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the 3rd international
symposium on
euroasian
biodiversity 

Abstract eBook

JULY 05-08
2017 MINSK
BELARUS

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Dear Colleagues,

It is great pleasure that we invite you to the The 3rd International Symposium on EuroAsian Biodiversity (SEAB2017) which will be held from June 5th to 8th, 2017 at Belarusian State University in Minsk, BELARUS.

Symposium will include invited talks, plenary talks given by selected pioneers of biodiversity, panel discussions and oral/poster presentations. The sessions will focus on the most recent scientific findings in the area of biodiversity and its related issues. By providing a highly interactive platform, this symposium will seek the views and creative ideas on novel approaches in biodiversity research and its other field applications.

We look forward to your participation in the The 4th International Symposium on EuroAsian Biodiversity (SEAB2018).

Best Regards,

SEAB2017 Organization Committee



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INVITED SPEAKERS



Prof. Dr. Vadim DEMIDCHIK

Department of Plant Cell Biology and Bioengineering
Biological Faculty
Belarusian State University, BELARUS

Speech Title: Reactive oxygen species in higher plants



Prof. Dr. Güven GÖRK

Department of Biology
Faculty of Arts and Sciences
Muğla Sıtkı Koçman University, TURKIYE

Speech Title: Traditional knowledge of wild edible endemic plants used in Turkiye



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POSTER PRESENTATION GUIDE

Posters will be on display in the Poster Area. This year we will have two full day poster sessions. Each poster session is divided into two time slots, as follows:

Thursday: First Group: 10:30 to 12:15, Second Group: 14:30-16:30

Friday: First Group: 10:30 to 12:15, Second Group: 14:30-16:30

Authors must be present during BOTH TIME SLOTS. Posters must be posted in exact time, and they must be removed after time ended.

Poster Size and Instructions

- One poster board is allocated to each presentation. The recommended poster size is 90 cm high by 60 cm wide.
- Posters must be mounted using tapes/pins provided by the organizing committee.
- Please note that there will be two poster sessions for exact day, therefore two posters will use the same board in the day, one in the morning and one in the afternoon. For this reason, be considerate and remove your poster in the designated time after your session is over, to allow enough time to the next authors to place their posters.
- Each poster presenter is required to defend his/her poster during the respective poster session slot for the paper to be included in the conference proceedings.
- The title of your poster paper should be done in block letters which are AT LEAST 36-72 punto.
- All text must be easily readable from a distance of 1 to 2 meters. Make the lettering at least 1 cm high, smaller lettering will not be legible from a distance of 1 to 2 meters.
- All graphs and charts should be AT LEAST 15 X 20 cm or larger.
- It is a good idea to sequentially number your materials in the poster. This will indicate to the viewer a logical progression through your Poster Paper Presentation.
- Provide an introduction (outline) and a summary or conclusion for your Poster Paper Presentation.
- Prepare your Poster Paper Presentation carefully so that it can be used as the basis to explain and answer questions from the viewers.
- It is helpful to have copies of the written version of your paper available for those viewers who may want to study specifics of your work in more detail.



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ORAL PRESENTATION GUIDE

Observing Your Allotted Time

- The total time allotted to each speaker is 15 minutes. You should plan to speak for 10 minutes and leave 5 minutes for questions.
- Invited speakers have twice this time, 60 minutes in total, and they should plan to speak for about 50 min, leaving 10 min. for questions.
- There is **NO EXCUSE** for using more than your allotted time. Rehearse your presentation several times; projecting slides and doing anything else you would otherwise expect to do at the meeting.
- It is a discourtesy to your audience, the Session Chair and the other speakers to exceed your allotted time.
- The Session Chairs are instructed to adhere to the printed schedule for the session. With parallel sessions this is critical to the overall success of the conference.



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GENERAL INFORMATION

Main Venue

Biological Faculty
Belarusian State University



Symposium Rooms

Oral presentations: Salon A, B, C, D, E, F. Poster presentations: Faculty Building, Floor A

Language

English is the predominant language in symposium.

Currency and Banks

The Belarusian Ruble (code: BYR) is the currency of Belarus. One dollar is ca. 2 rubles

Insurance

The meeting coordinators cannot accept any liability for personal injuries, loss or damage to properties belonging to participants, either during or as a result of the symposium. Participants are encouraged to take out their own personal travel insurance.

Name Badges and Materials

Name badges and meeting materials will be provided on-site at the registration desk. All participants are kindly requested to wear their name badge during all meeting functions and social events.

Shopping

Most shops and department stores are open from 09.00 – 20.00 (09 am – 8 pm) Major credit cards are widely accepted.

Weather

The climate in Minsk during this time is variable with temperatures between 20-23°C.

Time

Minsk is currently on Eastern Daylight Time, 3 hours ahead on Greenwich Mean Time (GMT).

Power

In Minsk the standard voltage is 220 V. The standard frequency is 50 Hz. The power sockets that are used are of type C / F.

SCIENTIFIC PROGRAMME FOR SEAB2017 - 5-8 July 2017 Minsk-BELARUS

05.07.2017

09:00-10:00	Registration(Kalvaryiskaia str. 9, 220004, Minsk)			
10:00-11:00	Opening Ceremony (Kalvaryiskaia str. 9, 220004, Minsk)			
11:00-11:45	Invited Speaker: Vadim DEMIDCHIK “Reactive oxygen species in higher plants”			
11:45-12:30	Invited Speaker: Güven GÖRK “Traditional knowledge of wild edible endemic plants used in Türkiye”			
12:30-14:00	Lunch(Juravinki Str. Yanki Kupala 25, Minsk)			
14:00-14:15	Coffee break (Faculty of Biology, Kurchatova St. 10, Minsk)			
Rooms	A	B	C	D
Chair(s):	Prof. Dr. Güven GÖRK	Prof. Dr. Temel SARIYILDIZ	Prof. Dr. Tofik MAMMADOV	Prof. Dr. Murat BARLAS
14:15-14:30	Kuddisi ERTUĞRUL	Ivan BORDOK	Katsiaryna KAKHANOUSKAYA	Ahmet KARATAŞ
	Numerical taxonomy of the genus <i>Psephellus</i> Cass. in Turkey	Collection of fungi strains at the Institute of Forest of the NAS of Belarus – preservation depositary of biological diversity of basidiomycetes	Comparative study of the kinetic parameters and thermodynamic parameters of thermal inactivation process of cow and goat milk lactoperoxidases	Two Examples of the Human Impact on the Shaping of Zoogeography From Turkey: Invasion and Drainage
14:30-14:45	Zeynep TOPRAK	Oktay YILDIZ	Liliya NADOLNIK	Maria MIKHAILOVA
	Species Delimitation and Assessment of Biodiversity: with emphasis on some Mediterranean <i>Silene</i> L. (Caryophyllaceae) Species	Eastern Beech (<i>Fagus orientalis</i>) Natural Regeneration and Forest Diversity	White, Brown, Beige Adipocytes: Modern Concepts of Function and Biological Role	Comparison of the Lowland and Lowland-Caucasian lines of the European bison (<i>Bison bonasus</i>)
14:45-15:00	Darya BELAMESYATSEVA	Pelin ACAR	Alensandr CHIRKIN	Tatiana ZHELEZNICHENKO
	The Herbarium of V.F. Kuprevich Institute of Experimental Botany and studies on fungal diversity in Belarus	The Phylogenetic Survey on Turkish <i>Salix</i> L. inferred from cpDNA and nrDNA data set	Proteolysis-Antiproteolysis System and Possible Mechanism of The Divergence of <i>Lymnaea stagnalis</i> and <i>Planorbarius corneus</i>	Production of bioactive substances with antiviral activity in <i>Nitraria schoberi</i> hairy roots culture
15:00-15:15	Metin ARMAĞAN	Turgay BİRTÜRK	Olga YAROSHO	Deniz İNNAL
	The Endemic Plants of Tunceli (Eastern Turkey)	Ecological Wood Anatomy of Naturally Grown <i>Acer cappadocicum</i> Gled. (Sapindaceae) Taxa in Turkey	Obtaining of callus tissue for representatives of the genus <i>Amaranthus</i> L.	Alien Fish Species of Göksu River Estuary (Mersin - Turkey)
15:15-15:30	Yavuz BAĞCI	Elshad GURBANOV	Yevgeny NIKOLAICHIK	Jakov DULČIĆ
	A new species of <i>Genista</i> , <i>Genista unalii</i> M. Dinç & Y. Bağcı	Arid-rare forests of Atropatan (Azerbaijan)	The diversity of <i>Pectobacterium</i> strains isolated in Belarus and worldwide	The State of the Art of the Adriatic Sea Ichthyofauna
15:30-15:45	Coffee break			

Chair(s):	Prof. Dr. Kuddusi ERTUĞRUL	Prof. Dr. Yavuz BAĞCI	Assoc. Prof. Dr. Ali Nafiz EKİZ	Prof. Dr. Orhan ADALI
15:45-16:00	Mesut KIRMACI General View of Turkish Bryoflora	Zafer KAYA Determination of Flora on Lava Columns in Bartın-Güzelcehisar Region in Turkey	Selma ÜLGENTÜRK Honeydew producer insects and their potential honeydew honey in Turkey	Alaattin ŞEN A promising neuroprotective agent for the treatment of multiple sclerosis: 3-beta-Hydroxyolean-12-en-28-oate isolated from <i>Capparis ovata</i>
16:00-16:15	Evren CABİ <i>Aegilops triuncialis</i> subsp. <i>bozdagense</i> (Poaceae), a new subspecies from South-Western Turkey	Alper UZUN Endemism Potential of Turkish Forests	Hüseyin ALLAHVERDİ A new genus record For Turkey Spider Fauna, Floronia Simon 1887 (Araneae/Linyphiidae)	Amangeldy BISSENBAEV <i>Arabidopsis thaliana</i> and wheat AP endonucleases contain the NIR function
16:15-16:30	Mortaza HAJYZADEH Germination of Scarified Seeds of Mediterranean Star of Bethlehem (<i>Ornithogalum ulophyllum</i> L.) Under In vitro Conditions	Aydın UZUN Genetic diversity of walnut (<i>Juglans regia</i> L.) genotypes selected from Central Anatolia region of Turkey with SRAP markers	M. Zeki YILDIRIM The Gastropod Fauna of the Antalya Kırkgöz Springs, Turkey	Mehmet ÇETİN The Effect of the Amount of CO ₂ on <i>Sansevieria trifasciata</i> in Indoor Environment
16:30-16:45	Kurtuluş ÖZGİŞİ ITS2 Secondary Structure and CBC Species Concept: A Case Study on the Genus <i>Noccaea</i> Moench (Brassicaceae)	Temel SARIYILDIZ Variation in some soil properties and soil organic carbon and total nitrogen stock capacities of Anatolian Chestnut: In relation to soil depths and altitudes	Deniz YAĞLIOĞLU The Molecular Systematic Analysis of Indo-pacific and Mediterranean <i>Barracuda</i> Species	Onur ÖZTÜRK Estimation of mutation age; population genetics data analysis, historical demography and geographical perspectives based on β -globin gene cluster haplotype variation in Denizli, Turkey
16:45-17:00	Bariş ÖZÜDOĞRU Historical biogeography of Anatolian alpine plant <i>Noccaea iberidea</i> (Boiss) Al-Shehbaz & Menke	Rukiye BORAN In vitro antioxidant and mutagenic activities of <i>Micromeria fruticosa</i> ssp. <i>brachycalyx</i> ethanol extract	Mevlüt GÜRLEK Molecular systematic analyse of the species of Triglidae family in the Mediterranean Sea	Alexey CHERESHNEV Construction of <i>Clostridium acetobutylicum</i> strain with enhanced production of n-butanol
17:00-17:15	Esra MARTİN Cytological studies of three taxa of <i>Anchonium</i> (Brassicaceae) section from Turkey	Lala DADASHOVA Influence of Unfavorable Factors to Biodiversity of Rare Geofits	Sema ÜLGENTÜRK Invasive Scale insects (Hemiptera: Coccoomorpha) of Turkey	Semih YILMAZ Protein Profiles of Seedy and Mutant Seedless Lemon Cultivars

Rooms	A	B	C	D	E	F
Chair(s):	Assoc. Prof. Dr. Evren CABI	Prof. Dr. İbrahim YOKAŞ	Prof. Dr. Alaattin ŞEN	Prof. Dr. İzzet KARA	Prof. Dr. M. Zeki YILDIRIM	Prof. Dr. Yakup KASKA
09:00-09:15	Kuddusi ERTUĞRUL Karyomorphological analysis of the Stenocephala section (Cousinia, Asteraceae) from Turkey	İhsan ALACABEY Adsorption Equilibrium Studies on the Raw and Activated Çaldıran Diatomite (Çaldıran/Van) of Heavy Metal (Lead)	Yusuf ALAN Molecular Identification and Plasmid Content Analysis of <i>Lactobacillus pentosus</i> and <i>Lactobacillus paraplantarum</i> Strains Isolated from Naturally Fermented Pickles	Zeynep KOLÖREN Molecular Characterization of <i>Acanthamoeba</i> species in Water Resources of Ordu Province in Turkey	Serkan GÜL Potential distribution in future of <i>Mertensiella caucasica</i> (Waga, 1876)	Mehmet Kıvanç AK The Effects of Simulation Techniques Used in Visual Quality Analysis on the Participants
09:15-09:30	Ahmet AKSOY Nickel hyperaccumulation in <i>Bupleurum croceum</i> Fenzl from serpentine soils in Yahyalı-Kayseri (Turkey)	Burcu DAŞER ÖZGİŞİ A Case Study on the Pollinator Bee Diversity: Barcoding the Members of the Genus Halictus s. str. Latreille (Halictidae: Apoidea: Hymenoptera) of Turkey	Hasan PINAR Comparing of in vitro and in vivo seed germination of wild fruit <i>Cerasus prostrata</i> collected from wild conditions	Murat BARLAS A Review on the Water Quality of important Streams of Muğla	Mahmut KABALAK Could using scanning electron microscope on Aedeagus morphology research make contributions to systematics of the family Elateridae (Coleoptera)?	Ayhan TOZLUOĞLU Thermo-Mechanical and Electrical Properties of Nanofibrillated Cellulose-PVA and Nanofibrillated Cellulose-Silica Composites
09:30-09:45	Semih YILMAZ Does Pomegranate Seed Oil Affect Protein Expression Levels	Hilal BAKİ A New Entomopathogen from <i>Altica hampei</i> (Allard, 1867) (Coleoptera: Chrysomelidae)	Ayşe Gül NASIRCILAR Usage of in vitro produced bulblets as an explant source for <i>Bellevia tauri</i> an endemic plant of Turkey	Ekrem Cem ÇANKIRILIGİL Scallop Species in Turkey and Evaluation in terms of Food Safety Considering 9th Task Group of Marine Strategy Framework Directive	Erol BAYHAN Distribution and Infestation Rate Melon Fly (<i>Myopordalis pardalina</i> (Dip: Tephritidae) in Diyarbakır (Turkey)	Hasan ÖZDEMİR Chemical Characterization of Wild Cherry (<i>Cerasus avium</i> L.) of Wood and Bark
09:45-10:00	Jeyran NAJAFOVA Morphogenesis of the buds and morphology of pollen Wild plum (<i>Prunus divaricata</i> L.) in Abseron conditions	Ali MİROĞLU An Interesting Dragonfly Record, <i>Selysiothemis nigra</i> (Vander Linden, 1825) from Black Sea Region of Turkey	Ali Ramazan ALAN Chromosome Doubling in Gynogenic <i>Allium cepa</i> and <i>A. ampeloprasum</i> Materials	Gürçay Kıvanç AKYILDIZ Assessment of Significant Water Quality Parameters and Distribution of Benthic Macroinvertebrates on Gediz Basin (Türkiye)	Yakup ŞENYÜZ Carabidae (Coleoptera) Records from Upland-Meadows of Türkmen Mountain (Kütahya-Eskişehir), Turkey	Ümit BÜYÜKSARI The Effect of Hydro-thermal Treatment on the Dimensional Stability of Particleboard Produced from Wheat Stalks
10:00-10:15	Özden ÖZGÜN ACAR Comparative Study of the Anti-inflammatory	Selime ÖLMEZ BAYHAN Aphids and Their Densities on Brassicaceae Plants in	Arzu B. MUSTAFAYEV Basic vegetation types of Shahdag National Park	Serdar AKSAN Autumn 2015 Plankton Bloom in İzmit Bay	Ali Nafiz EKİZ Determination of Geographical Distribution	Mehmet Kıvanç AK Valuation of the Plant Compositions at the

	Effects of Sub-extracts of the <i>Capparis ovata</i> Water Extract (COWE) Used as an Alternative and Complementary Treatment for Multiple Sclerosis	Diyarbakir Province of Turkey	(Azerbaijan)	(Marmara Sea)	Types by Using GIS software: Galerucinae (s. str.) (Coleoptera: Chrysomelidae) of Turkey	Spatial Level: A Case of Göztepe 60th Year Park
10:15-10:30	Coffee break					
Chair(s):	Prof. Dr. Esra MARTİN	Assoc. Prof. Dr. Necmi AKSOY	Assoc. Prof. Dr. Ümit BÜYÜKSARI	Prof. Dr. Nazime M. DOĞAN	Assoc. Pof. Dr. Deniz İNNAL	Prof. Dr. Hakan AKÇA
10:30-10:45	Mehmet Gökhan HALICI Similarities of Lichen biodiversity in Erciyes Mountain (Kayseri, Turkey) and James Ross Island (Antarctica)	Temel SARIYILDIZ Tree species effects on soil macro and micro nutrients in Turkish forest ecosystems: In relation to aspects and soil depths	E. Esin HAMES Isolation, Identification and Phytase Production Capacities of the Marine Derived Fungal Strains from Mediterranean Sponge and Sediment Samples	Esin POYRAZOĞLU ÇOBAN Biodiversity of Bacteria Isolated from Home-Made Wine and Vinegar	Nuri BAŞUSTA Otolith dimensions-total length relationships of Atlantic stargazer (<i>Uranoscopus scaber</i> Linnaeus, 1758) captured from northeastern Mediterranean	Serdar KARAKURT Polyphenolic Compound, Tannic Acid Inhibits proliferation of Human Colon Cancer and Induce Apoptosis
10:45-11:00	Mehmet Uğur YILDIRIM Successful Breaking Seed Dormancy of Immature Seeds of Charismatic and Endemic <i>Hyacinthella lineata</i> L. Under In vitro Conditions	Mehmet ÖZCAN Vegetation characteristics of forest gaps in Yuvacik watershed İzmit-Turkey	Yakup KUTLU Classification of Fish Families Using Texture analysis	Bahadır TÖRÜN Biodiversity of Fungi in Strawberry Fields in Anamur, Turkey	Filiz ÖZDEMİR Distribution and Threatened Status of Loach <i>Cobitis</i> (Pisces: Ostariophysi: Cobitidae) in Turkey	Ece Avuloğlu YILMAZ Assessment of The Possible Genotoxicity of Magnesium Diglutamate, a Food Additive, By Micronucleus Test in Human Lymphocytes
11:00-11:15	M. Cüneyt BAĞDATLI The Positive Impacts of Modern Irrigation Systems on Agricultural Biodiversity: A Case Study Nevşehir-Derinkuyu District of in Turkey	Hasan ÖZDEMİR Utilization of Harvesting Residue Wood Barks	Bülent YORULMAZ Evaluation Benthic Macroinvertebrate Fauna in Relation to Physical and Chemical Parameters in a small sized stream in SW Anatolia-Turkey	Handan ÇULAL KILIÇ Detection of Bean common mosaic virus in Bean (<i>Phaseolus vulgaris</i>) seeds growing in Antalya Province, Turkey	Murat YABANLI Arsenic Levels in Seven Marine Fish Species from the Eastern Aegean Sea and Health Risks Assessment for Consumers	Sevcen MAMUR Evaluation of Fusaric Acid Genotoxicity using Chromosomal Aberration Assay in Human Lymphocytes
11:15-11:30	Müge ETİK Determination of Genetic Differences	Ender MAKİNECİ Soil carbon under Maritime Pine (<i>Pinus pinaster</i> Aiton)	Hüseyin ŞAŞI The Structure of Fish Fauna in Dalyan-Iztuzu (Mugla,	Filiz Randa ZELYUT Detection of Lettuce viruses in Ankara (Turkey)	Ekrem Cem ÇANKIRILIGİL Amino Acid Composition of Cultured Black Sea	Sevtap KARAKURT Depletion of Cytotoxicity of Arsenic

	among <i>Salvia fruticosa</i> Mill. Populations from Muğla Turkey	plantations on sand dune restoration sites at Terkos (Durusu) – Istanbul	TURKEY)	Province	Trout (<i>Salmo trutta labrax</i> Pallas, 1811)	on Human Colon Cells After Modification of Ion Exchange Resins with Lysine
11:30-11:45	İlker ÇİNBİLGEL Species Diversity and Ethnobotanical Utilization of Lamiaceae in Akseki-Ibradı-Manavgat Districts (Antalya-Turkey)	Derya EŞEN Socio-economic Practices in Turkish Forests: A case for Muğla Regional Forestry Directorate, Turkey	Ekrem Cem ÇANKIRILIGİL Black Sea Trout (<i>Salmo trutta labrax</i> PALLAS, 1811) Culture in Turkey and Morphometric Characteristics of Fifth Culture Generation	Mehmet Hadi AYDIN Determination of sensitivity of <i>Trichoderma</i> species against some fungicides	Yusuf CEYLAN The sustainability of <i>Psetta maxima</i> populations threatened by bottom trawl fisheries in the Black Sea	Fusun GÜLSER Antioxidative Enzyme Activities in Pumpkin (<i>Cucurbita Pepo</i> L.) Influenced by Selenium Application Under Water Stress
11:45-12:00	Tural GASİMOV Species of family <i>Orthotrichaceae</i> Arn. (Bryopsida) in bryophyte flora of Azerbaijan	Derya Mumcu KÜÇÜKER The Relationship Between Some Stand and Topographic Variables on Mushroom Diversity in Northeastern of Turkey	F. Banu YALIM Parasitic Copepods (Crustacea, Copepoda) on Marine Fishes of The Antalya Bay, Turkey	Elif KALE Identification of the Cytochrome P4502D6 in the Metabolism of 5-Aminosalicylic Acid: In Vitro Investigations of Potential Co-Prescription Interactions	Abdurrahman KARA Evaluation of the Genetic Improvement Studies in Low Input Production Systems: Pırlak Sheep	Özgür CEYLAN Evaluation of anti-quorum sensing potential of <i>Origanum onites</i> L. and <i>Thymbra spicata</i> L.var. <i>intricata</i> P.H.Davis. essential oils
12:00-13:00	Lunch					
Chair(s):	Prof. Dr. Ahmet AKSOY	Assoc. Prof. Dr. Feyza CANDAN	Assoc. Prof. Dr. Yeşim KARA	Assoc. Prof. Dr. Şevki ARSLAN	Prof. Dr. Raşit URHAN	Prof. Dr. Yılmaz EMRE
13:00-13:15	Bilge TUNÇKOL Geophytes of the Küre Mountains National Park (Bartın Section)	Hayati ZENGİN Plant Richness of Fir (<i>Abies nordmanniana</i> ssp. <i>bornmuelleriana</i>) Stands Ranging at Aladağlar (Bolu) Region of Turkey	Siti MAESAROH Breaking Seed Dormancy under In vitro Germination of <i>Indigofera zollingeriana</i> Storage	Gürsel KARACA Distribution of <i>Pythium</i> species in Turkey	Mehmet Gökhan HALICI Ecology of <i>Candelariella</i> Distributed in Turkey	İhsan ALACABEY Sorption Kinetic and Equilibrium Studies of Methylene Blue on Diatomite (Çaldıran/Van)
13:15-13:30	Necmi AKSOY Riparian and Rocky Vegetation of the Argözü Valley in Kibriscik, Bolu	Derya EŞEN Forest Certification in the Turkish Forestry: An Assessment	H. Tuba BARLAS The Importance of Vermicompost on Converting Fertilization System From Chemical to Organic in Turkey	Hasan PINAR Determination of Genetic Diversity in the Fruit and Leaf Characteristics some quince genotypes collected from Kayseri region	Nedim ÖZDEMİR Evaluation of Water Quality Values of The Northern Coastal Line of Gökova Bay (Muğla-Turkey)	Ataç UZEL Xylanase Production of the Marine Derived Fungal Strains Isolated from Coastal Areas in Turkey
13:30-13:45	Mesut KIRMACI <i>Sphagnum</i> Peatlands of	Şemsettin KULAÇ Effects of Grafting Time and Type on Graft Success in	Derya Mumcu KÜÇÜKER Mapping of Spatial Distribution of <i>Boletus</i>	Eray ŞİMŞEK Identification of Genetic Diversity of Cucumber	Nuri BAŞUSTA Occurrence of trypanorhynch cestod	Hüseyin ŞAŞI Bentic Macroinvertebrate of

	Turkey	Chestnuts	<i>edulis</i> , and <i>Chanterelle cibarius</i>	Mosaic Virus in Pepper Fields in Şanlıurfa, Turkey	(parasite larvae) in blackmouth catshark, <i>Galeus melastomus</i> Rafinesque, 1810 (Scyliorhinidae) from Gulf of Antalya, Turkey	Koycegiz Lake (Mugla, Turkey)
13:45-14:00	Deniz HAZAR The Potential of Organic Laurel Production (<i>Laurus nobilis</i> L.) in the Mediterranean Region of Turkey	Sevinç ADİLOĞLU The Effect of Increasing Mycorrhiza Applications on Some Biological Properties of Baby Carrots (<i>Daucus carota</i> L.) Plants	Eray ŞİMŞEK Impacts of overuse of pesticides on biodiversity in agricultural production areas	H. Halil BIYIK Fungal Biodiversity of Strawberry Fields in Aydın, TURKEY	Deniz EKİNCİ Investigation of Inhibition Kinetics of Some Heavy Metals on Glucose-6-Phosphate Dehydrogenase Enzyme from Turbot Gill Tissue	Deniz MERCAN Determination of Water Quality and Diversity of Macroinvertebrates: A Case Study in Asi River Basin
14:00-14:15	Yusuf KURT Traditional Oil Production from Lamiaceae species and Utilization of Oil by Local People in Akseki-İbradi-Manavgat Districts (Antalya-Turkey)	Barbaros YAMAN Wood Anatomical Changes in Juvenile Stem of Common Alder due to Impact of Twining stem of Silkvine	Meral APAYDIN YAĞCI Trophic ecology of pike perch (<i>Sander lucioperca</i> Linnaeus, 1758) as revealed stable carbon and stable isotope ($\delta^{13}C$ and $\delta^{15}N$) in Lake Eğirdir (Turkey)	Kerem ÖZDEMİR Isolation, Identification and 16S r DNA Analysis of Micromonospora Bacteria From Van Lake Basin	Serdar AKSAN Invasive Freshwater Fish of Kocaeli Province/Turkey	İsmet BALIK Effect of depth on body size distribution of whiting, <i>Merlangius merlangus</i> , in the south-eastern coast of Black Sea
14:15-14:30	Marina KRİVOKHİZHA The low-doses of ionizing radiation impact on generative phase of <i>Arabidopsis thaliana</i>	Sevinç ADİLOĞLU The Effect of Increasing Mycorrhiza Applications on Nutrition of Pak Choi (<i>Brassica rapa</i> L. subsp. <i>chinensis</i> L.) Plant	Eray ŞİMŞEK Impacts of Climate Change on Biodiversity of Plant Pathogens	Daria NEFEDOVA Genomic DNA analysis for the Nod-gene of nodule bacteria, isolated from various territories	Bülent GÖZCELİOĞLU Biodiversity of Turkish Marine Sponges	Deniz MERCAN Gastropoda, Oligochaeta and Chironomidae Limnofauna of Van Lake Basin, Turkey
14:30-17:00	Social Events (Great Patriotic War Museum Visit)					

07.07.2017

Rooms	A	B	C	D	E	F
Chair(s):	Assoc. Prof. Dr. Mesut KIRMACI	Prof. Dr. Ahmet KARATAŞ	Prof. Dr. Nuri BAŞUSTA	Prof. Dr. Gürcan GÜLERYÜZ	Prof. Dr. Salih DOĞAN	Prof. Dr. Levent BAT
09:00-09:15	Emre ÇİLDEN Morphological, Palynological Properties	Yakup KASKA Monitoring And Conservation Studies On	Sedat PER A New record of rake legged mites from Turkey:	Yeşim KARA The use of HPLC in determination of	Mehmet YALÇIN Ascidians (Tunicata, Urochordata) Fauna of	İdris ŞENER An investigation of the effects of arsenite (As+3)

	and Seed Micromorphology of Genus <i>Reseda</i> L. (Resedaceae) in Turkey	Nile Soft-Shelled Turtle (<i>Trionyx triunguis</i>) During 2016 Nesting Season On Dalaman and Dalyan Nesting Beaches, Turkey	<i>Allocaeculus multispinosus</i> (Acari: Caeculidae)	endogenous hormones of <i>Hypericum retusum</i> Aucher exposed to UV- B and grown under in vitro conditions	Turkey Coasts	and Arsenate (As+5) ions on antioxidant enzyme system of the species <i>Echinodorus amazonicus</i> Rataj
09:15-09:30	Mehmet Gökhan HALICI	Akif KETEN	Sibel DOĞAN	Mahmut YILDIZTEKİN	Gazi GÖRÜR	Nuri BAŞUSTA
	The Lichenized Fungus Genus <i>Gyalolechia</i> (Teloschistales, Ascomycota) in Turkey	Mammals determined by wildlife camera trap in pure beech stand in Duzce in Turkey	Asymmetric variations in some species of the genus <i>Raphignathus</i> (Acari: Raphignathidae)	The Ameliorative Effects of Potassium applications on Tomato Plants Growing under Heavy Metal Stress	Ecological and zoogeographical implications of the determined aphid species from East and South eastern part of the Turkey	Length-weight and disc width-weight relationships of long- nosed skate (<i>Dipturus</i> <i>oxyrinchus</i>) obtained from Northeastern Mediterranean
09:30-09:45	Mikail AKBULUT	Gül OLGUN KARACAN	Raşit URHAN	Halit Seyfettin ATLI	Üzeyir ÇAĞLAR	Elvan ATILGAN
	Determination of Genetic Relationship among Local wheat landraces, Azerbaijan Originated wheat cultivars and Some Wild Wheat Genotypes by using ISSR	Genetic diversity in <i>Apodemus mystacinus</i> (Mammalia, Rodentia) based on SSRs in Anatolia	Final report for systematic studies on zerconid mites (Acari, Zerconidae) in Inner Aegean Region of Turkey	Clonal Almond Breeding by Crossing in Turkey	The Karyotype of the Jewel Beetle, <i>Anthaxia praeclara</i> Mannerheim, 1837 (Coleoptera: Buprestidae)	Relation between Seasonal Migration and Fishing of Bluefish (<i>Pomatomus saltatrix</i> L, 1766) Population in Turkish Coasts
09:45-10:00	Kadir Ersin TEMİZEL	Burak AKBABA	Mehmet KARACA	Hüseyin CÜCE	İsmail KARACA	Nedim ÖZDEMİR
	Effects of Irrigation Water Quality on Efficiency and Quality Parameters on Tobacco (<i>Nicotiana tabacum</i> sp.) Plant	Spatial and temporal distribution of Eurasian Lynx (<i>Lynx lynx</i> L. 1758) in north-western Turkey	Zerconid Mites (Acari: Zerconidae) Recorded from Denizli Province (Turkey)	Impacts of Agricultural Drainage on Trophic Structure in the Coastal Wetlands: A Case Study of Kızılırmak Delta in Turkey	Aphid Species (Hemiptera: Aphididae) Determined in Campus Areas of Isparta Province	Seasonal Changes of Chlorophyll-a Values of the Freshwater Sources Feeding in Gokova Bay (Mugla-Turkey)
10:00-10:15	Kuddusi ERTUĞRUL	Şafak BULUT	Sibel DOĞAN	Alla SHULGINA	Gökhan AYDIN	Ahmet Yavuz CANDAN
	Karyomorphological analysis of the Cynaroidae section (<i>Cousinia</i> , Asteraceae) from Turkey	Habitat Selection of Small Mammals in Soğuksu National Park (Ankara) in Turkey	The first description of all immature stages of <i>Eustigmaeus</i> <i>erzincanensis</i> (Acari: Stigmaeidae) from the Harşit Valley (Turkey)	Effect of high-coherent light on morphogenetic parameters of <i>Stevia</i> <i>rebaudiana</i> in vitro	Comparison of Biological Diversity Parameters at Apple Orchards	The Effects of Fungi in The Loggerhead Sea Turtles Nests, (<i>Caretta</i> <i>caretta</i> L.), at İztuzu Beach (Dalyan,Turkey)
10:15-10:30	Coffee break					
Chair(s):	Assoc. Prof. Dr. Metin	Prof. Dr. Gazi GÖRÜR	Prof. Dr. Halil BIYIK	Prof. Dr. Fatma ÜNAL	Prof. Dr. Gürsel KARACA	Assoc. Prof. Dr. Zeynep

ARMAĞAN				KOLÖREN		
10:30-10:45	Derya Mumcu KÜÇÜKER Inventory Methods of The Wild Edible Mushrooms for Sustainable Planning	Yakup KASKA Blood Cell Morphology and Blood Biochemistry of <i>Pelophylax bedriagae</i>	Ali Ramazan ALAN Turkish Doubled Haploid Onion (<i>A. cepa</i> L.) Lines	Mehmet MAMAY Harmful and Beneficial Insect Biodiversity in Pistachio Orchards (<i>Pistacia vera</i> L.) in Southeastern Anatolia Region of Turkey	İlker TOPAL Screening Of Bread Wheat Genotypes For Resistance To Crown And Root Rot Disease Causal Organism <i>Fusarium culmorum</i> (W.G. Smith) Under Irrigated Condition	Mevlüt GÜRLEK Length-Weight Relationship and Growth Features of the Red Gurnard <i>Chelidonichthys cuculus</i> (Triglidae) from Izmir Bay, Aegean Sea
10:45-11:00	Elza MAKARADZE Diversity of genus <i>Cyclamen</i> in Georgia	Akif KETEN Bird Diversity in Düzce Efteni Lake in Turkey	Arzu KASKA Responses of Cultivated and Wild Leeks to Gynogenesis Induction	Selime ÖLMEZ BAYHAN Heterocera (Lepidoptera) Species in Hazro District (Diyarbakır) of Turkey	Fatma YAMAN Investigation of the Antimicrobial Effect of Cleaning Products	Hüseyin ŞAŞI Some Population Parameters of Aegean Chub, <i>Squalius fellowesii</i> (Günther, 1868) in Dalaman River (Mugla, Turkey)
11:00-11:15	Mehmet ÇETİN The exchanging of leaf micromorphological characters in <i>Pyraecantha coccinea</i> depends on traffic intensity	Onur CANDAN Reproductive ecology of Soft-shelled Nile Turtle (<i>Trionyx triunguis</i>)	Bolatkhon ZAYADAN Replacement of phototrophic microorganisms collection by new prospective cyanobacteria strain	İsmail KARACA Insects on Lavander in Isparta Province, Turkey	Nazenin EFTEKHARİ Identification of a symbiotic Nitrogen fixing bacteria from <i>Cronanthus orientalis</i>	Yakup KUTLU The Landmarks Prediction for streaked gurnard <i>Chelidonichthys lastoviza</i> using Artificial Neural Networks
11:15-11:30	Elif ATMACA The Evaluation of the Floristic and Growth Environment in terms of Landscape Architecture through the Border of Düzce City Center of Riparian Region of Asar Suyu	Abdurrahman KARA Evaluation of the Genetic Improvement Studies in Low Input Production Systems: Karya Sheep	Azada ZAMANOVA Treatment of contaminated areas through <i>Opuntia vulgaris</i> Mill	Sultan ÇOBANOĞLU Mite Biodiversity in Vineyards of Ankara	Irina LYAPINA Biotechnological methods of obtaining brand new decorative characteristics of <i>Linum grandiflorum</i> Desf.	Cemal TURAN Some Biological Characteristics of the White Grouper <i>Epinephelus aeneus</i> from the Iskenderun Bay, Northeastern Mediterranean
11:30-11:45	Begüm PARLAK Investigation of Effects of Chaste Tree (<i>Vitex agnus-castus</i> L.) on Diabetic Wound Healing in Rats	Yakup KASKA Age structures and Growth Parameters in three populations of Levanten Frog, <i>Pelophylax bedriagae</i>	Anna S. DOBRONOĞOVA Bioontologies as a tool for plant research	Yakup ŞENYÜZ Phenology and Vertical Distribution of Aphodiinae (Coleoptera: Scarabaeidae: Aphodiinae) in Bozdag Mountain, Turkey	Natalia ZAGOSKINA Biotechnology <i>in vitro</i> and plant biological resources	Mevlüt GÜRLEK Genetic Analyses of Streaked Gurnard <i>Trigloporus lastoviza</i> Populations in Turkish Marine Waters

12:00-13:00 Lunch						
Chair(s):	Prof. Dr. Oktay YILDIZ	Assoc. Prof. Dr. Barbaros YAMAN	Pof. Dr. Mustafa DURAN	Prof. Dr. Cemal TURAN	Prof. Dr. İsmail KARACA	Prof.Dr. Selime ÖLMEZ BAYHAN
13:00-13:15	Alper UZUN	Vladimir TITOK	Siti MAESAROH	Hakan AKÇA	Mehmet MAMAY	Ahmet DEMİRAK
	Lithophyte Plant Diversity of Turkey	National reserve gene pool of rare species the natural flora of Belarus - new ex situ conservation concepts	Preliminary Tissue Culture of Legume <i>Indigofera zollingeriana</i>	Different Plant Extracts Effect Proliferation and NO Activity in NSCLC Cell Lines	Population Density of Overwintering Larvae of Carob Moth [Apomyelois (=Ectomyelois) ceratoniae Zell. (Lepidoptera: Pyralidae)] in Pomegranate Orchards in Southeastern Anatolia	Vertical Distribution of Lead (Pb) in Sediment Cores Taken From Köyceğiz Lake (TURKEY)
13:15-13:30	Feyza CANDAN	Mehlika ALPER	Arzu KASKA	Sultan ÇOBANOĞLU	Halit Seyfettin ATLI	Mehmet Cengiz DEVAL
	Macromorphological and Micromorphological Floral Peculiarities of <i>Acantholimon</i> Boiss. (Plumbaginaceae) genus from Turkey	Potential cytotoxic and anti-inflammatory effects of aetonic extracts of leaves of <i>Datura stramonium</i> and fruits of <i>Pyrus elaeagnifolia</i>	Morphological and Cytological Characterization of Gynogenic Garlic Chive (<i>Allium tuberosum</i> Rottler ex Spreng) Lines	Modeling relative risk infected plants using Poisson log linear model	Pistachio Rootstocks Breeding by Crossing <i>Pistacia khinjuk</i> Stocks and Some <i>Pistacia</i> Species for The Irrigated Area	Spatio-Temporal distribution of the bathyal Shark species off Antalya Bay, Eastern Mediterranean
13:30-13:45	Metin ARMAĞAN	Özgür CEYLAN	Ataç UZEL	İzzet KARA	Mahmut YILDIZTEKİN	Ahmet DEMİRAK
	The Contributions to Revision of <i>Gundelia</i> L. in Turkey	Some biological activities of five Asteraceae species from Turkey	Isolation and Antimicrobial Activity of a Rare Actinobacteria from Gülbahçe Bay, Aegean Sea	Antioxidant Properties of a Simmondsin: A Theoretical Study	Physiological Effects of The Brown Seaweed (<i>Ascophyllum nodosum</i>) and Humic Substances on Growth and Some Enzyme Activities of Pepper Plants Growing under Salt Stress	The Variations of Mercury and Aquatic Organic Matter in Lake Sediment Cores from Köyceğiz Lake (TURKEY)
13:45-14:00	Ceren SELİM	Nazenin EFTEKHARI	Ergun KAYA	Derya Mumcu KÜÇÜKER	Özlem DEMİRCİ	Mehmet MAMAY
	Molecular Markers Reveal Population Differentiation within <i>Dorystoechas hastata</i> Boiss. & Heldr. ex Bentham from Turkey	Investigation and Characterization of CRISPR-Cas system structure in Salmonella enterica Serovar enteritidis	Long-Term Conservation of Plant Genetic Resources Via Cryopreservation	Analysis of Mushroom Diversity Based on Some Ecological Factors with Some Biodiversity Indexes	Glyphosate-Based Herbicide Induced DNA Damage	The Expected Impact of Global Warming and Climate Change on Insect Biodiversity
14:00-14:15	Tubukhanum E. GASIMZADE	Aydın UZUN	Anastasia V. SOSINA	Eray ŞİMŞEK	Fatma ÜNAL	Serkan ŞAHİNKAYA
	Using of Some Plant Populations as Indicators	Identification of genetic variation among sweet orange cultivars using	Morphogenesis of <i>Dracocephalum moldavica</i> L. <i>in vitro</i>	Use of Next Generation Sequencing Technologies in Biodiversity Research	Genotoxic Effects of Environmental Contaminant	Disintegration of Waste Activated Sludge by Thermo-Chemical Pre-

	of Desertification	SRAP markers			Methidathion and Triadimenol Pesticides	treatment
14:15-14:30	Coffee break					
Chair(s):	Prof. Dr. Mehmet Gökhan HALICI	Prof. Dr. Aysel UĞUR	Assoc. Prof. Dr. Özgür CEYLAN	Prof. Dr. Ataç UZEL	Prof. Dr. İsmet BALIK	Assoc. Prof. Dr. Nurdan SARAÇ
14:30-14:45	Oktay YILDIZ Partial or Complete Removal of Understory Components Enhances or Limits Nutrient Availability for Tree Growth	Fatma ÖZDEMİR Molecular typing of <i>Staphylococcus aureus</i> from fish and ground beef	Ahmet Şükrü DEMİRCİ Investigation of xanthan biosynthesized by local isolate <i>X. axonopodis</i> pv. <i>vesicatoria</i>	Yeşim KARA A New Adsorbent to Remove Pb+2 and Zn+2 from Aqueous Solution Using Modified Bentonite Clay with <i>Pawlonia tomentosa</i> Extract (PAW/Bent)	Murat Nadi TAŞ Determination of the Aphid Species Feeding on Wheat and Their Population Growth In The District of Çumra and Karapınar (Konya)	Suna Muğan ERTUĞRAL Blue Economy Paradigm as Part of Sustainable Tourism: The Importance in Ecotourism
14:45-15:00	Necmi AKSOY Maquis Communities of Küre Mountains in Bartın, Turkey	Seydi YIKMIŞ Phenotypic and Genotypic Characterization of <i>Lactobacillus</i> spp. Isolated from Dairy Products and Determination Probiotic Properties	Fevziye CELEBI-TOPRAK Importance of Sucrose in Gynogenesis Induction in Two Turkish leek (<i>Allium ampeloprasum</i> var. <i>porrum</i>) lines	Mahmut YILDIZTEKİN Mitigating Effects of Ascorbic Acid and Potassium Nitrate on Salt-induced Oxidative Stress in Tomato Plants	Seval ARAS Invetebrate Limnofauna of Kızılırmak River (Nevşehir) and Their Relation with Environmental Variables	Ayşe Diljin KECECİ Herbal Alternatives to Synthetic Root Canal Disinfection in Human Teeth
15:00-15:15	Alper UZUN Plant Biodiversity in the Old World (A Case Study for Amedi District in the Northern Iraq)	Burak TOP Production of Bacterial Cellulose and Isolation of Acetic Acid Bacterium from Wine Vinegar	Merve Dilmaç AYDIN Immobilization and Characterization of Laccase from <i>Pleurotus ostreatus</i> to P(MMA-co-MAH)-Cu(II) Nanoparticles	Yılmaz EMRE Effects of Cyclamen graecum and Prospero autumnale on growth performance of rainbow trout (<i>Oncorhynchus mykiss</i>)	Abdullah YİNANÇ Alternatives of Different Refinement and Transmission System Applications in Refining and Reusing of Wastewater at Namık Kemal University	Suna Muğan ERTUĞRAL An Assessment Of Ecotourism And Recreational Activities In Nature Protection Areas: Case Of Nature Parks Of Sinop, Turkey
15:15-15:30	Ömer SÖZEN A Research on the Determination of Qualitative and Quantitative Features of Local Dry Bean Populations Collected from Kirsehir Province of Turkey	Aysel UĞUR Synergistic Antimicrobial Activity of Boric Acid and Biosynthesized-Hydroxyapatite against Oral Pathogenic Microorganism	Fevziye CELEBI-TOPRAK Gynogenesis Induction Studies in Wild Chive (<i>Allium schoenoprasum</i> L.)	İzzet KARA The Electrical conductivities of some plant extracts	Ahmet DEMİRAK Determination of cadmium(Cd) in samples of sediment cores, water and biota in Köyceğiz Lake (Turkey)	Hüseyin SARI Assessment of Chemical Properties of the Soils in the Catena Which Forms Tekirdağ Değirmenaltı-Muratlı Intersection Ringroad
15:30-15:45	Hatice Tuba SELÇUK	Nurdan SARAÇ	Olga V. ZUDOVA	Ayşe KURU	Kadir Ersin TEMİZEL	Hakan ARSLAN

	Investigation of Nutrient Contents of Tomato Plants Grown in Greenhouses in Elmali-Antalya Region	The antistreptococcal and antibiofilm activities of <i>Citrus bergamia</i> Risso et Poiteau oil, an alternative for oral infections	In vitro morphogenetic potential of <i>Sedum</i> L. representatives	Determination of the allelopathic effects of Jojoba (<i>Simmondsia chinensis</i> Link Scheinder) and Lavender (<i>Lavandula angustifolia</i>) plants on the seed germination and hormone development of different cultivated plants	Effects of Salt Stress and Water Amount on Plant Growth and Yield of Purple Coneflower (<i>Echinacea purpurea</i> L.)	Comparison of four spatial interpolation methods for some soil properties in corn grown areas, Northern part of Turkey
15:45-16:00	Ali AYDIN How can we evaluate the speed and movement direction of creep due to trees?	Hulya OZGONEN OZKAYA The effect of Glomus intraradices on gossypol synthesis of <i>Verticillium dahliae</i> inoculated cotton plants	Oxana POLIVANOVA Introduction to in vitro culture and micropropagation of two <i>Agastache</i> species - <i>Agastacheurticifolia</i> and <i>Agastachescropulariifolia</i>	Hilal BAKİ Antifeedant effects of <i>Tanacetum alyssifolium</i> extracts from Asteraceae family against <i>Ephestia kuehniella</i> Z. (Lepidoptera:Pyralidae)	Erkan KALIPÇI Obtaining Biogas From Animal And Agricultural Energy in Nevsehir City	Gürkan SEMİZ Methyl jasmonate-mediated induced volatiles in <i>Pinus brutia</i> from Turkey
16:00-16:30	Namik Rasydov: Biodiversity sketches of Ukraine, Welcome to Kiev, Ukraine for 2018					
20:00-23:30	GALA DINNER (Kafe SPADCINA - Street Pobediteley 23, Minsk)					

08.07.2017

Rooms

A

Chair(s):	Prof. Dr. Olcay DÜŞEN & Assoc. Prof. Dr. G. Kıvanç AKYILDIZ
10:00-10:15	Mithat GÜLLÜ Taxonomic, ecological and phylogenetic investigation of lichens belonging to <i>Acarospora cervina</i> group in Turkey
10:15-10:30	Emre KILIÇ Ecological Properties of The Lichenized and Lichenicolous Fungi in Çamlıyayla, Mersin, East Mediterranean, Turkey.
10:30-10:45	Murat TURAN Biolarvacidal and Antioxidant Activity of <i>Cyclamen parviflorum</i>
10:45-11:00	Hüseyin OZCELİK Dry Bean Bio-Diversity in Kelkit Valley
11:00-11:15	Polina Ya. TRETIAKOVA Evaluation of Variance of Some Valuable Features of Einkorn
11:15-11:30	Coffee break
11:30-12:00	Closing Ceremony(Faculty of Biology, Kurchatova St. 10, Minsk)
12:00-15:00	Social Events (Botanical Garden Visit)

Poster No:	Date and Time:
Poster Presentation No: PP101 to PP200	06.07.2017 Thursday 09:30 - 12:00
Poster Presentation No: PP201 to PP300	06.07.2017 Thursday 12:00 - 14:30
Poster Presentation No: PP301 to PP400	07.07.2017 Friday 09:30 - 12:00
Poster Presentation No: PP401 to PP506	07.07.2017 Friday 13:00 - 15:30

Table of Contents

ORAL PRESENTATIONS	45
A Case Study on the Pollinator Bee Diversity: Barcoding the Members of the Genus <i>Halictus</i> s. str. Latreille (Halictidae: Apoidea: Hymenoptera) of Turkey.....	12
A New Entomopathogen from <i>Altica hampei</i> (Allard, 1867) (Coleoptera: Chrysomelidae).....	13
A new genus record For Turkey Spider Fauna, <i>Floronina</i> Simon 1887(Araneae/Linyphiidae).....	14
A New record of rake legged mites from Turkey: <i>Allocaeculus multispinosus</i> (Acari: Caeculidae)	15
Age structures and Growth Parameters in three populations of Levanten Frog, <i>Pelophylax bedriagae</i>	16
An Interesting Dragonfly Record, <i>Selysiothemis nigra</i> (Vander Linden, 1825).....	17
Aphids and Their Densities on Brassicaceae Plants in Diyarbakir Province of Turkey	18
Ascidians (Tunicata, Urochordata) Fauna of Turkey Coasts	19
Asymmetric variations in some species of the genus <i>Raphignathus</i> (Acari: Raphignathidae)	20
Blood Cell Morphology and Blood Biochemistry of <i>Pelophylax bedriagae</i>	21
Carabidae (Coleoptera) Records from Upland-Meadows of Türkmen Mountain (Kütahya-Eskişehir), Turkey	22
Classification of Fish Families Using Texture analysis.....	23
Comparison of the Lowland and Lowland-Caucasian lines of the European bison (<i>Bison bonasus</i>).....	24
Could Using Scanning Electron Microscope on Aedeagus Morphology Research Make Contributions to Systematics of the Family Elateridae (Coleoptera)?	25
Determination of Geographical Distribution Types by Using GIS software: Galerucinae (s. str.) (Coleoptera: Chrysomelidae) of Turkey.....	26
Distribution and Infestation Rate Melon Fly (<i>Myopardalis pardalina</i> (Dip: Tephritidae) in Diyarbakır (Turkey).....	27
Distribution and Threatened Status of Loach <i>Cobitis</i> (Pisces: Ostariophysi: Cobitidae) in Turkey.....	28
Ecological and zoogeographical implications of the determined aphid species from East and South eastern part of the Turkey	29
Final report for systematic studies on zerconid mites (Acari, Zerconidae) in Inner Aegean Region of Turkey	30
Genetic diversity in <i>Apodemus mystacinus</i> (Mammalia, Rodentia) based on SSRs in Anatolia.....	31
Harmful and Beneficial Insect Biodiversity in Pistachio Orchards (<i>Pistacia vera</i> L.) in Southeastern Anatolia Region of Turkey.....	32
Heterocera (Lepidoptera) Species in Hazro District (Diyarbakır) of Turkey	33
Insects on Lavander in Isparta Province, Turkey	34
Mite Biodiversity in Vineyards of Ankara.....	35
Phenology and Vertical Distrubition of Aphodiinae (Coleoptera: Scarabaeidae: Aphodiinae) in Bozdag Mountain, Turkey	36
Reproductive ecology of Soft-shelled Nile Turtle (<i>Trionyx triunguis</i>)	37
Some Population Parameters of Aegean Chub, <i>Squalius fellowesii</i> (GÜNTHER, 1868) in Dalaman River (Mugla, TURKEY).....	38
The first description of all immature stages of <i>Eustigmaeus erzincanensis</i> (Acari: Stigmaeidae) from the Harşit Valley (Turkey).....	39
The Karyotype of the Jewel Beetle, <i>Anthaxia praeclara</i> Mannerheim, 1837 (Coleoptera: Buprestidae)..	40

The Landmarks Prediction for streaked gurnard <i>Chelidonichthys lastoviza</i> using Artificial Neural Networks.....	41
Zerconid Mites (Acari: Zerconidae) Recorded from Denizli Province (Turkey).....	42
Antioxidant Properties of a Simmondsin: A Theoretical Study	43
Antioxidative Enzyme Activities in Pumpkin (<i>Cucurbita Pepo</i> L.) Influenced by Selenium Application Under Water Stress.....	44
Comparative study of the kinetic parameters and thermodynamic parameters of thermal inactivation process of cow and goat milk lactoperoxidases	45
Determination of cadmium(Cd) in samples of sediment cores, water and biota in Köyceğiz Lake (Turkey)	46
White, Brown, Beige Adipocytes: Modern Concepts of Function and Biological Role	47
A new species of <i>Genista</i> , <i>Genista unalii</i> M. Dinç & Y. Bağcı	48
A Research on the Determination of Qualitative and Quantitative Features of Local Dry Bean Populations Collected from Kirsehir Province of Turkey	49
A Review on the Water Quality of important Streams of Muğla	50
Aphid Species (Hemiptera: Aphididae) Determined in Campus Areas of Isparta Province	51
Biotechnology <i>in vitro</i> and Plant Biological Resources	52
Comparison of Biological Diversity Parameters at Apple Orchards	53
Determination of Genetic Differences among <i>Salvia fruticosa</i> Mill. Populations from Muğla Turkey	54
Diversity of Genus <i>Cyclamen</i> in Georgia.....	55
Dry Bean Bio-Diversity in Kelkit Valley	56
Evaluation Benthic Macroinvertebrate Fauna in Relation to Physical and Chemical Parameters in a small sized stream in SW Anatolia-Turkey	57
General View of Turkish Bryoflora	58
Geophytes of the Küre Mountains National Park (Bartın Section).....	59
Influence of Unfavorable Factors to Biodiversity of Rare Geofits	60
Monitoring and Conservation Studies on Nile Soft-Shell Turtle (<i>Trionyx triunguis</i>) During 2016 Nesting Season on Dalaman and Dalyan Nesting Beaches, Turkey.....	61
Potential distribution in future of <i>Mertensiella caucasica</i> (Waga, 1876).....	62
Spatial and temporal distribution of Eurasian Lynx (<i>Lynx lynx</i> L. 1758) in north-western Turkey	63
<i>Sphagnum</i> Peatlands of Turkey	64
The Potential of Organic Laurel Production (<i>Laurus nobilis</i> L.) in the Mediterranean Region of Turkey	65
The Structure of Fish Fauna in Dalyan-Iztuzu (Mugla, TURKEY).....	66
Amino Acid Composition of Cultured Black Sea Trout (<i>Salmo trutta labrax</i> PALLAS, 1811).....	67
Antifeedant effects of <i>Tanacetum alyssifolium</i> extracts from Asteraceae family against <i>Ephestia kuehniella</i> Z. (Lepidoptera:Pyralidae).....	68
Arsenic Levels in Seven Marine Fish Species from the Eastern Aegean Sea and Health Risks Assessment for Consumers	69
Assessment of The Possible Genotoxicity of Magnesium Diglutamate, a Food Additive, By Micronucleus Test in Human Lymphocytes	70
Honeydew producer insects and their potential honeydew honey in Turkey	71
<i>In vitro</i> Antioxidant and Mutagenic Activities of <i>Micromeria fruticosa</i> ssp. <i>brachycalyx</i> Ethanol Extract	72
Scallop Species in Turkey and Evaluation in terms of Food Safety Considering 9 th Task Group of Marine Strategy Framework Directive.....	73
Historical biogeography of Anatolian alpine plant <i>Noccaea iberidea</i> (Boiss) Al-Shehbaz & Menke.....	74

Plant Biodiversity in the Old World (A Case Study for Amedi District in the Northern Iraq)	75
Species Diversity and Ethnobotanical Utilization of Lamiaceae in Akseki-İbradı-Manavgat Districts (Antalya-Turkey).....	76
The Gastropod Fauna of the Antalya Kırkgöz Springs, Turkey	77
Using of Some Plant Populations as Indicators of Desertification in Azerbaijan	78
Alien Fish Species of Göksu River Estuary (Mersin - Turkey).....	79
Invasive Scale Insects (Hemiptera: Coccoomorpha) of Turkey	80
The State of the Art of the Adriatic Sea Ichthyofauna.....	81
Two Examples of the Human Impact on the Shaping of Zoogeography From Turkey: Invasion and Drainage	82
Wood Anatomical Changes in Juvenile Stem of Common Alder due to Impact of Twining stem of Silkvine.....	83
A New Adsorbent to Remove Pb ⁺² and Zn ⁺² from Aqueous Solution Using Modified Bentonite Clay with <i>Pawlonia tomentosa</i> Extract (PAW/Bent).....	84
A promising Neuroprotective Agent for the Treatment of Multiple Sclerosis: 3-beta-Hydroxyolean-12-en- 28-oate Isolated from <i>Capparis ovata</i>	85
Biotechnological Methods of Obtaining Brand new Decorative Characteristics of <i>Linum grandiflorum</i> Desf.	86
Black Sea Trout (<i>Salmo trutta labrax</i> PALLAS, 1811) Culture in Turkey and Morphometric Characteristics of Fifth Culture Generation.....	87
Breaking Seed Dormancy under <i>In vitro</i> Germination of <i>Indigofera zollingeriana</i> Storage	88
Chromosome Doubling in Gynogenic <i>Allium cepa</i> and <i>A. ampeloprasum</i> Materials.....	89
Collection of Fungi Strains at the Institute of Forest of the NAS of Belarus – Preservation Depository of Biological Diversity of Basidiomycetes Mycologic Resources	90
Comparing of <i>in vitro</i> and <i>in vivo</i> seed germination of wild fruit <i>Cerasus prostrata</i> collected from wild conditions.....	91
Determination of Genetic Diversity in the Fruit and Leaf Characteristics Some Quince Genotypes Collected from Kayseri Region	92
Effect of High-coherent Light on Morphogenetic Parameters of <i>Stevia rebaudianain vitro</i>	93
Effects of Grafting Time and Type on Graft Success in Chestnuts	94
Estimation of mutation age; population genetics data analysis, historical demography and geographical perspectives based on β -globin gene cluster haplotype variation in Denizli, Turkey	95
Gynogenesis Induction Studies in Wild Chive (<i>Allium schoenoprasum</i> L.)	96
Immobilization and Characterization of Laccase from <i>Pleurotus ostreatus</i> to P(MMA-co-MAH)-Cu(II) Nanoparticles	97
Importance of Sucrose in Gynogenesis Induction in Two Turkish leek (<i>Allium ampeloprasum</i> var. porrum) Lines.....	98
<i>In vitro</i> Morphogenetic Potential of <i>Sedum</i> L. Representatives	99
Introduction to <i>in vitro</i> Culture and Micropropagation of two Agastache species - Agastache Urticifolia and Agastache Scrophulariifolia.....	100
Investigation of Xanthan Biosynthesized by Local Isolate <i>X. axonopodispv. Vesicatoria</i>	101
Isolation and Antimicrobial Activity of a Rare Actinobacteria from Gülbahçe Bay, Aegean Sea	102
Long-Term Conservation of Plant Genetic Resources via Cryopreservation	103
Morphogenesis of <i>Dracocephalum moldavica</i> L. <i>In Vitro</i>	104
Morphological and Cytological Characterization of Gynogenic Garlic Chive (<i>Allium tuberosum</i> Rottler ex Spreng) Lines.....	105
Obtaining of Callus Tissue for Representatives of the Genus <i>Amaranthus</i> L.	106

Preliminary Tissue Culture of Legume <i>Indigofera zollingeriana</i>	107
Protein Profiles of Seedy and Mutant Seedless Lemon Cultivars	108
Replacement of Phototrophic Microorganisms Collection by New Prospective Cyanobacteria Strain...	109
Responses of Cultivated and Wild Leeks to Gynogenesis Induction.....	110
The Electrical conductivities of some plant extracts	111
The Use of HPLC in Determination of Endogenous Hormones of <i>Hypericum retusum</i> Aucher Exposed to UV- B and Grown Under <i>in vitro</i> Conditions.....	112
Treatment of Contaminated Areas through <i>Opuntia vulgaris</i> Mill.	113
Turkish Doubled Haploid Onion (<i>A. cepa</i> L.) Lines	114
Usage of <i>in vitro</i> Produced Bulblets as an Explant Source for <i>Bellevallia tauri</i> an Endemic Plant of Turkey	115
Xylanase Production of the Marine Derived Fungal Strains Isolated from Coastal Areas in Turkey	116
An Assessment of Ecotourism and Recreational Activities In Nature Protection Areas: Case of Nature Parks of Sinop, Turkey	117
Blue Economy Paradigm as Part of Sustainable Tourism: The Importance in Ecotourism	118
Alternatives of Different Refinement and Transmission System Applications in Refining and Reusing of Wastewater at Namık Kemal University	119
An Investigation of the Effects of Arsenite (As ⁺³) and Arsenate (As ⁺⁵) Ions on Antioxidant Enzyme System of The Species, <i>Echinodorus Amazonicus</i> Rataj	120
Depletion of Cytotoxicity of Arsenic on Human Colon Cells After Modification of Ion Exchange Resins with Lysine	121
Evaluation of Fusaric Acid Genotoxicity using Chromosomal Aberration Assay in Human Lymphocytes	122
Genotoxic Effects of Environmental Contaminant Methidathion and Triadimenol Pesticides	123
Glyphosate-Based Herbicide Induced DNA Damage.....	124
Impacts of Agricultural Drainage on Trophic Structure in the Coastal Wetlands: A Case Study of Kizilirmak Delta in Turkey	125
Impacts of Overuse of Pesticides on Biodiversity in Agricultural Production Areas.....	126
Invertebrate Limnafauna of Kızılırmak River (Nevşehir) and Their Relation with Environmental Variables.....	127
Polyphenolic Compound, Tannic Acid Inhibits proliferation of Human Colon Cancer and Induce Apoptosis.....	128
The Importance of Vermicompost on Converting Fertilization System From Chemical to Organic in Turkey	129
Analysis of Mushroom Diversity Based on Some Ecological Factors with Some Biodiversity Indexes	130
Basic vegetation types of Shahdag National Park (Azerbaijan)	131
Chemical Characterization of Wild Cherry (<i>Cerasus avium</i> L.) of Wood and Bark.....	132
Determination of Flora on Lava Columns in Bartın-Güzelcehisar Region in Turkey.....	133
Eastern Beech (<i>Fagus orientalis</i>)Natural Regeneration and Forest Diversity	134
Ecological Wood Anatomy of Naturally Grown <i>Acer cappadocicum</i> Gled. (Sapindaceae) Taxa in Turkey	135
Endemism Potential of Turkish Forests.....	136
Forest Certification in the Turkish Forestry: An Assessment	137
Mapping of Spatial Distribution of <i>Boletus edulis</i> , and <i>Chanterelle cibarius</i>	138
Maquis Communities of Küre Mountains in Bartın, Turkey.....	139

Partial or Complete Removal of Understory Components Enhances or Limits Nutrient Availability for Tree Growth.....	140
Plant Richness of Fir (<i>Abies nordmanniana</i> ssp. <i>bornmuelleriana</i>) Stands Ranging at Aladağlar (Bolu) Region of Turkey.....	141
Riparian and Rocky Vegetation of the Argözü Valley in Kibriscik, Bolu	142
Socio-economic Practices in Turkish Forests: A case for Muğla Regional Forestry Directorate, Turkey	143
Soil carbon under Maritime Pine (<i>Pinus pinaster</i> Aiton) plantations	144
The Relationship Between Some Stand and Topographic Variables on Mushroom Diversity in Northeastern of Turkey	145
Tree species effects on soil macro and micro nutrients in Turkish forest ecosystems: In relation to aspects and soil depths.....	146
Utilization of Harvesting Residue Wood Barks	147
Vegetation Characteristics of Forest Gaps in Yuvacık Watershed, Izmit/Turkey	148
Production of Bioactive Substances with Antiviral Activity in <i>Nitraria schoberi</i> Hairy Roots Culture .	149
Cytological studies of three taxa of <i>Anchonium</i> (Brassicaceae) section from Turkey	150
Evaluation of the Genetic Improvement Studies in Low Input Production Systems: Karya Sheep	151
Evaluation of the Genetic Improvement Studies in Low Input Production Systems: Pırlak Sheep	152
Evaluation of variance of some valuable features of einkorn.....	153
Genetic Analyses of Streaked Gurnard <i>Trigloporus lastoviza</i> Populations in Turkish Marine Waters....	154
Genetic Diversity of Walnut (<i>Juglans regia</i> L.) Genotypes Selected from Central Anatolia Region of Turkey with SRAP Markers	155
Identification of Genetic Variation Among Sweet Orange Cultivars using SRAP Markers.....	156
Investigation and Characterization of CRISPR-Cas system structure in <i>Salmonella enterica</i> Serovar <i>enteritidis</i>	157
Molecular Markers Reveal Population Differentiation within <i>Dorystoechas hastata</i> Boiss. & Heldr. ex Bentham from Turkey.....	158
Molecular systematic analyse of the species of Triglidæ family in the Mediterranean Sea.....	159
National reserve gene pool of rare species the natural flora of Belarus - new <i>ex situ</i> conservation concepts	160
The Molecular Systematic Analysis of Indo-pacific and Mediterranean Barracuda Species	161
The Phylogenetic Survey on Turkish <i>Salix</i> L. inferred from cpDNA and nrDNA data set	162
Comparative Study of the Anti-inflammatory Effects of Sub-extracts of the <i>Capparis ovata</i> Water Extract (COWE) Used as an Alternative and Complementary Treatment for Multiple Sclerosis	163
Evaluation of Anti-quorum Sensing Potential of <i>Origanum onites</i> L. and <i>Thymbra spicata</i> L.var. <i>intricata</i> P.H.Davis. Essential Oils	164
Identification of the Cytochrome P4502D6 in the Metabolism of 5-Aminosalicylic Acid: <i>In Vitro</i> Investigations of Potential Co-Prescription Interactions	165
Investigation of Effects of Chaste Tree (<i>Vitex agnus-castus</i> L.) on Diabetic Wound Healing in Rats....	166
Potential cytotoxic and anti-inflammatory effects of aetonic extracts of leaves of <i>Datura stramonium</i> and fruits of <i>Pyrus elaeagnifolia</i>	167
Some biological activities of five <i>Asteraceae</i> species from Turkey	168
Construction of <i>Clostridium acetobutylicum</i> strain with enhanced production of n-butanol	169
Disintegration of Waste Activated Sludge by Thermo-Chemical Pre-treatment	170
Obtaining Biogas From Animal And Agricultural Energy in Nevşehir City.....	171
Impacts of Climate Change on Biodiversity of Plant Pathogens	172
The Expected Impact of Global Warming and Climate Change on Insect Biodiversity	173

Autumn 2015 Plankton Bloom in İzmit Bay (Marmara Sea)	174
Benthic Macroinvertebrate of Koycegiz Lake (Mugla, TURKEY)	175
Bird Diversity in Düzce Efteni Lake in Turkey	176
Determination of Water Quality and Diversity of Macroinvertebrates: A Case Study in Asi River Basin	177
Effect of depth on body size distribution of whiting, <i>Merlangius merlangus</i> , in the south-eastern coast of Black Sea	178
Evaluation of Water Quality Values of The Northern Coastal Line of Gökova Bay (Muğla-Turkey)	179
Gastropoda, Oligochaeta and Chironomidae Limnofauna of Van Lake Basin, Turkey	180
Invasive Freshwater Fish of Kocaeli Province/TURKEY	181
Investigation of Inhibition Kinetics of Some Heavy Metals on Glucose-6-Phosphate Dehydrogenase Enzyme from Turbot Gill Tissue	182
Length-Weight and Disc Width-Weight Relationships of Long-Nosed Skate (<i>Dipturus oxyrinchus</i>) Obtained from Northeastern Mediterranean	183
Occurrence of trypanorhynch cestod (parasite larvae) in blackmouth catshark, <i>Galeus melastomus</i> Rafinesque, 1810 (Scyliorhinidae) from Gulf of Antalya, Turkey	184
Otolith Dimensions-Total Length Relationships of Atlantic Stargazer (<i>Uranoscopus scaber</i> Linnaeus, 1758) Captured from Northeastern Mediterranean	185
Parasitic Copepods (Crustacea, Copepoda) on Marine Fishes of The Antalya Bay, Turkey	186
Relation between Seasonal Migration and Fishing of Bluefish (<i>Pomatomus saltatrix</i> L, 1766) Population in Turkish Coasts.....	187
Seasonal Changes of Chlorophyll-A Values of the Freshwater Sources Feeding in Gokova Bay (Mugla-Turkey)	188
Spatio-Temporal distribution of the bathyal Shark species off Antalya Bay, Eastern Mediterranean.....	189
The sustainability of <i>Psetta maxima</i> populations threatened by bottom trawl fisheries in the Black Sea	190
The Variations of Mercury and Aquatic Organic Matter in Lake Sediment Cores From Köyceğiz Lake (TURKEY)	191
Trophic ecology of pike perch (<i>Sander lucioperca</i> Linnaeus, 1758) as revealed stable carbon and stable isotope ($\delta^{13}\text{C}$ and $\delta^{15}\text{N}$) in Lake Eğirdir (TURKEY)	192
Vertical Distribution of Lead (Pb) in Sediment Cores Taken From Köyceğiz Lake (TURKEY)	193
Biodiversity of Bacteria Isolated from Home-Made Wine and Vinegar	194
Biodiversity of Fungi in Strawberry Fields in Anamur, TURKEY	195
Detection of Bean common mosaic virus in Bean (<i>Phaseolus vulgaris</i>) seeds growing in Antalya Province, Turkey	196
Detection of <i>Lettuce</i> Viruses in Ankara (Turkey) Province	197
Determination of Sensitivity of <i>Trichoderma</i> Species Against Some Fungicides	198
Distribution of <i>Pythium</i> Species in Turkey.....	199
Fungal Biodiversity of Strawberry Fields in Aydın, TURKEY	200
Genomic DNA Analysis for the Nod-Gene of Nodule Bacteria, Isolated from Various Territories	201
Herbal Alternatives to Synthetic Root Canal Disinfection in Human Teeth	202
Identification of Genetic Diversity of Cucumber Mosaic Virus in Pepper Fields in Şanlıurfa, Turkey ..	203
Isolation, Identification and 16S rDna Analysis of <i>Micromonospora</i> Bacteria from Van Lake Basin....	204
Isolation, Identification and Phytase Production Capacities of the Marine Derived Fungal Strains from Mediterranean Sponge and Sediment Samples	205
Molecular Characterization of <i>Acanthamoeba</i> species in Water Resources of Ordu Province in Turkey	206
Molecular Identification and Plasmid Content Analysis of <i>Lactobacillus pentosus</i> and <i>Lactobacillus paraplantarum</i> Strains Isolated from Naturally Fermented Pickles	207

Molecular typing of <i>Staphylococcus aureus</i> from fish and ground beef	208
Phenotypic and Genotypic Characterization of <i>Lactobacillus</i> spp. Isolated from Dairy Products and Determination Probiotic Properties.....	209
Production of Bacterial Cellulose and Isolation of Acetic Acid Bacterium from Wine Vinegar	210
Synergistic Antimicrobial Activity of Boric Acid and Biosynthesized-Hydroxyapatite against Oral Pathogenic Microorganism	211
The Antistreptococcal and Antibiofilm Activities of <i>Citrus bergamia</i> Risso et Poiteau Oil, an Alternative for Oral Infections	212
The Effect of <i>Glomus intraradices</i> on Gossypol Synthesis of <i>Verticillium dahliae</i> Inoculated Cotton Plants	213
The Effect of Increasing Mycorrhiza Applications on Nutrition of Pak Choi (<i>Brassica rapa</i> L. <i>subsp.chinensis</i> L.) Plant.....	214
The Effect of Increasing Mycorrhiza Applications on Some Biological Properties of Baby Carrots (<i>Daucus carota</i> L.) Plants	215
The Effects of Fungi in The Loggerhead Sea Turtles Nests, (<i>Caretta caretta</i> L.), at İztuzu Beach (Dalyan,Turkey)	216
The Exchanging of Leaf Micromorphological Characters in <i>Pyracantha coccinea</i> Depends on Traffic Intensity	217
Adsorption Equilibrium Studies on the Raw Çaldıran Diatomite (Çaldıran/Van) of Heavy Metal (Lead)	218
Biodiversity of Turkish Marine Sponges.....	219
Clonal Almond Breeding by Crossing in Turkey	220
Determination of the Allelopathic Effects of Jojoba (<i>Simmondsia chinensis</i> Link Scheinder) and Lavender (<i>Lavandula angustifolia</i>) Plants on the Seed Germination and Hormone Development of Different Cultivated Plants	221
Determination of the Aphid Species Feeding on Wheat and Their Population Growth In The District of Çumra and Karapınar (Konya)	222
Different Plant Extracts Effect Proliferation and NO Activity in	223
Ecological Properties of the Lichenized and Lichenicolous Fungi in Çamlıyayla, Mersin, East Mediterranean, Turkey.....	224
Ecology of <i>Candelariella</i> Distributed in Turkey.....	225
Effects of Cyclamen graecum and Prospero autumnale on growth performance of rainbow trout (Oncorhynchus mykiss)	226
Identification of a symbiotic Nitrogen fixing bacteria from <i>Cronanthus orientalis</i>	227
Inventory Methods of the Wild Edible Mushrooms for Sustainable Forest Management Planning	228
Investigation of the Antimicrobial Effect of Cleaning Products	229
Length-Weight Relationship and Growth Features of the Red Gurnard <i>Chelidonichthys cuculus</i> (Triglidae) from Izmir Bay, Aegean Sea	230
Mitigating Effects of Ascorbic Acid and Potassium Nitrate on Salt-induced Oxidative Stress in Tomato Plants	231
Modeling relative risk infected plants using Poisson log linear model	232
Physiological Effects of The Brown Seaweed (<i>Ascophyllum nodosum</i>) and Humic Substances on Growth and Some Enzyme Activities of Pepper Plants Growing under Salt Stress.....	233
Pistachio Rootstocks Breeding by Crossing <i>Pistacia khinjuk</i> Stocks and Some <i>Pistacia</i> Species for The Irrigated Area	234
Population Density of Overwintering Larvae of Carob Moth [<i>Apomyelois</i> (= <i>Ectomyelois</i>) <i>ceratoniae</i> Zell. (Lepidoptera: Pyralidae)] in Pomegranate Orchards in Southeastern Anatolia	235

Proteolysis-Antiproteolysis System and Possible Mechanism of the Divergence of <i>Lymnaea stagnalis</i> and <i>Planorbarius corneus</i>	236
Screening of Bread Wheat Genotypes For Resistance to Crown and Root Rot Disease Causal Organism <i>Fusarium culmorum</i> (W.G. Smith) Under Irrigated Condition	237
Similarities of Lichen biodiversity in Erciyes Mountain (Kayseri, Turkey) and James Ross Island (Antarctica)	238
Some Biological Characteristics of the White Grouper <i>Epinephelus aeneus</i> from the Iskenderun Bay, Northeastern Mediterranean	239
Sorption Kinetic and Equilibrium Studies of Methylene Blue on Diatomite (Çaldıran/Van)	240
Taxonomic, ecological and phylogenetic investigation of lichens belonging to <i>Acarospora cervina</i> group in Turkey	241
The Ameliorative Effects of Potassium applications on Tomato Plants Growing under Heavy Metal Stress	242
The Effects of Hydro-thermal Treatment on the Dimensional Stability of Particleboard Produced from Wheat Stalks	243
The Effects of Simulation Techniques Used in Visual Quality Analysis on the Participants	244
The Lichenized Fungus Genus <i>Gyalolechia</i> (<i>Teloschistales</i> , <i>Ascomycota</i>) in Turkey	245
Thermo-Mechanical and Electrical Properties of Nanofibrillated Cellulose-PVA and Nanofibrillated Cellulose-Silica Composites.....	246
<i>Aegilops triuncialis subsp.bozdagense</i> (Poaceae), a new subspecies from South-Western Turkey	247
<i>Arabidopsis thaliana</i> and wheat AP endonucleases contain the NIR function	248
Arid-rare forests of Atropatan (Azerbaijan).....	249
Biolarvacidal and Antioxidant Activity of <i>Cyclamen parviflorum</i>	250
Determination of Genetic Relationship among Local wheat landraces, Azerbaijan Originated wheat cultivars and Some Wild Wheat Genotypes by using ISSR.....	251
Effects of Irrigation Water Quality on Efficiency and Quality Parameters on Tobacco (<i>Nicotiana tabacum</i> sp.) Plant	252
Effects of Salt Stress and Water Amount on Plant Growth and Yield of Purple Coneflower (<i>Echinacea purpurea</i> L.).....	253
Germination of Scarified Seeds of Mediterranean Star of Bethlehem (<i>Ornithogalum ulophyllum</i> L.) Under <i>In vitro</i> Conditions.....	254
Investigation of Nutrient Contents of Tomato Plants Grown in Greenhouses in Elmali-Antalya Region	255
ITS2 Secondary Structure and CBC Species Concept: A Case Study on the Genus <i>Noccaea</i> Moench (Brassicaceae)	256
Karyomorphological analysis of the <i>Cynaroidae</i> section (<i>Cousinia</i> , Asteraceae) from Turkey	257
Karyomorphological Analysis of the <i>Stenocephala</i> Section (<i>Cousinia</i> , Asteraceae) from Turkey	258
Lithophyte Plant Diversity of Turkey	259
Macromorphological and Micromorphological Floral Peculiarities of <i>Acantholimon</i> Boiss. (Plumbaginaceae) genus from Turkey	260
Morphogenesis of the buds and morphology of pollen Wild plum (<i>Prunus divaricata</i> L.) in Abseron conditions.....	261
Morphological, Palynological Properties and Seed Micromorphology of	262
Nickel hyperaccumulation in <i>Bupleurum croceum</i> Fenzl from serpentine soils in Yahyalı-Kayseri (Turkey).....	263
Numerical taxonomy of the genus <i>Psephellus</i> Cass.in Turkey	264
Species Delimitation and Assessment of Biodiversity: With Emphasis on Some Mediterranean <i>Silene</i> L. (Caryophyllaceae) Species	265

Species of family <i>Orthotrichaceae</i> Arn. (Bryopsida) in bryophyte flora of Azerbaijan	266
Successful Breaking Seed Dormancy of Immature Seeds of Charismatic and Endemic <i>Hyacinthella lineata</i> L. Under <i>In vitro</i> Conditions.....	267
The Contributions to Revision of <i>Gundelia</i> L. in Turkey	268
The Endemic Plants of Tunceli (Eastern Turkey)	269
The Herbarium of V.F. Kuprevich Institute of Experimental Botany and studies on fungal diversity in Belarus.....	270
The low-doses of ionizing radiation impact on generative phase of <i>Arabidopsis thaliana</i>	271
The Positive Impacts of Modern Irrigation Systems on Agricultural Biodiversity: A Case Study of Nevsehir-Derinkuyu District in Turkey.....	272
Bioontologies as a tool for plant research.....	273
The diversity of <i>Pectobacterium</i> strains isolated in Belarus and worldwide	274
Use of Next-Generation Sequencing Technologies in Biodiversity Research.....	275
Assessment of Chemical Properties of the Soils in the Catena Which Forms Tekirdağ Değirmenaltı-Muratlı Intersection Ringroad	276
Comparison of Four Spatial Interpolation Methods for Some Soil Properties in Corn Grown Areas, Northern Part of Turkey	277
Variation in Some Soil Properties and Soil Organic Carbon and Total Nitrogen Stock Capacities of Anatolian Chestnut: In Relation to Soil Depths and Altitudes	278
How Can We Evaluate the Speed and Movement Direction of Creep due to Trees?.....	279
The Effect of the Amount of CO ₂ on <i>Sansevieria trifasciata</i> in Indoor Environment	280
The Evaluation of the Floristic and Growth Environment in terms of Landscape Architecture through the Border of Düzce City Center of Riparian Region of Asar Suyu	281
Valuation of the Plant Compositions at the Spatial Level: A Case of Göztepe 60th Year Park.....	282
Habitat Selection of Small Mammals in Soğuksu National Park (Ankara) in Turkey	283
Mammals Determined by Wildlife Camera Trap in Pure Beech Stand in Duzce in Turkey.....	284
Traditional Oil Production from Lamiaceae species and Utilization of Oil by Local People in Akseki-İbradı-Manavgat Districts (Antalya-Turkey)	285
Methyl jasmonate-mediated induced volatiles in <i>Pinus brutia</i> Ten. from Turkey.....	286
Assessment of Significant Water Quality Parameters and Distribution of Benthic Macroinvertebrates on Gediz Basin (Türkiye)	287
Does Pomegranate Seed Oil Affect Protein Expression Levels	288
POSTER PRESENTATIONS	289
Amphibian Fauna of Çankırı (Turkey) Province.....	289
An Overview of Faunistic Aspects of National Parks in Turkey	290
An Overview of Hydrophilidae and Helophoridae (Coleoptera) Species Diversity in Southwestern Anatolia (Aydın, Burdur, Isparta, İzmir, Manisa).....	291
Climate Change and the Evolution of Animal Species: Fuzzy Logic Modeling	292
Comparison of Biodiversity Parameters of Insects Belonging to Carabidae Family Caught by Pitfall Sampling Method in the Apple Orchards in Isparta Province, Turkey	293
Contributions to the Knowledge of Mammals in Çorum Province, Turkey	294
DNA Barcoding Research on Some Species of the Genera <i>Ampedus</i> (Coleoptera: Elateridae)	295
Exchanging between the Blood and the Digestive System of the Male Yearling Sheep Lipids	296
Extraction and Physicochemical Properties of Chitins from Four Different Insect Species.....	297
Leaf Beetle (Coleoptera: Chrysomelidae) Fauna of Hatila Valley National Park (Artvin, TURKEY) ...	298
Life history traits of a <i>Bufo variabilis</i> (Variable toad) population from Sapanca, Turkey	299

Morphometric and Karyological Analyses of Three Subspecies of <i>Meriones tristrami</i> (Muridae: Gerbillinae) Distributed in Anatolia, Turkey	300
Oribatid Mites (Acari: Oribatida) of Park and Garden Areas of Nazilli District Center (Aydın Province/Turkey).....	301
Pests Diversity Associated to the Tea Plant.....	302
Preliminary Phylogenetic Analysis of Hosts of <i>Pimpla turionellae</i> Based on Cytochrome Oxidase I....	303
Prospects of using Black Soldier Fly in biotechnology	304
Prostigmatid Mites (Acari: Trombidiformes) of Park and Garden Areas	305
Records of <i>Ocypus</i> genus (Staphylininae: Staphylinidae: Coleoptera) from South Aegean Region from Turkey	306
Sex and Age Ratios of the Overwinter Marsh Harrier <i>Circus aeruginosus</i> in Southwestern Turkey.....	307
Soil Invertebrates in Park and Garden Areas of Nazilli District Center (Aydın/Turkey)	308
Statistical Analysis of Vertebrate Species Richness in Pond Wetlands of Ukraine	309
Study of the Biodiversity of Entomofauna in Relation to Vegetation Distribution and Environmental Factors in Saltwater Wetlands (Sebkhet Bazer, Algeria).....	310
The Most Comprehensive Study on Mammal Biodiversity in Karabük Province (Turkey)	311
The Ornithofauna and Threats to İnceler Lake	312
The Second Report of <i>Stigmaeus livschitzi</i> Kuznetsov (Acari: Stigmaeidae) in Turkey.....	313
Two Newly Recorded Species of Oribatid Mites (Acari, Oribatida) for the Turkish Fauna from the House Dust	314
Antioxidant Activity and Total Phenolic Content of <i>Sternbergia candida</i>	315
Change in the amino acid composition of soluble protein fractions of plants of different tolerance for salinity	316
Changes In The Level Of Free Amino Acids In Blood Plasma Of Rats With Experimental Allergic Contact Dermatitis.....	317
Daily regulation of some C ₄ and Calvin cycle enzymes in some <i>dicotyledon species</i> of <i>Chenopodiaceae</i> family	318
Determination of Antioxidant Capacity of <i>Sphaerophysa kotschyana</i> Boiss.	319
Evaluation of Antioxidant Properties and Phenolic Compounds of <i>Asparagus acutifolius</i>	320
Influence of Homogenate of Drone Brood on Biochemical Parameters of Blood and Productivity of Growing Pigs	321
Inter-individual Variation of Mitochondrial DNA Deletion Percentage in Platelets	322
Metformin-Cisplatin Combination Treatment Alters mRNA Expression of Hexokinase II Gene in LNCaP and PC3 Prostate Cancer Cell Lines	323
Theoretical Investigation of Metal Chelating Activity in Phenolic Compounds	324
Agroflora of the Watered Areas in the Lesser Caucasus.....	325
Analysis of the Modification Changes According to Variation Row of the Leaves in <i>Quercus castaneifolia</i> C.A.Mey.	326
Biodiversity and Protection of the Hairless Liquorice Species (<i>Glycyrrhiza</i> L.)	327
Bioecological Characteristics of <i>Draba</i> L. Genus Spreaded in the Rocks and Debris of the North-Eastern Part of Lesser Caucasus	328
Biological and Ecological Features and Status of Cenopopulation of the Highlands of the Smaller Caucasus	329
Botanical Description <i>Carum carvi</i> L. and Introduction in the Institute of Dendrology	330
Brandt's bat (<i>Myotis brandtii</i>) - Species Action Plan with New Some Ecological and Locality Records	331
Collecting and Studying of the Introduced Onion Varieties (<i>Allium cepa</i> L.)	332

Detection of the Dangerous Fire Zones of the Forest Cover of Azerbaijan on the Basis of Space Data and the Fire Influence on the Biological Variety.....	333
Distribution of <i>Chalcides ocellatus</i> (Forskal, 1775) under Current Bioclimatic Conditions	334
Effect of Mulberry Leaves of Local Varieties of Azerbaijan on Improvement of Quality Indicators of Introduced Silkworm (<i>Bombyx mory</i> L.)Breeds Crop	335
Geophyte Diversity of Handüzü Natural Park, Rize, Turkey	336
Honey Plants of Tunca Valley (Ardeşen/Rize)	337
Important Insect Pests for Ornamental Plants and Their Control Strategies	338
Important Ornamental Plant Diseases and Novel Control Methods	339
Important Species of Mites Damaging Agricultural Plants in Turkey	340
In the Condition of Salt Stress, Differential Expression of Akvaporin Genes in	341
Medical Plants Insects, and Fighting Against Them in Georgia	342
Morphological and Anatomical Features of <i>Sphagnum compactum</i> (Sphagnophyceae /Brophyta) in Turkey	343
Morphological Features of Section Acutifolia (Sphagnophyceae /Brophyta) in Turkey.....	344
Morphological Features of Section Subsecunda (Sphagnophyceae /Bryophyta) in Turkey	345
One of the Factors Causing Diversity in an Animal Population: Multiple Paternity	346
Ornamental Geophytes of Quba and Qusar districts of Azerbaijan	347
Plant Collections <i>in vitro</i> and Cryobanks - a way of the Conservation and Rational Use of Plant Biodiversity.....	348
Population Size and Threats of Endemic Beyşehir Frog (<i>Pelophylax caralitanus</i>) In Two Distinct Locations	349
Problems Encountered in Protected Area Management in Turkey	350
Some <i>Sideritis</i> , <i>Origanum</i> and <i>Salvia</i> species used as sage in Antalya (Turkey) Province and Theirs Threat Status	351
Species Conservation Plan of <i>Verbascum eskisehirensis</i> Karavel.,Ocak&Ekici	352
Species Protection Suggestions for <i>Gypsophila osmangaziensis</i> Ocak&Ataşlar.....	353
Spreading Helminthiasis of Domestic Geese in the Western Region of the Republic of Azerbaijan	354
Study of Biological Features Some of <i>Nandina domestica</i> Thunb. Species in Abseron	355
Study the Biological Characteristics of <i>Lavandula</i> L. in Absheron.....	356
Survey of Medicinal Plants from National Park of Gouraya (Bejaia, Algeria) and Their Usage in Traditional Medecine.....	357
The Biodiversity and Genesis of the Garayazi State of Natural Reserve	358
The Bioecological Farmacological Features of Aloe Plant and Its Economic Affect Growing in Closed Condition in Azerbaijan	359
The Bioecological Features of Species of <i>Nepeta</i> L. (Lamiaceae) of theSmall.....	360
The Bryophyte Diversity of Archaeological Sites in Aydın and Arouds (Turkey) and Effect on Archaeological Ruins.....	361
The Determination of Quantity of Chlorophyllin the Wheat Sorts	362
The Influence of Regulators on the Seeds of Species Concernig to <i>Cupressus</i> L. Type	363
The Infusorians Land Lowlands of Samur-Davachi and Its Attitude to the Asset Reaction and Food Connections to the Environment.....	364
The Introduced Coniferous Species on Coastal Zones of the Caspian Sea and Biological Features of Their Stability	365
The Study of the Chemical Composition of <i>Ruta graveolens</i> L. Species.....	366
The Subendems of the Specially Protected Natural Areas of the North East of the Minor Caucasus	367

The Use of Cryopreservation for Conservation of Endangered Species and Biodiversity	368
The Vegetation of Handüzü-Çağrankaya (Güneysu/Rize), Turkey	369
Tuqay Woods a Mean of Intrazonal Vegetation Species	370
Opportunities of Lichens in Urbo-Ecosystems Bioindication	371
High School Students' Ideas About Endangered Animals.....	372
About Taxonomy of Wild Vegetable Crops of Nakhchivan Autonomous Republic of Azerbaijan	373
Antioxidant and Mutagenic Activities of <i>Mentha longifolia</i> Hudson Subsp. <i>longifolia</i> Ethanol Extract	374
Determination of the Virulence of <i>Pseudomonas aeruginosa</i> with the Infection of GreenCrops	376
Evaluation of the Genotoxic Effects of Monopotassium Glutamate In Human.....	377
Integrated Control Measures Against Pests of Trees and Shrubs In Absheron Condition.....	378
Production of Biogenic Amines and Fermentation Metabolites by <i>Lactobacillus plantarum</i> Isolated from Naturally Fermented Pickles	379
Some Wild Food Plants of Apiaceae Lindl Family Spread in Azerbaijan Flora.....	380
<i>Sorghum bicolor</i> Plays a Significant Role in Food Security	381
The Effect of Different Hydrated Ions for Absorption of Water And Puffiness Process in Seeds	382
Usage of Bacteria and Their Metabolites in Seafood Processing Technology	383
Areal Types of Representative of <i>Fabaceae</i> Lindl. Family Spread on Steppe Plateau of Azerbaijan.....	384
Assesment of Vegetation Mosaic and Alpine Landscape at a National Park from Eastern Mediterranean	385
Closing the Distribution Gap of <i>Lobotes surinamensis</i> in the Aegean Sea by Citizen Science	386
Floristic and Biodiversity of Asteraceae Weeds of Cereals in Algeria	387
10-Year Observation of Alien Mysids and Amphipods in Belarus	388
Fish of Artificial Waterbodies in Transcarpathia (Ukraine).....	389
Occurrence of the Invasive Blue Crab <i>Callinectes sapidus</i> Rathbun, 1896 (Crustacea: Portunidae) in the Adriatic Sea in Croatia.....	390
The Flora Biodiversity of Ravines of theShamkirriver Basin	391
Determination of Heavy Metal Pollution of Muratlı Districts Soils in Tekirdağ Province with Geostatistical Modeling Methods	392
Effect of Microbial Consortium on Diesel Oil Biodegradation.....	393
Effects of the Various Doses of Vermicompost Implementation on Some Heavy Metal Contents (Cr, Co, Cd, Ni, Pb)of Cucumber (<i>Cucumis sativus</i> L.)	394
Heavy Metal Accumulation in Kidney of wild <i>Microtus guentheri</i> (Danford and Alston 1880) from The Korkuteli-Antalya, Turkey	395
Heavy Metal Accumulation in Muscle Tissue of Wild <i>Microtus guentheri</i> (Danford and Alston 1880) from The Korkuteli-Antalya, Turkey	396
Kinetic Studies of Bioremediation of Hydrocarbon Contaminated Soil	397
Agricultural Waste: Rice Bran as a Carbon Source.....	398
Assesment of Luteolin Genotoxicity and Antigenotoxicity Using Sister Chromatid Exchange Assay <i>In vitro</i>	399
Biometric Analysis of Transgenic Plants of Spring Rape with <i>cyp11a1</i> Animal Origin Gene and Bacterial <i>bar</i>	400
Callusogenesis Study on <i>Thymus</i> spp.....	401
Comparative Study of Phenolic Complex <i>in vitro</i> Cultures of Species	402
Cryopreservation of <i>Saccharum</i> spp. Germplasm Using Droplet-vitrification Technique and Confirmation of Genetic Stability After Cryopreservation Using ISSR Markers.....	403

Determination of the Antioxidant and Phenolic Activities of Jojoba (<i>Simmondsia chinensis</i> Link Scheinder) Plant	404
Effect of Growth Regulators on Morphogenetical Potential <i>Witania somnifera</i> L. in vitro	405
Hydroxybenzoic Acid as a Potential Regulator of Low-Molecular Antioxidants in Plant Cells	406
<i>In vitro</i> Cultivation of Some Lamiaceae Representatives	407
<i>In vitro</i> Cultivation Potential of <i>Mentha × piperita</i> L.	408
<i>In vitro</i> Culture of <i>Mentha pulegium</i> L.	409
<i>In vitro</i> Introduction of Medicinal Herb <i>Elsholtzia ciliata</i> (Thunb.) Hyl.	410
<i>In vitro</i> Introduction of <i>Rosmarinus officinalis</i> L.	411
<i>In vitro</i> Introduction of <i>Satureja hortensis</i> L. Varieties.....	412
<i>In vitro</i> Introduction of Two <i>Matthiola</i> Species.....	413
<i>In vitro</i> Morphogenesis of <i>Ocimum basilicum</i> Varieties	414
<i>In vitro</i> Preservation of <i>Euonymus nanus</i> Bieb.	415
<i>In vitro</i> Seed Sterilization of Some <i>Salvia</i> Species and Varieties.....	416
Influence of Gene <i>Gpc-B1</i> of <i>Triticum turgidum</i> ssp. <i>dicoccoides</i> on Grain Protein Content in Bread Wheat	417
Introduction of <i>Mandevilla</i> Lindl. in vitro Culture.....	418
Investigation of Xanthan Yield of Local Isolate <i>X. axonopodis</i> pv. <i>dieffenbachia</i>	419
Micropropagation of <i>Eucalyptus uro-grandis</i> (<i>E. grandis</i> x <i>urophylla</i>) Using Synthetic Seed Technic .	420
Production of xanthan Gum from <i>Xanthomonas axonopodis</i> pv. <i>begonia</i> and Its Rheological Behaviour	421
Study on the Vitrification Phenomenon in Plants of the Family Lamiaceae	422
Studying Morphogenetic Potential and Properties of <i>Monarda</i> Secondary Metabolites.....	423
The Effects of Different Auxin on the Total Antioxidant Capacity and Phenolic Contents of <i>Hypericum retusum</i> Aucher raised under in vitro Conditions	424
The Influence of Natural Factors on the Technological Quality of Tea Leaves	425
The Studies in Turkey on Use of <i>In vitro</i> Cultures in the Conservation of Biodiversity	426
Virus Elimination in Plant Tissue Cultures via Cryotherapy Technique	427
Water Mint as an Object of Biotechnological Research	428
Ecotourism Planning for Sustainable Management of Protected Areas.....	429
Tourism Potential and Prospects of Its Development in Adjara	430
Tourism-Induced Environmental Pollution in Coastal Areas and Sustainable Use	431
Anatomical Study on Translocation of Carbon Nanomaterials Distribution in Leaf and Stem of the Pea Green (<i>Pisum sativum</i>) Plant.....	432
Application of Random Amplified Polymorphic DNA (RAPD) to Detect Genotoxic Effect of Sodium Propionate	433
Biochar Application Affects Water Content, Lipid Peroxidation and Antioxidant Capacity in Wheat Roots Grown in a Cobalt-Contaminated Soil	434
Changing Membrane Morphology Induced by Dichlorvos and Protective Role of Lycopene	435
Characterization of Soil and <i>Erysimum kotschyianum</i> Gay. Samples from Honaz Mountain	436
Cytotoxicity of Turkish Propolis Samples on Human Bronchial Epithelial Cells	437
Determination of Impact of Mycotoxin Enniatin-A on DNA Damage using Comet Assay <i>In Vitro</i>	438
Determination of Pesticide Residues on Anise Seed (<i>Pimpinella anisum</i> L.)	439
Ectoine Improves Oxidative Damage on Water Status, Photosynthetic Efficiency and Lipid Peroxidation Induced by Cadmium Treatment in <i>Zea Mays</i> (Maize) Leaves.....	440

Effects of Leachate from Open Dump Area on Underground Water	441
Evaluation of Genotoxic Effects of Needle-Like TiO ₂ Nanoparticles in Human Lymphocytes <i>in vitro</i> by Sister Chromatid Exchange Assay	442
Histopathological Changes in Manto Tissues of <i>Physa acuta</i> Draparnaud, 1805 (Gastropoda: Physidae) Exposed to CuSO ₄	443
Histopathological Examination of Cd Toxicity of Ovary in <i>Lymnaea stagnalis</i> Linnaeus, 1758 (Gastropoda: Pulmonata)	444
Histopathology of Liver in <i>Anabas testudineus</i> After Exposure to Sublethal Concentrations of Chlorpyrifos	445
Spectroscopic Study of the Gold Nanoparticles (AuNPs) Distribution in Leaf, Stem, and Root of the Pea Green (<i>Pisum sativum</i>) Plant	446
The Acute Toxic Effect of Glyphosate-Based Herbicide on <i>Melanopsis praemorsa</i>	447
The Comparison of Pesticide Residues on Organic and Conventional Raisin Products in Aegean Region	448
The Effect of Glyphosate on <i>Bacillus subtilis</i> growth, α -Amylase Activity and Plasmid	449
The Heavy Metal Concentrations in Water, Sediment, Soil and Muscle Tissues of Fish from Kabaklı Pond	450
The Structure of the Bacterial and Archaeal Community in a Lab-scale Hybrid Bio-Methane Reactor as Revealed by Denaturing Gradient Gel Electrophoresis and 16S rDNA Sequencing Analysis	451
Time-Dependent Toxicity of Silver Nanoparticles to <i>Daphnia magna</i>	452
Toxicity Effect of Furan on the Morphology of Human Erythrocytes	453
Altitude and Habitat Preferences of Zerconid Mites (Acari: Zerconidae) in Afyonkarahisar Province (Turkey)	454
Influence of Total Phenolics and Tannins on Nitrogen Mineralisation in Soils of Native Oldest Forest from Eastern Mediterranean	455
Insects on Forest trees and shrubs of Turkey	456
Soil Ecosystems and Vegetal Species: Artificial Neural Networks Modeling	457
Study on Promising Strains of Nitrogen-Fixing Actinomycetes Belonging to the Genus <i>Frankia</i> Under Laboratory Conditions	458
Chromosome Numbers of Genus <i>Geranium</i> (Geraniaceae) from Turkey	459
Cytogenetical Studies on Section <i>Dentati</i> of <i>Dianthus</i> (Caryophyllaceae) from Turkey	460
Karyotypes of <i>Origanum</i> (Lamiaceae) Section <i>Anatolicum</i> from Turkey	461
Molecular Phylogeny of <i>Acantholimon</i> Boiss. (Plumbaginaceae) Genus from Turkey Related TRN and ITS Regions	462
Morphological and Cytological Characterization of Some Turkish Okra (<i>Abelmoschus esculentus</i> L.) Landraces	463
Relationship Between Grain Productivity of Ear and Stem Dry Matter Weight of Main Shoot in Winter Wheat Varieties	464
Taxonomic Revision of six <i>Astragalus</i> Sections That Native to Turkey based on three non-coding <i>trn</i> regions of cpDNA	465
The Establishment of Fast-Growing Trees into <i>in vitro</i> Collection	466
Ab-Initio Study of Structural and Vibrational Properties of Latifolin	467
Activity of Caspase-3 in Erythrocytes of Patient with Anemic Conditions	468
Albendazole Bioavailability Change in Combination with β -Cyclodextrin	469
An <i>in vitro</i> Evaluation of Human DNA Topoisomerase I Inhibition by Small Nettle' (<i>Urtica urens</i>) leaves Extracts	470
Assessment of Cytotoxic Effect of Small Nettle' (<i>Urtica urens</i>) Seeds on Human Lung Cancer	471

Assessment of Hemolytic Uremic Syndrome Cases in terms of Community Health in Food Security...	472
Bioecological Features of <i>Opuntia vulgaris</i> and Its Juice in Regulating Sugar Dose in Blood	473
Calorimetric and Spectroscopic Studies of Interactions between Cucurbituril Q7 and N-acetylprocainamide Hydrochloride in Aqueous Solutions	474
Physicochemical Study on a Host-Guest Interaction between β -Cyclodextrin and Phenylbutazone in Aqueous Solutions.....	475
Calorimetric Studies of Interactions of Hydrochlorides of two Selected Antiarrhythmic Drugs: Procainamide and N-acetylprocainamide with Urea Molecules in Aqueous Solutions	476
Evaluation of Taro (<i>Colocasia esculenta</i> L.Schott) Plant in Food Innovation; Tarhana	477
General View to Physical Treatments and Rehabilitations Studies in Animals.....	478
Helminth Fauna of the Black Rat, <i>Rattus rattus</i> (Rodentia: Muridae) in Phaselis/Antalya, TURKEY...	479
Hibiscus (<i>Hibiscus sabdariffa</i> L.) Cheese Production and Sensory Analysis.....	480
In Terms of Nurses' Point of View Medication Errors as a Global Issue	481
Interaction between α -Cyclodextrin and Cinnamic Acid Derivatives in Water	482
Investigation of the Anti-inflammatory Potential of Glucocapparin Isolated from <i>Capparis ovata</i>	483
Investigation of the Anti-Tumourogenesis Potential of 5-Aminosalicylic Acid: Lack of Efficacy in Caco-2 Cells	484
Physicochemical Study on a Host-Guest Interaction between β -Cyclodextrin and Phenylbutazone in Aqueous Solutions.....	485
Protective Effects of Different Cryoprotectants on Post-Thawed Rabbit Epididymal Sperm Chromatin Condensation.....	486
Regulation of the Both Anti-Inflammatory and Inflammatory Cytokines Expression by 5-Aminosalicylic Acid in Caco-2 Cells.....	487
The Anti-quorum Sensing Activity of <i>Salvia fruticosa</i> MILLER and <i>Lavandula stoechas</i> L. subsp. <i>stoechas</i> Essential Oils.....	488
The Characteristics of the Psychological Excitement Performance of the Students Before the Exam....	489
The Effect of <i>Momordica charantia</i> on the Expression of Macrophage Migration Inhibitory Factor (MIF) in a Rat Model of Ulcerative Colitis	490
Wound Healing Role of Hayıt (<i>Vitex angus-castus</i> L.) Plant in Experimental Diabetes Created On Rats	491
Potential Geographic Distribution of the Monkey Goby (<i>Neogobius fluviatilis</i>) as Predicted from Native Range Presence Data by a BIOCLIM Model.....	492
Towards the Issues on the Impact of Global Warming on Biodiversity.....	493
5-Aminolevulinic Acid Increased Productivity and Photosynthetic Pigment Content in <i>Hematococcus pluvialis</i>	494
Antibacterial Effects of Marine Macroalgae the Coast of Ordu Province in Turkey	495
Assessment of Water Quality Using Benthic Macroinvertebrates and Physicochemical Parameters of Sarıkız Fountains and Gurdük Stream (Gediz Basin, Turkiye)	496
Monitoring Water Quality Using Benthic Macroinvertebrates and Physicochemical Parameters of Karaçay Stream	497
Composition and Diversity of the Larval Chironomidae (Diptera) Species on Gediz River Basin: Effects of Significant Environmental Variables and Altitude.....	498
Distribution and Species Diversity of Ephemeroptera on Gediz Basin.....	499
Assessment of heavy metals in <i>Dicentrarchus labrax</i> (Linnaeus, 1758) and <i>Sparus aurata</i> Linnaeus, 1758 marketed in Sinop (Turkey)	500
Assessment of Phytoplankton and Ecological Status in Alpine Glacial Lake Sağrak (Northeastern Turkey)	501

Benthic Amphipods from Turkish Aegean coast	502
Bentic Macroinvertebrates of Bafa Lake in Buyuk Menderes Basin (Mugla, TURKEY)	503
Biodiversity in the Black Sea Bottom Trawl Fisheries and Processing Possibilities of Discard Species	504
<i>Ceratothoa</i> sp. (Isopoda, Cymothoidae) Infestation on Bathydemersal Fishes from Gulf of Antalya, Turkey	505
A Preliminary Helminthological Study on <i>Pelophylax ridibundus</i> Pallas 1771 collected from Kırıkhan (Hatay) District.....	506
A Parasitic Copepod Larvae Existence in Catfish (<i>Silurus glanis</i> L. 1758) in Denizli Vali Recep Yazıcıoğlu Dam Lake, in Denizli District, Turkey	507
A Preliminary Study on Feeding Biology and Helminths of Kotschy's Gecko, <i>Mediodactylus kotschy</i> (Steindachner, 1870) Collected from Denizli Province, Turkey	508
A Preliminary Study on Feeding Biology of the European copper skink, <i>Ablepharus kitaibelii</i> (Bibron & Bory, 1833), collected from Denizli Province	509
A Preliminary Study on The Helminth Fauna of Euroasian Marsh Frog, <i>Pelophylax ridibundus</i> (Pallas, 1771) from Tokat, Artova District	510
Changes of Soft Bottom Macrozoobenthic Diversity with Depth in the Southeastern Black Sea	511
Comparison of Biodiversity Indices and Distribution of Some Fish Species in the Southeastern Black Sea Coasts	512
Ecological Study on the Epiphytic Algal Diversity in the Downstream of Turnasuyu Creek (NE, Turkey)	513
Effect of Season on Fatty Acid Composition of <i>Cyprinus carpio</i> (Linnaeus, 1758) in Çavuşçu Lake ...	514
Environmental Study of Epiphytic Algae on Emergent Macrophytes in the Lower Part of Akçaova Stream (Ordu, Turkey)	515
Heavy Metals Health Risk Appraisal in Benthic Fish Species of the Black Sea	516
Heavy Metals in the Mediterranean mussel <i>Mytilus galloprovincialis</i> Lamarck, 1819 from Sinop coasts of the Turkish Black Sea coast as Bio-monitor	517
<i>In vitro</i> Clonal Micropropagation of Aquatic Plant <i>Glossostigma elatinoides</i> (Benth.) Hook.f.	518
<i>In vitro</i> Cultivation of Aquatic Plant <i>Heteranthera zosterifolia</i> Mart.....	519
<i>In vitro</i> Cultivation of <i>Staurogyne repens</i> Kuntze.....	520
<i>In vitro</i> Introduction and Cultivation of Aquatic Plant <i>Alternanthera reineckii</i> Briq.	521
<i>In vitro</i> Introduction and Morphogenesis Study of Aquatic Plant <i>Marsilea hirsuta</i> L.....	522
Investigation of Microbial Dynamics Of Fish Farms Sediment by Real-Time PCR (Western Coast of Turkey)	523
Metal Levels in Commercial Pelagic Fishes and Their Contribution to Their Exposure in Turkish People of the Black Sea.....	524
Monitoring <i>Caretta caretta</i> (Linnaeus, 1758) Population At Bostanlı Beach in Phaselis/Antalya in Summer 2016	525
New Records for the Nematode Fauna of Turkey (Nematoda: Chromadoridae).....	526
Northward Expansion of Robust Cusk-Eel, <i>Benthocometes robustus</i> (Pisces: Ophiidiidae), from the Aegean Sea	527
Occurence of Juveniles and Egg Capsules of Thornback Skate, <i>Raja clavata</i> from North-Eastern Mediterranean Sea	528
Population Change and Density of <i>Notonecta viridis</i> (Hemiptera: Notonectidae) and Chironomidae Along Lake Van Coastline	529
Seasonal Dynamics of the Nematodes of the Genus <i>Neochromadora</i> : Most Abundant Chromadorids in Sinop Bay (Black Sea, Turkey)	530
Soft Bottom Echinoderms from the Coasts of Black Sea	531

Soft bottom Molluscan Assemblages of the Sea of Marmara, Turkey Basin	532
Species Composition and Seasonal Distribution of Benthic Macroinvertebrates in Zeytinli Dam Lake (Çanakkale/TURKEY).....	533
<i>Spirulina platensis</i> Biomass Concentration and Photosynthetic Pigment Content After Partial Substitution of Sodium Bicarbonate with Sodium Hydroxide in Culture Medium.....	534
The Determination of Water Quality by Using Biotic Sediment Index in Kovada Channel and Its Linked Lakes (Lake Eğirdir and Lake Kovada) (Isparta/TURKEY)	535
The Place of Chlorophyll a Determination In Water Analysis	536
The State of the Mayfly Species in the Eastern Black Sea Region.....	537
Toxicity of Cadmium on <i>Palaemon adspersus</i> Larvae Rathke, 1837 from the Black Sea	538
Toxicity of Copper on Marine Organisms from the Black Sea	539
Zooplankton Studies In The Boka Kotorska Bay (Southern Adriatic) – Appendicularia.....	540
A Plasmid from <i>Pectobacterium atrosepticum</i> is Self-Transmissible and Contributes to Virulence of the Host Bacterium.....	541
Amoebicidal Activity of Propolis collected from Different Regions within Turkey	542
Application of <i>Penicillium piceum</i> Cultural Liquid Permeate for Synthesis of Fe ₃ O ₄ /Co ₃ O ₄ Nanocomposite	543
Bioprotectives and Their Application in Food Products.....	544
Anti-biofilm effect of essential oils from some <i>Juniperus</i> species in Turkey	545
Boron Tolerant Actinobacteria from Boron Mines in Turkey	546
Combined Antimicrobial Effect of Potassium Metaborate and Mineral Trioxide Aggregate (MTA) for Dental Applications	547
Comparison of Fungi Species Found In Loggerhead Sea Turtle Nests ,(Caretta Caretta L.), at İztuzu Beach (Dalyan-Turkey) During The 2015-2016 Season	548
Determination of Extracellular Hydrolytic Enzyme Production Capacity and 16S rDNA Analysis of <i>Streptomyces</i> Bacteria Isolated from Soil Samples Collected in Sulaimani – IRAQ.....	549
Determination of Urease Enzyme Activities of Some Ureolytic Bacteria in Calcium Precipitation Medium	550
Development of Biopreparations for Biocontrol of Sugar Beet Diseases	551
Effect of Initial pH on Calcium Carbonate Mineralisation Induced by <i>Bacillus amyloliquefaciens</i> U7..	552
Endophytic Microorganisms from <i>Styrax officinalis</i> and their Antimicrobial Activities	553
Genetic Diversity of Motile <i>Aeromonas</i> spp. from Meat Samples	554
Genotyping of <i>Yersinia enterocolitica</i> Strains from Various Food Products by Enterobacterial Repetitive Intergenic Consensus (ERIC) - PCR.....	555
Investigation The Viral Diseases Using RT-PCR in The Tomato Growing Areas of VAN Lake Basin .	556
Isolation and Urease Activity of <i>Bacillus amyloliquefaciens</i> U7	557
Isolation of Thermophilic <i>Anoxybacillus kestanbolensis</i> SO-18 and its α -Amylase Production by Submerged Fermentation (SmF) and Characterization.....	558
Isolation, Identification and Antimicrobial Activities of Endophytic Microorganisms from <i>Dianthus erinaceus</i>	559
Microflora of Oat and Rape Seeds Used for Germination	560
Molecular typing of <i>Staphylococcus aureus</i> Strains Isolated from Ready-to-Eat Foods by PCR-RFLP..	561
Post-mortem Microbial Biodiversity and Forensic Pathology:	562
Production of Thermostable α -Amylase Obtained from a Novel <i>Bacillus vallismortis</i>	563
Selection and Characterization of the Yeast Strain Producing Polysaccharides	564
The Antibiofilm and Antimutagenic Activities of <i>Ballota nigra</i> L. subsp. <i>foetida</i> Hayek	565

The Anticariogenic and Antibiofilm Activities of <i>Marrubium vulgare</i> L.....	566
The Combination Effect of <i>Citrus bergamia</i> Risso et Poiteau Oil and Amoxicillin on <i>Staphylococcus aureus</i>	567
The Diversity of Pathogen Receptors in <i>Solanaceae</i> Plants and Characterisation of <i>Pectobacterium</i> -Specific Receptor-Like Kinases	568
The Effects of Urea and Calcium Chloride on Urease Activity in <i>Lysinibacillus fusiformis</i> U1 and <i>Sporosarcina pasteurii</i> ATCC 6453	569
A New Lichenized Fungus Species From Turkey: <i>Pertusaria rubefacta</i> Erichsen.	570
of <i>Corylus maxima</i> Mill. In Absheron Condition.....	571
A Study on the Development of Landscape Restoration and Management Plan in Büyük Melen River	572
An Integrated Catchment Approach to Management of Sediment Pollution in the Coastal Shallow Lakes	573
Anatomical Characters of Endemic <i>Astragalus stenosemioides</i> in Turkey	574
Antimicrobial Activity of Fresh and Ready Fruit Juices.....	575
Antimicrobial Effect of Essential Oil of <i>Tanacetum argenteum</i> (Lam.) Willd. subsp. <i>canum</i> (K. Koch) Grierson var. <i>canum</i>	576
Antimicrobial Effects of Depilatory Creams	577
Antioxidant and Antimicrobial Activity of Yeasts Originated from Yoghurt	578
Antioxidant, Anticholinesterase and Antimicrobial Activities of <i>Melissa officinalis</i> L.....	579
Assessment of Folate Derivatives and PABA with HPLC by <i>L. delbrueckii</i> ssp. <i>bulgaricus</i> ZN541 and ZN951 and <i>S. thermophilus</i> Z151 and Z1052 strains.....	580
Biosynthesis of Silver Nanoparticles Using Pomegranate Peel Extract and Evaluation of its Antimicrobial, DNA Cleavage Activities.....	581
Comperative Anatomy of Genus <i>Rubus</i> Subsection <i>Glandulosi</i>	582
Determination Antioxidant Activities of Different Solvent Extracts.....	583
Determination of ABTS Radical Cation Scavenging and Metal Chelating Activity of Three <i>Convolvulus</i> L. Species.....	584
Determination of Population Parameters of the Tub Gurnard, <i>Chelidonichthys lucerna</i> (Triglidae) from the Iskenderun Bay, North eastern Mediterranean	585
Determination of the Antioxidant and Phenolic Activities of Lavender (<i>Lavandula angustifolia</i> Miller) Plant	586
Determination of the Effects of Different Doses of Phosphorus and Humic Acid Application on Yield and Yield Components in Işık and Seçkin chickpea (<i>Cicer arietinum</i> L.) Cultivars.....	587
Development of Nanomaterials for Anti-Aging Applications.....	588
Predator <i>Macrolophus pygmaeus</i> (Rambur) on Different Prey Species Under Laboratory Conditions ..	589
Diagnostics of Rumen Acidosis: Evaluation of Rumenocentesis and Oro-Ruminal Probes as Routine Techniques	590
Evaluation of <i>in vitro</i> Antioxidant Activity of <i>Datura stramonium</i> L. Ethanollic Leaf Extract	591
Evaluation of Phylogenetic Relationships with IGS Gene Region in the Lichen-Forming Ascomycete <i>Xanthoria parietina</i> (L) Th. Fr. Specimen with a Cosmopolitan Distribution	592
Evaluation of Phylogenetic Relationships with mtLSU Gene Region in The Lichen-Forming Ascomycete Some Species <i>Umbilicaria</i> Hoffm., Which Spreaded in Turkey.....	593
Gymnosperm Garden of Botanical Garden of Adnan Menderes University	594
Heavy Metal Pollution in Surface Marine Sediment of the Bay of Izmit, the Marmara Sea (Turkey)....	595
Hydrophobicity and Aggregation Properties of Yeasts Isolated From Yoghurt	596
<i>In vitro</i> Antioxidant, Hemostatic Activities and Enzyme Inhibitory Potential for Wound Healing of Lactose.....	597

<i>In vitro</i> Nitric Oxide Scavenging Activity of Ethanolic Tuber Extracts of Six <i>Cyclamen</i> L. Taxa from Turkey	598
Isolation, Purification and Refolding of the Recombinant Bovine α -Interferon From Inclusion Bodies.	599
Meat Consumption Preferences and Evaluation of Poultry Meat Consumption in the District of Bolu-Mudurnu	600
Nest-Site Selection of Marsh Harrier (<i>Circus aeruginosus</i>) at Lake Acıgöl, Denizli/Turkey	601
NO Inhibitory Activity from the Aerial Parts of <i>Convolvulus aucheri</i> in LPS-activated H1975 and HCC78 cells	602
Palmetum of Botanical Garden of Adnan Menderes University	603
Phenolic Content of Different Parts of <i>Salviaspinosa</i> by Using LC-MS/MS	604
Population Parameters of the Black Sea Brill <i>Scophthalmus maeoticus</i> (Pleuronectiformes, Scophthalmidae) from Duzce, West Black Sea	605
Chemical Composition and Larvicidal Activity of Essential Oils from Some Lamiaceae Species from Turkey	606
Preparation of Novel Lectin Affinity poly(2-Hydroxyethyl Methacrylate-Ethylene Dimethacrylate) Hydrogel Membrane Systems for Investigation of Antibody Recognition	607
Removal of Boron from Contaminated Groundwater via Polyethyleneimine Assisted Cryogels Composite	608
Skeletochronological Age Determination and Body Size of Spadefoot Toad (<i>Pelobates syriacus</i>) from Afyonkarahisar, Turkey	609
Some Lichenes Identified by ITS Markers from Akdağlar	610
Study of the Genus <i>Marsilea</i> L. (family Marsileaceae Mirb.).....	611
The Antioxidant Activity and Chemical Composition of Essential Oils of <i>Salvia aramiensis</i> and <i>Calamintha nepeta</i>	612
The Antioxidant Activity of Ethanol Extract Fractions of <i>Salvia cerino pruinosa</i> var. <i>cerino pruinosa</i>	613
The Assesment of Polyethyleneimine Assisted Composite Cryogels for Arsenic [As(III), As(IV)] Removal as Major Groundwater Pollutant	614
The Cymothoid Isopod “ <i>Nerocila</i> sp.” on fishes in Turkey	615
The Essential Oil Compositon of <i>Hypericum pruinatum</i> and <i>H.lysimachioides</i> var. <i>spathulatum</i>	616
Essential oil composition of <i>Thymus longicaulis</i> C.Presl subsp. <i>chaubardii</i> (Rchb.f.) Jalas (Lamiaceae) from Sandras Mountain (Denizli-Turkey)	617
Essential oil composition of <i>Nepeta nuda</i> L. subsp. <i>lydiae</i> P. H. Davis (Lamiaceae) from Altınyayla (Burdur-Turkey)	618
The Phenolic Content Analysis of <i>Allium atroviolaceum</i> and <i>A. rhetoreanum</i> by LC-MS/MS.....	619
Total Phenolic, Flavonoid Contents and Antioxidant Assays in the extract of <i>Urospermum picroides</i> (L.) Scop. ex F.W.Schmidt	620
Total Phenolic-Flavonoid and Antioxidant Activities of <i>Nepeta congestavar. congesta</i> and <i>Nepeta celiotropifoliavar. celiotropifolia</i>	621
Total Phenolic-Flavonoid Contents and Antioxidant Activities of <i>Hypericum lyidium</i> and <i>H. hyssopifolium</i> var. <i>elongatum</i>	622
Traditional Use of Some Medicinal Plants in Menteşe (Muğla) Province	623
A Preliminary Study on Current Distribution of Genus <i>Iberis</i> L. (<i>Brassicaceae</i>) in Turkey.....	624
A Preliminary Study on the Woody Flora of Karadere Valley (Duzce-Bolu)	625
Adaptation of <i>Cucumis sativus</i> L. photosynthetic apparatus to red and blue LED lighting	626
Anatomical Research on the Endemic <i>Rorippa auerea</i> (Boiss. et Heldr.) Hub.-Mor. Distributed in Turkey	627
Arbuscular Mycorrhizal Fungi Species in Isparta (Turkey)	628

<i>Artemiseta lerchianae</i> Formation of Shirvan Steppe (Azerbaijan)	629
Assessing Range Shifts under Effects of Climate Change for a Relict Endemic <i>Dorystoechas hastata</i> Boiss. & Heldr. ex Bentham.....	630
Bio-Agriculture and Its Role in Biodiversity Preservation Case	631
Biodiversity of Landscape Architecture in Absheron.....	632
Biodiversity of <i>Rosa</i> L. Genus (<i>Rosaceae</i> Juss.) in Flora of Nakhchivan Autonomous Republic (Azerbaijan)	633
Biomorphological Analysis of <i>Juniperus</i> Species in Azerbaijan.....	634
<i>Arabidopsis thaliana</i> and wheat AP endonucleases contain the NIR function	635
Changing Some Characteristics of Actinidia in Connection with Orographic Conditions	636
Classification of Different Eastern Hyacinth (<i>Hyacinthus orientalis</i> ssp. <i>orientalis</i>) Cultivars by Neural Network Method	637
Distribution Mushrooms in Shahbus Region of Nakhchivan Autonomous Republic (Azerbaijan)	638
Diversity of Fruticose Lichens of Azerbaijan	639
The Rules of Traditional Use of Essential Oils and Extracts of <i>Melissa officinalis</i> L. Species	640
Ecological Structure of Flora of Vascular Plants of the Buiratau State National Nature Park of the Central-Kazakhstan Small Hill	641
Edible Flowers in Terms of Plant Biodiversity	642
Endemic Species Residing to the Genus <i>Hypericum</i> L. in Azerbaijan	643
Ethnobotany: Use of Wild Medicinal Plants by the Local Population in Azerbaijan	644
Flora of Kefken Island (Kocaeli/Turkey)	645
Garden nasturtium (<i>Tropaeolum majus</i> L.) With Regard To Plant Biodiversity	646
Genetic Diversity and Population Structure of Invasive <i>Bidens frondosa</i> L. (Asteraceae) in Lithuania .	647
Genetic Diversity of <i>Urtica</i> spp. in Ordu Province of Turkey	648
Genotype differences of <i>Pisum sativum</i> L. and <i>Petrosimonia brachiata</i> L. in standard conditions and under saline stress.....	649
Green Synthesis of the Fe ₃ O ₄ /Co ₃ O ₄ Composite Using a Tea Extract.....	650
Host Plants Belong to Brassicaceae Family of <i>Brevicoryne brassicae</i> L. (Hemiptera: Aphididae) in Diyarbakır	651
Identification of Asteraceae taxa Which Distributes on Gypsum and Marl Sils of the Eskisehir/Turkey	652
Impacts of Irrigation Water Salinity on Leaf Carbon Isotope Discrimination, Stomatal Conductance and Yields of Sweet Corn (<i>Zea mays saccharata</i>)	653
Karyological Study on Endemic <i>Onobrychis argaea</i> (Fabaceae)in Turkey	654
Karyomorphological Study on <i>Cyanus nigrofimbrius</i> (K. Koch) Soják and <i>Cyanus pinardii</i> (Boiss.) Soják (Asteraceae)	655
Karyotype of <i>Astragalus argaeus</i> (Fabaceae) Local Endemic for Turkey	656
Larvicidal Activity of <i>Calicotome villosa</i> (Poiret) Link. Extracts against the Larvae of <i>Culex pipiens</i> L.	657
Morphological and Anatomic Characteristics of Endemic <i>Lathyrus trachycarpus</i> Boiss.	658
Muğla Floras's Overview	659
Notes on the Genus <i>Noccaea</i> Moench (Brassicaceae) in Turkey	660
Phytocenological Structure of the Perennial Wheaty-Leguminous Grassy Hole-Meadow Vegetation Distributed at Mil steppe of Azerbaijan	661
Polymorphism of Microsatellite Loci in the Genus <i>Fragaria</i>	662
Seed Germination Studies in Native Species for Conservation of Biodiversity	663
Seed Morphology and Testa Sculptures of Three <i>Allium</i> species.....	664

<i>Taxus baccata</i> Callus Culture: Initiation and Growth Optimization	665
The Effect of Different Hydrated Ions on the Water Absorption and Swelling Processes in Seeds.....	666
The Flora Biodiversity on the Northeastern Part (Azerbaijan) of the Greater Caucasus Mountains	667
The Fruit Anatomy of Two Endemic <i>Bunium</i> Species (<i>Bunium allioides</i> and <i>B. pinnatifolium</i>) in Turkey	668
The Impact Of Drought in Wheat Genotypes Morphophysiological Indicators in Different Soil-Climatic Conditions.....	669
The Study of Genetic Diversity and Population Structure of <i>Nuphar lutea</i> in Lithuania	670
The Total Content of Phenolic Compounds in the Leaves of Regenerated Plants of Cabbage (<i>Brassica oleracea</i> L.).....	671
The Vascular Plant Diversity and EUNIS Habitat Classifications of Kırşehir Province (Turkey).....	672
The Vascular Plant Diversity and EUNIS Habitat Classifications of Kırıkkale Province (Turkey).....	673
Tugay Forests of the Northern Coast of the Caspian Sea	674
Vegetation Diversity of Mountainous Part of Lankaran (Azerbaijan)	675
The Importance of Traceability Regarding Sustainable Fishery Management.....	676
Traceability of Fisheries in EU and Turkey	677
Determination of Boron Extraction Methods for Plant Available Boron Content in Canola Grown Soils, Tekirdağ and Çanakkale Provinces.....	678
Erosion Process on Vegetation Cover in Genje (Azerbaijan) Districts	679
First Records of Nymphs of <i>Prozercon carpathofimbriatus</i> (Acari: Zerconidae) in Turkey.....	680
Mite Species on Litters in Ankara Vineyards	681
Research of Soil Pollution with Oil and Solution Ways of Their Restoration.....	682
The Effects of Gytjja on Soil Properties in Nickel Contaminated Soils.....	683
To the Oribatid Mite Diversity of Polessky Nature reserve, Ukraine.	684
Seasonal Changes of the Total Antioxidant Content in Plants of Ecologically "Pure" and "Dirty" Zones of Moscow.	685
Urban Green Infrastructure System: A comprehensive Approach to Support Biodiversity in Urban Areas	686
Folk Medicine: Phytotherapeutic Properties of the <i>Portulaca oleracea</i> L.	687
A Preliminary Study on the Helminths of Edible Frog, <i>Pelophylax esculentus</i> (Linnaeus, 1758) From Dniester River Province in Ukraine	688
A Research on Some Protozoan Parasites in Eğirdir Lake, Isparta from Turkey	689
Distributing in Antalya Province	690
A study on the Rumen Ciliates of Domestic Sheeps (<i>Ovis ammon aries</i>)in Denizli, Turkey	691
Occurrence of <i>Hysterothylacium aduncum</i> (Rudolphi, 1802) in some Teleost Fish Taxa from the Coast of Sakarya Karasu District in Black Sea	692
Morphological Characterization of Genetic Variability among Dwarf Green Bean (<i>Phaseolus vulgaris</i> L.) Landraces from West Mediterranean Region of Turkey.....	693



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ORAL PRESENTATIONS

A Case Study on the Pollinator Bee Diversity: Barcoding the Members of the Genus *Halictus* s. str. Latreille (Halictidae: Apoidea: Hymenoptera) of Turkey

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Aim of the study: Bees (Apoidea: Hymenoptera) are the most important group of pollinators and regarded as a keystone group in the ecosystem. There are about 20,000 identified bee species living in the World. Due to the global decline in feral honeybees, many researches have been focused on investigating the current status of wild bees. Among these *Halictus* s. str. Latreille is one of the mostly distributed taxa all around West Palaearctic Region and Turkey. In this study, we aimed to integrate both classical taxonomy with the DNA-based analytical approaches (barcoding) to evaluate the diversity of this group in Turkey.

Material and Methods: Study was carried on 153 specimens from 25 species which had been identified by classical taxonomy, previously. Partial *COI* sequences were used for three DNA-based analytical methods (Statistical Parsimony Networks-TCS, Automatic Barcode Gap Discovery-ABGD, General Mixed Yule Coalescent-GMYC). Intra- and inter-specific pairwise distances were calculated using a Kimura 2 parameter (K2P) in the MEGA v6 and visualized using the “sppDist” function in SPIDER package in R. The proportion of correctly identified specimens based on morphology was estimated using the Best Match (BM), Best Close Match (BCM) and All Species Barcodes criteria in the program SpeciesIdentifier tool of TaxonDNA.

Results: The study has compared classical taxonomy and three DNA-based analytical methods for the performance on delimiting the species boundaries. DNA based species identifications resulted in 32 OTUs. Classical taxonomy confirmed 19 species clearly. The rest of the species which are especially belonging to *Monilapis* group was found problematic in both DNA based tools and morphological examinations. The use of different analytical methods and parameters indicates that the true number of *Halictus* species may be higher than the estimated species based on morphology. Species delimitation methods detect misidentified specimens via morphological characters and these specimens seem to be morphologically similar and share similar morphological characteristics. Sequences that are delimited with a variety of quantitative methods are candidate species to examine for future studies. Overall, our study suggests that different types of methodologies should be considered together in obtaining true richness of pollinator bee species for the countries.

Acknowledgements: This study was supported by Hacettepe University Research Foundation Project No: 014.D01.601.010 (10-01-2014/10-01-2016). We are grateful to Cumhuriyet University Molecular Systematics Research Group for their contributions in laboratory work. This study is a part of MSc thesis of Burcu Daşer Özgişi, submitted to Hacettepe University Institute of Science in 26.01.2016.

Keywords: *Halictus*, Species delimitation, DNA-barcoding, *COI*, Biodiversity, Turkey

A New Entomopathogen from *Altica hampei* (Allard, 1867) (Coleoptera: Chrysomelidae)

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Aim of the study: In this study is aimed determination of pathogens of *Altica hampei* Allard (1867) (Coleoptera: Chrysomelidae). Protection of plants against to insects is generally done by using chemical insecticide. Chemical insecticide creates serious damages in both many living groups and ecosystem. Recently, scientists have begun to explore biological control methods. These methods aims to decrease the damage of insects utilizing their natural enemies. Natural enemies of insects involve parasites, predators, and entomopathogens (virus, protist, bacteria, fungus, etc.). Among these pathogens, protist pathogens (microsporidia group, Gregarin, and Neogregarins, etc.) are significant in terms of their diversity and potential of the usage for biological control. In Turkey, there is no study about pathogens of *Altica hampei*. This study will make contribution to investigate new living organisms which will contribute our country's and the world's biological richness.

Material and Methods: Insects were collected from Ordu province in 2016. Collected insects are dissected in Ringer's solution. *A. hampei* adults intestines examined under light microscope at a magnification from 100× to 1.000× for presence of pathogen according to Tosun et al. (Tosun et al., 2008). When the gregarine pathogens were observed, it photographed and measured using Nikon Eclips Ci microscope with digital camera DS-fi 2. Its different life stages (gamont, trophozoite, associative form, precyst and cyst) were detected. The following gregarine pathogen structures were measured (µm): length of epimerite (LE), length of deutomerite (LD), length of protomerite (LP), total length (TL), width of deutomerite (WD), width of protomerite (WP), ratio of the length of protomerite to total length (LP:TL) and ratio of the width of protomerite to the width of deutomerite (WP:WD) according to Lipa (1967) and Clopton (2004). These measurements are used to identify the gregarine pathogen. Presence of gregarine was recorded for each adult beetle

Results: A gregarine pathogen from *A. hampei* was observed in Turkey for the first time. There is no report about gregarine pathogen from genus of *Altica* in the world literature therefore the observed pathogen from *A. hampei* in this study is a new gregarine pathogen report for Turkey and in world literature. Several life stages of the gregarine pathogen, trophozoite, gamont, associative form and cyst were observed in the midgut epithelium of *A. hampei*. Gamonts belongs to pathogen are ovoidal or elongate. Average of morphological and structural measurements of gamonts of the gregarine parasite was as following: TL: 171 ± 40.2 µm; LP: 39.5 ± 14.5 µm; LD: 131.4 ± 27.9 µm; WP: 42.5 ± 8.1 µm; WD: 63.9 ± 18.5 µm; LP:TL: 4.5 ± 0.6 µm; WP:WD: 1.5 ± 0.3.

Acknowledgements: The authors are grateful to Giresun University for finance support as a scientific research project FEN-BAP-A-140316-39 in Turkey and also thank to Prof. Dr. İrfan Aslan for identification of insect.

Keywords: *Altica hampei*, Chrysomelidae, Entomopathogen, Gregarine, Turkey.

**A new genus record For Turkey Spider Fauna, *Floronia* Simon
1887(Araneae/Linyphiidae)**

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Aim of the study: With this work, it is aimed to contribute to the knowledge of Turkey Spiders Fauna. In this context, a new genus record has been provided for Turkey, with the characters treated at the genus level.

Material and Methods: The specimens which are considered in this paper are part of the doctorate thesis collection of the first author. All specimens were collected by hand aspirator and pitfall traps in 2000-2002 years. They are preserved in 70% ethanol at the first author's personal collection.

Results: Chelicera, on the outside are 5-6 large tooth. The legs are long, IV. Metatarsus is without trichobothria. Tibia and metatarsus have many spiny; all femurs have a dorsal setine; In addition, Femur I is 2-3 prolateral spines. Opisthosoma has folium, which is clearly higher than its length in the female. Weave their webs, like sheets, on bushes and short vegetation. If approach their webs they fall off their webs. This species was registered for the first time in Turkey with this study.

Acknowledgements: This research constitutes part of a project supported by TÜBİTAK. I would like to thank the TÜBİTAK - TBAG group members.

Keywords: *Floronia*, Linyphiidae, Spiders, Araneae, Turkey.

A New record of rake legged mites from Turkey: *Allocaeculus multispinosus* (Acari: Caeculidae)

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Aim of the study: The family Caeculidae is majority known as rake-legged mites due to the presence of elongate spine like setae on the legs, particularly the first pair, and they are usually predaceous. The caeculid mites are relatively large (1000–3000 µm) than others. This family comprises seven genera, including *Allocaeculus* Franz. This genus consists of 35 species in the world. To date, one species of *Allocaeculus* has been given from Turkey. *Allocaeculus multispinosus* has been found in Turkey for the first time. In the present work, we aimed to contribute to the biological diversity in Turkey.

Material and Methods: The mite specimens were obtained by pitfall traps from Aydın and Muğla provinces, Turkey. The specimens were examined by means of an Olympus CX21 microscope and Leo 440 scanning electron microscope. Specimens examined were deposited in the Biology Department of Bozok University, Turkey.

Results: *Allocaeculus* Franz is a genus within the family Caeculidae. They can be recognized by the anterior half of the prodorsal sclerite being extensively neotrichous, unequal tarsal claws of leg I and by the absence of dorsodistal bothridia on legs I and II. Up to now 35 species belonging to this genus are known in the world, only one of which, *A. turcicus*, is described from Turkey. With this study, an additional species, *Allocaeculus multispinosus* Franz, was recorded for the first time for the Turkish mite fauna. This species was only given before from Spain. This is the second report of the species for now.

Acknowledgements: We thank to Erciyes University Technology Research and Application Center for help on scanning electron microscopic investigations of the mites. We also thank Kemal Kurt (Gümüşhane University), Ersen Aydın Yağmur (Manisa Celâl Bayar University) and Mert Elverici (Erzincan University) for their help in collecting materials.

Keywords: Acari, *Allocaeculus*, diversity, new record, Turkey.

Age structures and Growth Parameters in three populations of Levanten Frog, *Pelophylax bedriagae*

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Aim of the study: Levanten frog, *Pelophylax bedriagae* is a highly opportunistic amphibian, and ranges widely in the eastern Mediterranean, is widespread along the Aegean coast and the southern part of the Anatolian highlands. Age determination provides crucial information on demographic parameters of amphibian's life-history. In many amphibians, skeletochronology can be performed on the phalanges, and hence, represents a powerful technique. In this context, we aimed to determine *P. bedriagae* populations' age structure and individual growth patterns in different altitudes from Denizli province.

Material and Methods: This study was performed at three amphibian habitats (Süleymanlı Lake, Acıgöl Lake and Vali Recep Yazıcıoğlu Dam) with different altitudes. The morphometric measurements were obtained with a dial caliper of 0.02 mm sensitivity and precision scales. The longest digit from the hind foot was cut and individually fixed in 70% ethanol. Age of the specimens was estimated using these bone samples. The procedure of skeletochronology followed previous descriptions (e.g. Castanet and Smirina 1990; Smirina 1994). The bones of each animal were cleaned of surrounding tissues, washed in running water for 12-14 h, decalcified for 3-5 h in 5% nitric acid then placed in distilled water for night. The bones were dehydrated using graded ethanol series and then cleared in xylene, before embedding in paraffin. Using rotary microtome, we obtained 16 µm thick cross sections from the central region of the diaphysis, stained them with H&E, and analysed with a light microscope.

Results: We studied total 133 bone samples to determine age structure and growth in three populations of the Levanten frog between the years of 2015-2017. We found statistically significant differences between SVL, and sexes ($F=28.15$; $df=1$; $p<0.001$), and females are larger (the mean $SVL=73.22\pm10.416$ mm for female; 64.20 ± 9.076 mm for male) than males in three populations. Similarly, the body weight of individuals were significantly different ($F=22.70$; $df=1$; $p<0.001$). However, we could not find any differences between age structure and sexes. On the other hand, we determined statistically significant differences in SVL ($F=4.25$; $df=2$; $p<0.05$), body weight ($F=5.17$; $df=2$; $p<0.05$) and age structure ($F=6.64$; $df=2$; $p<0.05$). The mean age was defined as 4.9 ± 0.25 years for Vali Recep Yazıcıoğlu Dam population, 6.5 ± 0.34 years for Süleymanlı population and 5.3 ± 0.33 years for Acıgöl population. Age at first reproduction was estimated as two years old for all populations while longevity of the species were found nine years in Vali Recep Yazıcıoğlu Dam and Acıgöl populations, and 12 years old for Süleymanlı population. On the other hand, SVL, body weight and age were positively correlated both sexes within three populations. These results show that there is intraspecific variation depend of altitudinal range in age structure and morphometric measurements of Levanten frog populations.

Acknowledgements: The permissions for field work, handling and laboratory studies of the frogs were issued by the Animal Ethics Committee of Pamukkale University, Ministry of Forestry and Water Affairs, General Directorate of Nature Conservation and Natural Parks and Turkish Ministry of Food, Agriculture and Livestock. This research was supported by Pamukkale University Scientific Research Projects Unit - BAP (Project No:2012FBE029).

Keywords: Amphibian, Age structure, Altitude, Longevity, Age at first reproduction

**An Interesting Dragonfly Record, *Selysiothemis nigra* (Vander Linden, 1825)
from Black Sea Region of Turkey**

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Aim of the study: In this study, it was given an interesting record of *Selysiothemis nigra* from Anatolia. *S. nigra* is an anisoptera species which is found around standing, shallow waters. Flying period of this species is determined as middle of May to beginning of August in Turkey. Distribution of *S. nigra* in world is around Central Asia, the Middle East, parts of North Africa (oases) and the Europe along Mediterranean Sea. This species is distributed around south coast and in the provinces of Gaziantep, Şanlıurfa and Edirne from Turkey.

Material and Methods: Examined specimens were collected from Samsun province of Turkey in July of 2011. *S. nigra* specimens were collected with aerial nets. Two females were collected in dry grassy area near the village and observed many females and males specimens in the Middle Black Sea Region of Turkey.

Results: It is clearly seen when taking notice ecological and zoogeographical requirements of the species. Finding two female samples belong to the species during field studies in Samsun which is found in Middle Black Sea Region in 2011, is so interesting in respect of geographic structure and zoogeography of Anatolia. According to geographical structure of Anatolia, for example coming across in Middle Black Sea Region around Samsun province is an interesting record for this species.

Keywords: Odonata, *Selysiothemis nigra*, Turkey.

Aphids and Their Densities on Brassicaceae Plants in Diyarbakir Province of Turkey

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Aim of the study: This study was carried out during 2014 and 2015 in Çınar District of Diyarbakir province, for surveying the aphid species and their density on Brassicaceae Plants.

Material and Methods: The aphids were collected by -infested leaves of livestock plants. The samples were taken by scanning the Brassicaceae plants at this location. The samples were taken into 70% alcohol and then the preparation process was carried out.

Results: Three species belonging to the Aphididae family were identified as the result of the study. These species are *Brevicoryne brassicae* L., *Lipaphis erysimi* Kalt., and *Myzus persicae* (Sulzer). Among these, *Brevicoryne brassicae* was identified as the most dense species.

Keywords: Diyarbakir, Brassicaceae Plants, Aphid

Ascidians (Tunicata, Urochordata) Fauna of Turkey CoastsAli MİROĞLU¹, Mehmet YALÇIN¹¹Fatsa Faculty of Marine Sciences, Ordu University, Ordu, Turkey
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Aim of the study: This study is the first attempt to compile give an up-to-date species list of the indigenous ascidians. At the same time, we are to explain the distinctive features that will be useful to determine the taxonomy of ascidians. Ascidians are the most diverse group of organisms belonging to the subphylum Tunicata comprise almost 2500 ascidians species are known to inhabit of the worldwide. Ascidians are usually identified as sessile, colonial and free living organisms. We are aimed to give an up to date species list of ascidians reported from the coasts of Turkey.

Material and Methods: The checklist of the Ascidians has been prepared by compiling all existing literature about along the coasts of Turkey (Black Sea, Marmara Sea, Aegean Sea and Mediterranean Sea) and ascidians are described along with their distinctive characters and illustrations.

Results: Existing literature search from the coasts of Turkey includes almost 50 recorded species in the Turkish marine fauna. In this study is to explain list of the ascidian species known to date from the coasts of Turkey is reviewed. The review of the literature shows that the publications concerning the ascidian fauna of the Mediterranean Sea 32 species, Black Sea 6 species, Aegean Sea 28 species and Marmara Sea 30 species have been reported along the coasts of Turkey.

Keywords: Ascidians, Tunicata, Taxonomy, Systematic, Turkey.

Asymmetric variations in some species of the genus *Raphignathus* (Acari: Raphignathidae)

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Aim of the study: The genus *Raphignathus* has a worldwide distribution and comprises about 70 species. They are predaceous, and can be found underneath tree bark and in litter, moss, lichen, soil, stored products, house dust and bird nests. During a faunal study on raphignathoid mites in Erzincan, Turkey, we detected 13 specimens with asymmetric variations observed in three species of *Raphignathus*; *R. gracilis*, *R. hecmatanaensis* and *R. kuznetzovi*. The current paper deals with new data on some anomalies on some *Raphignathus* mites.

Material and Methods: Mite specimens were collected from in Erzincan city center, between the years 2014-2016. The specimens were extracted by using Berlese funnels, cleared in 60% lactic acid and mounted on microscopic slides in Hoyer's medium. Asymmetric characters in the mite specimens were illustrated by using a Leica DM 4000B phase-contrast microscope equipped with a drawing tube under 40X magnification, and their photos were taken.

Results: In total, 773 specimens of *Raphignathus gracilis*, *R. hecmatanaensis* and *R. kuznetzovi* were examined for asymmetric variations. 13 of them (1.68%) were determined to be having some asymmetric morphologies. The most encountered mite species with morphological variations observed was *R. hecmatanaensis* (n=10, 76.92%), followed by *Raphignathus gracilis* (n=2, 15.38%) and *R. kuznetzovi* (n=1, 7.69%). Asymmetric variations in the number of their coxal setae (4c), aggenital setae (ag), genital setae (g), internal pair of humeral setae (c₁); and the location of setae f₁ were observed.

Keywords: Mite, *Raphignathus*, morphology, asymmetry, variation.

Blood Cell Morphology and Blood Biochemistry of *Pelophylax bedriagae*Ayşe Sevay ULUBELI, Eyup BAŞKALE, Yakup KASKAPamukkale University, Faculty of Arts and Sciences, Department of Biology, Denizli, Turkey
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Aim of the study: Amphibians have evolved an array of adaptive structures and mechanisms to cope with environmental changes that result from their life histories, which involves a transition from water to land. Compared to other vertebrates, large erythrocytes are one of these adaptations. Most of the studies about Anuran blood are focused on counting blood cells, measuring their dimensions and biochemical analyses. In this study, we aimed to evaluate the differentiation of values of blood parameters and biochemistry in *Pelophylax bedriagae* due to their genders.

Material and Methods: The blood cell morphology and blood biochemistry of the water frog *Pelophylax bedriagae*, from Denizli, TURKEY were studied in 2014 and 2015 from 9 males and 7 females from two different locations. The blood cell counts were performed utilizing a Thoma slide, and the standard solutions (Hayem's and Turck's) were used as diluting solutions for erythrocytes and leukocytes. Blood cell sizes were measured from dry frotto slides, which stained according to standard Romanowski techniques, under Olympus CX31 binocular microscope. Biochemical parameters of the blood samples determined for each individual using the ABL Flex800 Radiometer according to the manufacturer's instructions. Kruskal Wallis and Mann Whitney U tests were used to determine the differences between parameters and genders under SPSS 20.0.

Results: Obtained values were statistically evaluated to see whether morphological and biochemical parameters of blood cells in *Pelophylax bedriagae*. The pH, CO₂, O₂ concentrations were found 7.32, 23.54, and 125.45 (mmHg), respectively. Similarly, blood potassium, sodium calcium, chloride, glucose and lactose levels were found as 5.75, 165, 1.88, 98.64, 15.39, and 6.18 (mmol/L), respectively. Moreover, blood haemoglobin, saturated oxygen, oxyhemoglobin and carboxyhemoglobin levels were found as 5.48g/dl, 77.18%, 62.16%, 20.37%, respectively. In addition, the mean of red blood cell count was calculated as 288000 while white blood cell count was calculated as 3688. The results of this study were discussed in terms of the effect of gender on blood values.

Acknowledgements: The permissions for field work, handling and laboratory studies of the frogs were issued by the Animal Ethics Committee of Pamukkale University, Ministry of Forestry and Water Affairs, General Directorate of Nature Conservation and Natural Parks and Turkish Ministry of Food, Agriculture and Livestock. This research was supported by Pamukkale University Scientific Research Projects Unit - BAP (Project No: 2012FBE029).

Keywords: Amphibian, Blood cell, Erythrocyte size, Haematology, Biochemistry.

Carabidae (Coleoptera) Records from Upland-Meadows of Türkmen Mountain (Kütahya-Eskişehir), Turkey

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Aim of the study: The aim of this study to contribute the taxonomical and ecological information about the fauna of Carabidae in Turkey. 15 different species recorded from 11 different upland-meadows of Türkmen Mountain between 2005-2008.

Material and Methods: The material of this study comprises the Carabidae specimens which are collected from 11 upland-meadows of Kütahya province part of Türkmen Mountain. Specimens were collected with pitfall traps, hand and aspirator. Each specimen is identified and turned into a museum material with classic preparation methods. All of the specimens are stored in Entomology Laboratory of Department of Biology in Dumlupınar University.

Results: As a result of this study 86 Carabidae specimens belong to 15 different species has identified. This species are; Carabus (Pachystus) graecus morio Mannerheim, 1830; Pterostichus (Platysma) nigerriger Schaller, 1783; Amblystomus niger (Heer, 1841); Calathus (Calathus) fuscipes graecus Dejean, 1831; Calathus (Neocalathus) melanocephalus melanocephalus Linne, 1758; Calathus (Neocalathus) erratus C.R.Sahlberg, 1827; Calathus (Neocalathus) ambiguus dilutus Chaudoir, 1842; Amara (Amara) eurynota (Panzer, 1796); Zabrus (Zabrus) tenebrioides tenebrioides Goeze, 1777; Harpalus (Harpalus) attenuatus Stephens, 1828; Harpalus (Harpalus) honestus (Dufschmid, 1812); Harpalus (Harpalus) distinguendus (Dufschmid, 1812); Ophonus (Hesperophonus) azureus Fabricius, 1775; Brachinus eximius Duftschmid 1812; Siagona europaea Dejean, 1826. The sustainability of meadows is a very important factor of conservation the ecology on mountains and Carabidae species are using as habitat bioindicators from all over the World, for that reason this research is important for contribution of these species ecological information. Species World and Turkey distribution, habitus figures and ecological informations are given.

Keywords: Carabidae, Coleoptera, Türkmen Mountain, Kütahya, Turkey.

Classification of Fish Families Using Texture analysis

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Aim of the study: Fish species classification is a growing research area because of the fact that automatic fish classification systems can facilitate performing purposes such as fish counting, population assessments, monitoring fish migration. The aim of this study is to propose an approach on fish families classification using texture based features. For this purpose a fish images database consist of 1321 fish samples was used and 63 features were extracted from each sample. The extracted features were used within Nearest Neighbour algorithm and 89.6% general accuracy was achieved.

Material and Methods: In this study a fish images database which consist of 1321 fish samples was used. The used database includes fish samples from 16 fish families. Each image includes a fish sample which is located on a white background floor. In all of the images the fish samples has the same oriented position. The images were taken from different distances. Various manual processes and automatic algorithms were applied on images. These processes were purposed to obtain colored fish sample images with black background. The proposed color based feature extraction method ignores background and focuses on a solid fish texture image as region of interest. The intended regions of interest were obtained by using some automatic algorithms applied on black-backgrounded images. The obtained regions of interest were in RGB color space. Before feature extraction, region of interest divided into 3 pieces in order to vary the feature extracted local areas and increase the number of features. Features were extracted by using *red*, *green*, *blue* components of the RGB color space separately. For each color component 7 statistical features were extracted. Hence, 21 features were extracted for each divided piece and totally 63 features were extracted for each sample of fishes.

Results: The extracted 63 features of 1321 samples were used within Nearest Neighbour algorithm. Five-fold cross validation schema is used for performance measurement. In 5-fold cross validation, the dataset is randomly divided in 5 disjoint sets. Four sets are used for training and the remaining is used for testing. This procedure is repeated until each set is used for testing. Performance of classification is measured by the general accuracy. Classification of 16 fish families was performed by achieving 89.6% general accuracy.

Acknowledgements: Thanks to financial support by Mustafa Kemal University (13909).

Keywords: Classification, fish families, RGB, color, texture.

Comparison of the Lowland and Lowland-Caucasian lines of the European bison (*Bison bonasus*)

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Aim of the study: The European Bison (*Bison bonasus* L.) is the only wild species of the subfamily Bovinae which has survived to the present day in Europe. The last wild populations of the species were destroyed at the beginning of the 20th century. Currently, Belovezian Forest is the habitat of the largest population of the European Bison. Geographically, the population is divided into 2 parts – Belarusian (Lowland-Caucasian line) and Polish (Lowland line). Did the different principles of breeding affect the overall survival of animals, the effective numbers and the level of inbreeding? The purpose of this study is to compare the genetic markers of two populations of the Bison.

Material and Methods: We studied polymorphism of nine microsatellite loci of both studied populations of bison (30 individuals of Belarusian and 17 Polish individuals). Based on the allele frequencies of microsatellite loci we calculated the main indices of genetic variability for each population - F_{IS} , H_e , N_e . Unique allelic variants were identified in the Belarusian population of bison. We also analyzed the polymorphism of the second exon of the DRB3 gene and the second exon of the DQB gene of the Major Histocompatibility Complex (MHC). Four allele variants of the DRB3 MHC gene are described for the European bison. In the Belarusian population, three ones were found: Bibo-0101, Bibo-0201, Bibo-0301. The allele variant of Bibo-0401 is rare for the Polish population. Its frequency of occurrence is 2%. It was not identified in the samples of analyzed Belarusian animals. In the studied fragment of the DQB gene of MHC there were 5 allelic variants - 2 found in Belarusian, 2 - in Polish and 1 in the both populations.

Results: Variations of the nucleotide sequences of the studied allelic variants of the MHC genes are in the 2nd exon of the genes. This fragment encodes the peptide sequence of the so-called "antigen-binding site" - the sites where antigens of intracellular or extracellular pathogens are bound. It is believed that a high difference in the available allelic variants of genes is maintained by natural selection. Individuals with a large allelic diversity of MHC genes have a selective advantage, as they can form an immune response against a wider range of antigens. The obtained results show that, despite the uniform origin, the high similarity of the two populations of the European bison studied, the different principles of breeding led to obvious differences in the genetic structure. The presence of unique alleles of microsatellite loci can indicate the hybrid origin of the Belarusian livestock - a mixture of the Lowland and the Caucasian bison lines. Also, Belarusian individuals show the worst indicators of effective size and inbreeding levels than Polish ones. The presence in the Polish population of unique allelic variants of the DQB gene (Bibo-DQB-Pol2 and Bibo-DQB-Pol3) makes it a valuable source of genetic diversity for the Belarusian population.

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Keywords: European bison, genetic structure, major histocompatibility complex, microsatellites.

Could Using Scanning Electron Microscope on Aedeagus Morphology Research Make Contributions to Systematics of the Family Elateridae (Coleoptera)?

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Aim of the study: In this study, aedeagi of 65 species from 23 genera and 5 subfamilies were examined taxonomically by using SEM and compared with drawings. Ultrastructural data of aedeagi in subfamilies and genera, general taxonomical comparisons between aedeagi drawings and SEM photos and ultrastructural examination of aedeagi's SEM photos of all species were discussed.

Material and Methods: Aedeagi of 65 species, which are deposited as dried specimens in Hacettepe University Applied Entomology Laboratory (HUAL), were dissected due to standart aedeagi dissecting methods, and their photos were taken by using Scanning Electron Microscope in Hacettepe University Earth Sciences Research and Application Center. One specimen were used per species in these study because comparisons were only made in the level of subfamilies and genera. Most of SEM photos (56 species) were compared with aedeagi drawings in literature (Kabalak, 2010; Kabalak and Sert, 2009, 2011a and 2011b; Platia, 1994) and SEM photos of 9 species (*Agrypnus murinus*, *Ampedus demaisonii*, *Athous* (O.) *anatolicus*, *Athous* (O.) *daccordii*, *Melanotus monticola*, *Stenagostus rhombeus*, *Zorochros alysidotus*, *Zorochros pilosellus* and *Zorochros stibicki*) were compared with aedeagi drawings which are unpublished drawings of author. General appearance and ultrastructural morphologies were examined.

Results: Scanning Electron Microscope photos of aedeagi are examined and compared with aedeagi drawings. This examination showed that those are compatible each other according to general morphology. On the other hand, some morphological structures were detected from fine-structure of Scanning Electron Microscope photos like Kabalak's (2014) findings in *Athous* (*H.*) *subfuscus*. As a result of this study, detected structures of aedeagus exhibit non-homogenous presence among subfamilies, genera and species. Aedeagi morphology of the subfamily Cardiophorinae and Negastrinae have the least structures which are long bristles, small pits with spine in some species. On the other hand, those structures were detected on some species and genera while not in other genera and species in subfamilies Agrypninae, Dendrometrinae, and Elaterinae. In addition to that, some detected structures could be important taxonomical characters and used to identification for some genera (*Ampedus* and *Athous*) and species (*Adrastus montanus*, *Aeoloderma crucifer*, *Drasterius bimaculatus*). More comprehensive studies that contain more species and more genera, could help to evaluate systematical importance of these structures in detail throughout to family.

Acknowledgements: I thank to Hacettepe University Scientific Research Projects Coordination Unit for supporting this study with a project (Project Number: 013 D05 601 013-269).

Keywords: Elateridae, Aedeagus, Scanning Electron Microscope, New structures.

Determination of Geographical Distribution Types by Using GIS software: Galerucinae (s. str.) (Coleoptera: Chrysomelidae) of Turkey

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Aim of the study: Knowledge of presence and the distribution types of organisms provides fundamental information for many scientific fields. This information is intensely used in systematic, taxonomic, ecological and conservational studies. Galerucinae of Turkey includes 16 genera and 71 species, constituting one of the specious groups within Chrysomelidae fauna of Turkey. GIS (Geographic Information Systems) provide significant advantages for determining the distribution ranges and types of organisms, transferring the data on digital environment, processing the information in multiple dimensions and constructing available outputs to use in various fields. The main aim of this study is to determine distribution types of galerucines in Turkey by using GIS software.

Material and Methods: The distributional data of 71 species belonging to Galerucinae (s. str.) of Turkey, available in the literature, was transformed into a database and transferred to a Turkey map by using ArcMap(Esri)10.2 software. The locations that were not given as geographical coordinates were treated approximately. For the locations that are given only as the province names, the city centres were treated as exact locations. Distributional maps were created for each species and the distribution types of species were determined by comparing these maps.

Results: Locality records of five species were reported only as Anatolia (or Asia Minor) in the older literature and 20 species has only one locality record. Distribution type of these 25 species (35.2%) was categorized as “insufficient data”. As a result of the examination of the distribution maps of remaining 46 species, eight distribution types were determined. The species that were frequently reported from many parts of Turkey were categorized as “Widespread”, the species of which distribution records were disorderly separated were categorized as “Discontinuous”, and the species that were reported from certain regions are categorized as “Eastern”, “Southern”, “South-eastern”, “Northern”, “North-eastern” and “Mid-Anatolian”. The species numbers and percentages of the determined distribution types are as follows: Widespread, 16 species (22.5%); Discontinuous, 12 species (17%); Mid-Anatolian, 5 species (7%); North-eastern, 4 species (5.6%); Northern, 3 species (4.2%); Eastern, 2 species (2.8%); Southern, 2 species (2.8%); South-eastern, 2 species (2.8%). It was an expected result that 16 species were widespread; however, 25 species with insufficient data and 12 species with discontinuous distribution suggest that the faunistik surveys on leaf beetles are still needed in Turkey.

Keywords: Chrysomelidae, Leaf beetles, Galerucinae, GIS, Turkey.

Distribution and Infestation Rate Melon Fly (*Myopardalis pardalina* (Dip: Tephritidae) in Diyarbakır (Turkey)

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Aim of the study: Melon flies are causing serious yield losses in cucurbit crops. Surveys of Diyarbakır of were conducted in Bismil, Çınar and Hazro provinces in 2013-2015 to determine the distribution and infestation rates of melon fly.

Material and Methods: Infected melon flies plants were investigated from both cultivated and noncultivated cucurbit plants of different locations (Bismil, Çınar, Hazro) once a week.

Results: Cucurbit plants were found with infected melon fly in all three locations. The infestation rates of melons were more than watermelons. It was observed that deformation occurred in the watermelon.

Keywords: Melon Fly, Diyarbakır, Infestation rate.

Distribution and Threatened Status of Loach *Cobitis* (Pisces: Ostariophysi: Cobitidae) in TurkeyFiliz ÖZDEMİR¹, Füsün ERKAKAN¹¹Biology Department, Science Faculty, Hacettepe University, Turkey.
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Aim of the study: *Cobitis* is a Palearctic genus of ray-finned fish and is one of the most speciose in the family Cobitidae. This genus represented with 17 species including one species of cave in Turkey. Generally, *Cobitis* loachs have a very wide distribution but most of them have very limited areas like *Cobitis bilseli* which is restricted two stream flowing in to the Beyşehir Lake. The distribution of *Cobitis* loaches in Turkey is very complicated because of the uncertainties and misidentification. The ecosystem that is rapidly changing with the development of the global industrial development puts these species in danger. Conservation status and distribution information is very important tools in order to take the necessary precautions. The present study provides distribution and threatened status of *Cobitis* loaches in Turkey.

Material and Methods: The species list are compiled from previously publish. In addition, fish samples of *Cobitis* loachs in ichthyological collection of Hacettepe University (HUIC) was evaluated. The threatened status of *Cobitis* loachs were listed according to IUCN Red list, version 2016-3.

Results: Updated distribution and threatened status of loaches of the genus *Cobitis* of Turkey given as following order: Species name(Author), Distribution and threatened status. There are seventeen species of this genus, of which seven are endangered and two are critically endangered, five are least concern and three of them are not evaluated by IUCN Red list. According to our assessments, these three species are critically endangered. Some of these threatened status may change because of very restricted distribution and dramatic environmental change.

Acknowledgements: Researchers are pleased to thank technician İbrahim Aslan for collecting the materials.

Keywords: *Cobitis*, distribution, threatened status, Turkey.

Ecological and zoogeographical implications of the determined aphid species from East and South eastern part of the Turkey

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Aim of the study: Turkey has unique floristic, agricultural, zoogeographical and climatic properties that result in higher biodiversity in Turkey. Despite that there are nonignorable amount of area which has not been studied so far for aphid biodiversity. Anatolian diagonal located in study area that is considered one of the important barriers for aphid diversity and play role in speciation. In addition, there is a dam namely GAP that is one of the biggest in Europe. Study is also closed to the species passageway into Turkey from Africa, Asia and some members from Mediterranean.

Material and Methods: Study area includes Malatya, Şanlıurfa and Adıyaman provinces located in Eastern and South Eastern part of the Turkey. Aphid species were collected from both naturally and cultured almost all plant species and samples were identified by following generally accepted identification keys.

Results: There are climatic and biodiversity predictions indicating that these features are going to influence definitely climatic, agricultural composition and these are going to affect aphid diversity. As a result of the analyses of the preliminary findings from study area, about 170 aphid species were recorded. It has been shown that there are species from North America, Africa, Siberia and Far East that are called as invasive in Turkey. Ratio of the invasive species among determined species about is in accordance with the European and Turkey ratio calculated before which is about 8%. As Turkey is going to be directly affected from results of the global warming, these studies are important not only contribute to the current composition but also give foresight to future changes.

Acknowledgements: Authors thank to Turkish Scientific Council (TUBİTAK- Project Number 115Z325) for supporting this study.

Key words: Aphid, East and South eastern Turkey.

Final report for systematic studies on zerconid mites (Acari, Zerconidae) in Inner Aegean Region of Turkey

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Aim of the study: In this study, to determine zerconid mites fauna of Inner Aegean Region, Totally 2439 samples were collected from litters, rotted tree roots, moss pads, lichens and soil samples from 1041 different localities in between 15 February 2014 – 15 August 2016. 44 species of belonging to 2 genera from the family Zerconidae were recorded from Turkey. We aim to reveal the biological richness which is done insufficiently before and consequently we aim to contribute Turkey and World mite fauna.

Materials and Methods: Collected samples from research area were put into plastic bags, labelled, transferred to laboratory and placed to separate apparatus which consist of Berlese funnels. Samples were kept in separate apparatus during 5 or 7 days according to their humidity. After all mites were collected in bottles containing 70 % ethanol which were placed under separate apparatus. At the end of this process, the contents of bottles were transferred into Petri dishes. Zerconid mites were separated under dissection microscope by means of pipette and forceps. They were placed in 60% lactic acid for clearing and mounted onto permanent microscope slides using a glycerin medium. The examination and drawing of mites were done using an Olympus CX41 microscope with DP25 camera. Detected species were described, illustrated, different body parts were measured, taken photographs and their world distributions were given. Then, the samples were put in stock bottles containing 70 % alcohol and 1- 3 drops glycine and labelled.

Results: As a result of the analysis of the samples, totally 44 zerconid species were detected which 7 of them as new for science and 4 of them as new record for Turkish fauna. From these species, 34 species are belong to genus *Zercon* (*Z. afyonensis* sp.nov., *Z. alattini*, *Z. anatolicus*, *Z. arslani*, *Z. beleviensis*, *Z. burdurensis*, *Z. cabylus*, *Z. carpathicus*, *Z. cokelezicus*, *Z. colligans*, *Z. delicatus*, *Z. denizliensis*, *Z. domanicensis*, *Z. ekizi*, *Z. emirdagicus*, *Z. hispanicus*, *Z. huseyini*, *Z. inonuensis*, *Z. insperatus*, *Z. juvarae*, *Z. karacamehmeti* sp.nov., *Z. laczii*, *Z. longisetosus*, *Z. magdae*, *Z. marinae*, *Z. mehmeturhani*, *Z. osmaneliensis*, *Z. plumatopilus*, *Z. quadricavum*, *Z. similifoveolatus*, *Z. soguticus* sp.nov., *Z. tefenniensis*, *Z. turcicus* and *Z. yusufi*) and 10 species are belong to genus *Prozercon* (*P. balikesirensis*, *P. banazensis*, *P. denizliensis*, *P. bulbiferus*, *P. erdogani*, *P. graecus*, *P. morazae*, *P. plumosus*, *P. tragardi* and *P. yavuzi*). Species of *Z. arslani*, *Z. ekizi*, *Z. emirdagicus* and *P. banazensis* were identified as new species to science and published. Similarly, species of *Z. hispanicus*, *Z. juvarae*, *P. morazae* and *P. plumosus* were also recorded new to Turkish fauna and added to Turkish mite fauna. Species of *Z. afyonensis* sp.n., *Z. karacamehmeti* sp.n. and *Z. soguticus* sp.n. were identified as new to science and prepared for publishing. Also, in this study female specimens of *Z. plumatopilus* and male, deutonymph and protonymph specimens of *Z. cabylus* were recorded for the first time.

Acknowledgement: This research was financially supported by the Scientific and Technological Research Council of Turkey (TUBİTAK), Project number: 113Z717.

Keywords: Acari, Zerconidae, Systematic, Inner Aegean region, Turkey.

Genetic diversity in *Apodemus mystacinus* (Mammalia, Rodentia) based on SSRs in Anatolia

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Aim of the study: Anatolia is a region in where the variety of subspecies diversity is high because it serves as a refuge for species in the Pleistocene period. In particular, the micro-refuge areas in this area are exposed to subspecies studies. The use of polymorphic loci accelerated the search for refuge areas and species diversity. The aim of this study is to reveal the genetic variation of species in *Apodemus mystacinus* populations based on SSR loci and to determine the micro-refuge areas, if any.

Material and Methods: DNA was extracted from 70 *A. mystacinus* specimens collected from 19 localities in Turkey using CTAB method. 7 SSR loci were used to determine the genetic variation of *A. mystacinus*.

Results: As a result of this study, *A. mystacinus* includes 2 genetic groups that indicate the presence of two subspecies; *A. m. mystacinus* and *A. m. euxinus* in Anatolia. This result also supports that one of the micro refuge areas is eastern Turkey and the other western and southern Turkey.

Acknowledgements: This study was supported by Ankara University, Scientific Research Projects Coordination Unit (BAPRO: 14B0430001)

Keywords: *Apodemus mystacinus*, micro refuge, SSR, Anatolia.

Harmful and Beneficial Insect Biodiversity in Pistachio Orchards (*Pistacia vera* L.) in Southeastern Anatolia Region of Turkey

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Aim of the Study: Turkey is one of the main pistachio nuts producing country in the world. After Iran and USA, Turkey is the biggest third pistachio producer country in the World. Southeastern Anatolia Region provides over 90% of this production of Turkey. There are many insect pests in pistachio orchards and they cause large yield and quality losses. However, there are many beneficial insect species in pistachio orchards in Southeastern Anatolia Region of Turkey. In this study, we intended to review harmful and beneficial insect biodiversity in pistachio orchards (*Pistacia vera* L.). For this purpose, we wanted farmers and technical person to know both pests and natural enemies in insect biodiversity in pistachio orchards. In this way, we will have contributed to people to avoid using unnecessary pesticide.

Material and Methods: People need to recognize agricultural pests accurately in order to combat with right strategies against them. In this study, it was aimed to review both harmful and beneficial insects in pistachio orchards. In this context, not only pests but also predatory and parasitoids as natural enemies in insect biodiversity in pistachio nuts orchards in Southeastern Anatolia Region of Turkey will be discussed with literature and available knowledges.

Results: Insects are important parts of biodiversity in ecosystem. They behave as herbivores, pollinators, predators and parasitoids. Some of them pests, others are either beneficials or neutral. There are many insect pests in pistachio orchards and they cause large yield and quality losses. However, there are many beneficial insect species in pistachio orchards in Southeastern Anatolia Region of Turkey. Studies, conducted in Southeastern Anatolia Region of Turkey, reported that there are over one hundred insect species in pistachio orchards. The main insect pest species are *Agonoscena pistaciae* (Burckhardt and Lauterer, 1989), *Kermania pistaciella* (Amsel, 1964), *Hylesinus* (= *Chaetoptelius*) *vestitus* (Mulsant & Rey, 1860), *Capnodis cariosa* (Pallas, 1776), *Schneidereria* (= *Recurvaria*) *pistaciella* (Weber, 1957), *Thaumetopoea solitaria* (Freyer, 1838), *Eulecanium rugulosum* (Archangelskaya, 1937), *Anapulvinaria pistaciae* (Bodenheimer, 1926), *Ceroplastes rusci* (Linnaeus, 1758), *Suturaspis* (= *Salicicola*, = *Leucaspis*) *pistaciae* (Lindinger, 1906), *Lepidosaphes* (= *Pistaciaspis*) *pistaciae* (Archangelskaya, 1930), *Megastigmus pistaciae* (Walker, 1871). The important natural enemies of insect pests in pistachio are determined as *Anthocoris minki* Dohrn, *Oenopia conglobata* L., *Psyllaephagus pistaciae* Ferriere, *Chrysoperla carnea* (Stephens, 1836) *Coccinella septempunctata* L., *Hyperaspis quadrimaculata* Redt., *Orius laevigatus* (Fieber, 1860), *Pharoscymnus pharoides* Marseul, *Hippodamia variegata* Goeze, *Scymnus* spp., *Nabis* spp., *Campylomma lindbergi* Hombelandt, *Geocoris* (*Piocoris*) *luridus* (Fieber, 1844), *Stethorus gilvifrons* Mulsant.

Keywords: insect biodiversity, pistachio, pest, predatory, parasitoid.

Heterocera (Lepidoptera) Species in Hazro District (Diyarbakır) of TurkeyBerna KAYMAK¹, Selime ÖLMEZ BAYHAN²¹Diyarbakır Plant Protection Research Station, , Diyarbakır, Türkiye²Dicle University, Agricultural Faculty, Department of Plant Protection, Diyarbakır, Türkiye
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Aim of the study: This study was carried out in order to determine Heterocera species of the order Lepidoptera in Hazro district of Diyarbakır of Turkey during 2014-2015.

Material and Methods: Selection of different localities from Hazro (Diyarbakır) of Turkey in order to obtain different Heterocera species was prompted in the present study. Adults were mainly collected at night, mostly using a small generator with lamps.

Results: Night butterflies of Lepidoptera; 10 families (Arctiidae, Cossidae, Crambidae, Erebidae, Geometridae, Lymantriidae, Saturniidae, Sphingidae, Tineidae and Tortricidae), 15 subfamilies and 17 genus in a total of 17 species were identified. The synonyms and morphological characteristics of the identified species and their distribution in the world and in Turkey are emphasized. Some of the species identified in the study, *Ocnogynaloewi* (Hübner, 1790) belonging to Arctiidae family, *Tegostoma baphialis* (Staudinger, 1871) belonging to Crambidae family, *Camptogramma bilineata* (Linnaeus, 1758) belonging to Geometridae family, *Lymantria lapidicola* (Herrich-Schäffer, 1851) belonging to Lymantriidae family; *Hapsifera luridella* Zeller, 1847 belonging to Tineidae families are carried a new record for Diyarbakır region.

Acknowledgements: DUBAP (Dicle University Scientific Research Projects) unit is acknowledged for financial support.

Key words: Lepidoptera, Diyarbakır, Hazro, Fauna.

OP123
Insects on Lavander in Isparta Province, Turkey

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Aim of the study: Since time immemorial, people are concerned about perfumed and spicy plants and these plants were utilized in many areas such as cosmetics, flavors, foodstuffs and dyes. Effects on plant diseases and pests of these plant extracts and essential oils derived from plants were studied in detail. The lavender which is one of the aromatic plants, is an important plant for Isparta province and its importance and cultivation area is increasing day by day. But there isn't any study on pests of lavender in Turkey. The aim of this study is identification of insects that cause harm on lavender.

Material and Methods: The insect fauna related with lavender plants. Surveys were performed in 2015 in two locations of Isparta province in Turkey. Insects on lavender plants were sampled by three different methods (sweep net, pitfall and direct plant sampling). All the insects collected on lavender plants in various locations were brought into the laboratory with the help of plastic containers. These insects were sent to authorities for identification.

Results: As a result, that some insects belonging to different orders (Orthoptera, Hemiptera, Coleoptera, Diptera, Lepidoptera, Hymenoptera) were determined. The most common pest species were *Poecilimon glandifer* Karabağ (Orthoptera: Tettigoniidae), *Cercopis vulnerata* Rossi (Hemiptera: Cercopidae), *Lepyronia coleoprata* (L.), *Neophilaenus lineatus* (L.), *Philaenus spumarius* (L.), *Philaenus spumarius* (L.) (Hemiptera: Aphrophoridae), *Atrococcus achillae* (Kiritschenko) (Hemiptera: Pseudococcidae).

Acknowledgements: The authors thank to the Research and Technology Department of Süleyman Demirel University in Isparta, Turkey for financial support for this project (Project number: 4456-YL1-15) and Dr. Ünal Zeybekoğlu who identified the insect species.

Keywords: Aromatic plant, *Lavandula angustifolia*, pests.

Mite Biodiversity in Vineyards of AnkaraEmre İNAK¹, Sultan ÇOBANOĞLUDepartment of Plant Protection, Ankara University, Ankara
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Aim of the study: Anatolia region which contains Ankara is considered as origin of grape. It means, grape and mites have evolved over the years in this region. Also, Turkey is the sixth largest grape producer country in the world. So, determination of mite species of these region is so important for monitoring biodiversity, potential candidates for biological control and routine quarantine controls.

Material and Methods: This survey study was conducted in 2015-2016 in vineyards of Ankara. Five different distinct of Ankara were sampled weekly interval. Distinct were chosen according to amount of grape production. These five distinct has 87% of total grape production of Ankara and one of them has a local wine grape variety (Kalecik Karası). The samples were taken at different direction and height for a homogeneous sampling. Also, plant litters were sampled in some winter months. Mites were mounted in hoyer medium and identify under a light microscope.

Results: There was 97 different sample at the end of the study. Mites were found 90 of them (%92.7 of all samples). 26 species belong to 13 families were detected. The most abundant predatory family was Phytoseiidae. *Phytoseius finitimus* Ribaga, *Anthoseius bagdasarjani* Wainstein & Arutunjan and *Euseius finlandicus* Oudemans were most abundant species. Stigmaeidae and Tydeidae were within other important families. In terms of phytophagous mites, Eriophyidae was most common family with its two species: *Colomerus vitis* (Pagenstecher) and *Calepitrimerus vitis* (Nalepa). Tetranychidae and Tenuipalpidae families were found at low density but still they should not be overlooked because of their high potential of reproduce and carrying disease. In winter, plant litter were sampled for detecting decomposer and saprophyte mite species. High amount of Oribatidae were obtained in conventional fields. It was found promising because Oribatids are bioindicator species.

Acknowledgements: This study was supported by Ankara University (Project number: 16L0447001)

Keywords: Acari, Phytoseiidae, Eriophyidae, Biodiversity, Vineyards.

Phenology and Vertical Distribution of Aphodiinae (Coleoptera: Scarabaeidae: Aphodiinae) in Bozdag Mountain, Turkey

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Aim of the study: This study was monitored using dung baited pitfall traps from October 2012 to September 2013 in 3 localities at different altitudes in Bozdag, Eskişehir, Turkey. Totally 1178 specimens belonging to 17 species in 9 genus of Aphodiinae subfamily were trapped.

Material and Methods: Phenology and vertical distribution of Aphodiinae species was carried out between September 2012 and August 2013 in three locations on Bozdag's Mountain in Central Anatolia Region of Turkey. The samples were collected by dung baited pitfall traps. Each specimens identified and turn into a museum material with classic preparation methods. All of the specimens are deposited in Entomology Laboratory of Department of Biology in Dumlupınar University.

Results: Of these species, *Bodilus ictericus* (Laicharting 1781), *Esymus pusillus* (Herbst, 1789), *Melinopterus consputus* (Creutzer, 1799), *Nimbus contaminatus* (Herbst 1783), *N. johnsoni* (Baraud, 1976), *N. obliteratus* (Panzer, 1823), *Volinus sticticus* (Panzer 1798) are new records for central Anatolia region. Beetles of terrestrial system are supported imported ecological role in various ecological processes. Dung beetles are important group primer decomposing in forest ecosystems. Aphodiinae tribe distributed worldwide and this tribe are dominant species groups of dung beetles community in Palearctic Region. According to many of research these group more focused in West Palearctic Region.

Keywords: Aphodiinae, Coleoptera, Eskişehir, Scarabaeidae, Turkey.

Reproductive ecology of Soft-shelled Nile Turtle (*Trionyx triunguis*)Onur CANDAN¹¹Molecular Biology and Genetics Department, Ordu University, Turkey
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Aim of the study: There were limited studies on *Trionyx triunguis* in Turkey where has the largest population found in. The reproductive features of the species is little known. Also, studies on this species nesting ecology are conducted on western Mediterranean. The aim of this study is investigate the nesting ecology of *Trionyx triunguis* and providing more knowledge from the beaches that have no data for filling the gaps.

Material and Methods: This study was conducted on three different beaches (Belek, Göksu and Burnaz) in the Mediterranean coastline of Turkey. Beaches were patrolled morning from 15 May to 30 September during the 2016 nesting season. Throughout the morning patrols found nests and were all marked on a daily basis. All nests were caged against predation with mesh grid cages. Nesting dates, distance from high tide line and coordinates were recorded regularly. Nest excavation was done four days after last hatchling emerges. Nest depth was measured from sand surface to the bottom of nest. Dry and wet sand depths of nest were determined by sand color. All eggs were removed from the nest and counted when excavating. Eggs were counted as hatched and unhatched. Each of the failed ones was opened to determine the embryonic stages. To give a more accurate determination of the embryonic stages the criteria of Whitmore and Dutton (1985) were used.

Results: A total of 8 nests consist of 270 eggs were investigated on three distinct beaches. One of the nests were predated. Average clutch size was 33.75 eggs (ranged between 15 to 52 eggs), and the mean nest depth was 35.3 cm (ranged between 19 to 55.1 cm). The mean distance of the nests from shoreline was 11.7 m and varied between 1.2 to 29.0 m. The average hatching success was 69% and embryonic mortality were calculated high in the early and late stages of development. The nesting records of *Trionyx triunguis* from Belek (Aksu River and Köprü Stream) and Göksu (Göksu River) were given by previous studies. But, the Burnaz Beach is the new locality record for nesting of *Trionyx triunguis* in the Eastern Mediterranean.

Acknowledgements: This study represent with the financial support of Ordu University Scientific Research Projects (ODU-BAP).

Keywords: *Trionyx triunguis*, Nesting ecology, New locality, Turkey.

Some Population Parameters of Aegean Chub, *Squalius fellowesii* (GÜNTHER, 1868) in Dalaman River (Muğla, TURKEY)

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Aim of the Study: The Aegean chub *Squalius fellowesii* (Günther, 1868) is a cyprinid species endemic to the Aegean drainages of Anatolia (Turkey) from Eşen, Dalaman, Büyük Menderes, Gediz, Bakır and Madra drainages. The aim of this study was to provide basic information on length-length, length-weight relationships, growth and condition of Aegean chub in Dalaman River (Muğla, Turkey).

Material and Methods: Fish samples were collected by electrofishing from Dalaman River from February 2012 to February 2013. For each fish total length (TL, ± 1 mm), fork length (FL, ± 1 mm), standard length (SL, ± 1 mm) and body weight (W, ± 0.1 g) were measured. Age was estimated by scalimetry and sex was assessed by macroscopic observation of gonads. SL-TL, FL-TL and TL-W regressions were calculated separated for sexes and for the total sample. The theoretical length growth was estimated separated for sexes by von Bertalanffy's model. Fish condition was estimated by means of relative weight (W_r).

Results: The total sample consisted of 162 fish ranging in TL from 5.9 to 21.2 cm (mean 12.55 ± 3.17 cm), in W from 2.11 to 107.80 g (mean 27.83 ± 22.40) and in age from 0+ to 6+ years (mean 3.24 ± 1.31). In total, 86 females and 76 males were caught and the overall sex ratio resulted not significantly different from 1:1 at chi-square test ($X^2 = 0.62$; $p = 0.43$). The length-length and length-weight equations for the total sample were calculated as follow: $\log_{10} W = -5.315 + 3.179 \log_{10} TL$ ($R^2 = 0.989$); $TL = 0.195 + 1.053 FL$ ($R^2 = 0.995$); $TL = 0.809 + 1.113 SL$ ($R^2 = 0.988$). For females: $\log_{10} W = -5.380 + 3.208 \log_{10} TL$ ($R^2 = 0.991$); $TL = 0.289 + 1.047 FL$ ($R^2 = 0.996$); $TL = 0.839 + 1.115 SL$ ($R^2 = 0.989$). For males: $\log_{10} W = -5.265 + 3.157 \log_{10} TL$ ($R^2 = 0.989$); $T = 0.121 + 1.057 FL$ ($R^2 = 0.995$); $TL = 0.869 + 1.101 SL$ ($R^2 = 0.986$). The estimated parameters of von Bertalanffy growth model were: $L_{\infty} = 36.32$, $K = -0.097$, $t_0 = -0.983$ for females and $L_{\infty} = 34.98$ cm, $K = -0.091$, $t_0 = -0.985$ for males. An overall good condition was found (mean $W_r = 92.03$ for total sample, 91.43 for females and 92.71 for males) but a low condition resulted for the younger fish considering the sample for age classes (age 0+: mean $W_r = 77.88$).

Keywords: Endemic fish, Aegean Region, *Squalius fellowesii*, Growth, von Bertalanffy.

The first description of all immature stages of *Eustigmaeus erzincanensis* (Acari: Stigmaeidae) from the Harşıt Valley (Turkey)

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Aim of the study: *Eustigmaeus* Berlese is one of the largest genera in the family Stigmaeidae, with 124 species. *Eustigmaeus erzincanensis* Doğan were only given before from Turkey, and to date its immature stages were not found. 512 females, 25 males, two deutonymphs, one protonymph and one larva specimens of *E. erzincanensis* were found during afaunistic study carried out on mites inhabiting Harşıt Valley. With this study, all immature stages of *E. erzincanensis* were described for the first time.

Material and Methods: Mite specimens were collected from the Harşıt Valley, between the years 2013-2015. The specimens of immature stages of *E. erzincanensis* were found from moss. The specimens were extracted by using Berlese funnels, cleared in 60% lactic acid and mounted on microscopic slides in Hoyer's medium. The immature stages of *E. erzincanensis* were illustrated and their photos were taken by using a Leica DM 4000B phase-contrast microscope. Measurements were taken in micrometers (µm).

Results: In total, 512 females, 25 males, two deutonymphs, one protonymph and one larva specimens of *E. erzincanensis* were found among mite specimens in moss from the valley. The descriptions and illustrations of all immature stages of this species were given here. All immature stages of *E. erzincanensis* Doğan were found for the first time from Erzincan, Turkey.

Acknowledgements: This study was supported by the Scientific and Technological Research Council of Turkey (TÜBİTAK), research project number 113Z094.

Keywords: Mite, *Eustigmaeus*, distribution, Harşıt Valley, Turkey.

The Karyotype of the Jewel Beetle, *Anthaxia praeclara* Mannerheim, 1837 (Coleoptera: Buprestidae)

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Aim of the study: Cytogenetics of the genus *Anthaxia* Eschscholtz, 1829 has advanced more slowly. There is relatively little information available on the chromosomes of this genus. A perusal of literature reveals that only 10 species have been karyotyped to date, approximately 1.1% of all known *Anthaxia* species. Hence, karyotypic data of these beetles remain still scarce, requiring also a more systematic approach. In this work, we report the first karyological information of the jewel beetle *Anthaxia praeclara* Mannerheim, 1837 with the aim of contributing to a more knowledge and understanding of chromosomal diversity in the genus.

Material and Methods: The material used in present study was collected from Ankara and Eskişehir provinces, during May and July 2016. Karyotypes were obtained from testis cells of ethyl-acetate anaesthetised adult males, subjected to a hypotonic treatment in distilled water, fixed using fresh ethanol-acetic acid solution (3:1), then squashed in 50% acetic acid and stained in a phosphate buffered 4% Giemsa (pH=6.8) for karyotype analysis. Spermatogonial metaphases were analyzed and photographed with an Olympus light microscope coupled to a digital camera, at 1000x.

Results: The diploid chromosome number of the jewel beetle, *Anthaxia praeclara* Mannerheim, 1837, was found to be $2n=16$ with meioformula $n♂=7 + X_p$. This karyotype is consistent with previous reports in *Anthaxia* includes following karyotyped species; *A. viridifrons*, *A. Igockii*, *A. bicolor*, *A. podolica*, *A. deaurata*, *A. hungarica*, *A. sponsa*, *A. mirabilis*, *A. olympica*, *A. amasina*. The limited data indicate the need for further karyological studies. Since, these investigations will undoubtedly add to better understanding of the systematic and phylogenetic relationships within this genus and among genera of Buprestidae.

Keywords: Coleoptera, Buprestidae, *Anthaxia praeclara*, karyotype.

The Landmarks Prediction for streaked gurnard *Chelidonichthys lastoviza* using Artificial Neural Networks

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Aim of the study: The aim of this study is prediction of landmarks on streaked gurnard *Chelidonichthys lastoviza* using artificial neural networks which consist of two phases, image processing and prediction of landmarks. In first phase, image processing methods were applied to images in order to find fish object on image and then extract some species specific features. Artificial neural network was used for predicting landmark location on image using the features. After prediction, the landmarks were used to calculate morphometric measurements on the shape.

Material and Methods: In this study, 77 images of *Chelidonichthys lastoviza* were used to construct the proposed model. 14 landmarks were marked on each image for the prediction of *C. lastoviza*. Artificial neural network (ANN) was used as prediction tools in this study. ANN includes units corresponding neurons of biological neural network. There are input and output layers in an ANN with adjustable weights, and each neuron unit of these layers produces an output value which calculated via a function of the sum of its inputs.

Some image processing methods such as noise filter, edge detection, filling operation etc. were applied on the images. After this step, the fish objects were detected which was called ROI (region of interest). Then, some features were extracted from ROI on the images. The extracted features, which are centroid, area oriented and extreme points of object, are used as input parameter in the neural network. Fourteen landmark locations were determined for *C. lastoviza*. The neural network was constructed as two hidden layer with 20 neurons to predict 14 landmarks marked on each image. Networks were trained using extracted features.

Results: It is aimed to develop an algorithm to facilitate shape analyses of fish species. The algorithm can be used to get landmark location and to calculate morphometric measurements of shape. The algorithm automatically determines these landmarks by using image processing techniques and neural network. Actual average size of *C. lastoviza* was about 15cm. The average prediction errors were 0.225 cm of all landmarks. Some landmark prediction error was about 0.034 cm. However, some landmark prediction error was 0.423 cm. These results show that the algorithm automatically predicts landmarks by using image processing techniques and neural network.

Keywords: Morphology, Landmarks, Neural Networks, Prediction, Triglidae, *Chelidonichthys lastoviza*.

Acknowledgements: Thanks to financial support by Mustafa Kemal University (13909).

Zerconid Mites (Acari: Zerconidae) Recorded from Denizli Province (Turkey)Mehmet KARACA¹, Raşit URHAN², Elif Hilal DURAN², Esat KIZILKAYA²¹ Denizli Vocational School of Technical Sciences, Pamukkale University, Turkey² Department of Biology, Faculty of Science and Arts, Pamukkale University, Turkey
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Aim of the study: In this study, it has been evaluated the zerconid mites collected from Denizli province between February 1999 - July 2009. In these 10 years period, 17 zerconid species belonging to *Prozercon* and *Zercon* genera were recorded. These are *Zercon alattini*, *Z. ayyildizi*, *Z. beleviensis*, *Z. burdurensis*, *Z. colligans*, *Z. cokelezicus*, *Z. denizliensis*, *Z. honazicus*, *Z. huseyini*, *Z. kallimcii*, *Z. karadaghiensis*, *Z. mehmeturhani*, *Prozercon celali*, *P. denizliensis*, *P. erdogani*, *P. tragardhi*, and *P. yavuzi*. As a contribution to these known species and to understanding the faunal richness of zerconid mites of Denizli province, *Zercon quadricavum* are newly recorded from Lake Kartal (Beyağaç district) herein.

Material and Methods: Soil, litter and moss samples are collected from Lake Kartal in 2015. Samples are transferred to the acarology laboratory and zerconid mites are extracted. For examinations of mites an Olympus BX50 microscope with DP25 camera are used. Among these extracted zerconids, *Z. quadricavum* is new record for the zerconid mite fauna of Denizli province. The specimens examined are stored in 70% ethanol and deposited in the Acarology Laboratory of Pamukkale University (Turkey). Morphological terminology, idiosomal chaetotaxy and poidotaxy used in the description follow that of Mašan & Fend'a (2004).

Results: Previous studies were carried out by Dr. Raşit Urhan about zerconid mites systematic and ecology in Denizli province. According to collected materials which obtained with these studies 11 zerconid species were presented as new to science from Denizli province. So, terra typica of these 11 zerconid species is Denizli province. It is clearly visible that Çökelez and Honaz Mountains are important natural areas in terms of high endemism rates of zerconids. With newly recorded of *Z. quadricavum*, total number of zerconid species in Denizli province increases to 18. Additionally, some topics about Zerconidae systematic are discussed and identification keys to known species of Turkish zerconids are given.

Keywords: Acari, Mesostigmata, terra typica, Denizli province, Key, Turkey.

Antioxidant Properties of a Simmondsin: A Theoretical Study

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Aim of the study: Simmondsin is an extract of jojoba seeds and a part of the chemical family of flavonoids. Flavonoids are generally composed of polyphenol compounds of plant origin with various biological and chemical activities. Several experimental studies have been shown that antioxidant activity of simmondsin but there is no theoretical study. Because of hydroxyl (OH) groups in the structure of simmondsin, it can scavenge free radicals produced in vivo.

Material and Methods: In this study, the antioxidant activity of a simmondsin have been calculated using density functional theory (DFT), at B3LYP/ 6-31G+(d,p) level. For the antioxidant activity we must calculate the OH bond dissociation enthalpies (BDE) for hemolytic O-H bond breaking and the ionization potential (IP) in the gas phase at 298.15 K.

Results: The antioxidant estimation of simmondsin has been determined. Our calculations represented that IP and ΔE_{iso} are electronic properties responsible for the excellent antioxidant activity of the simmondsin is a flavonol class, which is one of the most antioxidant natural phenolic compound.

Acknowledgements: The authors are grateful to PAUBAP (Project No. 2012BSP004), TUBITAK (Project No. 107T606) and TUBITAK ULAKBIM, High Performance and Grid Computing Center (TRUBA resources).

Keywords: simmondsin, density functional theory (DFT), antioxidant activity.

Antioxidative Enzyme Activities in Pumpkin (*Cucurbita Pepo* L.) Influenced by Selenium Application Under Water Stress

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Aim of the study: The objective of this study was to investigate the effects of selenium on antioxidative enzyme activities of pumpkin (*Cucurbita pepo* L.) in drought stress conditions.

Material and Methods: The study was carried out according to factorial experimental design with three replication in a chamber room under controlled conditions. The plastic pots having 2 kg soil were used as growing media with adding the basic fertilization of 250 mg kg⁻¹ N, 32.75 mg kg⁻¹ P and 82.65 mg kg⁻¹ K into each pot. Two different variety of pumpkin were used in this study. The irrigation was made in three different levels of available water at 30 %, 60 % and 100 % rates. The four doses of selenium (0 mg kg⁻¹ Se, 1 mg kg⁻¹ Se, 2 mg kg⁻¹ Se ve 4 mg kg⁻¹ Se) solutions as natrium selenat (Na₂SeO₄) form were applied when seeds were sown. The experiment was ended after seven weeks.

Results: The positive effect of selenium application on level of peroxidase (POX), ascorbate peroxidase (APOX) and glutation reductase (GR) were found generally higher than in second variety than first variety. The drought stress conditions increased all of enzyme activities. The highest enzyme activities were determined as 16.61 unit/ mg protein, 783 unit/mg protein, 1293 unit/mg protein for peroxidase (POX), ascorbate peroxidase (APOX) and glutation reductase (GR), respectively.

Keywords: antioxidative enzyme, pumpkin (*Cucurbita pepo* L.), droght stress, selenium.

Comparative study of the kinetic parameters and thermodynamic parameters of thermal inactivation process of cow and goat milk lactoperoxidases

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Aim of the study. At the present time, the interest in the use of lactoperoxidase (LPO) has increased significantly in connection with the introduction of new technologies of production of given enzyme from milk and milk whey. However, systematic studies of the kinetic characteristics of LPO obtained from different sources have not been conducted. The purpose of the research was to study the kinetic parameters and thermodynamic parameters of thermal inactivation process of LPOs with respect to the natural substrate oxidation and to determine the substrate specificity of enzymes.

Material and Methods: Lactoperoxidase from goat milk (obtained by cation-exchange chromatography). Lactoperoxidase from cow milk (Sigma, L8257-1MG). The initial oxidation rate of natural substrates was determined in the region of the linear dependence of the change in the optical density on time, varying the pH of the solution, the LPOs concentration, the concentration of substrates. The rate of oxidation of substrates was fixed by the change in the optical density of the solution (412 nm for oxidation of thiocyanate and bromide ions, 353 nm for the oxidation of iodide ions) for 20 s after the addition of H₂O₂. Kinetic parameters were established by graphic methods. The thermodynamic parameters of LPOs were determined from the activity of the enzyme after thermostating (66.5-72°C, exposure to 60 min, SHELLAB W6M-2 water bath). The initial oxidation rate of the natural substrate (KI) was determined on a Solar UV-VIS PB 2201 spectrophotometer. For statistical processing of results the program Statistica 7.0 was used.

Results. Kinetic parameters of cow and goat milk LPOs were determined. K_M values at optimum pH for cow milk LPO were 0.36 mM, 2.66 mM, 1.28 mM for SCN⁻, Br⁻, and I⁻, respectively. K_{cat} were 0.57 s⁻¹, 0.66 s⁻¹ and 4.57 s⁻¹ for SCN⁻, Br⁻ and I⁻ respectively. K_{cat}/K_M were $1.58 \cdot 10^3 M^{-1} \cdot s^{-1}$, $2.48 \cdot 10^2 M^{-1} \cdot s^{-1}$ and $3.58 \cdot 10^3 M^{-1} \cdot s^{-1}$ for SCN⁻, Br⁻ and I⁻ respectively. K_m values at optimum pH for goat milk LPO were 0.084 mM, 2.1 mM, 0.75 mM for SCN⁻, Br⁻, and I⁻, respectively. K_{kAT} were 12.5 c⁻¹, 0.72 c⁻¹ and 1.78 c⁻¹ for SCN⁻, Br⁻ and I⁻, respectively. K_{kAT}/K_M were $1.5 \cdot 10^5 M^{-1} \cdot c^{-1}$, $3.8 \cdot 10^2 M^{-1} \cdot c^{-1}$ and $2.4 \cdot 10^3 M^{-1} \cdot c^{-1}$ for SCN⁻, Br⁻, and I⁻, respectively. The kinetic and thermodynamic parameters of the thermal inactivation process for cow's and goat's milk lactoperoxidases were studied and the activation energy values (372.23 and 409.61 kJ/mol, respectively), the values of the enthalpy of activation, entropy of activation, the value of Gibbs activation energy for thermal inactivation of the given enzymes were established.

Keywords: lactoperoxidase, substrate specificity, the Michaelis constant, thermal stability, thermal inactivation, thermodynamic parameters.

Determination of cadmium(Cd) in samples of sediment cores, water and biota in Köyceğiz Lake (Turkey)Feyyaz KESKİN¹, Ahmet DEMİRRAK²¹Mugla Sıtkı Kocman University, Research and Application Centre for Research Laboratories, 48000 Mugla, Turkey²Mugla Sıtkı Kocman University, Department of Chemistry, 48000 Mugla, Turkey
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Aim of the study: It has varied widely cadmium levels in the environment. The values of cadmium are moved continually between the three main compartments of environmental which are air, water and soils. There are cadmium as usually minor constituent of surface water. Cadmium is transported in a variety of ways to the aquatic environment such as erosion, atmospheric deposition, and direct discharge from industrial operations, leakage from landfills and contaminated sites, and the dispersive use of sludge and fertilisers in agriculture. Much of the cadmium entering surface waters from these sources may be rapidly adsorbed by particulate matter and then settled down in the sediment, and a small portion of the cadmium is dissolved in water as the hydrated ion, as inorganic complexes or as organic complexes with humic acids. The values of cadmium in the sediment and in the water are an important factor in whether is or is not available to enter the biota. The main aims of the study are to determine the concentrations of cadmium in sediment cores, water, and biota and to try to understand the accumulation of biota of cadmium in Köyceğiz Lake.

Material and Methods: In present study, concentration of Cd in sediment cores, water, fish tissue (muscle, liver, gill) and macrophytes samples taken from Koycegiz Lake were measured by Atomic Absorption Spectrophotometer (AAS).

Results: The finding of the study revealed that Cd concentration is higher in the top sediment layers. Moreover, the presence of cadmium in water, fish and macrophytes samples shows that it accumulates in biota.

Keywords: Cadmium accumulation, sediment cores, Biota, Köyceğiz Lake(Turkey).

White, Brown, Beige Adipocytes: Modern Concepts of Function and Biological Role

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Aim of the study: In recent studies, some new properties of adipocytes brown (BAT) and white (WAT) adipose tissue have been discovered. The presence of three functionally different types of adipose tissue requires a detailed study of the complex regulation of adipose tissue development. The discovery of a functionally active BAT in an adult raises the need for studying the specific features of the metabolism of adipocytes and expanding the understanding of its biological role. In this regard, the main purpose of the study was to study the function of BAT and WAT under the influence of physical stress and stress, as well as the mechanisms of differentiation of adipocyte precursors into white, brown and beige adipocytes.

Material and Methods: The studies were carried out on male Wistar rats weighing 200-240 g. The dosed physical exercise was modeled by running animals in a treadmill for 10 minutes daily. Psychoemotional stress - placing animals in cages-pencil boxes in a dark room, with brief light and sound effects (20 minutes daily). From the BAT of rats, mitochondria were isolated by ultracentrifugation. They studied their respiration, measured the membrane potential, the activity of tricarboxylic acid cycle enzymes. The protein profile of white and brown adipose tissue was evaluated. The level of free amino acids and biogenic amines in BAT was measured by HPLC. The source of preadipocytes was mesenchymal stem cells isolated from brown adipose tissue of newborn rats. The effect of unsaturated fatty acids on the differentiation of adipocytes was studied.

Results: Activation of CTA enzymes in mitochondria of BAT at 90-minute cold stress (increase in activity of 2-OGDG by 96.1%, SDH by 65.2%, MDG by 35.8%), which is consistent with the role of BAT in the regulation of thermogenesis. Activation of BAT with chronic stress (psycho-emotional, physical exertion) was first discovered. In BAT, dopamine and serotonin have been detected; reactions of decarboxylation of aromatic amino acids and oxidative deamination of amines have been revealed. It has been established that asparagine and glutamine levels can be assessed as stress markers. In BAT, a high concentration of ornithine (209.75 ± 51.33 nmol / g tissue) was found, which increases by 25% in stress. This may be due to its effect on fat metabolism. Ornithine is synthesized from arginine and, in turn, serves as a precursor for citrulline, proline, glutamic acid. In case of chronic stress, the increase in the activity of the enzymes CTA (55.08% ITS, 2% OGDG by 36.4%, SDG by 30.9%, MDG by 43.9%) indicates activation of the mitochondrial function and involves the participation of BAT in the mechanisms of adaptation organism to stress. With chronic psychoemotional stress, the size of brown adipocytes decreases, the number of mitochondria increases in them. It was found that linoleic, eicosapentaenoic and arachidonic acids induced the proliferation of preadipocytes in a monolayer culture of brown adipose tissue.

Keywords: brown adipocytes, white adipocytes, mitochondria, stress, exercise, differentiation.

A new species of *Genista*, *Genista unalii* M. Dinç & Y. BağcıMuhittin DİNÇ¹, Yavuz BAĞCI²¹Department of Biology, A.K Faculty of Education, Necmettin Erbakan University, Konya, TURKEY²Department of Biology, Science Faculty, Selcuk University, Konya, TURKEY
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Aim of the study: Some *Genista* specimens are collected from Bolkar mountains. Even though the specimens exhibit characteristic features of *Genista* sect. *Spartocarpus*, they clearly differ from the species included in this section. The aim of the study is to clarify the systematic position of the specimens.

Material and Methods: The present study is based on the plant material collected by the authors and the herbarium specimens of *Genista* kept at the herbaria GAZI, HUB and KNYA. In the light of the studies on the materials, *Genista* specimens from Bolkar mountains are compared with *G. sessilifolia* DC and *G. aucheri* Boiss. from the section.

Results: The results suggest the separation of the specimens from Bolkar mountains in the section *Spartocarpus*. Because of this, a new species of *Genista*, *G. unalii* M. Dinç & Y. Bağcı, is described and illustrated. The morphological comparison of the specimens from Bolkar mountains and its relatives show that *G. unalii* differs from *G. sessilifolia* and *G. aucheri* by having short, 1-2-flowered or sterile stems ending in leafy shoots (not long and many flowered ending in an inflorescence), leaves with densely hairy upper surfaces (not glabrous or sparsely hairy).

Acknowledgements: The specimens of the study were collected and photographed during field trips made for the projects 'The Revision of the genus *Johrenia* DC (Umbelliferae) in Turkey" supported by Scientific Investigation Project to Coordinate of Selçuk Univ. (project no. 06401052). We wish to thank Scientific Investigation Project to Coordinate of Selçuk Univ. for financial support. We would furthermore like to thank Prof. Dr Münevver Pınar for her help in the micromorphological studies.

Keywords: Fabaceae, *Genista*, endemic, Karaman, Turkey.

A Research on the Determination of Qualitative and Quantitative Features of Local Dry Bean Populations Collected from Kirsehir Province of Turkey

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Aim of the study: This study was carried out to determine the qualitative and quantitative variations of the local dry bean populations collected from Kirsehir province within the borders of the Central Anatolia Region and to determine its usefulness in breeding studies.

Material and Methods: The study was conducted for two years, 2014 and 2015. In the first year of the study, morphological characterization was performed according to the characteristics determined by the International Plant Genetic Resources Institute (IBGRI).

Results: As a result of the morphological characterization, it was determined that 49 of the population were stunted, 70 of them were semi-dwarf and the remaining 39 were in the form of wrapping. In addition, it was determined that the population showed a great variation in seed color, 58 of them were white, 51 were brown, 17 were black, 14 were violet and the remaining 18 were gray, red and green seed color. The agronomic and phenological characteristics of 158 local dry bean populations that underwent morphological characterization during the first year of the study were determined. In addition, minimum and maximum values for each property are set. 158 local dry bean populations were planted in augmented trial design with 6 standard varieties of dry beans (Zulbiye, Goynük 98, Akman, Karacasehir 98, Onceler, Yunus 90). As a result of observations, it was determined that the length of the plant varies between 47 - 178 cm, the number of pods in the plant is between 5 and 64 and the weight of one hundred varies between 16.23 - 45.29 g. As a result of the study, it is concluded that there are promising genotypes, which have the standard varieties in terms of breeding, and that selection studies on these genotypes should continue.

Acknowledgements: This work was supported by the Ahi Evran University Scientific Research Projects Coordination Unit. Project Number: ZRT.E2.17.015

Key words: Kirsehir, dry bean, breeding, characterization, variation.

A Review on the Water Quality of important Streams of Muğla

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Aim of the study: This study is a review of researches, which were carried out to determine water qualities of important streams in Muğla, SW Anatolia by physicochemical features, benthic macroinvertebrates and epilithic diatoms. For this aim, Eşen, Dipsiz-Çine, Sarıçay, Yuvarlakçay, Dalaman Akçay and Tersakançay streams were investigated. These streams are important natural sources of the Muğla City. Muğla city has important ecological and touristic potentials.

Material and Methods: This review contains the results of researches and projects those were carried on seven important streams, which cover a period between 2000 and 2015. For this aim, physical and chemical parameters, benthic macroinvertebrates and epilithic diatoms were evaluated. Macroinvertebrate communities along the streams were sampled by using a bottom kick net (500 µm mesh). The samples were taken from an area of nearly 100 m² in order to include all possible microhabitats at each station. In some areas with the presence of large stones, the collected macroinvertebrates, were first picked out and washed into the kick net in order to remove pupae and other attached individuals. The diatoms were sampled by scraping the 25 cm² upper surface of epilithon, with a stiff tooth brush and collected in 250 ml sample bottle. All biological and physicochemical samples were carried to Hydrobiology Laboratory of Muğla Sıtkı Koçman University Science Faculty, in freezers and biological samples were identified in possible taxa level under convenient microscopes.

Results: As a result, 37 sampling points on seven important streams were investigated. Sarıçay stream was found critically polluted while others were slightly polluted in general. The monitoring studies should be continued on these streams because of pollution pressure of increasingly developing urbanization, industrialization and touristic activities.

Keywords: Water Quality of Streams, Benthic macroinvertebrates, Epilithic Diatoms.

Aphid Species (Hemiptera: Aphididae) Determined in Campus Areas of Isparta Province

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Aim of the study: This study was carried out in 2015-2016 in order to determine the Aphids found on the woody plants, shrubs and trees in the campus areas of Süleyman Demirel University in Isparta province in Turkey.

Material and Methods: For this purpose, those were determined through surveys between April and October months of these years. Plant parts washed with Aphid were cut with pruning shears and brought to the laboratory with paper bags. Then, it was taken to 96% alcohol and labeled for preparation. The method of Hille Ris Lambers (1950) was used in Aphid preparation.

Results: 28 Aphid species from Aphididae family and belonging to 14 genres were identified through host plants like *Carlina marianum*, *Capsella bursa pastoris*, *Centaurea solstitialis*, *Cephalaria* sp., *Diplotaxis muralis*, *Euonymus japonica*, *Malus domestica*, *Punica granatum*, *Prunus avium*, *P. dulcis*, *Pinus nigra*, *Rosa canina*, *Rosa* sp., *Rumex obtusifolius*, *Sonchus asper*, *Tragopogon* sp., *Triticum* sp., *Vicia* sp. These Aphid species were recorded as *Aphis craccivora*, *A. fabae*, *A. gossypii*, *A. punicae*, *A. rumicis*, *A. nasturtii*, *Brachycaudus (Appelia) tragopogonis*, *B. (Thuleaphis) amygdalinus*, *B. helichrysi*, *Cinara pinea*, *C. pini*, *Dysaphis devector*, *Hyalopterus pruni*, *H. lactucae*, *Lipaphis erysimi*, *Macrosiphum rosae*, *M. euphorbiae*, *Myzus cerasi*, *M. ornatus*, *M. (Nectarosiphon) persicae*, *Rhopalosiphum maidis*, *R. padi*, *Rhodobium porosum*, *Sitobion avenae*, *S. fragariae*, *Therioaphis (Pterocallidium) trifolii*, *Uroleucon (Uromelan) aeneum* ve *U. cichorii*. Also, *Capsella bursa pastoris* (Brassicaceae), *Euonymus japonica* (Celastraceae) and *Rosa* sp. L. (Rosaceae) were determined as new host records for *A. nasturtii*, *Myzus cerasi* and *Rhodobium porosum* in Turkey, respectively. It is deduced that the results of this regional studies and other current studies may be important for the Turkish Aphid fauna.

Keywords: Aphid, Aphid fauna, Isparta, Turkey.

Biotechnology *in vitro* and Plant Biological Resources

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Aim of the study: Biotechnological methods are widely used in practice. Plant cell and tissue cultures are important as promising sources of various pharmacological compounds, including polyphenols. These substances of secondary metabolism exhibit antioxidant, strengthen, antitumor and other types of biological activity.

Material and Methods: Various phenylpropanoids (ferulic acid, caffeic acid, p-coumaric acid, vanillic acid and others), flavonoids (catechins, anthocyanins, isoflavones, flavonols, flavones, anthraquinones), as well as proanthocyanidins and lignin are synthesized in plant cell cultures. Sometimes in cell cultures were carried out by the biosynthesis of phenolic compounds is not specific to plants. There were changes in the content and composition of these substances compared with plant tissues. Suppose that these changes are attributable to cell dedifferentiation, in particular the absence of chloroplasts (when grown in the dark) or their low photosynthetic activity. Changing the composition of the nutrient medium (carbohydrates, hormones, macro- and microelements), as well as cultivation conditions (light, darkness), it was possible to obtain cell cultures where the content of specific phenolic compounds remained at the level of the intact plant or even exceeded it. The level of phenolic compounds is also associated with the growth of cell cultures.

Results: In this case, both a direct and an inverse correlation between the growth and formation of polyphenols are observed. All this testifies to the great specificity of individual strains of cell cultures and tissues of higher plants with respect to the synthesis of phenolic compounds. The use of various biotechnological approaches allows to regulate the accumulation of these biological active substances in plant cell cultures.

Keywords: Biotechnology, plant cell cultures, phenolics, regulation.

Comparison of Biological Diversity Parameters at Apple Orchards

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Aim of the study: Aim of this study was to find out dissimilarities of insect diversity in different type of apple orchards that were managed by organic farming and conventional farming. On the other hand, investigation whether pesticide application decrease and/or negatively affect to insect biological diversity or not. For this purpose Carabid beetles were sampled from four apple orchards and their data were evaluated by diversity index.

Material and Methods: This study was carried out in Isparta province (Turkey) in 2016. Four apple agro-ecosystems were chosen. Two of them were managed by organic farming (without chemical application) and the rest were managed by conventional farming (with pesticide application). Pitfall traps were used for sampling Carabidae family members. Totally 40 pitfall traps were set up in four apple orchards. EvenDiv program was used for calculation of biological diversity indexes including diversity, dominance, evenness, and similarity.

Results: Insect species richness was found higher on apple orchards that managed by organic farming than pesticides applied apple orchard. Both Shannon-Wiener and Simpson diversity indexes were measured lower in the garden where chemical applied while, as expected, dominance that is opposite of diversity were calculated higher. Shannon Evenness index showed that population dynamic of insect species were more balanced in apple orchards, managed by organic farming. According to similarity index (Sørensen); pesticide applied and not applied apple orchards resembled each other. The result of this study showed that applied chemical on the agro-ecosystems decreasing insect species richness therefore insect diversity.

Keywords: Carabidae, Shannon-Wiener, Simpson, Sørensen, Evenness, pesticide application, organic farming, Isparta, Turkey.

Determination of Genetic Differences among *Salvia fruticosa* Mill. Populations from Muğla Turkey

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Aim of the study: Biotechnological and molecular studies are important in conservation of endemic, rare and/or endangered species. The genus *Salvia* have numerous of pharmaceutical secondary metabolites. Due to relatively high essential oil content of *Salvia fruticosa* present in Turkey's western coast and its exports from Turkey makes this species economically important for our country. Furthermore, *S. fruticosa* is endemic to Eastern Mediterranean. Determination of genetic differences using various molecular markers is important in terms of their use in breeding studies that potentially lead to creating superior genotypes. The aim of this study is to determine intraspecific genetic differences using RAPD analysis among the *S. fruticosa* populations from Muğla.

Material and Methods: In this study, *S. fruticosa* seeds have been collected from five different locations in Muğla; Datça, Ortaca, Marmaris, Gökova and Bodrum. DNA isolations were carried out from the leaves of the sterile seedlings grown from seeds that were germinated in vitro. Intraspecific genetic distances among the samples from different locations were analyzed using the results obtained from 12 oligonucleotide primers. Finally a dendrogram illustrating the genetic distances among the plant samples were constructed to show the genetic relationship.

Results: A very high degree of polymorphisms (93.49%) were detected as a result of the studies conducted with 12 selected RAPD primers among the 11 seedlings that were analyzed. A total of 169 scorable bands were obtained. Size ranges of the scored bands were from 4000 bp (OPB-04) to 300 bp (OPB-08). OPB-02 primer produced the most bands and OPB-05 produced the least bands (21 bands and 8 bands, respectively). According to the distance values that were assessed by using PopGene software; the lowest difference value was between the two samples from Bodrum (0.2395), hence identified as the closest samples and the highest difference value was between the samples from Datça and Bodrum (0.6640) and these samples were identified the most distantly related samples. The studies concerning molecular analysis of *S. fruticosa* species are relatively limited in the literature. The results of this study provide the preliminary information regarding genetic profiles of *S. fruticosa* populations found in natural flora of Muğla and can be used as a basis for future molecular studies with these populations.

Acknowledgements: This study is supported by the Muğla Sıtkı Koçman University Scientific Research Projects Coordination Office through Project Grant Number 15/163 (this presentation is a part of 15/163 thesis project).

Keywords: *Salvia fruticosa*, genetic difference, molecular markers, RAPD-PCR.

Diversity of Genus *Cyclamen* in GeorgiaElza MAKARADZEBatumi Shota Rustaveli State University. Georgia
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Aim of the study: The floristic region of Ajara represents “Hotpoint” of Caucasian which is distinguished with the uniqueness of its relict Colchis flora. It represents one of the most powerful refuge in western Eurasia, which is not touched by the chilling. The nature of Ajara is under the economic impact of a powerful man pressure, which poses a threat to certain species and ecosystem balance. *Cyclamen* is a genus of family *Primulaceae* with 55 species of bulbous perennial herbaceous plants. The following 5 species are distributed in Georgia: *Cyclamen colchicum*, *Cyclamen vernalis*, *Cyclamen coum* Mill., *Cyclamen adzharicum* Pobed., *Cyclamen abchasicum*.

Material and Methods: The main methods was Expedition-excursion – observation of *Cyclamen* population, mark the sample. Plant identification was with book “The flora of Georgia”. I used a ruler, to measure the diameter of plant trunk. Also I had marked the area of populations with helping GPS and Gis program. There were difficult specimens, the vegetative features of plants which are not very characteristic of classification.

Results: The results of the study was that, I have identified the natural area of genus *Cyclamen* in Georgia. *Cyclamen adzharicum* Pobed. is distributed in Ajara region, *Cyclamen colchicum* Albov. is distributed in South of Abkhazia. *Cyclamen vernalis* – Samegrelo, Imereti, Ajara region. *Cyclamen coum* Mill. - Transcaucasia, *Cyclamen abchasicum* – Racha-Lechkhumi region. *Cyclamen adzharicum* Pobed. is endemic plant of Ajara and is extremely in danger because of their commercial use. The bulbs are widely used in medicine and its area is reduced.

Acknowledgements: I am very thankful for Prof. Natela Varshanidze, Batumi Shota Rustaveli State University, for her help and useful advises.

Keywords: *Cyclamen*, Endemic plant, distribution.

OP147
Dry Bean Bio-Diversity in Kelkit Valley

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Aim of the study: Kelkit Valley has a 6000 year old heritage. The Kelkit Valley is one of the rare areas of Turkey that have not been contaminated and have not been suffered serious damage to their natural structure. Local dry bean populations, especially grown in the Kelkit Valley, attract interest in all parts of Turkey and take place in Turkish cuisine with their taste. In this study, it is aimed to reveal the diversity of the Kelkit Valley's local bean populations.

Material and Methods: In the study, 5 provinces, 15 districts and 122 villages visited and 225 materials were collected within the boundaries of Kelkit Valley. The collected materials were grouped considering the seed shape and color and 367 sub-samples were formed. Even the seed colour and shape of the collected dry bean populations give clues to how rich the Kelkit Valley is in terms of diversity.

Results: The results showed that dry bean is grown by almost every village and every farmer even in small areas. It has also been determined that there is no commercial dry bean intake in the region. It can be said that most of the collected materials is local. In particular, grown dry beans in the towns and villages of Kelkit, Şiran and Suşehri districts, which are located within the boundaries of the Kelkit Valley, consumed in many places of Turkey. It is seen that dry bean is one of the most important field crops of the region along with wheat, maize and potatoes.

Keywords: Kelkit Valley, local dry bean, diversity, population, seed.

Evaluation Benthic Macroinvertebrate Fauna in Relation to Physical and Chemical Parameters in a small sized stream in SW Anatolia-Turkey

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Aim of the study: This study was carried out to determine the benthic macroinvertebrate fauna in relation to physical and chemical parameters of Yuvarlakçay Stream. Yuvarlakçay stream is an important source which influents Köyceğiz Lake, which is highly significant in terms of the ecological and touristic potential. Determination of the water pollution will be contribution to the improvement in the aspect of water quality. Besides there are a few trout farms one of which is large-scale enterprise and the others are small in quantity that works 1200 tonne annually. Although there are researches on ecologically highly popular Yuvarlakçay Stream, this study will be much more accurate and detailed.

Material and Methods: This study has been done between January 2014 and November 2014 in 6 chosen stations on Yuvarlak Stream in seasonal periods. Benthic macro invertebrates have been collected by using a bottom kick net (500 µm mesh) in the field. At the same time, some parameters of water quality were measured in the field and water samples were taken in to polyethylene containers for the others. Water quality of the stream was classified according to WPCD (2004), Klee (1991), and BBI. As for the conclusion, the water quality has been revealed physicochemical and biologically by the samples taken from 6 chosen stations during a year in this study.

Results: Benthic structure of macro invertebrates of Yuvarlak Stream has been revealed by having studied 5976 individuals. Individuals sampled from the stations belong to Turbellaria, Gastropoda, Bivalvia, Hirudinea, Crustacea and Insecta classis. Totally 47 taxa were identified of which 36 taxa belong to Insecta. Results were evaluated by statistical methods and by the national and international index values. When the obtained values handled it was found that Yuvarlakçay Stream was under a pressure of pollution but it was not an extreme.

Acknowledgements: This study was financially supported by Scientific Research Projects of Muğla Sıtkı Koçman University with the project number;13/164.

Keywords: Benthic macroinvertebrates, Water Quality, Yuvarlakçay Stream.

OP150
General View of Turkish Bryoflora

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Aim of the study: The main objective of this work is to reveal the situation of bryophyte in Turkey that forms the second largest group of plant biodiversity.

Material and Methods: The first bryophyte record from Turkey was given in 1829. After this date, many studies were carried out up to now. This study is a brief compilation of bryophyte history of Turkey.

Results: Especially after the 1990s, many important additions to the bryophyte flora of Turkey have been carried out. Up to date, about 1000 bryophyte taxa are known from Turkey (approximately 800 mosses, nearly 190 liverworts and 4 hornworts). Turkey is one of the few countries in which three different climate types can be found. This feature is one of the main factors in the diversity of plants. And also habitat diversity of Turkey plays a role in the diversification of species and the formation of hot spots. The recent bryophyte flora of South-West Asia is heterogeneous and consists of 6 floral elements that are derived from the different Pangaeian ancestral floral stocks. Turkey has 7 endemic bryophytes (3 liverwort and 4 mosses). Two of them are belong to genus *Cinclidotus*. Major centre of diversity and speciation of the *Cinclidotus* / *Dialytrichia* complex is the Mediterranean – SW Asian territory (Greece, Iberian Peninsula, Israel, Lebanon, Turkey). A concentration of species (11 taxa,) can be observed in Turkey. In this study, Turkish bryophytes were evaluated and the recent bryological developments in Turkey were presented.

Acknowledgements: I would like to thank all the researchers who contributed to the development of Turkish bryoflora.

Keywords: Bryophyte, Flora, Biodiversity, Turkey.

Geophytes of the Küre Mountains National Park (Bartın Section)

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Aim of the study: The object of this study is to introduce geophytes of Küre Mountains National Park which has a rich flora.

Material and Methods: The study area covers Bartın section of Küre Mountains. Küre Mountains start from Bartın River on the west and extends to Kızılırmak River in the east. The highest part of the area reaches 1210 m and decrease to 50 m in the north (Kurucaşile district). According to Davis's grid system, research area is in A4 square and both Euro-Siberian and Mediterranean influence are seen in the region. The National Park was identified as one of the 100 Forest Hot Spots of Europe which should be protected. However, it was attracted a number of researches until today. The field survey was carried out in March and September, between 2014-2017 years.

Results: As a result of identification of the collected plant specimens, 605 taxa belonging to 381 genera and 91 families have been determined. 85 of these taxa and 45 genera belonging to 25 families are geophytes and 3 taxa are rare and 5 taxa are endemic. Küre Mountains National Park makes contribution to rural economy with its eco-turism potential beside ethnobotanical resources. Most of the geophytes are collected from the nature for their tubers and rhizomes which are used for medical and aromatic purposes. For instance, *Equisetum arvense* L., *Anacamptis pyramidalis* (L.) Rich., *Orchis mascula* (L.) L., *Crocus ancyrensis* (Herb.) Maw., *Ornithogalum fimbriatum* Willd. taxa are collected by local people and sold. This uncontrolled utilization threatens geophyte population in the region. In addition to that, in the Black Sea Region, they are destroyed due to the pasturage and forestry activities. So, they should be identified with the flora studies and in situ and ex situ conservation should be provided. It is very necessary to continue such researches to show Turkey's natural richness.

Acknowledgements: This study is supported by TÜBİTAK, Project number: 114O660

Keywords: Geophytes, Küre Mountains, National parks, Turkey.

Influence of Unfavorable Factors to Biodiversity of Rare Geofits

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Aim of the study: Range and the number of rare species belonging to the genus *Tulipa* L. and *Iris* L. are gradually decreasing as a result of the degradation of natural landscapes under the anthropogenic influence. The use of places for agricultural purposes where geofit plants are historically inhabited, causes negative impact for sustainability of population. The study of ontogeny and bioecological characters of rare geofits is important in the the scientific substantiation of rehabilitation opportunities of plants. Reintroduction of the species *Tulipa* L. and *Iris* L. in the in depleted areas is one of the effective methods for protecting and restoring of biodiversity.

Material and Methods: The object of the research are species of *Tulipa eichleri* Regel, *T.biebersteiniana* Schul. et Schult, *T.julia* C.Koch, *Iris acutiloba* C.A.Mey., *I.reticulata* Bieb., *I.grossheimii* Woronow ex Grossh. what are widespread in the north-eastern part of Azerbaijan. These species can be found up to dry-grassy slopes of low and medium mountain zone of Great Caucasus, on wormwood-salinated, wormwood-ephemeral, turfen-grain, dry steppe, various grainy-grassy steppe, subalpine vegetation formations. Rare plants are found on dry, stony, gravelly mountain slopes, among rocks, in forest glade, planting fields, 140-1500 m above sea level. Individual monitoring techniques in special test grounds and methods of geobotanical searches in the fields have been used in order to study natural resources of geofits. Morphometric parameters of vegetative and generative organs of plants in testing fields, age range and resistance to environmental conditions were studied. Assigning the species in the plant group, diversity and number composition of the populations in the natural areas and agricultural ecosystems are comparatively studied. Abundant variation and diversity of *Tulipa* L. and *Iris* L. species in small locality of natural areas were investigated by an individual monitoring method. Reintroduction possibilities were studied in order to recover the number of plants in the depleted areas.

Results: Observations show that, *Tulipa* L. and *Iris* L. species adapted to different ecological conditions and have a broad range of ecological plasticity. The rare geophytes species are distinguished by abundant form and biodiversity in untouched natural areas. Analysis of age spectrum of geofits indicates that populations represented by *latent*, *juvenile*, *Immatur*, *virginil* and *generative* age stages of ontogenesis are more durable, and capable of self-regeneration. The plants of *generative* ages restore, burgeon and form seeds every year in natural phytocenosis where is minimal human impact. Plants of *juvenile* and *immatur* age stage of rare species which spring up in agroocenosis constantly expose to anthropogenic stress and get destroyed during cattle grazing, haymaking and agro-technical measures. Research shows that the loss of the age spectrum causes a sharp reduction of species diversity. Collection of *generative* plants growing around the edges of cultivated fields leads to a decrease in the plants population. Reintroduction of some geofit species in depleted areas is the main method for the rehabilitation of rare plants. It is recommended to create wildlife micro sanctuary, genetic bank of the plants and monitoring through GIS system in the areas with small plants localities in order to preserve rare geophytes species.

Keywords: rare geophytes, anthropotolerance, population, biodiversity, ontogeny.

Monitoring and Conservation Studies on Nile Soft-Shelled Turtle (*Trionyx triunguis*) During 2016 Nesting Season on Dalaman and Dalyan Nesting Beaches, Turkey

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Aim of the study: Mediterranean Subpopulation of Nile Soft-Shelled Turtle (*Trionyx triunguis*) is a Critically Endangered species. Despite it was identified from Africa, it is believed that main populations are found in Turkey. Dalaman and Dalyan host two of the most important populations of the species and nesting occurs on both regions. Nesting activities have been monitored since 2002 on Dalaman and on Dalyan since 2006 regularly. In this study, we aimed to present the status of nesting populations in two nesting area during 2016 breeding season with a trend analysis.

Material and Methods: Field studies were carried out on Dalaman, around Kükürtlü Lake which has one of the largest populations of Nile soft-shelled turtle, and Dalyan, Iztuzu Beach. Data collection was carried out by daily monitoring of the nesting areas by at least 2 people. Nesting and non-nesting emergences, predation and hatchling emergence were noted. GPS locations and distance from the water were also noted. All non-predated nests were protected by using 1X1 m cages. Predated eggs were counted on the predation day. Nests were excavated after hatchling emergence and number of eggs, dead and alive hatchlings in the nests were noted. All data were tabulated and statistical analyses were made by MS Office Excel 2013.

Results: A total of 29 and 23 nests were recorded on Dalaman and Dalyan Beaches during 2016 breeding season, respectively. Of these nests, 11 (37.9%) and 14 (60.8%) nests were predated by foxes on Dalaman and Dalyan respectively. A total of 298 hatchlings were produced from 601 eggs during 2016 in Dalaman with a hatching success rate of 49.6%. A total of 368 hatchlings were produced from 805 eggs during 2016 in Dalyan with a hatching success rate of 45.7%. Highest numbers of nests were observed in 2002 in Dalaman (71) and in 2015 in Dalyan (92). The mean numbers of nests were calculated as 30.1 nests per season in Dalaman and 36.4 nests per season in Dalyan. No statistically significant differences were seen in the number of nests in the two nesting areas (Dalaman: r^2 0.04; Dalyan r^2 : 0.1) among the years but yearly fluctuations were observed in the number of nests. Also, high predation rate is appeared to be the most important problem for conservation of the species in these two important nesting area.

Acknowledgements: The authors would like to thank to the Turkish Ministry of Forestry and Water Affairs, General Directorate of Nature Conservation and National Parks for their support during this study.

Keywords: Dalaman, Dalyan, Nile Soft-shelled turtle, conservation, nest.

Potential distribution in future of *Mertensiella caucasica* (Waga, 1876)Serkan GÜL¹, Yusuf KUMLUTAŞ², Çetin ILGAZ²¹Department of Biology, Faculty of Arts and Science, Recep Tayyip Erdoğan University, Rize, Turkey²Department of Biology, Faculty of Science, Dokuz Eylül University, Buca, İzmir, Turkey
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Aim of the study: To examine ecological niche modelling of *Mertensiella caucasica* under different climate scenarios to understand how change in climate affects the Caucasus salamander, and how the distribution of species will respond to change in climate.

Material and Methods: All distribution data for *M. caucasica* were assembled by searching (1) the available literature, (2) HerpNET, which is a global network of herpetological collections data (<http://www.herpnet.org/>), and (3) field observations between 2002 and 2014 years. A total of 85 records were selected to use as training points data for modelling. Raster data with 2.5 arc-minutes resolution (~5 km×5 km) for current (~1950-2000) were imported from generic grids on WorldClim. Future climatic conditions (2050s (average for 2041-2060) and 2070s (average for 2061-2080)), composed of 19 bioclimatic variables, were downloaded from the Climate Change, Agriculture and Food Security website (CCAFS). Two emissions scenarios named as Representative Concentration Pathways (RCPs) from the Fifth Assessment Report (AR5) of the Intergovernmental Panel on Climate Change (IPCC) were used for climatic projections (RCP 4.5 and RCP 8.5). The known localities of *M. caucasica* and bioclimatic data were used to build the model. In order to quantify the relationship between known distribution of *M. caucasica* and bioclimatic variables, the Maxent Modelling Algorithm was used.

Results: Future projections based on the HadGEM2-ES models under RCP 4.5 and RCP 8.5 scenarios generally exhibited small differences. Both RCP 4.5 and RCP 8.5 maps, which identified the most suitable regions for *M. caucasica*, are mostly similar. The future distribution was similar to the current distribution in terms of the absence of *M. caucasica* in the Russian Federation, the Greater Caucasus, south and southeast of the east Lesser Caucasus. The future distribution showed a remarkable expansion towards the northwest part of the Greater Caucasus whereas it indicated a regression from the west in the western Lesser Caucasus up to the Greater Caucasus. The greatest habitat declines for this species were predicted in the western Lesser Caucasus (2050 and 2080 in the RCP 8.5). In fact, there was a projected increase for habitat suitability towards a large part of the Lesser Caucasus and up to the Greater Caucasus in all scenarios of HadGEM2-ES scenarios in 2050s and 2080s. The west Lesser Caucasus, on the other hand, showed a projected decline in habitat suitability during each time period. In particular, habitat loss seems to occur most in the west Lesser Caucasus including the northeast of Turkey; moreover, habitat suitability for *M. caucasica* showed trends towards extinction according to both scenarios.

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Keywords: Amphibians, Biodiversity, Caucasus, Conservation, Ecological niche modelling.

Spatial and temporal distribution of Eurasian Lynx (*Lynx lynx* L. 1758) in north-western Turkey

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Aim of the study: *Lynx* plays key roles in the ecosystems like other predator species by controlling the fluctuations of prey populations and it helps to preserve the ecological balance. Therefore, it is certain that decrease in the number or complete extinction of the species will lead to irreversible problems. It is very important to understand ecological characteristics of lynx for assessing the status of the species in a region and to make effective conservation plans. In this study, carried out in rural parts of Çamlıdere, Kızılcahamam (Ankara) and Gerede (Bolu) in north-western Anatolia, which habitat(s) among the major vegetation structures in the area were preferred by lynxes and seasonal movement patterns, daily activity patterns and seasonal activity variations of lynxes were aimed to determine.

Material and Methods: This study was carried out between July 2013 and June 2015 continuously for 2 years. A total of 10,102 camera trap day observations with 24 passive infrared camera traps (Bushnell Trophy Cam), in an area of approximately 650 km² were made throughout the study period. Brown bear, grey wolf, red fox, badger, otter, red deer, roe deer, wild boar and European hare were determined to occur in the area in addition to lynx. Carnivore-carnivore competitions and carnivore-herbivore relations between lynx and these species were revealed and the effects of topographic, hydrologic and anthropogenic characteristics of the area on the distribution pattern of the species were evaluated. It was assessed whether spatial and temporal distribution of lynx correlated positively or negatively with other target species and abiotic factors. Regression models and other statistical analysis were made by using Statistica software.

Results: 147 independent camera trap records of lynx were obtained from 19 camera trap stations. These records were used for further analysis. As a result, lynx was found to be occur in the region every season and there were positive correlations between spatial distributions of lynx, brown bear and wolf. Although crepuscular and nocturnal activity preference of lynx was similar to those of wolf, red fox and European hare, its daily activity pattern, that peaks between 20:00-21:59 and 04:00-05:59 hours had positive correlations between daily activity patterns of brown bear, wolf and wild boar. Spatial distribution and daily activity pattern of lynx did not differ between seasons. During the study, lynx was determined to stay away from residential areas and roads or water supplies did not affect the distribution of the species in the region. No significant relationships were found between spatial distributions of lynx and domestic animals or human activities. The results obtained were also used for the assessment of the current protection areas (Soğuksu National Park and Eurasian Black Vulture Wildlife Reserve) with regard to mammal species and for suggesting alternative areas for more efficient conservation schemes.

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Keywords: Eurasian lynx, *Lynx lynx*, camera trap, spatial and temporal distribution.

OP156
***Sphagnum* Peatlands of Turkey**

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Aim of the study: The aim of this study is to introduce Turkish peatland created by sphagnum. Peat is a heterogeneous mixture of more or less decomposed plant (humus) material that has accumulated in a water-saturated environment and in the absence of oxygen. It covers large areas of land in the temperate northern hemisphere. These areas are very important ecologically and economically.

Material and Methods: Materials of this study were collected between 2013-2016 during the revisional project on Turkish *Sphagnum* supported by TÜBİTAK (TBAG, grant no. 113Z631). All locality data (habitat size, population size, altitude, etc.) were taken during the field trip. The relevant floras and monographs were used for identifications of sphagnum specimens. The voucher species are kept in the herbarium of the Adnan Menderes University, Aydın (AYDN).

Results: The *Sphagnum* rich peatlands are not common in Turkey. Because Turkey is located to the south of the northern hemisphere. One of the main factors for the formation of these peatlands is that the precipitation is much more from evaporates. Because of this, almost all of Turkey's sphagnum rich peatlands have been localized to the eastern Black Sea region. The most well-known of these are Ağaçbaşı peatland (Trabzon), Peatland of Barma Yayla (Trabzon), Çağrankaya Peatland (Rize) and Sazak (Artvin). It is also found in peatlands that do not cover very large areas. The only peatland, known from the northern western part of Turkey, is the Ciğergölü turbalığı (Çanakkale). This area is almost about to disappear.

Acknowledgements: I wish to thank to TÜBİTAK (The Scientific and Technical Research Council of Turkey) for financial support of project (TBAG 113Z631).

Keywords: Peatland, Sphagnum, Bryophyte, Conservation, Turkey.

The Potential of Organic Laurel Production (*Laurus nobilis* L.) in the Mediterranean Region of Turkey

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Aim of the study: Laurel (*Laurus nobilis* L.) is a native species of Turkish flora. It has been grown and used as medicinal and aromatic plant in the Mediterranean Basin for centuries. Meantime, it is also a very important ornamental plant used in parks and gardens for its pruning and shaping suitability. Nearly 95% of the world laurel leaf consumption is provided by Turkey alone. According to the data of 2013, annual laurel leaf production is 15,000 tons and export revenue is 32 million \$. In this paper was explained how the potential of organic laurel production can increase and its importance for environmental sustainability in the Mediterranean Region.

Material and Methods: Laurel is an important evergreen small tree species of Lauraceae family. Laurel grows naturally throughout Turkey's coastal regions. Manavgat-Sırtköy sample was studied in detail and taken into consideration for organic laurel leaf production. Manavgat-Sırtköy laurel research area is located within the borders Antalya Department of General Directorate of Forestry and has a size of 1318.3 hectares. Other studies on laurel production have also been examined.

Results: Laurel leaf collection is mostly done by conventional methods in Turkey, so this causes some unwanted damages on the trees. Overgrazing is another serious problem of the trees. These undesirable production and collections of laurel leaves should be done under control. Unfortunately, there have not been enough technical and scientific researches on laurel cultivations in Turkey yet. The demand for organic products is becoming popular all over the world. In this sense, organic laurel production and laurel leaf collections become quite important. According to the related article 13 of the regulations concerning the principles and implementation of organic agriculture, transitional period does not apply to the products collected from the wild. Environmental sustainability can be assessed by many indicators: biodiversity, landscape, soil, water, climate, air and energy. These regulations concerning the principles and implementation of organic agriculture also contribute to improvement of environmental sustainability.

Keywords: Laurel, *Laurus nobilis*, Mediterranean Region, organic agriculture.

The Structure of Fish Fauna in Dalyan-Iztuzu (Mugla, TURKEY)Huseyin SASI*Basic Sciences Department, Fisheries Faculty, Muğla Sıtkı Koçman University, Turkey
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Aim of the study: Dalaman River is a main river, located West Mediterranean Basin, in Southwestern part of Turkey. The river has two HES (Hydro Electrical) Dam Lake and one have aquaculture activities. The biodiversity of freshwater systems have been deteriorating with human activities. The introduction of exotic species, where these fish were unknown before, in natural water could be damage for native fishes many natural waters around the world. The aim of this study was to provide fish fauna in Dalaman River (Mugla, Turkey).

Material and Methods: This study was carried out between February 2012 and February 2013, to determine the fish fauna inhabited in Dalaman River. Fish samples were collected by electrofishing and seine net from Dalaman River. For all fish total length ($TL \pm 1\text{mm}$), fork length ($FL \pm 1\text{mm}$) and body weight ($W \pm 0.1\text{g}$) were measured.

Results: It was determined that specimens caught were belonging to 11 species and 5 families (Salmonidae, Cyprinidae, Poeciliidae, Anguillidae, Cichlidae) were identified. The fish found as *Oncorhynchus mykiss* (Walbaum, 1792), *Cyprinus carpio* (L. 1758), *Squalius fellowesii* (Günther, 1868), *Capoeta bergamae* Karaman, 1969, *Anguilla anguilla* (L., 1758), *Gambusia affinis* (Baird & Girard, 1853), *Carassius gibelio* (Bloch, 1783), *Petroleuciscus smyrneus* (Boulenger, 1896), *Barbus pergamonensis*, Karaman, 1971, *Alburnus escherichii* Steindachner, 1897 and *Tilapia zilli* (Gervais, 1848) are new records from Dalaman River.

Acknowledgement: This study has been sponsored by Mugla Sıtkı Kocman University through the University grant no 16/88-BAP.

Keywords: Fish fauna, Dalyan, İztuzu, Caretta beach, Native, Invasion.

Amino Acid Composition of Cultured Black Sea Trout (*Salmo trutta labrax* PALLAS, 1811)

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Aim of the study: Black Sea trout is endemic fish species of northern Black Sea region and cultured since 1999 by Central Fisheries Research Institute. Since those days, Black Sea trout has been more prevalent in public, and hence has become a one of the primary choices for the aquaculture sector. However, the processing of Black Sea trout in the seafood sector was limited. In this study, it was aimed to reveal the high amino acid content of Black Sea trout. Thus, these results provide information for the further studies and it can be compensates lack of information about nutrient content.

Material and Methods: In this study, 30 individuals of cultured trouts approximately 350 gr each of them were used. Fillets were cut into two pieces throughout from anus to dorsal, vertically. The meat tissue from anus to caudal fin named as caudal section. Second part of the fillet were also divided two pieces throughout to linea laterallis and upper part was named as dorsal, lower part was named as abdomen sections. Thus, amino acid analyses were carried out in dorsal section (DS), abdomen section, caudal section, liver and gonadal tissue. In the analyses, the two gram of all samples were taken and digested with 10N HCl at 110°C in a drying oven for 24 hours. The obtained mixtures were filtered by 0.20 µm PTFE syringe filter. Thereafter, samples were derivatized and syringed (20 µl) to the Agilent Infinity 1260 model HPLC system with 2mL/min flow rate, gradient mobile phase (A:Na₂HPO₄, B:ACN:MeOH:H₂O) and Zorbax amino acid colon (4.6x75mm, 3.5µm). Finally, samples were detected with diode array detector (DAD) in two different wavelengths as 338 nm and 262 nm. The obtained results after being integration were calibrated and expressed as g/100g. Also, proximate composition of all samples was determined.

Results: According to results, dorsal section has 16.021±0.21 g/100g, abdomen section has 12.034±0.37 g/100g, caudal section has 15.617±0.17, liver has 11.510±0.41 and gonad has 17.274±0.43 total amino acid. In the meat tissues, the most commonly found amino acids were found as glutamic acid, aspartic acid and lysine, respectively. Dorsal and caudal section's amino acid contents were found similar to each other, while abdomen section has lower amino acid content than others statistically. The abdomen contains more fat than other sections. In parallel with this, it contains less protein and the amino acid ratio is lower. Likewise, liver has lowest amino acid compositions among groups with their high fat and glycogen content. The gonadal tissues has high amount of raw fat, ash and protein. Besides, it has highest amino acid content among groups. Besides, it was found that all groups contained all of the eight essential amino acids in significant amounts. In the view of the results, Black Sea trout's meat and gonad are rich in terms of amino acid composition especially essential ones.

Acknowledgements: This research was part of the doctoral thesis named as "Determination of Meat Quality of Black Sea Trout (*Salmo trutta labrax* PALLAS, 1811) Provided from Different Feeding Conditions" mentored by Assoc. Dr. Nermin Berik and supported by "A Research on Possibilities of Using Some Phytobiotic Containing Diets in Blacksea Trout (*Salmo trutta labrax* Pallas, 1811) nutrition" named TAGEM project.

Keywords: Black Sea trout, *Salmo trutta labrax*, amino acid, seafood, cultured fish, endemic fish.

Antifeedant effects of *Tanacetum alyssifolium* extracts from Asteraceae family against *Ephestia kuehniella* Z. (Lepidoptera:Pyralidae)

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Aim of the study: Determination of antifeedant effects of chloroform, hexane and water extracts of *Tanacetum alyssifolium* against *Ephestia kuehniella* Zeller (Lepidoptera: Prelidae) larvae. Both our country and all around the world, insect pests living in the stored products cause a serious decline in the quality of products. One of them is *Ephestia kuehniella* which is well-known and called as a flour moth. The use of plant extracts against insect pests is becoming increasingly popular. Accordingly, in this study, antifeedant effects of chloroform, hexane and water extracts of *Tanacetum alyssifolium* against *Ephestia kuehniella* Zeller (Lepidoptera: Prelidae) larvae was investigated.

Material and Methods: 4rd instars insect larvae were brought from Ankara University and plants are collected from Erzincan in Turkey. Plant samples are divided into pieces and dried in the laboratories. Dried aerial parts of the plant are used to extraction. *Tanacetum alyssifolium* extract, employing different solvent were obtained. Dried aerial parts of the plant were powdered. A portion (20 gm; 5 gm portions into 3 cartridges) of dried plant material was extracted in Soxhlet apparatus. Wheat flour were used as test food. Hexane, chloroform and water extracts were prepared in 1000 ml and mixed with 1 gr of the wheat flour at a concentration of 50, 100, 250 and 500 ppm for the test. Accordingly, in this study, consumption of wheat flour eaten by *Ephestia kuehniella* larvae was determined by following. Larvae were cultivated in petri dishes including 50, 100, 250 and 500 ppm hexane, chloroform and water extracts for 24 hours and the average of the difference between the final and initial weight of the petri dishes was determined as the amount of consumption. The antifeedant indices at different treatments were compared using an analysis of ANOVA followed by Duncan test for multiple-comparison where significant differences were observed.

Results: According to the results, hexane extracts of this plant at most of concentrations had highest antifeedant effect to the control. The increasing concentrations of chloroform extracts of *T. alyssifolium* have positive antifeedant effect against *Ephestia kuehniella* larvae. Only the 50 ppm of water extracts of *T. alyssifolium* have positive antifeedant effect due to their lowest amount of consumption. Other concentrations of water extracts have negative antifeedant effect.

Acknowledgements: The authors are grateful to Giresun University for finance support as a scientific research project FEN- BAP-C-250414-13 in Turkey.

Keywords: Antifeedant, Endemic, *Ephestia kuehniella*, *Tanacetum alyssifolium*, Turkey.

Arsenic Levels in Seven Marine Fish Species from the Eastern Aegean Sea and Health Risks Assessment for Consumers

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Aim of the study: The aim of this study is to determine the presence of arsenic, a carcinogenic element, in the seven marine fish species (*Mullus barbatus*, *Mullus surmuletus*, *Lithognathus mormyrus*, *Diplodus vulgaris*, *Pagellus erythrinus*, *Sparus auratus* and *Dicentrarchus labrax*) gathered from Eastern Aegean Sea and to assess possible risks for consumer health.

Material and Methods: After microwave wet digestion of muscle tissues with nitric acid and hydrogen peroxide, their arsenic concentrations is determined by the method of inductively coupled plasma-mass spectrometry (ICP-MS). For basic statistical analyses and the comparison between groups, IBM SPSS Statistics V.22 is used.

Results: Under the light of the obtained data, the highest level of total arsenic is found in the muscle tissues of *Sparus auratus* (0.95 mg kg⁻¹), the lowest level of total arsenic is found in the tissues of *Diplodus vulgaris* (0.33 mg kg⁻¹). Except sea bass, there is a statistically significant difference between sea bream and other fish species ($p < 0.05$). According to health risk assessments based on Estimated Daily Intake (EDI), Target Hazard Quotient (THQ) and lifetime cancer risk (TR), it is determined that there is not any risk in the consumption of these species in terms of arsenic.

Acknowledgements: There is no any financial support used for current study.

Keywords: Arsenic, fish, risk assessment, Aegean Sea.

Assessment of The Possible Genotoxicity of Magnesium Diglutamate, a Food Additive, By Micronucleus Test in Human Lymphocytes

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Aim of the study: Natural resources and their quality are diminishing and natural food resources are also being destroyed. For this reason the use of artificial additives in foods are increasing. Flavour enhancers are used to bring out the flavour in a wide range of foods. They are found in frozen foods, packet soups and canned foods. The most commonly used food enhancers are glutamic acids. Magnesium diglutamate (MDG) is a food flavour enhancer and it is magnesium salt of glutamic acid. The aim of this study is to evaluate the genotoxic potential of MDG by using micronucleus assay (MN) in human peripheral lymphocytes.

Material and Methods: Lymphocytes obtained from three healthy young donors were treated with four different concentrations (93.75, 187.50, 375.00, and 750.00 µg/mL) of MDG. A negative and a positive control (mitomycin-C) were also maintained for each treatment. In addition, cytokinesis-block proliferation index (CBPI) was also determined.

Results: According to the obtained results, MDG significantly increased the frequency of MN in two highest concentrations compared to negative control. However, MDG did not affect cytokinesis-block proliferation index. These results showed that MDG may have genotoxic effect to human lymphocytes *in vitro* at high concentrations. However, other genotoxicity tests should also be applied for detail analysis.

Keywords: Magnesium diglutamate, food additive, genotoxicity, human lymphocytes, micronucleus.

Honeydew producer insects and their potential honeydew honey in Turkey

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Aim of Study: The aim of this study was to survey honeydew producing insect species that source for honeydew honey in forest of Black sea Marmara and Mediterranean regions. *Marchalina hellenica* Gennadius (Hemiptera: Marchalinidae) is one of the important source of Pine honey, its honeydew in large quantities which is collected by honeybees and used pine honey production.

Material and Methods: In survey, sampling was carried out twice per week during spring and summer in the years of 2016 and 2017. Scale insects and aphids were collected from 20 cm infested branches of host plants forests of mainly in Antalya (Mediterranean), Bolu, Giresun (Black Sea) and Kırklareli (Thracian region) in Turkey. Slides were mounted for light microscopy using the methods of Kosztarab & Kozar (1988) and Hille Ris Lambers (1950) respectively.

Results: It was found that there were several species of honeydew producers on pine, cedar, oaks, spruce, fir and various shrubs. *M. hellenica* (?) on *Picea orientalis*, *Physokermes hellenicus* (Kozar & Gounari) on *Abies bommülleriana* and *Metcalfa pruinosa* Say (Hemiptera: Flatidae) and some other honeydew producer species on different host plant and forest areas. All produce large amount of honeydew depending on their population size. The using of honeydew from these insects and their potential of honeydew honey are discussed.

Acknowledgements: This research is supported by Ministry of Forestry and Water Affairs.

Keywords: *Marchalina hellenica*, *Picea orientalis*, *Physokermes hellenicus*, *Metcalfa pruinosa*.

***In vitro* Antioxidant and Mutagenic Activities of *Micromeria fruticosa* ssp. *brachycalyx* Ethanol Extract**

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Aim of the study: Herbs and spices, which are important parts of the human diet, have been used for thousands of years to enhance the flavor, color and aroma of food. Some studies have demonstrated the mutagenic effect many of these plants *in vitro*. In addition to plant-based products capable of protecting humans against oxidative damage, cancer, aging and heart disease. In the current study an effort was made to explore *in vitro* mutagenicity and antioxidant potentials of ethanolic extracts of *Micromeria fruticosa* ssp. *brachycalyx*.

Material and Methods: The aerial parts of *M. fruticosa* ssp. *brachycalyx* were collected from Adana, Turkey and identified by Dr. Olcay Ceylan (Botanist, Department of Biology, Faculty of Science, Mugla Sitki Kocman University, Turkey). Antioxidant activity, total antioxidant content and total phenolic content were determined by free radicals scavenging (DPPH), β -carotene bleaching test system and Folin–Ciocalteu colorimetric method, respectively. The mutagenic effect of the extract was evaluated by the Ames test, using *Salmonella typhimurium* TA98 and TA100 strains.

Results: The *M. fruticosa* ssp. *brachycalyx* leaf extract exhibit remarkable antioxidant activity and showed no sign of mutagenicity at the tested concentrations. The IC₅₀ values of DPPH radical scavenging and β -carotene-linoleic acid bleaching assays for ethanolic extract was determining as 0.53±0.23 mg/ml and 0.62±0.9 mg/ml, respectively. The total phenolic content of the extract was evaluated spectrophotometrically and calculated in gallic acid equivalents (GAE) as 36.2±4.1 mg/ml. Data from present results revealed that *M. fruticosa* ssp. *brachycalyx* leaf extract act as an antioxidant agent due to its free radical scavenging and inhibition of β -carotene-linoleic acid bleaching activity. In addition, even increasing the concentration of the extract did not induce any significant increase in the number of revertant colonies compared with the negative control plates, and different concentrations of the ethanolic extract did not show any mutagenic effect on the TA98 and TA100 strains.

Keywords: *Micromeria fruticosa* ssp. *brachycalyx*, antioxidant, mutagenicity.

Scallop Species in Turkey and Evaluation in terms of Food Safety Considering 9th Task Group of Marine Strategy Framework Directive

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Aim of the study: The Mediterranean basin is regarded as a marine biodiversity hotspot by several scientists. Due to such diversity, many species are used in human nutrition since ancient eras. However, concerns about water quality due to rapid population growth and urbanization, bring the problem of establishing food safety, especially for bivalves in recent years. Among these bivalves, scallops are one of the substantial families having both biological and economic importance. In this comprehensive review, the possible food safety risks of scallop species in the Turkey seas were analyzed by taking into consideration Marine Strategy Framework Directive (MSFD) published by European Commission (2008/56/EC) aimed at reaching good environmental status (GES).

Material and Methods: In this review, the scallop species caught in Turkish waters were examined in terms of food safety. For this purpose, the food safety studies carried out on scallop species such as *Pecten jacobaeus*, *Mimachlamys varia* and *Flexopecten glaber* in Turkey and Mediterranean Sea were reviewed according to MSFD. The 9th task group of MSFD is concerned with contaminants which are any hazardous and accumulative material in fish and other seafood and also interesting to identify levels of contaminants in fish and other seafood by different sub-regions. Thus, the obtained data from researches evaluated according to implications offered by 9th task group.

Results: Scallop species generally distributes in the coasts of Mediterranean and Aegean seas in Turkey. It is an obvious fact that the food safety studies on scallop species are limited in Turkey. According to studies; scallop meat rich in terms of calcium, magnesium, sodium and potassium along with some trace elements such as zinc, boron, manganese and copper within acceptable limits. However, some of these trace metals exceed limits especially in polluted areas. According to 9th task group of MSFD, lead, cadmium, mercury, polycyclic aromatic hydrocarbons (PAH), dioxins and radionuclides should be monitored. However, researchers mostly monitored heavy metals instead of PAH, dioxins and radionuclides. MSFD identified some fish, crustacean and bivalve species which they were consumed extensively in their sub-region as indicator species for those contaminants. Thus, scallop species are not identified as indicator species for the Mediterranean, Aegean and Black Seas which are coasts of Turkey. However, the consumption of scallop species is increasing as well as promising for both the aquaculture and seafood sectors. If the food safety studies on the scallop species of Turkey and whole Mediterranean basin will be carried out considering to implementations of 9th task group coupled with applying the standardized methods and sample preparation procedures determined by the European Commission, more consistent data can be obtained. Thus, it is possible to achieve general objectives of 9th task group, to achieve good environmental status (GES) and to get downward trend on any contaminants can be harmful to humans by seafood consumption.

Keywords: Scallop, pecten, Marine strategy framework directive, shellfish, Mediterranean, food safety.

Historical biogeography of Anatolian alpine plant *Noccaea iberidea* (Boiss) Al-Shehbaz & Menke

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Aim of the study: The main aim of this study was to understand how Anatolian alpine plant *N. iberidea* has responded to global climate changes through the Late Quaternary glacial-interglacial cycles.

Material and Methods: Demographic history of *N. iberidea* was investigated using ca. 25 populations (more than 100 individuals) and two plastidic loci (*trnL-F* and *trnS-ycf9*). Nucleotide diversity and haplotype diversity were estimated. To understand relationships between haplotypes, statistical parsimony networks were generated for each locus separately. To evaluate population expansion, mismatch distribution analyses were conducted using pairwise differences. To determine changes in effective population size through time, an extended Bayesian skyline plot was used. Additionally, to predict the potential distributions of *N. iberidea* under past and present bioclimatic conditions, the maximum entropy machine learning algorithm in the software MaxEnt was used, together with presence-only data and bioclimatic variables. Thus, two key approaches that have been widely used together in recent biogeographic studies were used: molecular phylogeography and ecological niche modelling.

Results: One haplotype was found in higher frequencies, and other haplotypes were generally separated from this haplotype with one mutation step in both *trnL-F* and *trnS-ycf9* data sets. Thus, both haplotype networks were typically star-like, and indicated a recent population expansion. This expansion was supported by unimodal mismatch distributions. Bayesian skyline plot also clearly indicated a population expansion starting from before Last Glacial Maximum), followed by a contraction starting after the LGM, during the present interglacial period. The results of ecological niche modelling were also in agreement with those of molecular phylogeography in that *N. iberidea* expanded its range in the Last Glacial Maximum and contracted its range in the present interglacial period.

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Keywords: Anatolia, *Noccaea iberidea*, phylogeography.

Plant Biodiversity in the Old World (A Case Study for Amedi District in the Northern Iraq)

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Aim of the study: This study was conducted at Amedi District (Duhok / Iraq) to investigate flora, life forms and geographical distributions of vascular plants. Settlement centre of Amedi is a plain and the district totally has an area of 2723,7 km². It is located in the far north of Iraq also is in the north-eastern part of Dohuk province, just about 50 km away according to air distance. The Study area is situated between the latitudes (37° 07' 30,00" & 37° 00' 50,45" N) and (43° 32' 40,00" & 43° 32' 55,90" E) longitudes, with an altitude between 1000-1700 meters. The complicated topography and habitat heterogeneity, in addition to influencing the plain by cold semi-arid climate and precipitation regime of Mediterranean climate type caused variable environmental formations, landscapes and distinctive flora which included by diverse vegetation types including mountain and riparian forests, and steppe grasslands.

Material and Methods: Plant samples are the materials of this study which collected and dried according to the standard herbarium techniques. Almost 800 plant samples were collected at the surrounding of the 21 villages within the district Amedi in 2016. The samples were pressed in the field and transferred to the laboratory, and identified according to the Flora of Iraq, Flora Iranica and Flora of Turkey.

Results: In the present study, 294 plant taxa belonging to 175 genera and 74 families were identified and geo-located. Of the total taxa, 247 are herbaceous (84.0 %), 20 trees (6.8%), 25 shrubs (8.5%), 1 ferns (0.3%) and one parasitic taxon (0.3%). The life form spectrum was determined using Raunkiaer's classification system and compared with the normal spectrum. The families with the greatest number of species were *Asteraceae* with 29 plant taxa (18.4%), *Fabaceae* with 26 plant taxa (16.5%), *Brassicaceae* with 18 plant taxa (11.4%), *Lamiaceae* with 17 plant taxa (10.8%), *Poaceae* and *Rosaceae* with 13 plant taxa (8.2%) for each, *Apiaceae* with 12 plant taxa (7.6%), *Boraginaceae* with 11 plant taxa (7.0%), *Ranunculaceae* and *Scrophulariaceae* with 9 plant taxa (5.7%) for each. The results revealed that the life-form spectrum in the present study was characteristic of a cold semi-arid climate region and dominated by Therophytes (40.4%), Hemicryptophytes (29.2%), Phanerophyte (15.3%), Cryptophyte-Geophyte (10.5%) and Chamaephyte (4.0%). Results showed that the ratios of Therophytes, Hemicryptophytes and Cryptophytes (Geophyte) were more than the normal spectrum, while the ratios of Phanerophytes and Chamaephytes were less than the normal spectrum. In geographical distribution, Irano-Turanian phytogeographical region was the most frequent with the ratio 50.6% (149 plant taxa).

Keywords: Plant diversity, floristic composition, Raunkiaer's classification system, Amedi, Northern Iraq.

Species Diversity and Ethnobotanical Utilization of Lamiaceae in Akseki-İbradı-Manavgat Districts (Antalya-Turkey)

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Aim of the study: The Lamiaceae/Labiatae family includes more than 240 genera and over 7000 species spread worldwide. The family has the commercially most used species such as oregano, thyme, marjoram, mint, rosemary, hyssop, lavender, savory and sage. In this study, Lamiaceae species richness and ethnobotanical utilization of plant products were presented from southern Turkey.

Material and Methods: Research area includes Akseki-İbradı and Manavgat districts of Antalya Province in South Anatolia - Turkey. Districts and their villages were visited during this study. Before visiting to study region, ethnobotanic and taxonomic past studies about species of region and close areas in the literature were considered. We interviewed with local people in the study area to get information about which Lamiaceae species they use, local names of these species, used plant parts, methods of preparation and source of their knowledge about species and traditional uses. We also visited local bazaars and tea houses to compare knowledge from interviewees within and between villages. The collected samples were identified by the first author of the study according to "Flora of Turkey and the East Aegean Islands", the list of Turkish plants and the plant list database.

Results: There were 152 taxa and 134 species belonging to 27 genera of Lamiaceae in the research area. 52 (34.2%) taxa were found endemic to Turkey. The local people are commercially collected many species of Lamiaceae belonging to *Origanum*, *Thymbra*, *Salvia*, *Sideritis* and *Satureja* genus. They sell collected plant parts to middlemen or authorized person of the factories to get income. They use almost every part of plants such as fresh shoots, leaves, aerial parts, flowers, fruits and seeds. Lamiaceae species in the study area are generally used as a spice, condiment, herbal tea and essential oil/extracts resource. The local people ethnobotanically use Lamiaceae species against so many diseases and problems such as cough, cold, flu, stomachache, wounds, diabetes, skin problems, abdominal pains and intestinal problems. Although the local people harvest wild populations after flowering, the sustainability of genetic diversity source of wild populations should be conserved by in situ and ex situ conservation methods.

Acknowledgements: The authors thank to people of Akseki-İbradı-Manavgat (Antalya/Turkey) districts who informed about Lamiaceae species and their ethnobotanical utilization.

Keywords: Ethnobotany, Lamiaceae, plant diversity, southern Turkey.

The Gastropod Fauna of the Antalya Kırkgöz Springs, Turkey

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Aim of the study: This study is aimed to determine Gastropod fauna of the Antalya Kırkgöz spring which is very important wetland in Turkey.

Material and Methods: In this study all old works were complied and field study was performed in 2015. Snails were collected on the stones by hand. They preserved in plastic tubes including 80% ethanol. Dissections and measurements of the shells and genital organs were carried out using a stereo microscope (Olympus SZX7) and photographs were taken with a digital camera system (Olympus DP26).

Results: The Lakes region is the hot biodiversity center for lots of groups including freshwater snails. Studies on Gastropods of the Lakes region started by 1960s. We looked at the recent studies, Schütt, (1964) described 4 new species; *Chilopyrgula zilchi*, *Bithynia pseudemmericia*, *Islamia bunarbasa* and *Greacoanatolica pamphylica* from Kırkgöz Springs. Later he described (Schütt, 1965), *Theodoxus altenai* as new. In 1973, Radoman described, *Islamia pseudorientalica* and *Islamia anatolica* in Kırkgöz springs. Then, Glöer and Yıldırım, (2006) described *Stagnicola tekecus* from Kırkgöz with other locality of Isparta. Besides these, Kebapçı and Yıldırım, (2010) recorded *Borysthenia naticina* and *Radix labiata*. Total of 10 species have been described the locality so far. Our field study is verified this data. We found same species on this region. The basin has high endemism. All species are endemic for Turkey except *Borysthenia naticina* and *Radix labiata*. Kırkgöz springs in an important speciation center for Gastropod species. Threats on Kırkgöz freshwater ecosystem is increasing as in every wetlands. It is thought that there will be more endemic snails here so studies should be continued in this springs before the extinction of the species.

Keywords: kırkgöz spring, gastropoda, endemism, Turkey.

Using of Some Plant Populations as Indicators of Desertification in Azerbaijan

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Aim of the study: Data about spread of *Salsola dendroides* population as an indicator of desertification in Shirvan region of Azerbaijan have been determined in results of carried out researches. Desertification – one is the biggest problems of humanity today. Aridity, salinization, removal by wind and etc. cause formation of the local biotypes of the xerophytes which adapt to disastrous factors are unfavourable in the modern desert cenoses. The quantity of the local biotypes was studied by new formula in pattern sites arranged in Shirvan regions. 10 population of *Salsola dendroides* Pall. species in desert and semi-deserts of Shirvan regions of the Azerbaijan Republic were assessed. The main association and their floristic composition were defined and classification on ecological groups of *Salsola dendroides* phytocenose were developed for the first time.

Materials and Methods: Research had been carried out in flat part of Shirvan territory (desert and semi-deserts of Hajigabul, Kurdamir, Aghsu, Gobustan, Goychay, Yevlakh, Ujar districts of Shirvan regions) of the Azerbaijan Republic in 2012-2014 years. The main object of the research are degraded, steppe, useless, deserted natural ecosystems and agrolandscapes. As scientific-research works conducted by us are multiprofile, morphologic, systematic, floristic, geobotanical, bioecological, industrial, mathematical, monitoring, agrotechnical, phenological, expeditionary, semiportable, stationary, vegetation resources, comparison and other methods were used. During implementation of the researches use the methodology and works of L.G. Ramenski [1937], B.V. Sochava [1950], Brown-Blanquet [1964], I.H. Beydeman [1954], P.D. Yaroshenko [1967; 1969], A.R. Shennikov [1951], B.Q. Shakuri [2004], G.Sh. Mammadov [2007] have been used. Under studying of degradation process of the soil-vegetation cover used the methods of the geographic comparison.

Results: Representatives of ephemers sinusation has been defined by homogeneous development cycle. Ephemers develop strongly after winter silence related with rainfall in March. One of very important features of ephemers is that their vegetations are constant. Ephemers are divided into two groups in *S. dendroides* phytocenosis: the first spring species - their development cycle starts March-April, finishes at the second half of June; last spring species - finishes in the second half of July. The first spring species: *Chamamelum praecox*, *Hernaria hirsuta*, *Adonis aestivalis*, *Phleum paniculatum*, *Holosteum umbellatum*, *Erodium ciconium* etc; Last spring plant: *Lolium rigidum*, *Lepidium perfoliatum*, *Leimonium spicata*, *Helianthemum salicifolium*, *Alussum desertorum*, *Anisantha rubens*, *Senecio vernalis*, *Filago spathulata*, *Bromus japonicus*, *Rostraria cristata* etc. Ephemers and ephemeroids developing in the spring create the physiognomy of the *Salsola dendroides* desert. High temperature and drought changes the spring aspect at the beginning of May. Ephemers and *S. dendroides* stay as a dominant plant, other semi-bushes and annual saltwort give yellowish color. In the autumn, related with fruit period, aspect of the *S. dendroides* deserts changes sharply. *Salsola dendroides* phytocenoses looks beautiful and bright colors of the fruits. Desertification process in the territory has been studied on the scientific bases and the main indications causing desertification, their development parameters, modern condition, factors have been identified and the ways of their prevention have been defined. Direction of spreading, intensity and areals of the ecological modifications intensifying desertification process have been determined. Analysis of the population parameters have been shown that all investigated cenopopulations restored. Parameter of CP 1 and 2 restoration index was higher in 2014 than in 2012 - 2013.

Keywords: *Salsola dendroides*, plant population, indicator, desertification.

OP171
Alien Fish Species of Göksu River Estuary (Mersin - Turkey)

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Aim of the study: Estuaries and coastal lagoons are used by large numbers of fish as nursery sites, migration routes, feeding and/or breeding areas. This study presents population density of alien fish species of Göksu River Estuary.

Material and Methods: Specimens captured with seine-net, fyke net and gill netting between November 2014 and August 2016 (8 sampling events).

Results: 150 individuals belonging to 5 species (*Carassius gibelio*, *Gambusia holbrooki*, *Liza carinata*, *Oreochromis niloticus*, *Sillago suezensis*) belonging to 5 families (Cyprinidae, Poeciliidae, Mugilidae, Cichlidae, Sillaginidae) were caught. While 3 species (*Carassius gibelio*, *Gambusia holbrooki* and *Oreochromis niloticus*) are fresh-water species, 2 species (*Liza carinata* and *Sillago suezensis*) are Red Sea immigrant fishes. *Gambusia holbrooki* has the highest population density (89.3%).

Acknowledgements: This research was financially supported by the TÜBİTAK (Scientific and Technological Research Council of Turkey) under the Project numbered KBAG, 114 Z 259.

Keywords: Alien fish, Red Sea immigrant, Göksu River, Estuary, *Gambusia holbrooki*.

Invasive Scale Insects (Hemiptera: Coccoomorpha) of TurkeySelma ÜLGENTÜRK¹ M. Bora KAYDAN²¹Department of Plant Protection, Faculty of Agriculture, Ankara University, Turkey²Çukurova University, Biotechnology Application and Research Centre, Turkey
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Aim of Study: Goals of this study are presented economically imported invasive scale insects (Hemiptera: Coccoomorpha) that last decades incidental introduced and unwanted spread in Turkey.

Material and Methods: Sampels were collected irregularly intervals during 2007-0017 in Turkey. Scale insects were prepared for light microscopy using the methods of Kosztarab & Kozar (1988). Informations of other invasive scale insect were based on author' records and bibliographic sources.

Results: It was record a new *Acanthococcus* sp. on *Lagerstroemia* sp for Turkish fauna and some new hosts and distribution of notorious scale insects such as *Maconellicoccus hirsutus* (Green), *Nipaecoccus nipae* (Maskell), *Nipaecoccus viridis* (Newstead), *Phenacoccus madeirensis* Green, *Phenacoccus solani* Ferris, *Phenacoccus solenopsis* Tinsley (Pseudococcidae) recently in Turkey. These species produce heavy infestations in suitable climatic conditions, hosts and lacking natural enemies in new regions. They caused important economical and esthetical lost beside of spreading of some plant diseases.

Keywords: Coccoidea, *Maconellicoccus hirsutus*, *Phenacoccus solenopsis*.

The State of the Art of the Adriatic Sea Ichthyofauna

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Aim of the study: The aim of this study is to present actually state of Adriatic ichthyofauna. In this paper we would also like to present the factors, which are to our opinion the main reasons for the changes in Adriatic ichthyofauna. One of the objectives is also to present a new checklist of the Adriatic fishes and to briefly discuss doubtful records.

Material and Methods: The present checklist of the Adriatic fish fauna is compiled from: (i) previous faunistic surveys, (ii) survey of the main scientific journals dealing with the Adriatic geographic area (iii) new records and evidence of fish species by checking the recent ichthyological scientific literature. Only those species which were documented in scientific literature were taken into consideration.

Results: During the last few decades, various factors including climate change, anthropogenic activity and lessepsian migration have altered composition of Adriatic ichthyofauna. Furthermore, extensive investigations carried out in the Adriatic Sea in the last few decades allowed us to recognize species previously unknown from this area. These changes are reflected in the number of species quoted in the checklist of Adriatic fishes, from 407 in 1996 to 440 in 2010. In the period of 2010-2014, twelve new fish species have been recorded in the Adriatic Sea. Consistent with these findings number of recorded fish species in the Adriatic Sea arise to 457. Of 14 Lessepsian migrants that were recorded in the Adriatic, it seems that *Fistularia commersonii*, *Lagocephalus sceleratus* and *Siganus luridus* are successful invaders for its southern part. Some neglected fish species were recorded for the very first time by performing new approaches and techniques in the area. Other fish species were related to certain processes in the Adriatic Sea, such as bioinvasion and meridionalisation. The majority of the fish species introduced by humans (by the mariculture, shipping activities, aquarium releases, etc.) are represented by single findings, and for many of them there is no evidence of established populations.

Acknowledgements: This work has been supported in part by Croatian Science Foundation under the project IP-2016-06-5251.

Keywords: biodiversity, non-indigenous fish species, invasion, Lessepsian migrants, ichthyofauna, Adriatic Sea.

Two Examples of the Human Impact on the Shaping of Zoogeography From Turkey: Invasion and Drainage

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Aim of the study: When we evaluate invasion in terms of zoogeography, we face the facts that the natural distribution of species varies by way of invasion and that invasive species also affect the distribution of the native species. In this study, the invasion of species and the human factor in the variation of the distribution of animal species, how to discern between invasive species and native species and how invasive species spread through new areas are determined. In the last century, due to the rapid increase in population and international transportability many non-native species have entered Anatolia. The situation of introduced species in the Anatolian geography and invasion in the geography of Turkey is revealed on the basis of species that are identified as invasive.

Material and Methods: In this study, data has been used obtained from observations and sampling studies carried out during many years of field studies in Turkey as well as desktop studies from literature.

Results: Human communities arriving in Anatolia from outside have also brought with them many non-indigenous species. Until the last century, no negative impact as to how the alien species effect the fauna of the Anatolian geography could be determined. However, due to the rapid increase in population and international transportability many non-native species has entered Anatolia in the last century. Most of invasions are Lessepsians (=Erythrean migrants) come from Red Sea and/or Indian Ocean via Suez Channel. The worst outcomes resulted from 2 events: 1. The loss of many species due to planned wetland drainages carried out by the state; 2. Fish introduction efforts of the Turkish State Hydraulic Works (DSİ).

Keywords: Invasion, allieni, lessepsians, drainage, human, zoogeography, Turkey.

Wood Anatomical Changes in Juvenile Stem of Common Alder due to Impact of Twining stem of Silkvine

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Aim of the study: Climbing plants may attach to their host plants by means of one of the following mechanisms: twining stems, tendrils, adventitious roots, spines, thorns, sprawling and rambling. The silkvine (*Periploca graeca* L.) belonging to the Apocynaceae family is one of the woody twining species. In this study, the impact of the silkvine to a juvenile individual of the common alder (*Alnus glutinosa* (L.) Gaertn.) was comparatively examined based on some wood anatomical properties of both species.

Material and Methods: Wood samples were taken using handsaw from both the juvenile stem of the common alder and the twining stem of the silkvine. Transverse, radial and tangential sections (20-25 µm thick) were cut from small wood blocks (100 – 1000 mm³) using a sliding microtome, and they were prepared using routine methods for bleaching, staining, anatomical measurements etc.

Results: The preliminary results showed that some anatomical changes (e.g. in vessel diameter and vessel frequency mm⁻²) were present in secondary xylem under the friction surface and its both sides of the juvenile stem of the common alder (host plant). However, except for stem eccentricity index, there was no anatomical change on the twining stem of the silkvine.

Keywords: common alder, silkvine, twining stem, wood anatomy.

A New Adsorbent to Remove Pb^{+2} and Zn^{+2} from Aqueous Solution Using Modified Bentonite Clay with *Pawlonia tomentosa* Extract (PAW/Bent)

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Aim of the study: In this study, the extracted *Pawlonia tomentosa* was immobilized onto natural Bentonite clay to remove Pb^{+2} and Zn^{+2} ions from aqueous solution.

Material and Methods: For this *Pawlonia tomentosa* components were extracted using methanol (1g/10ml) in a water bath stirring for 10 hours. The extracted solution was then filtered and processed to synthesize PAW/Bent adsorbent.

Results: The obtained results show that modified bentonite clay adsorbed more ions than that of the pure bentonite. The operational parameters such as pH, initial concentration and temperature were performed in the adsorption studies. The obtained results exhibit that adsorption process was favorable at low temperature. The optimal pH, initial concentration and temperature was found 6, 0.4 mg/L and 298 K respectively. When the effect of initial concentration was examined at different concentrations, it was observed that adsorption increased by increasing the initial concentration initially and was then held constant as the adsorption probability is higher at higher concentrations. In the present study, we found that q_e values at initial concentration of 0.1 mg L⁻¹ and 1 mg L⁻¹ were 24.78 µg g⁻¹ and 79.87 µg g⁻¹, respectively. The evaluated isotherms possessed that Langmuir isotherms better explain the adsorption of Pb^{+2} And Zn^{+2} than Freundlich isotherm, as reflected in the correlation coefficient.

Keywords: *Pawlonia tomentosa*, Bentonite, Heavy metal removal, Langmuir isotherm.

A promising Neuroprotective Agent for the Treatment of Multiple Sclerosis: 3-beta-Hydroxyolean-12-en-28-oate Isolated from *Capparis ovata*

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Aim of the study: Multiple sclerosis (MS) is a chronic autoimmune disease where the inflammation throughout CNS cause demyelinated plaques of gliotic scar tissue and a variable degree of axonal loss. There is still no complete cure for MS without undesired side effects. Thus, studies on medicinal plants have been pulling in much consideration due to their potential constituents applicable to modern medicine. In this study, potential anti-inflammatory and immunomodulatory activities of Oleanolate (OA, 3 β -hydroxyolean-12-en-28-oate), a universal pentacyclic multifunctional triterpenoid, isolated from *Capparis ovata* were investigated in SH-SY5Y neuroblastoma cells.

Material and Methods: *Capparis ovata* parts had been collected from the beginning of May to end of September in Denizli and Burdur in 2012. (PAMUH 2012000006300). Preparation of water extract of *Capparis ovata* (COWE) parts are defined elsewhere in detail (Turkish Patent Institute TR 2012 04093B). Oleanolate was isolated from the COWE by dichloromethane sub-extraction and was identified by TLC, NMR, and MS analysis. OA was applied at non-toxic doses to the human neuroblastoma cell line SH-SY5Y to study the regulation of the expression of MS-related genes. Total RNA from SH-SY5Y was isolated using RNeasy Plus Universal Mini Kit. RNA was reversely transcribed using Easy Script cDNA Synthesis Kit. Custom designed, tested and validated human MS primers along with the housekeeping genes were used for quantitative determination of differential gene expression profiles between different treatment groups. Then synthesized cDNA was used for qPCR protocol. PCR Array Data Analysis Web Portal was applied for calculations of folds changes in mRNA abundance accordingly to the $2^{-\Delta\Delta Ct}$ method.

Results: The results are the average of the experiments conducted in three independent set of experiments. Statistically significant changes in the expression of 13 genes were detected. The altered expression was observed in genes belonging to myelination, T-cell activation/signaling, adaptive immunity, inflammation regulation, apoptosis, cell adhesion, cellular stress, receptors, and transcription factors. These genes have been suggested to be involved in the development of MS. The expressions of pro- and anti-inflammatory chemokines/cytokines such as CXCL9, CXCL10, and have been shown to be prominently reduced with OA treatment. Also, expressions of TNF and C1S were also downregulated with OA in these cells. Thus, these data strongly suggest that OA is a potent inhibitor of the T cell activation and differentiation. The expression of MMP9, which is known to be important in leucocyte infiltration was also significantly decreased with OA treatment. It was also found out that the transcripts levels of myelin-specific proteins such as MAG and PLP1 were upregulated by OA. Therefore, it may be more beneficial in remyelination of demyelinated axons in MS. Collectively, these results indicate that OA was associated with the suppression of molecules essential for disease development and induction of molecules important in healing.

Acknowledgments: This work was supported by the Scientific and Technological Research Council of Turkey [TUBITAK-112S187].

Keywords: 3-beta-Hydroxyolean-12-en-28-oate, Multiple sclerosis, *Capparis ovata* SH-SY5Y, Anti-inflammatory, Neuroprotective.

Biotechnological Methods of Obtaining Brand new Decorative Characteristics of *Linum grandiflorum* Desf.

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Aim of the study: *Linum grandiflorum* Desf. is widespread decorative plant, however it possesses petty polymorphism of flower shape and corolla colour. For these indicators are of importance in determination of variety we decided to assay different biotechnological methods for approaching this purpose. There is small amount of publications on biotechnology and genetic transformation of *Linum grandiflorum*, so we needed to optimize known techniques.

Material and Methods: Seeds of *Linum grandiflorum* two forms, rubrum and album, were used. Also we took *Linum usitatissimum* as an example for its techniques are worked out. We used 5 % sodium hypochlorite solution (exposure 15 min.) for sterilisation and unsterile control. For cultivation Murashige and Skoog (MS) and Gamborg (B5) medium with growth regulators BAP, NAA and 2,4-D in different concentrations were used. To obtain transformed cells we applied different methods of agrobacterial transformation including those modified by us. As a marker gene we took *gfp* as well as selective gene *nptII*.

Results: Technique of introduction *Linum grandiflorum* seeds of two forms *in vitro* was worked out, comparative analysis of germination efficiency of seeds on nonhormonal medium B5, on this medium with 2 mg/l 2,4-D and in unsterile control was conducted. In order to better characterize the physiological status of the plant, we studied the influence of various growing conditions on the plant morphology. Also we obtained data on morphogenesis efficiency out of callus of different origin and age, data on rhizogenesis efficiency, spontaneous callusogenesis and interaction of endogenous and exogenous hormones. Supposition of differences between spontaneous callus somaclones was made. Work on adaptation and improving existing protocols of *Linum grandiflorum* agrobacterial transformation is continuing.

Keywords: *Linum grandiflorum*, somaclonal variability, genetic transformation, decorative.

Black Sea Trout (*Salmo trutta labrax* PALLAS, 1811) Culture in Turkey and Morphometric Characteristics of Fifth Culture Generation

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Aim of the study: Black Sea trout is endemic fish species of eastern Black Sea and it was adapted to culture conditions for the first time in 2002 by Central Fisheries Research Institute in Turkey. In the last 15 years, with the contribution of the research projects carried out, the Black Sea trout became an important species for the aquaculture sector with reaching 5186 tons yearly production in 2013. By the year of 2015, the latest culture line of the Black Sea trout (fifth generation) was developed. In this study, the culture conditions of the fifth generation which will introduce to aquaculture sector in the upcoming years were determined. Besides, morphological characteristics of the fifth generation were determined with the aim of constitute a basis for culture line registration in Turkey.

Material and Methods: The eggs of the fifth culture line were spawned from broodstocks of fourth generation in November 2014 in recirculating aquaculture system (RAS) with 10% fresh-water change per day. After that, trouts were transported and stocked as 20 kg/m³ to marine cages in December 2015 for smoltification in order to complete their life-cycle. Before the fish reaches the spawning period (forerun the age 2), meristic and morphometric characteristics of Black Sea trout were determined. The measured morphometric characteristics were: total length, standard length, head length, pre-dorsal length, pre-pelvic length, pre-anal length, body height (in dorsal fin), body height (in anal fin), body width (in anal fin), dorsal fin length, dorsal fin height, pectoral fin length, pelvic fin length, anal fin length, anal fin width, caudal fin length, caudal fin width, adipose fin length, adipose fin width, nose length, length between nostrils, eye diameter, length between eyes, head height (in head), head height (in operculum), mouth width, mouth wide, vertebral bones and gill rakers. The vertebral bones and fin rays were counted from the radiograms were taken with x-rays. All measurements were divided as female and male.

Results: Black Sea trout eggs hatched within approximately 38 days at 10°C in RAS and they reached to smolt size in 12 months. After 12th month, Black Sea trouts transported to sea and they reached to table size (approximately 250gr) within 16 months. Moreover, according to meristic measurements; dorsal fin rays are 14; pectoral fin rays are 10; pelvic fin rays are 14, anal fin rays are 12; scale numbers in the lateral line are 112-125, vertebral bones are 57-58 and gill rakers are 16-18. According to statistical analyses; the ratio of the nose length, length between nostrils, and head height to total length of the females were found more than males ($P < 0.05$). However, there were no significant differences between other characteristics of male and females ($P > 0.05$). Also, it has been determined that the fifth generation of Black Sea trout is morphologically similar to natural fish. In a conclusion, due to the economic importance of Black Sea trout in Turkish aquaculture sector, newly-developed culture line can be recommended to sector with convenient culture conditions as well as morphological resemblance.

Acknowledgements: This research was part of “The Determination of Nutritional Requirements in Black sea Trout (*Salmo trutta labrax*)” named project and supported by Ministry of Food, Agriculture and Livestock. The authors would like to thank all researchers who have contributed to culturing Black Sea trout throughout the years.

Keywords: Black Sea trout, *Salmo trutta labrax*, morphometric characteristic, cultured fish, endemic fish.

Breaking Seed Dormancy under *In vitro* Germination of *Indigofera zollingeriana* Storage

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Aim of the study: Indonesia is a country consisting of >18000 islands and with third largest area of rainforests in the world is home to 10 percent of the world's known plant species. *Indigofera zollingeriana* is an important forage plant species that grows widely in Indonesia for livestock feeding because of high protein contents. *I. zollingeriana* has small seed and number of seeds is 5-7/pod with 64-82% of pithy seed. Seed germination reduces rapidly with the passage of time. Seeds stored for 2 months has viability of 28-35% only. The aim of this research was to study the factors affecting seed viability under in vitro conditions.

Material and Methods: *I. zollingeriana* seeds were collected from the Department of Nutrition Science and Feed Technology, Bogor Agricultural University, Indonesia. The seeds were stored under ambient conditions of room temperature for one year followed by their treatment with sandpaper. Thereafter, the seeds were scarified within 98% H₂SO₄ for a range of minutes. Subsequently, they were rinsed 3 times for 5 minutes with autoclaved distilled water to remove the traces of H₂SO₄. The sterilized seeds were cultured on paper bridges suspended over liquid media containing a range concentration of GA₃ and sterilized water (control). The germinated seeds were transferred after 3-4 days cultured onto agar solidified sterile MS medium (Murashing and Skoog, 1962), pH 5.6-5.8 medium and incubated in growth cabinet.

Results: The sterilization using H₂SO₄ for 5 minutes, treatment using sandpaper, and 0.1 mg/L GA₃ showed the best result. The germination percentages of *I. zollingeriana* was 90% in liquid medium containing 0.1 mg/L GA₃ and 87% in sterilized water with injured roots. Germination seed of control (no treatment) was 4%. Using MS media after seed germinated, can improved injured roots condition and roots were growing normally. Comparing two, seeds treated with liquid medium containing GA₃ had more plant height and more roots number compared to those germinated in sterilized water.

Acknowledgements: The authors would like to thank Prof. Luki Abdullah, Bogor Agricultural University, for extending help in supply of the seeds and published literatures on the subject.

Keywords: *Indigofera zollingeriana*, germination, in vitro, propagation, regeneration, seed storage.

Chromosome Doubling in Gynogenic *Allium cepa* and *A. ampeloprasum* Materials

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Aim of the study: Edible *Alliums* such as *A. cepa* (onion) and *A. ampeloprasum* (leek) are highly heterozygous plants. Development of pure lines takes many generations in both species. Gynogenesis-based haploidization techniques allow production of plants with gametic chromosome numbers in both *Allium* species. These gynogenic plants must be converted to doubled-haploids (DHs) to obtain selfed seeds from them. Our studies show that small percentages of gynogenic onion and leek plants are spontaneous DHs. We are investigating efficiencies of classical and novel chromosome doubling techniques that can be utilized in the gynogenic onion and leek materials.

Material and Methods: Gynogenic onion and leek plants obtained by culturing the whole flower buds in induction media were analyzed with flow cytometry to determine their ploidy status. Haploid onion and dihaploid leek plants were subjected to various chromosome doubling treatments. Basal explants were prepared from 3-4 leaf stage plants by cutting their roots, leaves and pseudo-stems (5-7 mm above the base). Treatments were carried out in 6-well plates filled with doubling medium (liquid MSO with varying concentrations of an antimitotic chemical). Treated explants were washed three times with sterile water and placed in Magenta boxes containing regeneration medium. Plants regenerating from the treated explants were rooted and acclimated to *in vivo*. Regenerants were analyzed for ploidy changes when they reach to 3-4 leaf stages.

Results: Treatments with antimitotic agent were highly toxic to most of the explants in both species. In onion, the best treatment resulted in ~70% regeneration and recovery of ~30% plants with doubled chromosomes. Most of the onion plants regenerating from doubling treatments were mixoploids (for haploid and diploid cells), while the rest remained as haploids. In leek, regeneration from treated explants varied between 30 and 50% depending on treatment periods. Analysis of the leek regenerants showed that ~25% of them were converted to tetraploid level. About 50% of leek plants regenerating from doubling treatments were mixoploids (for diploid and tetraploid cells), while the remaining plants did not show any change in their ploidy levels. Plants recovered from doubling treatments were acclimated and grown in the greenhouse for further morphological evaluation and fecundity. Results from our studies show that although chromosome doubling process is rather difficult, sufficient amount of DH regenerants could be recovered from both *Allium* species through the basal explant treatment technique. Further studies are necessary to optimize this technique, especially for the recovery of high number of regenerants.

Acknowledgements: This research was supported by PAU BIYOM.

Key words: *Allium ampeloprasum*, *A. cepa*, Chromosome doubling.

**Collection of Fungi Strains at the Institute of Forest of the NAS of Belarus –
Preservation Depository of Biological Diversity of Basidiomycetes Mycologic
Resources**

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Aim of the study: Saving ex-situ of the taxonomical and ecological variety of genetic resources of the basidiomycetes which have a wide geographical origin as well as strains of rare and endangered species; extension of the collection by separation from a natural mycobiota of new genetic sources of specific and intraspecific variety; comprehensive study, certification and genetic identification of depositors; formation of the database and structure of the collection fund; scientific and practical use of strains as a bases for development and deployment of biotechnologies of receiving fruit bodies of trophic and medicobiological fungi.

Materials and methods: Viability of strains is maintained by the subcultivation method in the mash-agar environment by means of annual resowings with 4-time frequency. Collection strains are stored in refrigerators at a temperature of +4 ... +5 °C in the biological test tubes closed by wadded and gauze corks. Release of natural ex-situ isolates is carried out by the isolation method from basidioma fabric and cultivation of a vegetative mycelium in the agarized nutrient environment. Certification and formation of the electronic database of the depository is carried out according to the standard rules used by world collections of microorganisms and the modern nomenclature using the international customer service of MycoBank. Verification of genetic sources of the collection is carried out by the study of macro - and micromorphological features of collection samples. Productivity of perspective strains is identified by their fruit forming ability on vegetable substrata. Specific accessory of depositors is confirmed with the use of molecular and genetic methods of sequenation of the ribosome operon of the nuclear DNA of basidial fungi.

Results: The collection of fungi strains - the object of national property - is the most representative one in Belarus according to quantity and a variety of true cultures of basidiomycetes, maintains viability of 355 strains of 75 types which belong to 51 species. The most part of the strains belong to the eco-trophic group of xylotrophic fungi. About a half of genetic isolates have been obtained in different years from the fruit bodies collected in nature of Belarus, the others are obtained from other microbiological and mycologic collections of the near and far abroad. The collection fund provides preservation of the genetic material of rare and endangered species of micoflora of Belarus (*Ganoderma lucidum*, *Grifola frondosa*, *Hericium erinaceus*). In the depository viability of more than 250 fungi strains of trophic and medicinal-and-prophylactic purpose is maintained (fungi of *Pleurotus*, *Lentinula edodes*, fungi of *Flammulina*, *G. lucidum*, fungi of *Auricularia*,). Some species of basidial fungi (*Pleurotus ostreatus*, *L. edodes*) are used when developing extensive and intensive production technologies of sowing mycelium and fruit bodies of fungi and have formed a basis for formation in Belarus of the new direction – the industrial fungi production, created on the basis of the enterprises of agro-industrial complex, forestries and farms.

Keywords: collection of strains, preservation of biodiversity, biotechnology.

Comparing of *in vitro* and *in vivo* seed germination of wild fruit *Cerasus prostrata* collected from wild conditions

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Aim of the study: *Cerasus prostrata* (Lab.) Ser. is a wild fruit which grows at 920-2400 m altitude and rocky areas as bush form. Especially, it grows at west, east and central part of Turkey. *Cerasus prostrata* seeds germinates at natural conditions but seed germination time about one year. In this study, it was aimed to determine germination status of *Cerasus prostrata* seeds in tissue culture.

Material and Methods: In present study, we collected seeds from wild grown *Cerasus prostrata* located Erciyes mountain (Turkey) and used torf:perlite media as *in vivo*, hormone free MS media as *in vitro* with different applications. For *in vivo*, direct sowing, HCl application to seeds, hot water application naked seed sowing, for *in vitro*, direct sowing, naked seed on hormone free MS media.

Results: Although we couldn't get any seed germination on *in vivo* at 6 month, all naked seeds germinated at 21 day *in vitro* conditions. Obtained results showed that *in vitro* germination applications are successful for wild *Cerasus prostrata* seeds. Current results can benefit *Cerasus prostrata* breeding and reproduction.

Keywords: *Cerasus prostrata*, seed germination, *in vitro*, *in vivo*.

Determination of Genetic Diversity in the Fruit and Leaf Characteristics Some Quince Genotypes Collected from Kayseri Region

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Aim of the study: Turkey is the first place in world quince production. In Turkey, quince is generally assumed to grow from the seeds in home gardens and it has a wide genetic diversity quince in turkey. This richness should be evaluated by selection studies and genotypes that can be candidate for variety should be determined. In this study, it was aimed to determine the genetic diversity of some quince genotypes selected from the provinces of Kayseri province.

Material and Methods: The study material was obtained by determining genotypes showing superior characteristics in Develi, Felahiye, Incesu, Talas, Tomarza, Yahyalı and Yesilhisar regions where the quince populations are intense in the provinces and districts of Kayseri. DNA isolation was performed in quince genotypes and analysis was performed on 2% agarose gel with 16 SRAP primer combinations. PCR components and cycles were arranged in accordance with the method specified by Uzun et al. (2009). PCR products were run in 2% agarose gel at 100 volts for 2-3 hours. To determine band widths, 100 bp DNA ladder was used. Resultant bands were imaged under UV light.

Results: According to the results of the study, 97 scorable bands were obtained, 91 of these bands were polymorphic and polymorphism rate was 87.7% the genetic similarity interval varied from 0.53 to 0.92. For the primers used, the average number of bands was 6.06 and the average number of polymorphic bands was 5.68. While The highest polymorphism rate was 100% with the primers em10me10, em3me7, em1me1, em11me2, em8me3, em2me2, em9me6, em15me10, em4me4, em6me6, em9me6, the lowest polymorphism ratio was obtained as 0% from the combination of primer em11me11.

Keywords: Quince (*Cydonia oblonga* Mill.), SRAP, Kayseri, genetic diversity.

Effect of High-coherent Light on Morphogenetic Parameters of *Stevia rebaudiana* in vitro

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Aim of the study: Studies on secondary metabolites of plants have an increasing interest because some of them are useful and helpful. The object of our study is *Stevia rebaudiana* Bertoni (Asteraceae). Its leaves are rich with sweet glycosides, the major and the most valuable substance of them is stevioside, which has a hypoglycemic effect – reduces blood sugar level. It has strong sweet taste, about 300 times sweeter than sucrose. Stevioside is widely used as low-caloric sugar substitute product. The purpose of our research is to study, how short-term coherent light treatment effects on morphogenetic parameters of *Stevia rebaudiana* plants *in vitro*.

Material and Methods: Secondary metabolites synthesis directly depends on the photosynthesis intensity and also on the growth rate. Therefore the morphogenetic changes of stevia were especially studied. One of the physical factors is high-coherence light. The maximum aligned stevia plants were cultivated under various light conditions. Different exposure duration of coherent light was used: 30, 60, 120 and 240 seconds as well as different periodicity of irradiation: once and weekly treatment. The wavelength was 650 nm, the oscillation frequency – 2000 Hz, the power of light beam – 2-4 W/m². According to this scheme, the experiment was carried out on hormone-free MS medium and on MS with the 0.1 ml/l Appin and 0.5 ml/l IAA. This hormonal combination had been selected in our previous studies as the best medium for clonal micropropagation *in vitro*.

Results: After three weeks of cultivation, such parameters as the height of newly formed shoots, the total number of leaves, the multiplication factor and the presence of the root system were analyzed. The positive effect on morphogenetic potential of *Stevia rebaudiana* explants under *in vitro* conditions of high coherence light treatment was found. Increased parameters such as shoot height and leaves number of weekly coherence light treatment compared with a single treatment was established. The difference in comparison with control also was found. The most striking instance of stimulating effect of high-coherence radiation on shoot height and leaves number was found on a hormonal medium. Once in a week treated explants were higher by 20-40%, compared with control variant (without any light treatment). The conclusion was made that the combination of the two factors (hormonal and physical) gave a synergistic effect and the effect of coherent light was intensified in the presence of hormones. In general, the effect of weekly treatment with high-coherence radiation was stronger in comparison with a single one. It is necessary that a more thorough study of effect of coherent light on secondary metabolites of *Stevia rebaudiana* should be performed.

Acknowledgements: The research was conducted at the department of agronomy, biotechnology, plant breeding and seed production in Russian State Agrarian University, Moscow, Russia. The study was entirely carried out by Alla Shulgina Andreevna, PhD student, under the supervision of scientific adviser – Kalashnikova Elena Anatol'evna, professor, PhD (Biology).

Keywords: *Stevia rebaudiana*, stevioside, *in vitro* cultivation, coherent light.

Effects of Grafting Time and Type on Graft Success in Chestnuts

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Aim of the study: Turkey is a country with very rich biodiversity resources. Particularly, forests have an important place for plant species and composition. One of these valuable assets is the Anatolian chestnut (*Castanea sativa* Mill), which is the only chestnut species that is naturally found in Turkey. Since chestnuts were under considerable risk due to fungal and cancer diseases, the propagation of this significant tree species through generative or vegetative means is of a great importance. This study aimed to determine the most appropriate grafting time and type in two chestnut varieties in the western Black Sea Region, specifically in the Duzce Province.

Material and Methods: In this regard, two different varieties (Mariguale and Erfelek) and three different grafting types (budding, tongue and cleft) were studied in two different environments (greenhouse and open field) across five different months (December, January, February, March and April). The factorial design and variance analysis (ANOVA) was used for the experiment.

Results: Results showed that grafting success in the greenhouse has been twice as much as that of in the open field. Among the grafting types, tongue grafting was the most successful across all months except for July. However, only in July, the bud grafting was found to be the most successful technique. The highest success was achieved in February and then July. From varieties, the Mariguale was more successful than the Erfelek. In addition, 86% success was obtained from the Mariguale variety grafted by the tongue method in the greenhouse In February. In addition, 83% graft success was achieved by the Mariguale variety in July. Based on findings, tongue and bud grafting, as the most appropriate grafting types and February and July, as the most favorable times could be recommended for further grafting experiments in Duzce Province. During winter and spring periods, graft success was found to be greater in the greenhouse environment.

Keywords: Graft, chestnut, *Castanea sativa* Mill., Erfelek, Mariguale.

Estimation of mutation age; population genetics data analysis, historical demography and geographical perspectives based on β -globin gene cluster haplotype variation in Denizli, Turkey

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Aim of the study: We aimed to investigate the possible genetic drift, relationships, expansion and historical origin based on haplotype frequencies of the β -globin gene cluster of various disease population and mutations in Denizli, Turkey. Understanding the genetic origin of the mutations or various diseases may elucidate population interactions such as movements, migrations, and environmental effects on mutation mechanisms in human biology throughout history.

Material and Methods: We studied DNA samples from unrelated patients and unrelated healthy subjects from our DNA bank. β -globin gene cluster haplotypes have been commonly used to procure data regarding human genetic diversity, genetic relationships and evolution. In our study, haplotype analysis, Hardy–Weinberg equilibrium tests, measurement of genetic diversity and population differentiation parameters such as frequency of each haplotype, haplotype diversity (h), nucleotide diversity (π) and theta (θ) values based on the number of polymorphic sites (S) and the mean number of pairwise differences (k), respectively, analysis of molecular variance (AMOVA) using F-statistic (F_{ST} , F_{IT} , F_{IS}), historical-demographic analyses such as neutrality tests (Tajima's and Fu's tests), mismatch distribution analysis, analyses of tau (τ) and initial theta (θ_0 ; estimated assuming theta final (θ_1) as infinite), SSD, the Harpending's raggedness index (Hri) and P-values of SSD were performed using Arlequin 3.05 software program.

Results: Molecular diversity results from the populations show that some populations are genetically similar and some different as far as development and expansion during the historical period. Historical gene flow results show high gene flow between the populations Normal-Hb D Los Angeles and Behçet' disease. Unlike normal-Hb S populations show low gene flow. SSD and rg tests failed to reject the null hypothesis of population expansion which is consistent with unimodal distribution. Our estimated τ values show that the average time since the demographic expansion for all populations. Our results support that the origin of the Hb D-Los Angeles and Behçet's disease populations in Denizli province may have been in the Mediterranean area, independent from other populations rather than from recent Asiatic migrations. Moreover, our results support the hypothesis that the origin of the Hb S population may have been in the Silk Road area, genetically independent from Mediterranean area.

Keywords: Beta Globin Gen, Haplotype, Population Genetics, Historical Analysis, Mutation Age.

Gynogenesis Induction Studies in Wild Chive (*Allium schoenoprasum* L.)

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Aim of the study: *A. schoenoprasum* breeding studies may benefit from gynogenesis-based doubled haploid technology. This technology allows development of completely homozygous lines in one generation. We are investigating applicability of DH technique in the development of new DH lines from *A. schoenoprasum* materials maintained in our *Allium* improvement program.

Material and Methods: Unopened flower buds (several days before anthesis stage) were collected from donor *A. schoenoprasum* lines that were maintained in an unheated greenhouse between mid-April and mid-May. Surface sterilized flower buds were cultured in various BDS- and MS-based induction media to obtain gynogenic regenerants. Responsive buds were detected after about three months of culture. Buds with emerging gynogenic and somatic shoots were sub-cultured in elongation medium. Gynogenic and somatic shoots developing from the buds were evaluated for their ploidy levels and transferred to *in vivo* for further growth and observation. Regenerants and seedlings of donor plants were placed in pots filled with a soilless mix and placed in a greenhouse.

Results: Results in this study shows that *A. schoenoprasum* materials are suited for gynogenesis response and clonal propagation. Gynogenic plant were produced in all types of induction media with variable efficiency levels. However, somatic shoot regeneration was poor and development of a somatic shoot regeneration system in *A. schoenoprasum* may require a more detailed investigation. According to nuclear DNA content analysis with flow cytometry, the majority of the gynogenic plants produced were diploid and only three of them were haploid. All somatic regenerants obtained were diploid. Gynogenic and somatic plants transferred to a greenhouse showed normal development similar to donor plants.

Acknowledgements: This research was supported by PAU BIYOM.

Keywords: *Allium schoenoprasum*, DH, Gynogenesis, Flow cytometry.

Immobilization and Characterization of Laccase from *Pleurotus ostreatus* to P(MMA-co-MAH)-Cu(II) Nanoparticles

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Aim of the study: Laccases (EC 1.10.3.2, p-diphenol dioxygen oxidoreductase) are a class of oxidative enzymes which are attracting increasing interest for their potential industrial applications. The aim of the study shows that immobilized laccase has better storage, stability and reusable than free laccase.

Material and Methods: In this study, polymethylmethacrylate-co-methacryloylamidohistidine (MMA-MAH) nanoparticles were synthesized by surfactant-free emulsion polymerization. Then, Cu(II) ions were attached as a metal ligand because of its affinity towards proteins. Specific surface area of the p(MMA-MAH)-Cu⁺⁺ nanoparticles was calculated. p(MMA-MAH)-Cu⁺⁺ nanoparticles were characterized by scanning electron microscopy (SEM) and Fourier transform infrared spectroscopy (FTIR). Average particle size was also performed by Zeta-Size analysis. Partial purified from *Pleurotus ostreatus* wastes laccase was immobilized through physical adsorption on p(MMA-MAH)-Cu⁺⁺. The quantities of adsorption were calculated (Q value). To optimize p(MMA-MAH)-Cu⁺⁺ nanoparticle immobilization conditions; pH, temperature, concentration, time, ionic strength experiments were performed. The optimum pH, temperature value of the immobilized laccase was determined. The molecular weight of purified laccase and immobilized laccase was determined by SDS-Page. The storage stability experiments were conducted to determine the stabilities of free and adsorbed laccase preparations after storage for 45 days. The activity of each preparation was expressed as a percentage of its residual activity compared to the initial activity.

Results: An extracellular laccase was isolated and partial purified from *Pleurotus ostreatus* wastes. Purification was carried out using ultrafiltration system. The enzyme was purified up to 7.8 fold from the initial protein preparation. The purified laccase was monomeric with on apparent molecular weight of 55 kDa. The optimum pH and temperature for the purified enzyme were 4.5 and 50°C, respectively. When the morphological structures of the nanoparticles are examined, it is seen that they are in spherical morphology and when SEM analysis is examined, they are in the size of 78.5 nm and the surface areas are 1182,4 m² / g. Optimum immobilization was achieved at pH 8, with a concentration of 2 mg/ml, in a 0.5 M ionic strength when the temperature was 35°C. The quantities of adsorption was 147.17 mg/g (Q value). Using ABTS as a substrate, the optimum pH 8 and temperature value was 50°C for the immobilized laccase.

Acknowledgments: This study is supported by BAP/2014 Fen 011 project. Experiments were carried out in the Microbiology laboratory of the Ege University Biology Department and the Research laboratory 5 (Biorege) of the Biochemistry Department. *Pleurotus ostreatus* waste mushrooms were provided by Egecan Mantar in Urla/Izmir and Ömer Mantar in Foça-İlupınar/Izmir.

Keywords: Laccase, enzyme immobilization, p(MMA-MAH)-Cu⁺⁺, adsorption.

Importance of Sucrose in Gynogenesis Induction in Two Turkish leek (*Allium ampeloprasum* var. *porrum*) Lines

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Aim of the study: A detailed study was carried out to investigate the effects of sucrose concentrations in the induction of gynogenic embryo and plant production from economically important Turkish leek cultivars.

Material and Methods: Unopened flower buds collected from two open pollinated (OP) Turkish leek (*A. ampeloprasum* var. *porrum*) were used in this study. Flower buds (>3 mm) were collected from the umbels of green-house grown plants and surface sterilized in sterilization solution for 30 min and rinsed thrice before culturing in induction media. Cultures were established in MS-based media prepared with different concentrations of sucrose (0-100 g/l). Cultures were placed in a growth room adjusted for 16 hrs light and 20° C. Cultures were observed weekly and changes in cultures were recorded. Buds responding to induction were transferred to elongation medium (EM, composed of BDS with 30 g/l sucrose and no PGRs). Plantlets and plants regenerating from responsive buds were placed in culture tubes with EM to promote their growth until reaching to 3-4 leaf stage. Ploidy level of the regenerants were determined using a flow cytometer. Plants were acclimated and transferred to an unheated greenhouse for evaluation for morphological features.

Results: Immature flower buds cultured in sucrose-free media (in the presence or absence of PGRs) developed very poorly and no gynogenic response was obtained from these cultures. It was found that in the presence of sucrose (25 g/l and above) gynogenesis can be induced regardless of presence or absence of PGRs. The highest frequency (1.33%) of gynogenic plantlet production was obtained in a PGR-free medium containing 100 g/l sucrose. Flower buds showed substantially lower response in the medium containing both PGRs and 100 g/l sucrose. These results suggest that *in vitro* gynogenesis induction in leek can be achieved in the absence of PGRs. However, induction media must contain sucrose at a minimum amount of 25 g/l. 21 gynogenic plants obtained from two Turkish leek genotypes continued to develop and analyzed for their ploidy level. Flow cytometry analysis showed that most of the leek regenerants obtained were diploids. In general, plants with reduced ploidy levels showed significantly slower growth and had smaller plant size than tetraploid plants.

Acknowledgements: This research was supported by the Scientific and Technological Research Council of Turkey (TUBITAK-TOVAG, Project No. 113O232) and PAU BIYOM.

Keywords: *Allium ampeloprasum*, Gynogenesis, Ploidy, Sucrose.

***In vitro* Morphogenetic Potential of Sedum L. Representatives**

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Aim of the study: Representatives of the genus *Sedum* L. are important decorative, honey and medicinal plants. *Sedum selskianum* Regel & Maack and *Sedum lydium* Boiss are widely used in landscape design, including the creation of green roofs. Cultivation of these species *in vitro*, in contrast to traditional breeding in the field or in the greenhouse, allows obtaining genetically homogeneous and healthy material throughout the year, despite the environmental conditions. The aim of this study was to evaluate the morphogenetic potential *in vitro* of two species of the genus *Sedum*.

Material and Methods: The cuttings (with or without true leaves) of *S. lydium* and *S. selskianum* were treated with a 0.1% solution of mercury (II) chloride for 3 and 5 minutes. Then the plants were washed twice in sterile distilled water and placed on MS nutrient medium without phytohormones and growth regulators, as well as MS supplemented with 0.5 mg/l IAA or with 1...2 mg/l BAP. The resulting aseptic plants, after the formation of 3...4 nodes, were subjected to clonal micropropagation, placing the cuttings on the MS nutrient medium with the addition of IAA, NAA or IBA at a concentration of 0.5 mg/l. The influence of medium composition was studied. To characterize the morphogenic potential of the studied plants, explants (segments of true leaves, internodes and nodes) were placed on the MS nutrient medium with the addition of 2,4-D (1...2 mg/l); various combinations of substances of auxin's (IAA, NAA) and cytokinin's (BAP) nature; control (MS without phytohormones and growth regulators). To study the effect of pH, the cuttings were placed on the MS medium of different acidity level (pH 4...8) supplemented with 0.5 mg/l IAA. Dynamics of growth was taken into account.

Results: The best variant for introduction of the studied *Sedum* species into *in vitro* culture is the MS nutrient medium with the addition of 0.5 mg/l IAA or 2 mg/l BAP. *S. lydium* on the studied variants of nutrient media shows a lower growth rate than *S. selskianum*. *S. lydium* possesses a higher ability for callusogenesis than the second species. For the induction of stem organogenesis in *S. selskianum*, it is to recommend using internode segments as a primary explant, also nodal explants for *S. lydium*. *In vitro* cultivation of both species should use nutrient media with a pH-value in the range 4...6, which leads to an increase in shoots at a low contamination.

Keywords: *Sedum* spp., Crassulaceae, decorative plant, *in vitro* culture, morphogenetic potential.

Introduction to *in vitro* Culture and Micropropagation of two *Agastache* species - *Agastache urticifolia* and *Agastache scrophulariifolia*

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Aim of study: *Agastache* is a genus of *Lamiaceae*, comprising 29 species of perennial medicinal herbs. Some of these species are utilized as a source of essential oil and herbal drugs. The bioactivity of different special compounds or extracts from *Agastache* species include antimicrobial, antiviral, anti-inflammatory, anti-mutagenic activity and anti-nociceptive, antioxidant and cytotoxic properties. Biotechnological study has focused on *in vitro* propagation and enhancing the biosynthesis of bioactive metabolites in cell and organ cultures. Our investigation is devoted to *in vitro* cultivation of two *Agastache* species - *Agastache urticifolia* and *Agastache scrophulariifolia*.

Material and methods: Seeds of various *Agastache* species were surface sterilized by immersion in 70% ethanol for 1 minute followed 2,5 % sodium hypochlorite or 0,1 % mercuric chloride. The sterilization time was 10 and 15 minutes for sodium hypochlorite and 3 and 5 minutes for mercury chloride respectively. The sterilized seeds were cultured in Murashige and Skoog (MS) medium. Material for explant preparation was obtained 30-day-old *in vitro* seedling. Nodal segments were used as explants. The explants were cultured on MS medium and modified MS media, which contained $1/3$ NO_3^- ions and $1/2$ mineral salts and sugar. After 30 days of cultivation length of shoots and efficiency of micropropagation were estimated.

Results: The highest germination frequency without contamination for sterilization using sodium hypochlorite during 10 minutes was observed for both species. Longer shoots were obtained by MS medium culturing, but micropropagation on modified MS medium contained $1/3$ NO_3^- ions is more effective both for *Agastache urticifolia* and *Agastache scrophulariifolia*.

Keywords: secondary metabolites, *in vitro* culture, micropropagation, surface sterilization, *Agastache*, *Lamiaceae*.

Investigation of Xanthan Biosynthesized by Local Isolate *X. Axonopodis* pv. *vesicatoria*

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Aim of the study: Due to wide applications of xanthan gum, it is important to investigate a local strain of *Xanthomonas* which can produce polysaccharide with high yield and technological properties. This study aimed to determine production and rheological behaviours of the biopolymers obtained from a local strain, *X. Axonopodis* pv. *vesicatoria* isolated from pepper plant compared to that of standard strain, *X. campestris* DSM 19000 (NRRL B-1459).

Material and Methods: The experiments were performed at 28  C, fermentation time of 72 h and initial pH 7.2 in shake flasks. The inoculum size and agitation rate were optimized in order to improve xanthan gum production. The effect of agitation rate (at 180-300 rpm) and inoculum size (5 and 10 %) on xanthan production were also studied. After fermentation, the broth was centrifuged 30 min for cell removal at 4  C and 10.000 rpm and the product was recovered with organic solvents and dried.

Results: Similar xanthan yields were obtained for the local isolate compared to the standard strain. For both strains, the best agitation rate and inoculum size conditions for the biosynthesis of xanthan in a orbital shaker were found to be 180 rpm and 5 %, respectively, which resulted in an average production of 10.96 and 11.19 g/L for the isolate and standard strain, respectively. Ostwald de Waele model was used to compare non-newtonian behaviors. Consistency of gum from the isolate was higher at all concentrations. Arrhenius model was used to compare viscosity change of solutions with respect to temperature. Similar activation energies for both gum solutions indicated comparable temperature stability of the novel gum with the commercial xanthan gum according to Arrhenius model. Therefore, the results clearly confirmed the suitability of industrial production of this novel xanthan gum.

Acknowledgements: We thank The Scientific and Technological Research Council of Turkey (TUBITAK) for financial support (Project Number TOVAG-114O429).

Keywords: *X. Axonopodis* pv. *vesicatoria*, xanthan, rheological properties.

Isolation and Antimicrobial Activity of a Rare *Actinobacteria* from Gülbahçe Bay, Aegean Sea

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Aim of the study: Marine environments present a rich source for microorganisms and harbour rare species. These microorganisms may produce different metabolites from terrestrial counterparts. The aim of this study was to investigate the presence of slow growing rare actinobacteria from sediment samples and determine their antimicrobial activities.

Material and Methods: A marine sediment sample was collected by SCUBA diving at 15m depth from Gülbahçe Bay, Aegean Sea in September 2016. The sample was collected in a 120 ml sterile plastic Whirl-Pak bag. The sample was brought to the laboratory in cold box at the same day and subjected to three different pre-treatment prior to inoculation in order to eliminate the fast growing Gram negative bacteria. Nutrient rich sediment extract agar (NRS) used for isolation of the rare actinobacteria strains. Plates were incubated in a humidified atmosphere at 28°C for up to 6 weeks. The strain 13651S was isolated after 4 weeks incubation and subjected to fed-batch fermentation. Erlenmeyer flasks containing Seawater-based M1 medium (50 ml) were inoculated with the organism and incubated at 25°C for 15 days at 150 rpm. Cell-free fermentation broths were extracted with ethyl acetate and the extracts were tested for their antimicrobial activities against a panel of test microorganisms using disc diffusion assay. The isolate was also identified using 16SrDNA sequence analysis.

Results: *Streptomyces* strain 13651S was isolated from the marine sediment collected from Gülbahçe bay (İzmir Gulf, Aegean Sea) at the 5th week. The strain was identified as *Streptomyces aculeolatus* with the 16SrDNA sequence analysis. The isolate was tested for its antimicrobial activity against 6 antibiotic resistant test organisms and found active against 4 of them. The activities were as follows; *Enterococcus faecium* 34 mm, *Staphylococcus aureus* 19 mm, *Candida albicans* 9 mm and *Bacillus cereus* 8 mm. The extract didn't show any activity against *Escherichia coli* 0157:H7 and *Pseudomonas aeruginosa*. According to the best of our knowledge a marine derived *Streptomyces aculeolatus* strain was isolated from Aegean Sea for the first time and showed strong activity against Gram positive bacteria. This study also demonstrates the

Acknowledgements: We would like to thank to Dr. Barış Akçalı from 9 September University for providing the sediment sample with SCUBA diving.

Keywords: Rare actinobacteria, *Streptomyces aculeolatus*, marine sediment, antimicrobial activity, 16SrDNA.

Long-Term Conservation of Plant Genetic Resources via CryopreservationErgun KAYA

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Aim of the study: Plant genetic resources for food and agriculture are the basis of global food security. Cryopreservation aims to the storage of biological samples at ultra-low temperature, usually that of liquid nitrogen (-196 °C), and is considered as an ideal means for long-term storage of plant germplasm. At this temperature, cell division and metabolic activities remain suspended and the material can be stored without changes for long periods of time. Cryopreservation is the only available method for long-term conservation of vegetatively propagated plant germplasm. In this study, we aimed to describe advances in cryogenic techniques for the long-term preservation of plant germplasm.

Material and Methods: In the last three decades a number of different cryopreservation protocols, such as classical slow-cooling, vitrification, droplet vitrification, encapsulation / dehydration and encapsulation / vitrification protocols have been developed and utilised for germplasm storage. The choice of cryopreservation method to attain the highest survival rates is largely dependent on the plant species and tissue type that is being cryostored. Slow cooling or controlled rate cooling techniques involve the simple dehydration of plant material before cryogenic storage in LN. This can be done by slow cooling of the plant tissue to a temperature of approximately -40°C. Encapsulation-dehydration method involves encapsulating shoot tips and then, silica gel or airflow is used to dehydrate the beads until the moisture content drops to 20-30%, before they are immersed in LN. Vitrification involves the treatment of tissues in a mixture of highly concentrated penetrating and non-penetrating cryoprotectants applied at non-freezing temperatures, followed by rapid cooling in LN. The droplet-vitrification technique is a modification of the basic vitrification protocol that involves placing the sample within a droplet of 1-10 µl of cryoprotective solution on a piece of aluminium foil before immersion in LN.

Results: Many plant species have been successfully cryopreserved through the development of various cryopreservation methods. As a standard protocol, vitrification and droplet vitrification are widely applied. Fundamental studies looking at membrane composition, membrane damage and repair are likely to help to elucidate why some species are cryosensitive and how cryopreservation protocols can be improved for those species.

Acknowledgements: This work is dedicated to Prof. Dr. Fusun Gumusel, former Director of the Department of Molecular Biology and Genetics of the Gebze Technical University, who recently passed away; the authors will be greatly indebted for life for her steady scientific support and precious friendship.

Keywords: Cryopreservation, Cryoprotectant, DMSO, Liquid Nitrogen.

Morphogenesis of *Dracocephalum moldavica* L. *in vitro*

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Aim of the study: *Dracocephalum moldavica* L. (dragonhead) is medicinal plant with an analgesic, tranquilizing, soothing, antioxidant effects. This plant has a pleasant lemon scent. The vegetative part of dragonhead contains 0,05 - 0,63% of essential oil. The main components of essential oil are citral, geraniol, thymol, nerol. When the external conditions change, the composition and content of secondary metabolites varies. Culture *in vitro* is characterized by consistency and controlled conditions. The purpose of the research was introduction callus of *Dracocephalum moldavica* *in vitro*.

Material and Methods: There were 2 varieties in study: Gorynych and Limonnyi aromat. For introduction *in vitro* culture, the seeds were sterilized in mercury chloride, in sodium hypochlorite, in hydrogen peroxide. Seeds were placed on the nutrient medium of Murashige and Skoog. 4-week-old seedlings were used as a material for explants (pieces of leaves, petioles of leaves and internodes). They were placed on a nutrient medium containing various phytohormones and plant growth regulators such as 6-benzylaminopurine (BAP), kinetin, 2,4-dichlorophenoxyacetic acid (2,4-D), indole-3-acetic acid (IAA), indole-3-butyric acid (IBA), 1-naphthaleneacetic acid (NAA). Observations were conducted for one and a half months.

Results: Mercury chloride is better suited for sterilizing Gorynych seeds, and sodium hypochlorite for Limonnyi aromat. On a medium containing 2,4-D, 2,4-D in combinations with kinetin and BAP, a callus of yellow color was formed on explants from internodes and petioles of leaves. Green callus with white impregnations was produced under the influence of IBA in combination with BAP and kinetin. From leaf explants, callus was formed only on media with 2,4-D in combination with kinetin and BAP. Rhizogenesis was observed on media with IAA, IBA.

Keywords: morphogenesis, phytohormones and plant growth regulators, *in vitro*.

Morphological and Cytological Characterization of Gynogenic Garlic Chive (*Allium tuberosum* Rottler ex Spreng) Lines

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Aim of the study: *Allium tuberosum* is a perennial *Allium* species cultivated mainly in East Asian countries. Its flowers and leaves that are edible. This plant is used as ornamental plants, culinary herb, and traditional medicine. It is a highly heterozygous, tetraploid plant ($2n=4x=32$) with a large genome. These features present difficulties in *A. tuberosum* improvement programs. This study was designed to develop an efficient system for the production of *A. tuberosum* lines with gametic chromosome numbers ($n=2x=16$) and examine their potential for use in the genetic improvement of this valuable *Allium*.

Material and Methods: *In vitro* whole flower bud cultures were established using about 3000 whole flower bud explants collected from *A. tuberosum* plants in various induction media. The propagation media tested were MS and BDS with varying amounts of growth regulators and sucrose. Regenerants obtained from induction cultures were analyzed for ploidy levels and acclimated to *in vivo* for detailed evaluation. Morphological features such as length and width of the fully grown leaves, number of shoots, and number of leaves were observed and noted in greenhouse-grown *A. tuberosum* materials.

Results: In the present study, gynogenic (diploid and tetraploid), somatic, and donor *A. tuberosum* plant materials were successfully grown and compared. Nuclear DNA amounts and ploidy levels of regenerants from gynogenesis induction cultures were estimated by flow cytometry and confirmed by chromosome counts. Frequency of diploid plants among the gynogenic regenerants was rather low (<1%). Acclimated plants transferred to *in vivo* grew well in the greenhouse. There were substantial differences in growth performances of *A. tuberosum* plants depending on their ploidy status. Overall, tetraploid gynogenic plants grew more vigorous than diploid gynogenic plants. They produced higher number of pseudo-stems with longer and thicker leaves than diploid plants. There were substantial differences among diploid plants as well. Diploid plants generally grew slower and were significantly smaller in size.

Acknowledgements: This research was supported by PAU BIYOM.

Key words: *Allium tuberosum*, Chromosome number, Flow cytometry.

Obtaining of Callus Tissue for Representatives of the Genus *Amaranthus* L.

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Aim of the study: The aim of this work was to induce the formation of callus tissue of *Amaranthus caudatus* L. the varieties "Helios", "Karmin", Kremovyi rannii", hybrids *A. paniculatus* L. x *A. caudatus* L. variety "Sterkh", *A. caudatus* x cv. "Sterkh" variety "Zhaivir".

Material and Methods: Plant culture *in vitro* methods and statistical methods were used. The object of the research was *A. caudatus* 'Helios', "Karmin", Kremovyi rannii", hybrids *A. paniculatus* L. x *A. caudatus* L. variety "Sterkh", *A. caudatus* x cv. "Sterkh" variety "Zhaivir". The starting material for callus was hypocotils of 1 cm in length, obtained from 7-day-old seedlings grown *in vitro*. The explants were cultured horizontally for 2 weeks on medium Murasige and Skuga (MS₃₀), which contained 30 g/l sucrose, pH 5,7-5,9, with adding kinetin (Kin) and 2,4-dichlorophenoxyacetic acid (2,4-D) in concentration 1 mg/l 2,4-D and 1 mg/l Kin. The growth index was used to estimate the growth of biomass. The growth index is the ratio of the mass of raw callus tissue (m_2) that was obtained after 2 weeks of cultivation on the nutritive agarized medium MS₃₀ with respect to the weight of the raw callus (m_1) obtained at the beginning of the experiment on the same nutritive medium. Growth index = m_2/m_1 . The experiment was conducted in 6 replicates for each variety.

Results: As a result of the experiment, calus tissue was obtained. The average arithmetic growth index for "Helios" was 11, for "Karmin" - 9, for Kremovyi rannii "- 11, for" Sterkh "- 7, for" Zhaivir "- 15. The callus tissue was obtained. The medium for obtaining a stable callus culture was Murasige and Skuga (MS₃₀) supplemented with 30 g/l of sucrose), 1 mg/l of 2,4-dichlorophenoxyacetic acid and 1 mg/l of kinetin. The obtained rates of the growth index from 9 to 15 indicate a high morphogenic potential of the experimental varieties.

Keywords: *Amaranthus caudatus* L., *Amaranthus paniculatus* L., callus culture.

Preliminary Tissue Culture of Legume *Indigofera zollingeriana*Siti MAESAROH¹, Çiğdem Alev ÖZEL², Nurdan ŞAHİN DEMİRBAĞ¹¹Department of Agronomy, Ankara University, Turkey²Department of Biology Education, Gazi University, Turkey
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Aim of the study: Indonesia with approximately 1.3% of the world's land surface, is home to >10 percent of the world's known plant species. Fast industrialisation and migration of rural population to urban centres is affecting local biological diversity. There is need to conserve this diversity that is slowly moving to extinction by development of meaningful plant multiplication Protein rich *Indigofera zollingeriana* is a deciduous plant that grows throughout Indonesia. The plant has low rate of propagation from the seeds. The study was carried out on calli obtained on leaves, hypocotyl, and cotyledons explants taken from in vitro regenerated seedlings.

Material and Methods: Surface sterilized seeds were germinated to raise seedlings containing 0.1 mg/l GA₃ under aseptic condition followed by their transfer to MS medium (pH 5.6-5.8). Thereafter, excised leaves, hypocotyl, and cotyledons explants were cultured on different concentrations and combinations of BAP+ NAA for induction of callus and tested for their biochemical activities using agar disc diffusion method using extracts obtained from various concentrations and combinations of plant growth regulators.

Results: Profuse callus induction was noted on three explants irrespective of the concentration and combination of BAP+ NAA. The highest frequency of callus and root induction was noted on hypocotyl explants using MS medium with 1 mg/L BAP +0.1 mg/L NAA. The callus obtained on each type of plant growth regulator combination varied from soft friable to solid compact. The obtained callus can be used to biochemical analysis.

Acknowledgements: The authors are grateful to Prof. Luki Abdullah, Bogor Agricultural University, for help in give of seeds and published literatures on the subject.

Keywords: *Indigofera zollingeriana*, growth regulator, legume, callus, tissue culture.

Protein Profiles of Seedy and Mutant Seedless Lemon Cultivars

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Aim of the study: Seedlessness is one of the most desired characters for citrus fruits and can be obtained through several methods. 'Alata', 'Uzun' and 'Gülşen' varieties were rendered seedless by exposure of budwood to gamma radiation (⁶⁰Co). In the present study, it was aimed to determine the proteins responsible from seedlessness through comparisons of seedless lemon cultivars with the seedy control (Kütdiken) cultivar.

Material and Methods: The whole fruit of the 'Alata', 'Gülşen', 'Uzun', and 'Kütdiken' lemon cultivars were crushed and homogenized in extraction buffer and protein extractions were carried out by phenol extraction method. The quantitation analysis was performed by modified Bradford method and the amounts of proteins in samples were equalized. Subsequently, the samples were subjected to 2D gel electrophoresis. Spot differences were determined by comparing the protein spots of the varieties with the Delta2D DECODON software. Spots seen in one sample but not in others, and also differentially expressed ones were excised from the gels and stored for further dual spectrometric mass analysis using Eksigent ekspert™ nano LC 400 system.

Results: In the current study, immature fruit tissues of seedless 'Alata' and seedy 'Kütdiken' were compared in terms of protein expression profiles. Approximately 400-425 different protein spots ranging from 5-150 kDa with pH range of 3.0-10.0 were observed. The 2D gel protein profiles of varieties were localized in 4 specific locations in general. The majority of the spot differences among the varieties were observed at high molecular weight proteins in the range of 4 to 7 isoelectric point. Of these, five spots were observed only in seedy 'Kütdiken' but not in seedless 'Alata' variety. Although few protein spots were observed as up regulated, most of the others aroused mainly in the form of down regulation in seedless 'Alata' variety. The results were confirmed by repeating the processes with proteomics grade chemicals. It is suggested to conduct more detailed studies to reveal the identification of these interesting proteins in order to better understanding of the major protein/s responsible for seed formation by using the mass spectroscopic analysis. In case of clearly identifying peptide/s responsible for seedlessness, they can be used in breeding programs through biotechnological methods.

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Keywords: Lemon, Seedlessness, 2D gel electrophoresis, Kütdiken, Alata, Gülşen, Uzun.

Replacement of Phototrophic Microorganisms Collection by New Prospective Cyanobacteria Strain

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Aim of the study: Questions of objective evaluation of current state of world biodiversity and renewal of disturbed ecosystem are actual for modern Kazakhstan. The aim of investigation is replenishment of collection cultures of cyanobacteria prospective for obtaining the biofuel, biofertilizers, biologically active substances.

Material and Methods: Cyanobacteria were collected according to general methods of algology. Determination of initial taxonomy of cyanobacteria was carried out based on morphological traits according to Elenkin and Gollerbach. For obtaining the strains used accumulative cultures with further isolation of monocultures. Cultivation of algae was carried out on liquid and agarized media Zarrouk, Gromov (7,5 - 9). Strains in collection are stored in glass tubes on 20 ml with cotton-cork bung, in petri dishes. For initiation of colonies growth they are crossed to enriched media and placed in a light installation under phyto-lamps (FAR 40 micromol м2с1, Pandora-Led, Russia) at room temperature during 12-14 days, after that strains put into refrigerator and cultivated at temperature +10 °C with additional illuminated by a daylight lamp-LB-40 (FAR 15 micromol м-2с-1). Reseeding of collection cultures performed every 2-3 months. Microscopy of cyanobacteria was carried out with the help of microscopes MS 20 (Micros, Austria) и Axio Imager A1 ("Carl Zeiss", Germany) with an increase in × 400, 1000 times.

Results: The search of prospective cyanobacteria strains from springs of Turgen gorge (Kazakhstan), Karlovy Vary (Czech Republic) and from Shar-Nuur lake (Bayan Ulgy region, Mongolia), from soils of Baghlan region (Northeast Afghanistan), from Lake Balkhash and Bilikol (Kazakhstan). From collected water and soil samples ten axenic cultures of cyanobacteria were obtained. From isolated cyanobacteria strains two toxin-forming cyanobacteria isolated from Shar-Nuur lake were collected, two cultures of nitrogen fixing cyanobacteria from soil of Baghlan region and one culture from Balkhash lake as prospective lipid and fatty acid producers. It was established that toxin-forming cyanobacteria *Desertifilum* sp. and *Nostoc* sp provided the greatest inhibitory effect on cancer cells proliferation of cell line M HeLa. Mass spectrometric analysis allowed attributing the toxins of cyanobacteria to the class of cyclic depsipeptides. In extracts of *Desertifilum* sp. two cyclic depsipeptides were found: micropeptin T and oscilla-peptine. In *Nostoc* sp. extract cryptophan was detected and - in small amount - cyclic depsipeptide micropeptin SD. Nitrogen fixing activity of cyanobacteria isolated from soils of Baghlan region in *Anabaena variabilis* made up 30.2 %, *Nostoc caldicola* -29.9%. The highest lipid content observed in *Cyanobacterium* sp. IPPAS B-1200. fatty acid composition analysis of *Cyanobacterium* sp. IPPAS B-1200 detected the high amount of myristic and myristoleic acids.

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Keywords: Collection, microalgae, cyanobacteria, strain, culture, biomass.

Responses of Cultivated and Wild Leeks to Gynogenesis Induction

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Aim of the study: Cultivated leek (*Allium ampeloprasum* var. *porrum*) is an important agricultural crop plant grown and consumed in many parts of the world. Wildleek (*Allium ampeloprasum*) grows naturally in many parts Mediterranean region. In Turkey, these cultivated and wild forms of leek can be found side by side in the farmlands of southern and western Turkey. Both of these leeks are tetraploid ($2n=4x=32$) and they can interbreed with each other. The aim of present study was to develop an efficient and reliable system for high frequency induction of gynogenic plants via gynogenesis in cultivated and wild leek materials.

Material and Methods: Plants materials used in this study were obtained PAU BIYOM *Allium* improvement program. Plants from both leek materials were grown in an unheated greenhouse. Immature flower buds were collected from the umbels between mid-May and mid-June. Gynogenesis induction experiments were carried out by culturing large buds (>3 mm) in BDS- and MS- based media supplemented with different plant growth regulators at varying concentrations. All media contained 100 g/l sucrose and were solidified with 7 g/l agar. Bud cultures were placed in a culture room and observed weekly. Ploidy levels of some of the regenerants were determined using flow cytometry. Acclimated gynogenic plants were transferred into a greenhouse and grown under standard growing conditions. Morphological features of plant materials were evaluated and recorded.

Results: In vitro gynogenesis induction experiments yielded gynogenic plants from both cultivated and wild leek materials. In general, gynogenesis responses were low (less than 1%) in both species. Gynogenic regenerants from both leek materials were all green and grew well in *in vitro*. Flow cytometry analysis showed that there were diploid ($n=2x=16$) and tetraploid ($2n=4x=32$) plants among them. Diploid and tetraploid gynogenic plants were acclimated and grown in a greenhouse. Diploid and tetraploid plants from both leek materials showed significant differences in many morphological features evaluated.

Acknowledgements: This research was supported by PAU BIYOM.

Key words: *Allium ampeloprasum*, Cultivated, Gynogenesis, Wild.

The Electrical conductivities of some plant extracts

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Aim of the study: In recent years, biological molecules appear to be frequently used in biosensor studies. Therefore, it is important to know the electrical conductivity properties of phenolic compounds. The purpose of this study is to determine the electrical conductivity of some plant extracts.

Material and Methods: The electrical conductivities of plant extracts were determined with respect to various variables. For this, the extracts of the solid phase of 6 different plants were compressed under a pressure of about 0.76 bar. The extracts were pelleted to a diameter of 13 mm. For each of these materials, the electrical conductivities were measured at temperatures ranging from 200 K to 304 K in 1 K.

Results: The electrical conductivities of plant extracts were determined depending on various variables of the selected sample. Furthermore, whether the considered extracts are semiconducting or not is investigated depending on the temperature. The resistance of element A1 decreased up to 0.89 ohms at 282 K. In the material A2, it is considered to exhibit semiconductor behavior in the range of 320-302 K.

Keywords: Electrical conductivity, resistivity, phenolic

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The Use of HPLC in Determination of Endogenous Hormones of *Hypericum retusum* Aucher Exposed to UV- B and Grown Under *in vitro* Conditions

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Aim of the study: This study were determined the using high performance liquid chromatography (HPLC) of endogenous hormones in *Hypericum retusum* Aucher exposed to UV-B and grown under *in vitro* conditions. Proliferation of plantlets on MS medium containing 0.5 mg l⁻¹ N-6- benzylaminopurine (BAP) was achieved under in vitro conditions. In this study not analyzed BAP, because it is added to the medium. HPLC metod was used for seperation of these hormones (Kinetin, GA₃ IAA, ABA, IBA, NAA, 2,4D).

Material and Methods: The seeds of *Hypericum retusum* Aucher (Clusiaceae) were collected from south-eastern Turkey, in Diyarbakır. For proliferation of shoot, the micro-shoots were transferred in to MS (Murashige & Skoog 1962) medium contained 0.5 mg l⁻¹ N-6-benzylaminopurine (BAP). Afterwards the selected seedlings were exposed to UV-B radiation at different durations (15; 30; 45; 60 min.). Control group was not subjected to UV-B radiation. The plantlets were placed approximately. 56 cm from the surface of the lamp at the middle of the light period. Each radiation experiment was carried out at room temperature for 5 days. The HPLC system consisted of Agilent Eclipse XDB C-18 (250mm x 4.6 mm, 5µm) with a methanol gradient in 0.3 % formic acid and UV detector set at 280 nm. The substance to be analyzed is required to determine the retention time, before going into the analysis process by HPLC. Besides research in chromatographic equipment, extraction and purification procedures are also important. The method of Tang et al. (2011) and Chen et al. (2005) a modified method were used for the application of the sample preparation method.

Results: This study were determined the using high performance liquid chromatography (HPLC) of endogenous hormones in *Hypericum retusum* Aucher exposed to UV-B and grown under *in vitro* conditions. At all the doses of UV-B applications were observed on important changes. In this study were determined significant changes at amounts of endogenous hormones in *H. retusum* extracts with the increasing UV-B radiation doses. To best of our knowledge, there is no report especially on determined the using high performance liquid chromatography (HPLC) of effects of ultraviolet-B radiation to endogenous hormones in *Hypericum retusum* plantlets grown under in vitro conditions.

Key words: *Hypericum retusum* Aucher, HPLC, hormones, UV-B.

Treatment of Contaminated Areas through *Opuntia vulgaris* Mill.

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Aim of the study: The purpose of the research is consist of reducing of concentration heavy metals through their transportation to *Opuntia vulgaris* Mill in contaminated areas and treatment of contaminated soils from heavy metals at least partially.

Materials and methods: The contaminated field has been taken for research in Gala exploring area in Apsheron Peninsula. The study area was equal to 10 m x 10 m. First of all, soil samples have been taken in research area and has been appointed the concentrations of heavy metals (Cd, Pb, Zn, Ni, Co, Mn) in soil samples. XRF spectrometer was applied for determining of concentrations. Then *Opuntia Vulgaris* Mill saplings were brought from ecologically clean areas and were planted in contaminated areas. It should be noted that, storing water collected ability of this plant is very strong, so it is very resistant to drought and harsh climatic conditions. At the same time, this plant does not require any care in its growing process. The examples were taken from the same saplings before planting and have been identified the initial concentrations heavy metals according to plant examples. Six months later, *Opuntia vulgaris* Mill examples were taken from research area and analyzed.

Results. The taking examples of plants from research area through special technology and have been appointed concentrations (Cd, Pb, Zn, Ni, Co, Mn) of heavy metals in these examples. The concentrations of heavy metals were as below mentioned before the beginning of research in taking examples (average rate for 3 piece) (measurement mg/kg) Cd-1.76; Pb-8.05; Zn-57.3; Ni-29.63; Co-5.42; Mn-42.53. At the end of the study it was determined that Cd, 57.2%; Pb, 36.4%; Zn-47.8%; Ni-36.9%; Co-62.5%; 49.2% Mn-contaminated soil was transported to *Opuntia Vulgaris* Mill. These results indicate that the plant is effective in the treatment of contaminated areas.

Acknowledgements: The author thanks to the leadership of SOCAR oil and gas producing department for permission to conduct researches.

Keywords. Contaminated areas; concentrations of heavy metals; transport of heavy metals.

OP206
Turkish Doubled Haploid Onion (*A. cepa* L.) Lines

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Aim of the study: Onion (*A. cepa*) is one of the most important agricultural crop cultivated and consumed all around the world. However, there is a strong demand for F1 hybrids, which can provide higher yield and more uniform marketable crop. Development of hybrid onion varieties require pure lines that can be used as parents. Onion is a highly heterozygous biennial species. Therefore, production of homozygous inbreds may take many years. In onion, gynogenesis-based doubled-haploid (DH) technique can provide completely homozygous lines in one generation. In this study, findings obtained from 8 years of Turkish DH onion production studies will be discussed.

Material and Methods: Plants materials used in this study represent OP land races collected from different onion production regions of Turkey. OP onion land races were maintained at PAU BIYOM *Allium* improvement program. Ten DH onion lines developed from various OP land races were used in this study. For simplicity, DH onion materials were categorized according to their bulb colors as red, white, and yellow. A red DH line was used as male parent in the cross with a yellow bulbed female to produce an experimental F1 hybrid. These materials were compared with their donors and parents under greenhouse and field conditions.

Results: Gynogenesis induction experiments yielded hundreds of gynogenic onion plants from all types of donors included in this research work. Ten of them were fecund and provided selfed seeds. DH lines did not show any indication of inbreeding depression and they were similar to their donors in many features. Some of the red DH lines outperformed their donors in bulb size and weight while yellow and white DH lines did not differ significantly from their donors. Plants of experimental F1 hybrid line grew uniformly and produced red bulbs. Bulb features such as shape and size were intermediate between parental lines. Our findings suggest that Turkish DH onions developed in our research program can be used as parents in the production of new F1 hybrid lines.

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Key words: *Allium cepa*, DH, Gynogenesis, F1 hybrid.

Usage of *in vitro* Produced Bulblets as an Explant Source for *Bellevalia tauri* an Endemic Plant of Turkey

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Aim of the study: Propagation of geophytes which has got underground storage organs by alternative production methods instead of collecting from their natural habitat is a necessity to protect biological diversity. *In vitro* culture is one of these alternative production methods for breeding and multiplication of several ornamental plants. Even though, this technique has been widely used as an area of biotechnology, the contamination caused by the use of underground storage organs is the most important problem of geophyte production. Different sterilization methods and explant sources are used to overcome the contamination in micropropagation of various geophytes. *Bellevalia tauri* Feinbrun which has a great potential as an ornamental plant is an endemic geophyte of Turkey. When the underground storage organ of *Bellevalia tauri* is used as explant source, a very limited number of bulblets are obtained due to the contamination. In this research, it was aimed to increase the number of bulblets using *in vitro* produced primary bulblets as an explant source.

Material and Methods: The *in vitro* produced bulblets of *B. tauri* were used as an explant source. The bulblets which were obtained from the immature embryo explants by tissue culture methods were longitudinally cut into 4 parts. Explants were placed on MS medium supplemented with various combinations of 6-benzylaminopurine (BAP) and α naphthaleneacetic acid (NAA) or 2,4-D (2,4-dichlorophenoxyacetic acid) and 30 g l⁻¹ sucrose and 7g l⁻¹ agar. The cultures were kept at 25±1 °C under 16-h light (40 μ mol m⁻² s⁻¹) condition.

Results: Although any sterilization process was performed, no contamination was observed at *in vitro* produced primary bulblets explants. Secondary bulblets were obtained on bulb scales of *in vitro* produced primary bulblets on MS medium supplemented with different combinations NAA and BAP. There was no new bulblet formation on MS medium containing 2,4-D. The best result was achieved on MS medium containing 1 mg l⁻¹ NAA and 0.25 mg l⁻¹ BAP. On this medium, 2.83 bulblets per explant were obtained.

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Keywords: *Bellevalia tauri*, contamination, *in vitro* culture, secondary bulblet formation.

Xylanase Production of the Marine Derived Fungal Strains Isolated from Coastal Areas in Turkey

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Aim of the study: In recent years bioprospecting studies are heading toward to marine derived microorganisms. The aim of this study was to investigate the xylanase production capacities of 88 marine-derived filamentous fungal strains previously isolated and identified from sediment and sponge samples collected from Aegean and Mediterranean coastal regions of Anatolian Peninsula that have a high biodiversity.

Material and Methods: A total of 88 marine-derived filamentous fungal (MDF) strains isolated from 31 sediments and 57 sponge samples which are collected from six different locations in Aegean Sea and Mediterranean coastal sides were used in the study. A semi quantitative assay was conducted in order to assess the extracellular xylanase activity of the MDF isolates in the modified Wickerham's medium. Extracellular xylanase activities were characterized by the development of a blue zone surrounding the fungal colony. Xylanase activities of the selected strains were also determined quantitatively in the fermentation broth. One unit of enzyme activity was defined as the amount of enzyme required to release 1 µmol of reducing sugars from the substrate in 1 min. One of the best of xylanase producing strains was chosen for enzyme characterization studies. The crude enzyme was partially purified using ammonium sulphate precipitation and dialysis for 24 h. Partially purified enzyme was used in the characterization studies to determine optimum pH, optimum temperature thermal stability, pH stability, the effect of organic solvents, metal ions and denaturants.

Results: Isolates were screened for their extracellular xylanolytic activities and 81 of the 88 (92%) isolates presented activity on the solid medium. Presence of salinity in the fermentation medium increased the specific activity up to 6.66 fold on *T. pleurotica* 08ÇK001. One of the best of four xylanase producing strains was chosen for further studies considering their specific activity, potential pathogenicity and mycotoxigenicities based on the literature data. *Trichoderma pleurotica* 08ÇK001 xylanase was further characterized. Optimum pH and temperature was determined as 5.0 and 50°C respectively. The enzyme retained 53% of its activity at pH 5.0 after 1 h and have found resistant against several substance such as K⁺, Ba²⁺, Na⁺, β-mercaptoethanol, Triton X-100 and toluene. Based on the results of the present study, MDF provides an important source for bioprospecting studies and *T. pleurotica* 08ÇK001 xylanase could be efficiently used in industry regarding to its general characteristics.

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Keywords: Xylanase, marine derived fungi, *Trichoderma pleurotica*, sediment, Mediterranean.

An Assessment of Ecotourism and Recreational Activities In Nature Protection Areas: Case of Nature Parks of Sinop, Turkey

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Aim of the study: Interest in alternative tourism types is rapidly increasing. Some of the negative effects of mass tourism on the natural environment have increased the importance of nature-based tourism types. Natural areas and biodiversity in these areas offer a wide range of activities for ecotourism and recreation. Participating in ecotourism and recreational activities in natural areas, the visitors gains a more responsible tourism experience, including knowledge of local cultural values, flora and fauna, natural life and their protection. The aim of this study is to evaluate the present situation of ecotourism and recreational activities of nature parks of Sinop Province of Turkey.

Material and Methods: Turkey is a country with very rich plant and animal species. Regulations for the protection of flora and fauna within its own ecosystem started in 1950s. In this context, various statutory protected areas such as National Park, Nature Park, Nature Protection Area, Natural Site, Wildlife Development Area, Special Environmental Protection Area and wetland with international precaution have been declared. The study area is the Nature Parks and Nature Conservation Area in the Sinop province within the area designated as "ecotourism-focused development zone" in the Turkey Tourism Strategy Action Plan (2007-2013). In this frame, literature review will be done for the Sarikum Nature Conservation Area, Hamsilos Nature Park and Tatlica Waterfalls Nature Park. The current situation of ecotourism and recreation facilities of these areas will be determined. In addition, analyzes of advantages and disadvantages will be made in terms of sustainability.

Results: As a result of the study, information will be provided about ecotourism potential, plant and animal species, recreation facilities, accommodation, food-beverage and transportation facilities for the protected areas of Sinop. The study is expected to contribute to the sustainable planning for the region.

Keywords: ecotourism, recreation, protected area, Sinop.

Blue Economy Paradigm as Part of Sustainable Tourism: The Importance in Ecotourism

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Aim of the study: Tourism is an important sector for each country due to its economic and socio-cultural benefits. However, it is known that tourism has caused some non-ignorable environmental problems (air, water, noise and visual pollution, climate change, bioturbation etc.) as well as economic and socio-cultural benefits. Since the economic system based on more resources and investments is useless anymore, it has begun to seek a new paradigm towards an answer to the question how can efficiently be benefited from existing sources and changed the system. In this regard, one of the paradigms is “blue economy” revealed by Gunter Pauli in 2010. According to his paradigm, more profits and social capital can be created with less investment. In other words, the paradigm of blue economy is based on an economic model aiming to draw on economy of scope instead of scale, to meet sustainably the needs of the world with current resources. In brief, blue economy looks for an answer relating to how monetising more than one with current resources and meeting the basic needs. Sustainability which has been put forward in order to prohibit the eco-destruction for the sake of consumption and to take measures is also an approach that aims to reduce negative impacts of tourism on nature. In this context, main purpose of the study is to scrutinise importance of ecotourism in Turkey via relationship blue economy paradigm and sustainability. In addition to that, how it should be realized economic, environmental and social capital was also revealed in the study within the context of sustainability.

Material and Methods: Ecotourism is a new field of business that has begun to attract more attention as a type of tourism and people who are engaged in agriculture can easily adapt to ecotourism entrepreneurship due to developing in rural areas as well. It also covers a wide range of activities including coastal and marine tourism which is not limited to rural areas. So that, coastal and marine tourism within ecotourism is a large industry with a very complex relationship between many different actors and sectors and has particularly a key proposition for developing countries such Turkey. In this study, Within the scope of the blue economy, The current situation of ecotourism of these areas will be determined. Literature study will be done in this study. Also statistical data will be utilized.

Results: As a result of the study, within the scope of this study, Turkey has significantly created attractions for many domestic and foreign tourists with the beauty of the Mediterranean, Aegean and Marmara coastal regions where have tourism businesses. It is suggested that the practices should be accomplished within the framework of the blue economy concept by converting each environmental waste into input to create a new cash flow. Thereby, it will be possible to contribute developing coastal and marine tourism within ecotourism by protecting the natural structure of tourism regions and increasing tourism income. The study is expected to contribute to the sustainable planning for the sea region.

Keywords: Ecotourism, Blue Economy, Sustainable Tourism, Coastal and Marine Tourism.

Alternatives of Different Refinement and Transmission System Applications in Refining and Reusing of Wastewater at Namık Kemal University

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Aim of the study: In order to achieve sustainable goals, the detection and application of methods, which could reduce or bar waste of water, wastewater and waste electricity, are very important in establishing techniques and systems which could be used to combine social and economic aims with ecological needs.

Material and Methods: The wastewater of university is a kind of domestic wastewater, and at least 60% of the total wastewater usage consists of grey water, and this water will be reused. Domestic wastewater will primarily be collected in 2 different systems. These could be two side by side piping systems, as well as a different system to be obtained by passing a smaller diameter pipe through the same pipe.

As material in this system;

- 1- Waste water storage tank,
- 2- "Discontinuous suction and force pump",
- 3- A different suction pipe for negative purposes and all kinds of materials,
4. All the equipment of the existing wastewater treatment plant will be used.

Results: The more the demands and standards of environment rise, the more necessary it has become to figure out and apply effectively different and innovative solutions. Particularly, it is really important for the countries or cities whose foundation of facilities or running those facilities cost a lot to be able to reuse wastewater. For example, the need for water increased by 45% in Istanbul (Turkey) and increased by 20 % in Sydney (Australia) and 14, 8 % in Monterrey (Mexico) in the last ten years.(2008, OECD research). It is seen that, in the countries where tourism has developed, the usage of electricity overnight is between 3-6 kWh per bed and water 600-1300 liters per bed. Ultra refining, combined purification and transmission technology (membrane, UV, transmission by vacuumetc.) which have been reconstructed and used after the 1990s, have been researched within the scope of the present study. Reactivating the existing water purification system at Namık Kemal University central campus, which is convenient for daily usage in the summer months, and ultra-refining methods purified from bacteria and utility of the systems that are determined to use in the transfer of waste water, have been presented comparatively in the present research.

Key words: Reuse, vacuum canal system, grey water, membrane.

An Investigation of the Effects of Arsenite (As^{+3}) and Arsenate (As^{+5}) Ions on Antioxidant Enzyme System of The Species, *Echinodorus amazonicus* Rataj

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Aim of the study: The aim of this research is to investigate the effects of inorganic arsenic, As^{+3} and As^{+5} at different concentrations (0, 6, 18 ve 54 μM) on the aquatic macrophyte *Echinodorus amazonicus* Rataj, also their total protein amounts, enzymatic antioxidant peroxidase (POX) and catalase (CAT) activities, and melondialdehyde (MDA) amount which is a marker of lipid peroxidation are examined. Lastly, photosynthetic pigment content is investigated.

Material and Methods: As plant material, *Echinodorus amazonicus* Rataj species is used. The instruments applied for analyses are UV/VIS spectrophotometer, water bath, precision scales, cooled centrifuge, magnetic stirrer, 8 plastic aquarium for placing plants, white tube fluorescent lamps with $300 \mu\text{mol m}^{-2} \text{S}^{-1}$ photon intensity for photoperiod implementation and an air pump for ventilating water. For the specification of chlorophyll and carotenoid the method of Amon (1949); for the specification of protein the method of Bradford (1976), for peroxidase activity (POX) the method of Chance and Maehly (1955), for the lipid peroxidation (MDA) the method of Madhava and Sresty (2000) and for catalase activity the method of Bergmeyer (1970) are applied and these implementations are determined in a spectrophotometric way. Statistical analyses of the data are conducted with Statistica Version 10 and ANOVA and Post Hoc Tukey Test are applied in order to reveal the differences between groups.

Results: In this study, it is observed that antioxidant enzyme activities of arsenite and arsenate ions increase at low concentrations (6 μM) and decrease at high concentrations (18 and 54 μM) with the help of their increasing concentrations. It is also deduced that lipid peroxidation (MDA) shows continuous increase and that protein amounts and chlorophyll contents show a decrease with increasing concentrations. Also, necrosis and chlorosis are observed in the groups with the highest concentrations (54 μM), and As^{+3} has more toxic influence than As^{+5} .

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Keywords: Heavy metal stress, Arsenic, Aquatic macrophytes, *Echinodorus amazonicus*, Antioxidant enzymes.

Depletion of Cytotoxicity of Arsenic on Human Colon Cells After Modification of Ion Exchange Resins with Lysine

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Aim of the study: Arsenic (As), one of the trace metals, presents in soils and groundwaters. Depending on the geographical location, its abundance may vary, which must be declined to definite limits in order to prevent carcinogenic effects of it. Ion exchange resins are simple tools for removing trace metals from water but they must be strengthened to increase their efficacy as well as decreasing the cost of removal. As is mainly absorbed by intestine and therefore colon is the first target of its toxicity. The aim of this study is to decrease cytotoxic effects of arsenic on the human colon cells via modification with ion exchange resins that also be modified with lysine.

Material and Methods: 100 ppb As solution was treated with Monoplus MP64 and Purolite A400 resins. Besides, these resins were also modified with positively charged amino acid, lysine. Resins and their amino acid modified correspondences were also applied to human colon cell line DLD-1. DLD-1 cells were grown in RPMI-1640 medium supplemented with 10% fetal bovine serum and 2 mM glutamine. Cytotoxicity of As on DLD-1 cell lines was determined with Alamar blue and IC₅₀ value was calculated by using sigmoidal graph of data.

Results: In this study, we found that As dose dependently inhibited proliferation of DLD-1 cells. IC₅₀ value was calculated as 75±3 ppb. However, ion exchange resins Monoplus MP64 and Purolite A400 prevent cells against As. Moreover, resins modified with lysine showed strong protective effects against As toxicity. As removal is one of the main concerns for drinking water and depletion of the exposure to acceptable limits must be taken into account. Hence, using these kind of modifications might be important strategies against As toxicity

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Keywords: Arsenic, Ion Exchange Resin, Lysine, Cytotoxicity, DLD-1.

Evaluation of Fusaric Acid Genotoxicity using Chromosomal Aberration Assay in Human Lymphocytes

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Aim of the study: Given the importance of the sustainable use of biodiversity for food and agriculture, the biodiversity has critical role in sustainable intensification of agricultural production. However, agricultural products consumed by human and animal can be contaminated by secondary fungal metabolites called mycotoxin. Such a contamination not only harm agricultural production and food resources but also human and animal health. Fusaric acid (5-butylpicolinic acid) (FA) is a mycotoxin produced by various *Fusarium* species especially *Fusarium moniliforme* growing on corn. The presence of mycotoxins in foodstuffs is a major concern for food safety. Therefore, determination of genotoxic and mutagenic effects of mycotoxins are very important for human health. This study was undertaken to evaluate genotoxic effect of FA in human lymphocytes in vitro using chromosome aberrations (CAs) assay.

Material and Methods: Cells were treated with 0.78, 1.56, 3.125, 6.25, 12.5, 25, 50, 100, 200, and 400 µg/mL concentrations of FA, as well as a solvent [DMSO, 0.5% (v/v) of the culture medium], a negative and a positive controls (Mitomycin-C, 0.20 µg/mL). This study was approved by the ethical committee of the Faculty of Medicine, Gazi University (26.05.2014-277).

Results: Fusaric acid did not significantly increase the number of CA and the frequency of abnormal cells at 24 h treatment. At 48 h treatment, on the other hand, FA significantly increased the number of CA and the frequency of abnormal cells at only 6.25 µg/ml concentration compared to negative control. When compared to solvent control, FA did not affect chromosome aberrations in all the treatments. FA showed toxic effect in human lymphocytes at 25 µg/mL concentration and over. As a result, FA ≥ 25 µg/mL was toxic, however, it did not induce genotoxic effect by CA test except at certain concentration in long treatment periods in human lymphocytes in vitro.

Acknowledgements: This study was supported by TUBITAK under the project number 114Z713.

Keywords: Fusaric acid, mycotoxin, chromosomal aberration (CA) assay.

Genotoxic Effects of Environmental Contaminant Methidathion and Triadimenol Pesticides

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Aim of the study: Pesticides are applied in fruits, vegetables and crops at different growth stage to protect against pest and during post-harvest to preserve their quality. They are also used in the household, workplace, hospitals and schools. This application has resulted in widespread environmental contamination in surface and groundwater resources, soil, air, as well as crops etc. to which they are applied. This contamination induces toxic effects to non-target organisms including human health. The aim of this study was to investigate genotoxic potential of methidathion (MD) and triadimenol (T) pesticides using chromosomal aberrations-CAs, sister chromatid exchange-SCE, and micronucleus-MN assays in cultured human lymphocytes.

Material and Methods: Methidathion is one of the most widely used organophosphate insecticides (OPIs) in agriculture and public health programs. Triadimenol is a broad spectrum triazole systemic fungicide with protective, curative and eradicate action for the controlling of dusty mold and rusts in cereals. Lymphocytes were treated with four different concentrations of methidathion (3.75, 7.5, 15.00, and 30.00 µg/ml) and triadimenol (2.5, 5.0, 10.00, and 20 µg/ml). Treatment period was applied as 24 h and 48 h.

Results: Triadimenol has increased the percentage of abnormal cell in all the concentrations and treatment periods in a dose-dependent manner ($r=0.91$ for 24 h, $r=0.98$ for 48 h). Methidathion has also increased the percentage of aberrations in a dose-dependent manner at both treatment duration ($r=0.95$ for 24 h, $r=0.54$ for 48 h). The most common types of aberration were sister union, which is followed by dicentric chromosomes and chromatid breaks. MD and T pesticides increased the number of SCEs in a dose-dependent manner. Both pesticides have increased the frequency of MN. While MI significantly decreased, replication index (RI) and nuclear division index (NDI) was not affected by these pesticides.

Conclusion: Significant changes in CAs, SCEs, MN and MI in cells exposed to pesticides compared to control demonstrate the clastogenic, mutagenic and aneugenic effects as well as cytotoxic effects of MD and T pesticides in human lymphocytes in culture.

Acknowledgements: This study was supported by Gazi University Research Fund by the project code: 05/2005-27.

Keywords: Environment, pesticides, methidathion, triadimenol, genotoxicity, lymphocyte.

Glyphosate-Based Herbicide Induced DNA Damage

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Aim of the study: Glyphosate is currently the top-selling pesticides in the world and its selling keeps on the growcorrespondingly increase in the cultivation of glyphosate-tolerant (GT) transgenic crops. As seen with other pesticides, glyphosate, due to its high water solubility, may contaminate surface and ground waters. The purpose of this study is to determine the effect of different concentrations of glyphosate on pBluescript M13+ plasmid DNA (3.2 kb) in the absence and presence of Cu (II) ions.

Material and Methods: The commercial formulation of glyphosate (Roundup) supplied from a local agricultural pest store, were used. The DNA cleavage assay is a simple, quick, and robust tool for the *in vitro* damage effect chemicals on DNA. Plasmid relaxation assay was used to describe the association of markers of DNA damage with pesticide exposure.

Results: It has been found that the Glyphosate can effectively promote damage of plasmid DNA.

Keywords: DNA cleavage, Genotoxicity, Glyphosate.

Impacts of Agricultural Drainage on Trophic Structure in the Coastal Wetlands: A Case Study of Kızılırmak Delta in Turkey

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Aim of the study: The aim of this study is to assess the impact of agricultural drainages have on coastal shallow waters in the Kızılırmak Delta, located in the central Black Sea region of Turkey.

Material and Methods: Within the Kızılırmak Delta area (about 56 000 ha) can be found many shallow lakes, the surroundings wetlands are unique biological resources and highly important for sustaining biodiversity. Delta coastal areas are subject to many types of anthropogenic disturbances. High nutrient concentrations in the coastal waters are derived from external inputs from the watershed. There are many drainage canals connected to the lakes. These coastal lakes typically are located in lowland areas that are readily used for agriculture and other human activities as fishery. Nutrients and different biological components are brought by canals into the lakes. With the increasing water usage and growing population in the delta, ecosystem degradation occurs. Furthermore, the different types of pollution problems occur in the wetlands due to the modern international trade of agricultural chemicals, heavy metals inputs, ubiquitous dispersion of persistent contaminants and changing hydrological cycles, etc. It is targeted in this field study methodology to discuss the steps that have been taken for solution of these issues in order to evolve suggestions that will provide guidance over and support to the action plans developed to ensure consistency of the Delta.

Results: Despite the fact that coastal wetlands are ecosystems with high environmental values, they are actually among the most vulnerable and threatened habitats. Nutrients, sediments and pollutants are washed off the landscape during rain events and often times enter drainage systems that are connected to the Delta aquatic systems. Eutrophication is still a major problem in these shallow waters. Agricultural non-point source pollution is a major contributor to the eutrophication of these coastal systems. Also, various fertiliser applications and other agricultural activities such as pesticide spraying have been linked to losses of the wetland biodiversity. At the end of the ongoing works in the field, physico-chemical results indicated a extremely-eutrophic status for the shallow lakes with a range of chlorophyll-a varied from 40 µg/L (at Balık Lake) to 90 µg/L (at Cernek Lake) as annual average. Unfortunately, there are still significant threats and problems concerning the conservation and management of the shallow lakes. Finally, all authorities must be developed large-scale management strategies to determine long-term trends in water and sediment quality and to relate observed trends to human activities as a basis for informed decision making for that target conservation of these lakes. Preventing or alleviating the problem of trophic structure in the coastal areas requires more efficient monitoring combined with effective pollution prevention strategy. However, it is necessary to continue the monitoring studies on the agricultural drainage pollution effects on the lake trophic status comparatively with other lakes in Kızılırmak Delta before reaching an exact conclusion. For this reason, the use of natural treatment applications for the treatment of agricultural drainage outlets could improve the quality of water discharged into constructed canals and coastal wetlands, since they are very efficient and inexpensive solutions to reduce nutrients.

Keywords: Agricultural Drainage, Eutrophication, Nutrients, Wetland, Kızılırmak Delta.

Impacts of Overuse of Pesticides on Biodiversity in Agricultural Production Areas

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Aim of the Study: The use of pesticides has increased many folds over the past few decades. Pesticides provide the effective management of organisms damaging agricultural areas, however, unfortunately, the risks associated with their use have surpassed their beneficial effects. The aim of this study is to highlight the damage to nature and biodiversity caused by the excessive use of pesticides and to compile current studies on the subject.

Material and Methods: This report used observation method and study literature method. Current studies in this area have been compiled and discussed. This report presents an interpretive review of the literature in biodiversity and use of the pesticide.

Results: Non-selective pesticides kill non-target living beings along with the targeted ones. The use of high doses of pesticides has become widespread, as some organisms have developed resistance to pesticides. Biodiversity is also adversely affected by excessive use of these chemicals. Such problems have led to serious threats to not only terrestrial ecosystems but also aquatic ecosystems. Because of the problem of residue in nature, pesticides also cause harm to microorganisms living in the soil. Microorganisms living in the soil are contributing to the nature through the decomposition of the organic matter, the increase of the nutrient intake of the plant and the improvement of the soil fertility. The areas of arable land in the world are steadily decreasing in contrast to increasing human population. It is necessary to increase the yield obtained from the unit area in order to meet people's needs in terms of agriculture. Pesticides come into play at this point. But the overuse of these chemicals will result in damage to nature and biodiversity and will continue to suffer. Policymakers should take steps so as to protect biodiversity in pesticide licensing. Otherwise, overuse of pesticides will change the natural balance and biodiversity and so various disaster scenarios will be inevitable.

Keywords: Climate change, biodiversity, temperature, agro-ecosystem.

Invertebrate Limnofauna of Kızılırmak River (Nevşehir) and Their Relation with Environmental Variables

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Aim of the study: In this study, distribution of invertebrate species of Kızılırmak river and to evaluate the impact of environmental variables on the distribution of species.

Material and Methods: Six stations were sampled along the Kızılırmak river located in Nevşehir city during 2013-2014 seasonally. The physico-chemical parameters (water temperature, biological oxygen demand (BOD), chemical oxygen demand (COD), pH, dissolved oxygen (DO), conductivity, nitrite (NO₃), ammonium (NH₄), ammonia (NH₃), phosphate (PO₄), sulphate (SO₄)) and heavy metals were measured in the water samples to determine the water quality of the Kızılırmak river. During the study benthos samples were collected seasonally from determined 6 stations. All benthic invertebrates were identified to possible taxonomic level.

Results: When the water quality classes were examined in terms of the measured physico-chemical parameters, it was detected that the river is IV. class for nitrite, III. class for BOD, phosphate and pH, II. class for NH₄-N. The results showed that the heavy metal concentrations in water of the Kızılırmak river were within the quality class I. limits of the EPA and WPCR. During this study 19594 individuals were collected. In study area, the highest diversity of taxa richness (17 taxa) was found at Station 1, followed by station 2 = station 3 = station 5 (15 taxa), station 4 (13 taxa), station 6 (11 taxa). According to abundance of benthic invertebrates, the most abundant groups were Gastropoda (%75.9), Gammaridae (%5.7), Nematoda (%9.4), Oligochaeta (%5.6) and Chiromomidae (%2) respectively.

Acknowledgements: The study was supported by Nevşehir Hacı Bektaş Veli University Scientific Research Project Fund (NEUBAP) [Project number: NEUBAP13F22].

Keywords: Kızılırmak river, Benthic macroinvertebrates, Water quality, Nevşehir.

Polyphenolic Compound, Tannic Acid Inhibits proliferation of Human Colon Cancer and Induce Apoptosis

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Aim of the study: The aim of this study was to investigate the effects of plant phenolic compound tannic acid (TA) on proliferative, metastatic, invasive properties of colon cancer cell line, SW-620, as well as drug-metabolizing and antioxidant enzymes.

Material and Methods: Characterization of TA was done by using FT-IR and NMR. The effects of TA on metastatic, invasive and colony formation properties of colon cancer cells were investigated via wound healing, matrigel invasion and colony formation assays. The effects of TA on apoptosis-induced cell death were examined by flow cytometry following Annexin V-APC and 7-AAD staining. Effects of TA on drug-metabolizing and antioxidant enzymes gene and protein expressions were performed by using qRT-PCR and Western Blotting techniques, respectively.

Results: Cytotoxic effect of tannic acid was determined by using "Alamar Blue". TA was found to inhibit proliferation of SW-620 cells in a dose-dependent manner. The IC_{50} value was calculated as 7.2 μ M. In that IC_{50} concentration, TA treatment of cells inhibits migration (82%), invasion (73%) and colony formation (72%), respectively. TA increased early apoptosis rate 21% of SW-620 cells. The significant increase in the protein and mRNA expression levels of NQO1 and GSTM1 having effective role in metabolism of colon cancer treatment drugs and significant decrease in the protein and mRNA expression of CYP1A1, CYP2B6 and CYP3A4 having the role in androgen metabolism, reveal that TA can be used as an alternative and supporting treatment of colon cancer. The results obtained from this study shows that TA might be a good candidate for combinational therapy and highly effective strategy for reducing the occurrence of colon cancer

Acknowledgements: This study was supported by Selcuk University Scientific Committee (Project Number:14401031)

Keywords: Tannic acid, Colon Cancer, Apoptosis, Proliferation, Migration.

The Importance of Vermicompost on Converting Fertilization System From Chemical to Organic in Turkey

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Aim of the study: Vermicompost is a kind of fertilizer that is received after digestion of some organic wastes by earthworms. Eventhought its application has an increasing trend, there are still some drawbacks about this valuable fertiliser's application. The strongest effect on this situation is the attitudes of farmers from the old school.

The aim of this study is to introduce the current status of vermicompost usage on transition to organic fertilizer from chemical fertilizers in Turkey.

Material and Methods: This study is planned as a review.

Results: Parallel to increasing population, more food is needed around the World. In last decades, gaining high yield with intensive farming in which so many chemical fertilizers are used were a trend. Chemical fertilizer use has reached around 11 million tonnes in 2015. However, after many years with many hazards on soil, water and ecological cycle; transforming fertilization choices from chemical to organic ones came to prominent.

Vermicompost is a recently known fertilizers in Turkey. None the less the usage amount has risen to a considerable rate. The main of this positive trend can be enlightened with vermicompost fertilizers' various advantageous. These properties of vermicomposts can be summerized as:

- Enhancing soil chemical, physical and biological characters
- Supporting some plant nutrients
- Converting some organic wastes to a valuable input for farming
- Helping plant to be more resistant to maladies and pathogens

In addition to this frame, researches on vermicompost fertilization must be focused in Turkey. This fertilizermust also be well presented to farmers for a better fertilization and more healty products.

Keywords: Vermicompost, organic fertilizer, chemical fertilizer, soil conditioner.

Analysis of Mushroom Diversity Based on Some Ecological Factors with Some Biodiversity Indexes

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Aim of the study: Forest ecosystems are resource of wild edible and nonedible mushrooms. To estimate of mushroom diversity in the forest area is difficult due to its multidimensional property. Especially, some ecological factors such as elevation and aspect significantly affect mushroom diversity. Therefore to find out biodiversity it is necessary to understand relationships between this diversity and ecological factors. The diversity indices facilitate to compare mushroom diversity in the different region and ecological properties of forest areas. Though which indices are better is not known, these are fundamental source for environmental monitoring, determining of underlying areas in conservation and changes in species diversity of wild mushrooms in the natural forest ecosystems. The main objective of this study is to determine the mushroom diversity based on elevation and aspect in the planning unit in terms of richness and abundances with several common diversity indices.

Material and Methods: The study area is Kulakkaya and Kemerköprü Planning Units located on the Northeast of Turkey. The altitude ranges between 800 and 1900 m above sea level with an approximately average slope of 47%. Existence of humid and rainy seasons throughout the year in the study area is a main reason of rich mushroom species in the case study area. 155 permanent sample plots were established randomly from forested areas in the Planning unit. However, 100 m² size and square shaped sample plots were selected to represent widest range of different aspect, slope, elevations and stand characteristics. The sampling measurements were performed in each plot from August to November at about ten days interval in 2013. All mushrooms were collected, and fresh weight and number of collected mushrooms in each plot were recorded. In this study changing in mushroom diversity based on elevation and aspect was analyzed with common diversity indices of species richness (S), Shannon weiner (H'), Simpson index (D), Simpson diversity index (D), Simpson reciprocal index (D), Pielou regularity (E), Margalef richness (D) and Berger-Parker dominance (BP). Whether or not the differences between elevation and aspect classes in terms of biodiversity was tested through some statistical analysis by using SPSS.

Results: A total of 11 mushroom species were observed in the planning unit. The results showed that the calculated biodiversity indices, dominance and evenness values change depending on elevation and aspect classes. Especially, it was shown that mushroom diversity increases until 1500 meter after that decreases.

Acknowledgements: We gratefully thank Natura Engineering for inventory studies in the planning unit and the Giresun Regional Directorate of Forestry for data support.

Keywords: mushroom diversity, ecological factor, diversity indices, dominance, forest ecosystem, forest conservation.

Basic vegetation types of Shahdag National Park (Azerbaijan)Arzu B. MUSTAFAYEV¹, Sayyara J. IBADULLAYEVA²¹Ministry of Ecology and Natural Resources of Azerbaijan, Shahdag National Park²Institute of Botany of ANAS, 40 Badamdar shosse, Baku, Azerbaijan
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Aim of the study: Studying of modern conditions of vegetation of Shahdag National Park created in high mountain ecosystems of Greater Caucasus botanical-geographical region (within the Azerbaijan Republic) was the main goal of research. Classification of vegetation prevalent in mountain-forest and high mountain-meadow and meadow-steppe regions have been carried out.

Material and Methods: Shahdag National Park located in Great Caucasus botanical-geographical region within Azerbaijan Republic. The total area of the park - 130,501.5 hectares, of which approximately 93,980 hectares of forests. 36,521 hectares of area - pastures and hayfields belonging to the State Reserve Fund. Research have been carried out in all districts of Great Caucasus (Gabala, Gusar, Guba, Ismayilli, Khachmaz districts) by classical methods in 2014-2016.

Results: The bush vegetation presents by 2 formation classes, 9 formations and 14 association spread on Shahdag National Park territory on altitudes above sea level 1200-3200m, rise to the borders of subalpine and alpine zones. Forest vegetation on altitudes above sea level 1500-2700m creates points. *Quercus macranthera*, *Fraxinus excelsior*, *Betula pendula*, *Crataegus meyeri*, *Acer ibericum*, *Pyrus caucasica*, *Malus orientalis*, *Salix triandra* and another species are found in these forests. This vegetation type is divided into 3 formation classes, 8 formations and 17 associations. Tugay forests of region spread in the form of narrow zones along river banks. *Populus canescens*, *Ulmus minor*, *Pyrus caucasica*, *Berberis iberica*, *Tamarix meyeri*, *Rhus coriaria*, *Rubus caesius* are found here. Meadow vegetation covers all high-altitude belts along vertical zoning. 14 formation classes, 42 formations and 52 associations are spread in alluvial, meadow, under forest and after forest vegetation of meadow-brush, subalpine, alpine and alpine meadow half-type. Water-marshy vegetation is not so widespread in the study area. Marshes are formed in flat land in the places of accumulation of rainwater and close to the ground water line. Also marshes are found in high-mountain zones, near springs, natural and artificial lakes. Rock and reef vegetation type covers all mountain zones and spread in 2 formation classes (rock plants and reef plants). Oasis plants covers flat, middle mountain zone, territory of orchards and irrigated cultivated fields. Classes, formations and associations of area vegetation and their types have been appointed during the field search. Prevalence areas of vegetation and biodiversity were clarified, botanical description and phenological observations were carried out. Areas of plants distribution are revealed and prepared about 300 herbariums from regions. Ecosystem of this territory have been analyzed in modern times. 2000 flora species in and around the National park have been established, from them 32 species are included in the Red Book of Azerbaijan. Some national and international status species have been identified.

Keywords: Shahdag National Park, vegetation type.

Chemical Characterization of Wild Cherry (*Cerasus avium* L.) of Wood and BarkHasan ÖZDEMİR¹, Cihangir DOĞAN²¹Duzce University, Faculty of Forestry, Forest Industry Engineering²Ministry of Forestry, Forest Industry Engineer
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Aim of Study: In this study, chemical characterization of wood and bark of Wild Cherry (*Cerasus avium* L.) tree which is naturally distributed in Turkey, and the tannins obtained from their barks have been investigated in the leather industry.

Material and Methods: For this purpose basic chemical analyzes were applied to the wood and bark of the tree, In addition, tannin yield experiments were carried out in the barks.

Results: As a result of basic chemical analysis applied to wood and barks, ash content in heartwood % 0,41, in sapwood %0,49 and in bark %2,26. Determination of the amount of extractive substances and the amount of hot water solubility in heartwood 2,73, in sapwood 4,34 and in bark 16,19. Amount of %1 NaOH solubility in heartwood % 22,92, in sapwood % 22,44 and in bark % 48,24. When the solubility of alcohol cyclohexane-alcohol is examined in bark % 7,03 and in sapwood % 3,45. Solubility of alcohol content in bark %2,73 in sapwood % 0,51 and in heartwood %1,07. Amount of residual lignin in bark % 30,04, in sapwood % 19,96 and in heartwood % 20,37. Amount of soluble lignin in bark %1,22, in sapwood % 1,29 and in heartwood % 2,04. When the amount of monomer sugar is examined, glucose in heartwood % 39,11, in sapwood % 37,78 and in bark % 27,89; xylose in heartwood % 23,83, in sapwood % 23,56 and in bark % 11,17; galactose in heartwood % 0,08, in sapwood % 0,03 in bark %0,44; mannose+arabinose in heartwood % 4,61, in sapwood % 5,11 and in bark % 4,72. Tannins obtained from the bark with various extraction methods were applied to leather. The changes in the thickness and color of the tannins applied were investigated. The results of the chemical analysis obtained as a result of the study were found to be consistent with the values in the literature. As a result of application of the obtained tannin, the effect on the thickness and color was observed and the increase in thickness increased shoemaking, accessory and bag to which visual effects were requested. It is thought to be suitable for production.

Keywords: *Cerasus avium* L. ,Wood, Bark, Tannin, Leather.

Determination of Flora on Lava Columns in Bartın-Güzelcehisar Region in Turkey

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Aim of the study: The lava columns have special site conditions for plants in terms of the main material of the soil. In this context, the aim of this study is to determine the flora of herbaceous and woody species living on lava columns.

Material and Methods: Study field was visited twice a month between 2015 and 2017. After routine herbarium process for plant samples collected, they have been protected in the Herbarium of Bartın University, Faculty of Forestry. The species were identified using the Flora of Turkey written by Davis and The Plant List. The GPS records and photos of the samples were taken as well. In addition, 12 sample plots, 1000 square meters, were taken in the lava columns to determine the silvicultural stand characteristics and the name of tree species.

Results: According to the results obtained from the observations made on the research area which is Güzelcehisar province, annual and perennial herbaceous and woody plant species which are quite different from each other in their life forms and forest tree species such as oriental beech (*Fagus orientalis* Lipsky.), wild cherry (*Prunus avium* L.), European hornbeam (*Carpinus betulus* L.), pedunculate oak (*Quercus robur* L.), sessile oak (*Quercus petraea* (Matt.) Liebl.) and black pine (*Pinus nigra* Arnold.) have been determined. In the flora, some Mediterranean plant species are also present as well as European-Siberian ones.

Keywords: Lava columns, Flora, Güzelcehisar, Forest Stand Characteristics, Turkey.

Eastern Beech (*Fagus orientalis*) Natural Regeneration and Forest Diversity

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Aim of the study: The coastal Black Sea Region is primarily composed of eastern beech (*Fagus orientalis*). Dense rhododendron (*R. ponticum*) understories inhibit regeneration and seedling growth and survival, due to the combined effects of low light and reduced belowground resource availability of water and nutrients. Thus, controlling rhododendron is considered to be the most critical requirement for sustainable beech forest management in Black sea Region of Turkey. The aim of this study is evaluate the natural beech regeneration practices on plant diversity in the region.

Material and Methods: The beech stands are naturally regenerated during harvesting on mast years which occurs 4-5 years intervals. Different woody vegetation control methods have been applied to rhododendron on eastern beech natural regeneration sites in Turkey without any attention paid to the plant diversity of these ecosystems. However, many broadleaves contribute the region's plant diversity: *Acer campestre* L., *A. platanoides* L., *A. trautvetteri* Medw., *Castanea sativa* Mill., and *Cerasus avium* (L.) Moench. Rhododendron is the dominant woody species in the understory, and it outcompetes the other understory plant species once it is established on the site. In addition to rhododendron, some of the gaps under the forest canopy are occupied by *Hedera helix* L., *Cornus sanguinea* C. A. Mey, *Ilex aquifolium* L., *Sambucus ebulus* L., *Daphne pontica* L., *Mespilis germanica* L., *Rosa canina* L., *Atropa belladonna* L., *Clematis vitalba* L., *Clinopodium vulgare* L., *Conyza canadensis* (L.) Cronquist, *Coronilla varia* L., *Euphorbia amygdaloides* L., *Geranium rotundifolium* L., *Helleborus orientalis* Lam., *Lolium perenne* L., *Plantago lanceolata* L., *Pteridium aquilinum* (L.) Kuhn., *Solanum nigrum* L., *Sonchus asper* (L.) Hill, *Tamus communis* L., *Trachystemon orientalis* (L.) G. Don, *Trifolium repens* L., *Tussilago farfara* L., and *Viola odorata* L.

Results: Removing *Rhododendron* from the site may give an opportunity to the other plant species to establish on the site. However, during the operation 70-80 beech trees are left as seed sources and the other plant species are usually removed from the site. Therefore the seed sources of the species contributing the mixture is wipe out off the site. In addition, the bulldozer equipped with a brush rake used for site preparation can lead to scalping and surface soil removal with substantial negative effects in seedbank. Despite the risk of declining plant diversity, this type of management is still carried out over large areas of the Black Sea Region. To sustain plant diversity of these ecosystems, new regeneration techniques should be adopted for the region

Keywords: Beech regeneration, mixed broadleaves, diversity, Black Sea Region.

Ecological Wood Anatomy of Naturally Grown *Acer cappadocicum* Gled. (Sapindaceae) Taxa in Turkey

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Aim of the study: *Acer cappadocicum* Gled. species spread on 4 different taxa in various habitats ranging from Italy to China. *Acer cappadocicum* subsp. *cappadocicum* Gled. and *Acer cappadocicum* subsp. *divergens* (K. Koch) Pax. from these 4 taxa spreads naturally in the forested areas of the Eastern Black Sea Region in Turkey. The ecological wood anatomy of the wood samples belonging to the *Acer cappadocicum* Gled taxa, which grows naturally in the growing environments which are divided into two subgroups as Eastern Black Sea Region "Eastern Black Sea Subsequent Region" and "Eastern Black Sea Region Submarine Growth Zone" was studied in this study.

Material and Methods: 16 wood samples and 10 soil samples were taken from altitudes between 670 m and 1800 m from the "Eastern Black Sea Subsequent Growth Medium Zone". 10 wood samples and 7 soil samples were taken from the 140 m to 1300 m altitudes in the "Eastern Black Sea Region under the Marine Affected Area". Wood samples were obtained by entering under the bark at 1.30 m height of the tree. Soil samples were taken from the top soil (0-20 cm) as a bag specimen at the points where the wood samples were taken. Measurements and counts of the properties of vessel, ray and fibers on the wood samples obtained from the land were made. Soil samples were subjected to hygroscopic moisture, soil reaction (pH), organic matter, field capacity and moisture at the wilting point, available water capacity and soil mechanic composition and soil type identification.

Results: According to the results of Independent Sample T Test made with obtained wood anatomy data; there were significant differences between two different growth environment wood samples properties likewise the number of vessel, cell length of vessel, tangential diameter of vessel, radial diameter of vessel, multiseriate ray width and (micron) height, numbers of multiseriate ray in 1 mm², numbers of uniseriate ray in 1 mm², lengths of fiber, widths of fiber, widths of fiber lumen and thickness of fiber wall.

According to the results of the Independent Sample T Test conducted with the data obtained from the physical and chemical analyzes on soil samples; Sand ratio, silt ratio, available water capacity, soil reaction (pH), electrical conductivity, amount of organic matter and total amount of lime were found significantly different between the studied growth environments.

Acknowledgements: This research is funded by the Karadeniz Technical University Scientific Researches Projects Department, grant number 2007.113.001.3, and we thank the staff of Forestry Directorate.

Keywords: *Acer cappadocicum*, Ecological wood anatomy, Soil properties, Turkey.

Endemism Potential of Turkish Forests

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Aim of the study: Endemic species are the names given to species that are unique to a particular region, country, continent, or island. These species are threatened and are facing the risk of extinction in the future. Endemic species can be found on steep rocky slopes, which are difficult to reach, and they can survive even in easily reachable wide spreading areas. In this respect, life strategies of endemic species are also directly related to the living environments. Forests are a type of habitat that shelters a wide variety of endemic life forms.

Material and Methods: There is no comprehensive study of which endemic species are preferred by which habitat types of forest in Turkey. This study will share the statistical data, derived from Turkish flora and other pertinent works with the conservation point of view, of the endemic plant species hosted by the Turkish forests.

Results: As a result of first assessments, 891 endemic plant taxa (24,12%), almost a quarter of total endemics (3693 plant taxa) in Turkey, were found as related to forest habitats. The families that are richest in terms of endemic plant taxonomy are as follows. *Scrophulariaceae* family has the most endemic plant taxa (123 endemics, 13.8%) among 55 plant families (38% of 144 total plant families of Turkey) living in Turkish forests. *Asteraceae* family is in the second rank having 119 endemic plants (13.4%). *Lamiaceae* is in the third rank having 96 endemic plants (10.8%). In the assessment of IUCN threat categories, *Scrophulariaceae* is the only family with the highest number of taxa in three threat categories “EN, VU and LC”, while, *Asteraceae* is the leading family with the highest taxa numbers in CR, NT and DD. According to 891 endemic plant taxa in Turkish forests, 53 of which (6%) are in CR, 185 of which (21%) are in EN, 170 of which (19%) are in VU, 213 of which (24%) are in NT, 231 of which (26%) are in LC, 29 of which (3%) are in DD and also the status of 10 plant taxa (1%) are unknown.

Keywords: Forest endemics, plant, endemism, IUCN threat categories, Turkey.

Forest Certification in the Turkish Forestry: An Assessment

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Aim of the study: Forest certification in the most simplistic way aims to ensure sustainable and good management of forest resources. Forest certification has now been an important part of forestry and forest industry in the globe. Turkish forests are owned and managed by the State in Turkey, specifically through the General Directorate of Forestry (GDF) operating under the Ministry of Forest and Water Works. The GDF is strongly hierarchical administration body with a well-distributed web throughout the country. Although forest certification has long been part of forest management in many parts of the world including Europe and US, it has recently been introduced to the Turkish forestry. Less than one-third of Turkish Regional Forestry Directorates have been involved in FSC so far. This paper discusses the experience gained through the certification process to the Turkish forestry with an emphasis paid to benefits and issues. Issues identified are in general terms discussed.

Material and Methods: Impact of forest certification on the Turkish forests has been assessed using the public summary reports of the certification surveillances and assessments for various Regional Directorates of Forestry in Turkey.

Results: Although Turkish forest agencies have had adaptation issues with certification process and requirements in the beginning, they have quickly adapted and improved on the problematic issues the certification assessments had pointed. Overall, the forest certification process has made significant contributions to the Turkish forestry both conceptually and practically. For instance, high conservation values and health and safety issues have demonstrated quite improvements over the years. The continuation of the forest certification process in the Turkish forestry is recommended.

Keywords: forest certification, Turkish forestry.

Mapping of Spatial Distribution of *Boletus edulis*, and *Chanterelle cibarius*

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Aim of the study: The forest is the most important resources for edible or non-edible wild mushrooms. Mapping of spatial distribution in mushrooms is increasingly important for preparing forest management planning. Forest management plans integrated spatial distribution map of mushroom can provide a wide range of alternatives for management of biodiversity and conservation of mushrooms. Geographic Information Systems (GIS) potentially can be used for mapping of species through the spatial database. The spatial distribution maps developed by GIS can play an important role in sustainability of forest values. The objective of this study is to develop the spatial distribution map of *Boletus edulis*, and *Chanterelle cibarius* mushrooms in Bicik planning unit of Turkey with GIS.

Material and Methods: This study was conducted in the Bicik Planning Unit, northwestern Turkey. The study area covers about 11,554 ha forested area. The forested area was composed by *Fagus orientalis*, *Picea orientalis*, *Abies sp.* and *Carpinus sp.* species. In the field survey the expert visited total 75 sample plots randomly distributed throughout the forested areas representing a range of different topographic and stand characteristics. Absence or presence of the related mushrooms in the each sample plots was determined without picking of the mushrooms. All plots were visited four times in mushroom season of 2013. The occurrence of the related mushroom in the each plot recorded as binary with location through GPS. Spatial database showing spatial distribution of mushroom species in the study area was created and then a point layer showing the occurrence of the related mushroom species in the each sample point was created by using some functions of GIS in Arc/Info 10.0™. Thiessen polygon method was used to allocate all points with the same quality for the mushroom occurrence. Then the polygon layer indicating occurrence of related mushroom species was combined with stand type map of the planning unit.

Results: Based on the field data, spatial distribution of *Boletus edulis*, and *Chanterelle cibarius* were mapped by using geographic information systems in the area. In conclusion, spatial distribution maps of mushroom species can be produced by using the practical and useful method demonstrated in this research.

Acknowledgements: We thank Giresun Regional Directorate of Forestry for data support.

Keywords: Spatial distribution, *Boletus*, *Chanterelle*, mapping, forest ecosystem, GIS.

Maquis Communities of Küre Mountains in Bartın, Turkey

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Aims of the study: The object of this study is to classify the Maquis Communities of Küre Mountains in Bartın (Turkey).

Material and Methods: Küre Mountains National Park, which is located on the Western Black Sea Region of Turkey, has characteristics of a plateau. The National Park starts from Bartın River on the west and extends approximately 300 kilometers to the Kızılırmak River on the east. The study area covers Bartın section (19.000 ha) of the Küre Mountains (37.753 ha). Soil types of the region are grey-brown podzolic soil and red-yellow podzolic soil. Bed rock is mostly limestone. The annual precipitation is about 1040.2 mm and means annual temperature is 12.9°C. The National Park was identified as one of the 100 Forest Hot Spots of Europe which should be protected. In this study, maquis vegetation of the National Park will be presented with 40 relevés which were taken using Braun-Blanquet method. The mapping was developed by means of ArcGIS software. The altitude of the relevés vary between 184 m to 739 m. The vegetation was collected and classified according to Braun-Blanquet methods. All of the relevés were stored into TURBOVEG and the classification was done within JUICE software.

Results: Maquis vegetation data consists of 40 relevés and 182 different taxa. As a result of the classification using TWINSpan, *Erica arborea* and *Juniperus oxycedrus* dominated community was separated from *Carpinus orientalis* dominated communities. On the second level of division, optimal groups were identified for these main units. Consequently, 4 maquis plant communities which are sociologically different from others were determined.

Based on the classification and ordination following classification scheme was proposed:

Erica arborea-*Cisteium creticum* Aksoy et Efe 2006

Cotinus coggygriae-*Pinetum brutiae* Korkmaz et. Engin 2010

Phyllirio latifolia-*Arbutum andrachne* Ketenoğlu, Akman et Aydoğdu 1980

Phyllirio latifolia-*Carpinetum orientalis* ass. nova

Acknowledgements: This study is supported by TÜBİTAK, Project number: 114O660

Keywords: Maquis Vegetation, Küre Mountains, National parks, Turkey.

Partial or Complete Removal of Understory Components Enhances or Limits Nutrient Availability for Tree Growth

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Aim of the study: Conifer seedlings need to be released from competition with understory until seedlings overtop shrubs during the stem exclusion stage. The question arises as to whether partial or complete removal of understory components enhances or limits nutrient availability for tree growth in new plantations. Although competing species can be detrimental to seedling growth in the early stages of stand establishment, excessive understory vegetation control may, in some cases, be ecologically undesirable. In this study, an effort was made to analyze the soil isotopes, $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ properties for interpreting effects of understory vegetation removal on nutrient cycling at the ecosystem level.

Material and Methods: This study utilized a previously established, large-scale project where the understory vegetation was differentially controlled in Douglas-fir plantations in Oregon, USA. The experiment used a randomized block design with four blocks. Treatments included 3 randomly assigned levels of salmonberry (*Rubus spectabilis* Pursh) and herbaceous vegetation control. After the understory were cleared, Douglas-fir seedlings (2-0 bare-root stock) were planted at a 3 x 3 m spacing. A control plot received no vegetation removal after initial establishment with Douglas-fir seedlings (DFC). On one of the plots, shrubs were completely removed, leaving only herbs and Douglas-fir (DFH). Finally, complete removal of shrubs and herbs was included in the array of treatments, leaving only Douglas-fir (DFO). Each treatment was maintained manually through the growing seasons for five years. Soil samples were collected from 0-7.5 cm and 7.5-15 cm soil depths at 5 randomly selected locations on each plot. Soil samples were separated as light (LF)- and heavy-fraction (HF) organic material. Stable isotopes ^{13}C and ^{15}N of the LF and HF were analyzed for their ^{13}C and ^{15}N stable isotope values using a continuous flow method.

Results: Total understory vegetation removal significantly enriched soil $\delta^{15}\text{N}$ on DFO sites at age 5 yr. Soil on DFO plots had the highest $\delta^{15}\text{N}$ values. $\delta^{13}\text{C}$ signatures of < 2 mm soil light (LF) and heavy fractions (HF) were not different between plots, but the differences between LF and HF were significantly affected by understory removal ($P < 0.04$). Our data imply that organic matter on DFC sites decomposed faster due to the fact that these sites were dominated by shrubs and herbs. In contrast, the forest floor on DFO sites decomposed slowly due to the more recalcitrant properties of needles. Further research is needed to investigate changes in soil C and nutrients in the future with the presence and absence of understory as part of ecosystem.

Keywords: Understory removal, stable isotopes, mineralization.

Plant Richness of Fir (*Abies nordmanniana* ssp. *bornmuelleriana*) Stands Ranging at Aladağlar (Bolu) Region of Turkey

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Aim of the study: Forest ecosystems are important areas in terms of biological diversity. Currently, forest areas in Turkey are managed under ecosystem-based multiple use planning approach by trying to consider biological diversity, beside other ecosystem services. Sustainable management of these areas is only possible with a good understanding of relations among the elements of forest ecosystems. In this study we aimed to carry out the plant richness of managed Fir (*Abies nordmanniana* ssp. *bornmuelleriana*) stands having different structural characteristics in Aladağlar (Bolu) region of Turkey.

Material and Methods: The study is realized in fir forests at Aladağlar (Bolu) region of Turkey. Fir forests in the area are managed for wood production for many years based on selective cutting techniques. These stands are grouped under 4 stand types as GA, GB, GC and GD based on distribution of number of trees to diameter classes. The inventory design is based on to carry out the plant species at different aspects (North and South) of these 4 fir stand type along the vegetation period in different months (June, July, August and September). 10 quadrat samples on transect lines were taken from each different stand types (4), aspects (2) at different observation times (4) with replication (2). Data are collected from totally 640 (10*4*2*4*2=640) quadrat samples which are 0,25m² (50cm*50cm). Quadrat samples at different observation times were taken randomly on the pre-determined transect lines at each stand. Number of individuals and closure of each different plant in the quadrats were recorded in the field. Samples or photo from the unknown plants were taken to identify them in the herbarium.

Results: Totally, 122 taxa were identified in the fir stands along the 4 observation periods. 63 of these taxa were identified at species level while 49 at genus and 2 at family level and deposited in DUOF Herbarium. The number of taxa which could not identified because the vegetative and generative organs were not developed enough to be able to identify is 8. While some taxa (*Galium verum*, *Echium vulgare*, *Dorycnium graecum*, *Asperula involucreta*) were seen only at some stands, some other (*Cyclamen coum*, *Daphne pontica*, *Doronicum orientale*) were observed in all the stands. This situation is also true for aspects and observation periods. While some taxa were seen only at one aspect or one of the observation periods, some other were observed all times at all aspects.

Acknowledgements: This research is funded by the Scientific and Technological Research Council of Turkey (TUBITAK) with a grant number 115O958. We also thank to Yusuf Ercan and Ahmet Aytegin for their support in the field and identification of the taxa.

Keywords: Plant richness, biodiversity, Fir, Turkey.

Riparian and Rocky Vegetation of the Argözü Valley in Kibriscik, Bolu

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Aim of the study: The object of this study is to analyse the riparian and rocky vegetation of Argözü Valley in Kibriscik, Bolu (Turkey).

Material and Methods: The study area is situated on the southern slopes of Köroğlu Mountains and in Euxine province of Euro-Siberian Region. Volcanic with andesite characteristic rocks occur in the area. The climate of the region changes from less rainy Mediterranean to rainy Mediterranean type. Annual precipitation varies from 700 mm to 1200 mm depending on altitudinal zones and mean annual temperature is 11°C.

Results: As a result of classification and ordination, one riparian community and three rocky communities were defined. According to this definition following communities were proposed for riparian and rocky communities. For vegetation analysis, a total of 20 sample plots were taken from riparian vegetation and 65 sample plots were taken from rocky vegetation of the study area. Vegetation data were classified using TWINSpan (Hill, 1979) under JUICE software and indirect ordination analysis were applied to the data.

Class: *SALICI PURPUREAE-POPULETEA NIGRAE* (Rivas-Martínez & Cantó ex Rivas-Martínez, Bascónes, T.E. Díaz, Fernández-González & Loidi 1991)

Order: *POPULETALIA ALBAE* Br.-Bl. ex Tchou 1948

Alliance: *SALICION ALBAE* Soó 1930

Association 1: *Heracleo-Salicetum albae* ass. nova

Class: *DAPHNETO-FESTUCETEA* Quézel 1964

Order: *DAPHNO-FESTUCETALES* Quézel 1972

Alliance: *HYPERICO-VERBASCION*

Association 1: *Sileno-Daphnetum oleoidi* ass. nova

Upper Class: *QUERCO-FAGEA* Fukarek-Fabijanik 1968

Class: *ASPLENIATEA TRICHOMANIS* (Br.-Bl. 1934) Oberd. 1977

Order: *SILENETALIA ODONTOPEATALEA* Quézel 1973

Alliance: *SILENION ODONTOPEATALEA* Quézel 1973

Association 2: *Centaureo-Sedetum confertiflorae* ass. nova

Association 3: *Saxifrago-Sedetum albae* ass. nova

Most of the endangered endemic taxa in the research area, distributes in all the rocky communities. For this reason especially rocky communities are very important. Moreover, some of rocky communities in the study area are located within the high mountain ecosystem. Therefore they are very sensitive and under pressure of activities such as grazing, nature walk, mountaineering. In order to minimize the damage in such sensitive ecosystems, these activities should be conducted in a reduced or controlled manner.

Acknowledgements: This study was supported by Scientific Research Project Coordination Unit of Duzce University, Project number: DÜBAP2012.02.02.117.

Keywords: Riparian, Rocky, Communities, Kibriscik, Bolu, Türkiye.

Socio-economic Practices in Turkish Forests: A case for Muğla Regional Forestry Directorate, Turkey

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Aim of the study: With the recent paradigm shift in the Turkish forestry, forestry practices focus more on ecologic and socio-economic functions in addition to the long-going economic (i.e. wood production) functions in forestland. Establishing forest stands with income-generating tree species and honey stands for local beekeeping for the locals stand out two forestry practices with the socio-economic functions in the Muğla Regional Forestry Directorate in Turkey. This paper provide a synopsis of practices for the aforementioned functions including silvicultural practices carried out in these stands and the feedback from the locals regarding these practices.

Material and Methods: The forestry practices carried out in the directorate's jurisdiction area for the aforementioned socio-economic functions were introduced and evaluated in terms of ecological and socio-economic outcomes.

Results: More area are allocated in the directorate's jurisdiction area to socio-economic functions including income generating tree species and stands for beekeeping in the revised forest management plans. There is still considerable size of people living in and around state forestland the rural area in Muğla, and agriculture, animal husbandry and forestry jobs are the main sources of income for these local people. Stone pine, olive, and almond trees are the main tree species of interest for income-generating tree species. Muğla Region also stands out at both national and international levels for pine honey production. Identification of some of the existing stands of Turkish red pine as honey forests with much reduced level of feeling levels makes a great contribution to the region's pine honey production. In addition, these socio-economic practices help improve the life standards of the local and reduce the antropogenic pressure on the region's forest resources.

Acknowledgements: We thank the Muğla Regional Directorate of Forestry for providing information and visual resources.

Keywords: Income generation, pine honey production, socio-economic functions.

**Soil carbon under Maritime Pine (*Pinus pinaster* Aiton) plantations
on Sand Dune Restoration Sites at Terkos (Durusu) – Istanbul**

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Aim of the study: Sand dunes occupy a large proportion of the Terkos Lake, Istanbul-Turkey, and its movement by wind threatened the important municipal water resource. It's also a significant location because of being the first afforestation and dune restoration study in Turkey concerning to stabilize coastal dune movements. Currently, 1674 hectares of maritime pine plantation area exists on Terkos coastal dune site. Introduced maritime pine trees have stabilizing performance and growth on sandy material which has poor water and nutrient capacity, however, critically important aim of this research on soil carbon to improve understanding soil carbon sequestration on coastal sand dunes.

Material and Methods: Sampling design was mainly set on the development stages of stands. 15 sample plots from each development stages according to (DBH) tree diameters of 0-8 cm; 9-20 cm; 21-35 cm and <36 cm with abbreviations a, b, c and cd respectively. Thus a total of 60 sample plots were selected. Also 20 soil pits were dug from open coastal dunes without any planted tree cover. Forest floor samples were collected from 25x25 cm area with five replications in each plot. Samples were separated to two layers as litter+fermentation and humus. For soil sample collection, one soil pit was dug in each sample plot. It is observed that there is no pedogenic horizon development in the field except for an Ah horizon. Therefore, soil samples were taken from constant depths (0-5 cm, 5-15 cm, 15-30 cm, 30-50 cm, 50-70 cm and 70-100 cm). Forest floor and soil samples were analyzed to determine carbon concentrations.

Results: Sand dune movement were mostly controlled because of the effects of both forest floor and planted trees. Thick forest floor layers under stands likely shows slow decomposition rate, therefore, forest floor accumulation increase with the stand development stages. Carbon concentrations did not show a clear tendency with stand development in both litter+fermentation and humus layers of forest floor. Soil organic carbon concentrations has a decreasing tendency with soil depth, and the first soil depth layer (0-5 cm) has more carbon concentration than lower depths in all plots.

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Keywords: Afforestation, forest, humus, organic soil, restoration, stabilization.

The Relationship Between Some Stand and Topographic Variables on Mushroom Diversity in Northeastern of Turkey

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Aim of the study: Commercial collection of wild mushroom is becoming increasingly important as a non-wood forest product (NWFP) due to its economic importance. Mushrooms are not the only sources of medicine and food but they are also important for recreation activity. However, excessive use and lack of control mechanism can led to a disappearance of these products. Hence, sustainability of mushrooms depends on proper conservation, management and use of these products. Some topographic and stand variables have significant effect on mushroom diversity. Especially, determining of mushroom richness based on stand and topographic conditions is important for specifying of underlying areas in conservation and monitoring changes in mushroom diversity in the natural forest ecosystems. Thus the integration of this product into forest management plans depends on understanding of relationships between these variables and mushroom richness. The aim of the present research is to examine the extent to which stand and topographic variables can serve to explain variations in mushroom diversity.

Material and Methods: This research was carried out in Kulakkaya and Kemerköprü Planning Units, Giresun Province of Turkey. Total 155 permanent sample plots with 10x10m size were established randomly different range of topographic and stand characteristics in order to capture high variation in mushroom diversity from forest ecosystems in the study areas. The sample plots were visited from August to November in 2013 about ten days interval to explore macrofungal diversity. During the survey each macrofungi species within each sample plot was photographed and then collected in the separate bags. Fresh weight and the number of each collected macrofungi were recorded separately. In each sample plots, morphological features of sporocarps such as size, colour, shape and some stand and topographic characteristics were recorded. In this study mushroom diversity of each plot was calculated with common diversity indices of Shannon weiner (H'), Simpson index (D) and Simpson diversity index (D), Pielou regularity (E), Margalef richness (D) and Berger-Parker dominance (BP). Correlation analysis was used to measure strengths of association and the direction of the relationship between mushroom diversity and some stand and topographic characteristics. In addition, the effects of stand and topographic variables in the mushroom diversity were analyzed by using one-way ANOVAs test. The individual mean values were compared with a post hoc test. All statistical analysis were tested by SPSS statistical package.

Results: The results showed that some topographical variables such as elevation, aspect and slope and some stand variables such as stand age, crown closure and development age have significant effect on mushroom diversity.

Acknowledgements: We wish to thank Natura Engineering for their valuable inventory studies in the planning units and the Giresun Regional Directorate of Forestry for data support.

Keywords: mushroom diversity, stand variables, topographical variable, diversity indices, forest conservation.

Tree species effects on soil macro and micro nutrients in Turkish forest ecosystems: In relation to aspects and soil depths

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Aim of the study: The effect of tree species on the ability of soils to supply nutrients to plants is more complex. It involves nutrient release through litter fall and organic matter decomposition, and depletion of nutrients through uptake by the plant. Soil properties also vary with topographic settings. One reason is the orientation of aspects on which soils develop; this affects the microclimate, such as north vs. south-facing slopes, and hence the soils. Aim of this study was to investigate the effects of tree species on soil nutrients using Scots pine and Black pine growing at the north and south aspects in Turkey.

Material and Methods: This study was carried out in the Kastamonu province, Daday Districts, north-west of Kastamonu, Turkey, (41°28'N 33°28'E). Soil samples of Black pine and Scots pine were collected from the altitudes of 1200 meter on the north- and south-aspect. The soil samples were taken randomly from 0-5cm, 5-10 cm, 10-15 cm, 15-20 cm, 20-25 cm and 20-30 cm soil depths by digging three soil pits at each sampling site. The soil samples were air-dried, ground and pass through 2 mm mesh-sized sieve. They placed into marked plastic bags and kept in a fridge until chemical analysis. The soil samples were then analyzed for soil pH, soil texture, and soil macro (N, P, K, Ca, Mg, and S) and micro ((Fe, Mn, Na, Cu, Zn, Cl, Al and Co) nutrient contents. Soil pH (H₂O) was measured in deionized H₂O using a glass calomel electrode, after equilibration for 1 h in a solution:soil paste ratio of 10:1. Soil texture (sand, silt and clay) was determined by Bouyoucos' Hydrometer method. Soil total nitrogen content was analyzed using Eurovector EA3000-Single CNH-S element analyzer and soil nutrients using Spectro-Xepos II model XRF at Kastamonu University Center Laboratory.

Results: Soil pH showed significant difference for black pine stands between the two aspects. Soil macro nutrients (Mg, P and S) from black pine stands were higher on the north aspect than the south aspect, whereas Ca and K contents were higher on the south aspect than the north aspect. For Scots pine stands, soil macro nutrients (Ca, Mg and P) were higher on the north aspect than the south aspect, whereas K content was higher on the south aspect than the north aspect. Soil S content was similar on each aspect. For Scots pine stands, soil micro nutrient, Fe content was higher on the north aspect than the south aspect, whereas other soil micro nutrients (Mn, Na, Cu, Zn, Cl and Al) were higher on the south aspect than the north aspect. For black pine stands, there were completely different trends with soil micronutrients. Soil micronutrients (Fe, Mn, Na, Zn and Cl) were higher on the north aspect than the south aspect, whereas Cu and Al contents were higher on the south aspect than the north aspect. Soil total nitrogen was higher on the north aspect than the south aspect for both tree species.

Acknowledgements: The result presented here was a part of the big study which was submitted to the Graduate School of Natural and Applied Sciences in Kastamonu University as the Degree of Master of Science in Department Forest Engineering.

Keywords: Soil nutrients, Black pine, Scots pine, Altitude, Soil depths, Kastamonu.

OP244
Utilization of Harvesting Residue Wood Barks

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Aim of Study: Tree barks as harvesting residues in forest areas have different uses. As harvesting by-products, barks are both cheaper and more environmentally friendly than most other resources.

Material and Methods: Barks have various ways of utilizations. For example, the barks of some tree species contain significant amounts of tannins. Tannin is commonly used as a sepia material in leather and substrate in pulp production. Bark is also used as a fuel. Depending on the species obtained and the moisture content of the materials, barks release between 1000 and 5000 calories/kg tree bark is also used as a mulch material in agricultural areas and nurseries. The mulch material produced from the tree barks improves the soil structure, it acts as a buffer against heat and moisture losses from the soil surface and it can increase the infiltration rate.

Results: Every year 2 million m³ of tree bark is produced as by-product during harvesting operations from about 21 million hectare forestlands in Turkey. These harvesting residues that remain in the system as forest floor can be used more effectively with various potential uses.

Keywords: Forest harvesting, bark, tannin, mulch, Turkey.

Vegetation Characteristics of Forest Gaps in Yuvacık Watershed, İzmit/Turkey

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Aim of the study: Despite agricultural areas and rangelands, forest gaps can have different microclimatic conditions from each other, depending on its elevation, size and surrounding forest types. This situation can have effects on the biological, chemical, physical, and hydrological processes and cycles in the forest gaps. Different microclimates depending on gap size, altitude, and adjacent forest type can affect forage production, plant cover, plant diversity and nutrient dynamics. The objective of this study is to carry out how forage production, plant cover, plant diversity and plant species change is affected by size of the forest openings, elevation above sea level and surrounding forest stand type.

Material and Methods: The study was conducted in Yuvacık watershed in İzmit/Turkey. Experimental design was complete randomized block design with sub sampling. Factors were gap sizes (0-5 ha, 5-15 ha, and 15 ha<), elevations of the forest gaps (800-1000 m and 1000-1200 m) and surrounding stand types (beech stand and mixed stand). Data were analyzed by using analysis of variance and means were separated with Tukey test ($P<0.05$). Additionally regression and correlation analysis were carried out to determine relationships between parameters.

Results: Results showed that plant cover increased with elevation, gap size increase and surrounding mixed stand. Gramineae plants in botanical composition increased with gap size, elevation and in the openings surrounded by mixed stand. In contrast, other plants from different families decreased with elevation, gap size and in the openings surrounded by mixed stand. Additionally forage production decreased with gap size and elevation but root biomass showed totally opposite trend to forage production. Plant diversity and number of plant species were not affected with gap size, elevation of the gaps and surrounding stand types. In conclusion, it can be said that forest gaps surrounded by different forest types with different sizes at various altitudes can influence percent of plant cover, botanical composition, forage production, root biomass and nutrient dynamics and hence have different soil properties.

Keywords: Forest gaps, Plant diversity, Botanical composition.

Production of Bioactive Substances with Antiviral Activity in *Nitraria schoberi* Hairy Roots Culture

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Aims of the study were: A. rhizogenes-mediated transformation of *Nitraria schoberi* plantlet parts, obtaining intensively growing on hormone-free media hairy root cultures producing biologically active substances and subsequent evaluation of culture extracts for antiviral activity, in particular against the influenza virus.

Material and Methods: Hairy roots were obtained by agrobacterial transformation of sterile seedling hypocotyls and primary leaves using A. rhizogenes strains A4-RT, R-1601, 8196-RT, 15834 SWISS. After the transformation the explants were placed on agar-solidified BDS medium supplemented with cefotaxime. The developed hairy roots were transferred to hormone-free BDS liquid media. To prove the transformed nature of hairy root culture, PCR-analysis was performed with the use of primers detecting rol-genes, and to exclude possible contamination of agrobacterial DNA, the preparations were checked by amplification of the vir-gene sequence. Analysis of the secondary metabolite content of *N. schoberi* hairy roots was performed by spectrophotometric methods (Belikov, Shraiber, 1970; Ermakov et al., 1987; Kiseleva et al., 1991). The quantitative and qualitative compositions of catechins was studied using an analytical HPLC system consisting of an «Agilent 1200» chromatograph with a diode array detector and a ChemStation system. The roots of the intact five-year-old plant were used as a control. Cytotoxicity and antiviral activity against RNA-containing A influenza virus of H3N2 and H5N1 subtypes were determined in aqueous solutions of ethanol extracts on MDCK culture and laboratory mice.

Results: Hairy roots were formed when using all four strains of agrobacteria, however, the most effective were 8196-RT and 15834 SWISS. PCR analysis showed presence of rol-genes in hairy roots, which indicated the successful agrotransformation. As a result of the analysis, no agrobacterial DNA contamination of the samples was detected. Biochemical study showed that the content of flavonols, tannins, catechins, pectins, protopectins, and saponins in the genetically modified roots was considerably higher than that of the same components in the control. In the extracts of the hairy roots, 13 compounds of the catechin nature were found. Gallic acid, $\pm$ catechin, and L-epicatechin were identified. It was found that aqueous solutions of plant extracts under study in a concentration of ≤ 0.01 mg / ml did not cause toxic effects on the cell culture of MDCK. The aqueous solution of the ethanol extract of *N. schoberi* hairy roots was shown to have antiviral activity against the RNA genome virus of human A influenza of H3N2 subtype and the highly pathogenic avian influenza virus of H5N1 subtype at a concentration of no less than 0.01 mg/ml in the cell culture of MDCK and 1.0 mg/ml in the model of experimental influenza infection in mice. Thus, the data obtained favour the prospect of further study of *N. schoberi* hairy roots.

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Keywords: *Nitraria schoberi*, hairy roots, bioactive substances, antiviral activity.

Cytological studies of three taxa of *Anchonium* (Brassicaceae) section from TurkeyEsra MARTİN¹, Murat ÜNAL², Mustafa İLERİ²¹Biotechnology Department, Necmettin Erbakan University, Konya, Turkey²Biology Education Department, Yüzüncü Yıl University, Van, Turkey

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Aim of the study: The research has made contribution to the cytotaxonomic revision of the genus *Anchonium* in Turkey.

Material and Methods: All samples were collected from wild populations from Turkey. Collected specimens were deposited in Balıkesir University. All karyological observations were carried out on root tips. Root-tip meristems were provided from seed by germinating them on wet filter paper in Petri dishes at room temperature. Firstly root tips pretreated for 16 h in α -monobromonaphthalene at 4°C, fixed in 3:1 absolute alcohol/glacial acetic acid, then the root tips were hydrolyzed with 1 N HCl for 13 min at room temperature and stained with 2% aceto-orcin for 3 h at room temperature. Stained root tips were squashed in a drop of 45% acetic acid and permanent slides were made by mounting in Depex. For karyotype analysis the photographs enlarged 10 ×100 were taken using a microscope with a camera attachment. The karyotypes were measured by Software Image Analyses (Bs200Pro) loaded on a personal computer. Ideograms of these taxa were arranged in decreasing length.

Results: The number of the chromosomes in the *Anchonium* genus which belongs to Brassicaceae family were studied using the Image Analysis System. Chromosome number was determined as $2n = 14$ in *Anchonium elichrysifolium* subsp. *canescens*, $2n = 14$ in *Anchonium elichrysifolium* subsp. *cilicicum*, $2n = 14$ in *Anchonium elichrysifolium* subsp. *glandulosum*. *Anchonium elichrysifolium* subsp. *glandulosum* taxon was studied from three different localities and their chromosome numbers were the same.

Keywords: Chromosome, Image Analysis System, *Anchonium*.

Evaluation of the Genetic Improvement Studies in Low Input Production Systems: Karya Sheep

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Aim of the study: Karya is one of the sheep breeds of Turkey which is raised in Aydın, İzmir, Manisa, Uşak and Denizli provinces in Aegean region of Turkey. It is a multi-purpose, high milk yielding, high fertility, thin-tailed sheep breed and was included into the National Genetic Improvement Scheme in Aydın and Denizli provinces in the year 2006. The aim of this study was to evaluate the genetic improvement studies for Karya sheep in Denizli Province within the context of national genetic improvement scheme for small ruminants in low input production systems.

Material and Methods: Study data was obtained with questionnaires completed through face-to-face interviews with all Karya sheep breeders in the scheme along with the breeders out of the scheme equally in number. Karya breeders in and out of the national scheme were compared regarding rates of twin (or more) births, rates of lamb deaths after birth, infertility and miscarriage rates, lamb live weight at birth and subsequent weighing dates, important breeding problems, diseases and internal-external parasites along with gross profit calculated for every breeder interviewed. Descriptive statistical methods were employed in analysis of the data as student t-tests for independent and paired samples were used in comparisons. Breeding problems, diseases and parasites were scored using 1-5 scale.

Results: Significant lamb live weight increases were determined at birth and subsequent weighing dates. Lamb death rates declined by 3,3% during the study. Twin and triplet birth rates increased by 9,8% and 3,2% respectively. However, flock birth rate declined by 4,9% and miscarriage rates were calculated to be 8%. Nevertheless, infertility rates declined by 3,4%. There was no significant difference between the two breeders' groups in terms of breeding problems, diseases and internal-external parasites. Low product prices, lack of dairy, insufficient veterinary services and diseases were the highest priority problems, while wood tick, brucellosis, lamb septicaemia, foot and mouth disease, enterotoxaemia, sheep plague and mastitis were the most important diseases and parasites. As an economic achievement, the breeders in the scheme, obtained 53,2 TRY more gross profit per product unit. It was also calculated that support payments paid in 2014 were 29,8 TRY per production unit. That is, the gross profit surplus (53,2 TRY) achieved as the result of cumulative advancements is about 1,8-fold of the support payments paid in 2014. It was concluded that sheep diseases, pests and breeding problems should be tackled for the sustainability and higher achievements.

Keywords: Genetic improvement, Karya sheep, small holder low input systems, gross profit, production unit, Denizli, Turkey.

Evaluation of the Genetic Improvement Studies in Low Input Production Systems: Pırlak Sheep

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Aim of the study: Turkey ranks eighth regarding sheep asset in the World with a number of sheep breeds with different physiological and morphological characteristics adapted to ecological conditions of the regions where they are raised. Low yielding indigenous sheep breeds constitute more than 90 per cent of the total sheep asset of Turkey. One of these sheep breeds is the Pırlak sheep which is raised in the area covering the whole inner part of Aegean region and the North part of the western Mediterranean region of Turkey. It is a multi-purpose, thin-tailed sheep breed and was included into the National Genetic Improvement Scheme in Afyonkarahisar province in the year 2006. The aim of this study was to evaluate the genetic improvement studies for Pırlak sheep within the context of national genetic improvement scheme for small ruminants in low input production systems.

Material and Methods: Study data was obtained with questionnaires completed through face-to-face interviews with all Pırlak sheep breeders in the scheme along with the breeders out of the scheme equally in number. Pırlak breeders in and out of the national scheme were compared regarding rates of twin (or more) births, lamb death rates, infertility and miscarriage rates, lamb live weights at birth and subsequent weighing dates, important breeding problems, diseases and internal-external parasites along with gross profit calculated for every breeder interviewed. Descriptive statistical methods were employed in analysis of the data as student t-tests for independent and paired samples were employed in comparisons. Breeding problems, diseases and pests were scored using 1-5 scale.

Results: An increase in twin and triplet births by 3,6% and 0,7% were calculated since the beginning of the scheme. Significant lamb live weight increases were determined at birth and subsequent weighing dates. Miscarriage and infertility rates were 4,4% and 5,5% and infertility rate and lamb death rate were decreased by 3,5% and 3,8% respectively. The most important breeding problems were low product prices, wild animal attacks, high shepherd wages, lack of shepherd, diseases and parasites. On the other hand, brucellosis, enterotoxaemia, sheep pox, tapeworm, intestinal nematodes, wood tick, lamb septicaemia, sheep plague, foot and mouth disease and liver fluke were the most frequent complaints respectively. Considering the economic achievement, the breeders in the scheme, although not significant, obtained 14,6 TRY less gross profit per product unit than other breeders despite the advances recorded over the course of the scheme. The reason for this may be that the breeders in the scheme neglected the milk and dairy products and they mostly made do with lamb sales than other breeders. It was concluded that to be able to transform the good results from the scheme into revenue, and for the sustainability and higher achievements, sheep diseases, parasites and breeding problems should be tackled.

Keywords: Genetic improvement, Pırlak sheep, small holder low input systems, gross profit, production unit, Afyonkarahisar, Turkey.

Evaluation of variance of some valuable features of einkorn

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Aim of the study: Einkorn (*Triticum monococcum* L. subsp. *monococcum*) is directly associated with soft and hard wheat. *T. monococcum* is considered as a highly nutritious cereal, especially rich in protein and antioxidants. It is a good donor of beneficial signs associated with resistance to various diseases, chemical composition, etc., and can be used in breeding programs to improve the properties of soft and hard wheat. The aim of the study was to characterize the variance of some valuable features of einkorn.

Material and Methods: Phenotypic data were analyzed separately, based on the following statistical model: $y_{ino} = \mu + g_i + r_n + b_{no} + e_{ino}$. Combined location analysis was carried out using BLUES (best linear unbiased estimates) and the following statistical model: $x_{ikno} = g_i + l_k + y_n + b_o + (gl)_{ik} + (gy)_{in} + (gly)_{ikn} + e_{ikno}$. The best linear unbiased estimator is the result of solving a mixed model related to fixed factors. The procedure of the best linear unbiased estimator is used in cases where it is required to evaluate (rather than to predict) the influence of any factors (usually of a non-genetic nature) on the resultant characteristic in a certain population and certain conditions. BLUES were calculated when establishing the genetic effect as a fixed value. The variance components were determined by the REML method (restricted maximum likelihood). All calculations were performed using the statistical program R-studio and the program ASReml 3.0. The variance calculation was performed for all characteristics, taking into account the genotype as the main factor, using the ANOVA as a statistical method.

Results: Einkorn is a promising crop for use in breeding programs, with the aim of improving features such as the amount of protein, the amount of yellow pigment, and winter hardiness in varieties of hard and soft wheat. The presence of a significant genotypic effect in such features as the time of earing, plant height, winter hardiness, lodging during earing and before harvesting, the amount of yellow pigment and the sedimentation index allows to perform breeding experiments aimed at changing their values. The presence of a negative correlation between the features will allow, by decreasing the lodging, increasing their yield, increasing the time of earing, reducing plant height, lodging and sensitivity to *Septoria*, decreasing the height of the plant, increasing the sedimentation index and the amount of protein. Thanks to positive correlation, it is possible, by decreasing the lodging during the earing, to reduce lodging before cleaning and sensitivity to *Septoria*, and by increasing the amount of protein, to improve the sedimentation index.

Keywords: Einkorn, *Triticum monococcum*, valuable breeding features, genetic variance.

Genetic Analyses of Streaked Gurnard *Trigloporus lastoviza* Populations in Turkish Marine Waters

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Aim of the study: In this study mitochondrial DNA 16S rRNA gene sequencing was used to investigate genetic structure of three Streaked gurnard *Trigloporus lastoviza* populations from the Marmara, Aegean and Mediterranean Seas.

Material and Methods: *T. lastoviza* were collected from three different seas, Marmara Sea (Bandırma (MS)), Aegean Sea (İzmir Gulf) (AS) and Mediterranean Sea (Iskenderun Bay). Total genomic DNA was isolated using the standard phenol-chloroform extraction method. The 16S rRNA region of mtDNA were amplified via PCR using universal primers. BioEdit, MEGA were used for statistical analysis.

Results: After alignment, the partial 16S rRNA gene sequences consisted of 757 bps. The average nucleotide composition of thymine (T), cytosine (C), adenine (A), and guanine (G) were examined as 19.8 %, 27.7 %, 31.2 % and 21.3 %, respectively. The 16S rRNA dataset contained 46 variable sites, of which 27 were parsimony informative. Sequence analysis of 16S rRNA revealed 21 different haplotypes. Average haplotype diversity between populations was found to be 0.94. The lowest genetic diversity was observed in the Aegean Sea (0,054) population, whereas the highest was in the Mediterranean (0.0180) population. For inter-population comparison, the lowest genetic divergence (0.007) was observed between the Marmara and Mediterranean populations, and the highest value (0.016) was detected between the Marmara Sea and Mediterranean populations. In NJ tree analysis, the Iskenderun Bay population was highly separated from the other geographic populations, whereas the populations of Marmara and Aegean Sea showed the least differentiation.

Acknowledgements: Thanks to the Mustafa Kemal University BAP-15040 for financial support.

Keywords: Streaked gurnard, *Trigloporus lastoviza*, 16S rRNA, Population genetics, Turkish marine waters.

Genetic Diversity of Walnut (*Juglans regia* L.) Genotypes Selected from Central Anatolia Region of Turkey with SRAP Markers

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Aim of the study: *Juglans regia* L. with large size, delicious and thin-shelled fruits is the most widely cultivated walnut species worldwide. The genetic material to be used in walnut breeding should be original and the genetic relations among the genotypes should be well elucidated. In present study, efficiency of SRAP method was assessed for walnut genetic diversity studies and the method was used to identify genetic relatedness among walnut genotypes selected from Kayseri region and to determine some biochemical contents of these walnut genotypes.

Material and Methods: The present study was conducted with 50 walnut genotypes known with their superior characteristics (yield and fruit characteristics). Genotypes were selected from central towns (Kocasinan, Melikgazi) and Felahiye, Bunyan, Talas, Hacilar town of the Kayseri province located in Central Anatolia region of Turkey. Some biochemical characters (protein and crude oil content) were investigated. For genetic studies genomic DNA was extracted from young leaf tissues (0.5 g) with CTAB method. Twenty SRAP primer combinations produced clear fragments were used for the study. PCR reaction components, PCR cycling parameters, electrophoresis and gel imaging procedures were performed. A 100 bp standard DNA ladder was used for estimating sizes of fragments. Data of molecular analyses were performed as follows: Bands obtained from SRAP primers were scored based on their scorability. Cluster analysis was performed in accordance with unweighted pair group method with arithmetic averages (UPGMA) method and dendrogram was created with NTSYS pc 2.11 software.

Results: Crude protein contents of the genotypes varied between 14.18-20.82% and crude oil contents varied between 62.21-72.36%. To identify DNA-level genetic diversity in walnut genotypes, 20 SRAP primer combinations were used. A total of 130 bands were obtained and 117 of them were polymorphic. Genetic similarity levels among walnut genotypes varied between 0.62–0.93. In general, all genotypes separated from each other. The genotypes 49 and 50 were the closest ones with a similarity level of 0.93. Quite high polymorphism ratio (90%) of the present study may provide significant outcomes for further breeding studies.

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Keywords: Walnut, *Juglans regia*, SRAP, genetic difference.

Identification of Genetic Variation Among Sweet Orange Cultivars using SRAP Markers

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Aim of the study: In *Citrus*, sweet orange (*Citrus sinensis* L. Osbeck) is the most produced species in the world. Considerable number of orange cultivars exist and, they have wide range of variation for morphological characters. In present study, genetic variation among 86 orange cultivars were studied by using sequence related amplified polymorphism (SRAP) markers to understand genetic similarities of orange cultivar and genotypes.

Material and Methods: Eighty-six sweet orange cultivars were used for this study. DNA was extracted from young leaves by the CTAB method. Twenty-one SRAP primer combinations produced clear fragments were used for the study. PCR reaction components, PCR cycling parameters, electrophoresis and gel imaging procedures were performed. A 100 bp standard DNA ladder was used for estimating sizes of fragments. Data of molecular analyses were performed as follows: Bands obtained from SRAP primers were scored based on their scorability. Cluster analysis was performed in accordance with unweighted pair group method with arithmetic averages (UPGMA) method and dendrogram was created with NTSYS pc 2.11 software.

Results: Using 21 SRAP primer combinations, of 138 bands obtained, 47 were polymorphic (29%). The unweighted pair-group method arithmetic average analysis demonstrated that the accessions had a similarity range from 0.87 to 1.00. High level of genetic similarity was observed among oranges. Orange cultivars originated from hybridization such as 'Chironja' and 'Ambersweet' were clearly separated from the others. Despite differences in morphological characters, genetic variation among the sweet oranges was very low. This study verified that mutations were effective in formation of most sweet orange cultivars as in the other citrus fruit groups such as lemons and grapefruits.

Acknowledgements: The authors thanks to Scientific and Technological Research Council of Turkey (TUBITAK) (Project no: 106G048), General Directorate of Agricultural Research and Policies of Ministry of Food, Agriculture and Livestock, and Scientific Research Project Unit of University of Cukurova, Adana, Turkey for funding and supporting.

Keywords: Citrus, *Citrus sinensis*, genetic diversity, molecular marker, orange.

Investigation and Characterization of CRISPR-Cas system structure in *Salmonella enterica* Serovar *enteritidis*

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The aim of this study: *Salmonella enterica* is an enteric pathogen and one of the cause of bacterial foodborne illness in the world. It is known as enormously diverse species with six subspecies and over 2500 serovars. CRISPR- associated Cas proteins systems are found in 45% bacterial genomes including *Salmonella* spp. which provide an adaptive immune system against bacteriophages and plasmids. Nowadays CRISPR loci could provide information useful for typing. *Salmonella* has two CRISPR loci (CRISPR1 and CRISPR2) and in this study, we analyze 15 isolates of *Salmonella enterica* serovar *enteritidis* with the aim of developing subtyping methods or understanding the *Salmonella* phylogeny better.

Material and method: In this study 15 isolates of *Salmonella enterica* serovars *enteritidis* were isolated from poultry in Izmir. We analyzed CRISPR1 and CRISPR2 loci of these isolates by PCR; the both DNA strands of amplicons of PCR products were sequenced. CRISPR loci sequences were aligned and the arrangement of spacers performed by CRISPR finder and CRISPRcompar programs (<http://crispr.i2bc.paris-saclay.fr/>). MEGA 5 were used for phylogeny analysis and drawing genetic dendrogram.

Results: Both CRISPR1 and CRISPR2 loci were detected in 14 (93%); 12(80%) and 11(73%) of isolates. The direct repeat sequence is same in two CRISPR loci and different spacers sequences were found in an average of 5 spacers. This results shows that *Salmonella* spp. save themselves against the foreign DNAs like bacteriophages and plasmids and CRISPR-Cas systems play an important role in virulence, infection, and evasion of host immune system.

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Keywords: *Salmonella*, CRISPR-Cas, Typing, Phylogeny.

Molecular Markers Reveal Population Differentiation within *Dorystoechas hastata* Boiss. & Heldr. ex Bentham from Turkey

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Aim of the study: *Dorystoechas hastata* Boiss. & Heldr. ex Bentham is a woody shrub and relict endemic to Antalya located at the Mediterranean Region of Turkey. It is a protected species and listed as “Vulnerable” in IUCN Red List Categories. It possesses an economic value due to its intense volatile and aromatic content and is used as a raw material for pharmacology and cosmetics. The aim of this study was to determine genetic diversity among natural populations of *D.hastata*.

Material and Methods: The 15 different natural populations of *D.hastata*, grown at elevations ranging from sea level to 1855 m and located in Kemer, Korkuteli and Kumluca districts of Antalya province were characterized at molecular level. The plant samples were collected from distribution areas between March and July 2016 for DNA extraction. SRAP (sequence region amplified polymorphism) and iPBS (interprimer binding sites) molecular marker systems were used to determine the genetic diversity of the populations. All clearly detectable SRAP and iPBS markers were scored as either present (1) or absent (0). Then, a similarity matrix was assembled using the markers. The matrix was then used for the following analyses: the percentage of polymorphic band, observed number of alleles (na), effective number of alleles (ne), Shannon's information index (I) and Nei's gene diversity (H). These measures were obtained at population level using the software package POPGENE. Genetic distance (D) and pairwise genetic differences (Fst) values were used with the aim of determining the genetic differences among *D.hastata* populations using POPGENE and ArleQuin softwares. AMOVA (Analysis of Molecular Variance) was carried out using ArleQuin Software to understand how much of the observed total genetic variation was due to the variation between the populations and among the individuals within each population.

Results: The 357 scorable bands were obtained with 13 selected SRAP and 11 iPBS primer combinations. The overall genetic diversity of *D.hastata*, was relatively high. The mean number of alleles per population (na) was 1.9692, the mean number of effective alleles (ne) was 1.5699, Nei's gene diversity index(h) was 0.3324, Shannon index(Ho) was 0.497, the number of polymorphic loci(n_P) was 346, the ratio of polymorphic loci (P_{poly}) was 92.9, and average number of polymorphic bands per primer was 14.4. AMOVA results showed that %51 of the total genetic variation was among the populations and %49 was within the populations. According to phylogenetic relationship among populations based on genetic distance Altinyaka and Sivridag populations were the most dissimilar (Fst=0.76), and Tunektepe and Hacisekiler populations were the closest genetically (Fst=0.15).

Acknowledgements: The funding for the Project (115O863) was provided by Scientific and Technological Research Council of Turkey (TÜBİTAK).

Keywords: *Dorystoechas hastata*, genetic diversity, Mediterranean, Antalya, biodiversity, population genetics.

Molecular systematic analyse of the species of Triglidae family in the Mediterranean Sea

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Aim of the study: Systematic analyse of the species of the family Triglidae including ten species (*Chelidonichthys cuculus*, *Chelidonichthys lucerna*, *Chelidonichthys obscurus*, *Eutrigla gurnardus*, *Lepidotrigla cavillone*, *Lepidotrigla dieuzeidei*, *Trigla lyra*, *Trigloporus lastoviza*), Dactylopteridae (*Dactylopterus volitans*), Peristedidae (*Peristedion cataphractum*) from the Turkish seas were investigated with genetic (mitochondrial COIII, 16S rRNA genes sequencing) and morphological (morphometric and meristic) technics.

Material and Methods: *C. cuculus*, *C. lucerna*, *C. obscurus*, *E. gurnardus*, *L. cavillone*, *L. dieuzeidei*, *T. lyra*, *T. lastoviza*, *D. volitans*, *P. cataphractum* were collected from the Mediterranean, Aegean Sea, Marmara Sea and Black Sea Coasts of Turkey. Total genomic DNA was isolated using the standard phenol-chloroform extraction method. The COIII and 16S rRNA regions of mtDNA were amplified via PCR using universal primers.

Results: The mtDNA COIII Neighbour Joining analysis, *L. cavillone* and *L. dieuzeidei* showed closest relationship and *E. gurnardus* was sister to this group. *C. cuculus* and *T. lyra* were distinctly clustered to these species respectively. In another side of Triglidae main branch, *C. lucerna* and *T. lastoviza* were grouped together. The other two family members, *D. volitans* and *P. cataphractum* were grouped highly separately from the Triglidae family members, and *P. cataphractum* showed most distinct relationship among them. The mtDNA 16S rRNA Neighbour Joining analysis, Triglidae family member were grouped together at the genus level in which *L. cavillone* and *L. dieuzeidei* were clustered together as a closest species, and *T. lyra* and *T. lastoviza* were sisterly clustered, respectively. *C. cuculus* ve *C. lucerna* were clustered together and *E. gurnardus* was clustered sisterly this group in another main branch of the Triglidae main branch. The other two family members, *D. volitans* and *P. cataphractum* were grouped highly separately from the Triglidae family members, and *D. volitans* showed most distinct relationship among them. In the morphological analysis, *D. volitans* and *P. cataphractum* were found to be very different from the species of Triglidae family.

Acknowledgements: Thanks to the Scientific & Technological Research of Turkey (TUBITAK-212T115) for financial support.

Key words: Triglidae, Gurnard species, molecular systematic, mtDNA sequencing, morphology.

National reserve gene pool of rare species the natural flora of Belarus - new *ex situ* conservation concepts

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Aim of the study: To create scientifically and practical standards for collecting rare species. Provide a system for the restoration of critical *in situ* populations through *ex situ* methods. The aim of *ex-situ* is to create a reserve stock of protected species. And this should not be an end in itself, *ex-situ* conservation is: the source of plant material for reintroduction into a disturbed environment; for the reconstruction of critical populations; for scientific and educational work; for a breeding works.

Material and Methods: The objects are natural populations of rare and endangered species, model cenopopulations in the *ex situ* conditions and also germplasm (seeds, tissue and pollen) of these plants. To study the habitat, many methodical blocks from the areas of investigate of the ontogeny, morphology, phytocenology and phytoindication are used. For the preservation and reproduction of rare species, cryopreservation methods, short-term controlled storage, conservation in living field collections and tissue culture are used.

Results: The gene pool of the Collection of rare plants in the Central Botanical Garden has been evaluated from the point of view of the uniqueness and originality of the material. The collection contains a gene pool from populations that no longer exist in nature now. Critical species populations are identified that need urgent conservation measures. Methods for estimating the ecological conditions of phytocenoses for translocation activities (reintroduction, repatriation and re-stocking) have been tested. The germplasm repository is founded and being tested. Standards and storage protocols have been prepared, taking into account local features and integrating into international accounting systems. The recovery templates are designed taking into account the specifics of the species and the threats to them.

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Keywords: Gene pool, rare species, reintroduction, germplasm, *ex situ* conservation.

The Molecular Systematic Analysis of Indo-Pacific and Mediterranean Barracuda Species

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Aim of the study: Genetic effect of Lessepsian migration and phylogenetic structures of five barracuda species (*Sphyraena sphyraena*, *Sphyraena viridensis*, *Sphyraena pinguis*, *Sphyraena putnamae*, *Sphyraena jello*) collected from Indo-Pacific and Mediterranean Sea were examined with PCR-RFLP of mtDNA ND 3/4 gene.

Material and Methods: Samples were collected separately by commercial fishing vessels from five fishing ports from the Arabian Gulf (Manama) and Mediterranean Sea (Syria, Iskenderun Bay, Mersin Bay, Antalya Bay). Total DNA was extracted from muscle using the standard phenol: chloroform: isoamyl alcohol procedure (Sambrook *et al.*, 1989). PCR amplification of the mitochondrial ND 3/4 rDNA gene was carried out using the universal primers: ND3/4 a:5'- TAA (C/T) TA GTA CAG (C/T)TG ACT TCC AA-3'
ND3/4 b:5'- TTT TGG TTC CTA AGA CCA A(C/T)G GAT-3'

The PCR product was restricted with 8 restriction enzymes: Bsurl, Alul, Hin6I, RsaI, XhoI, MspI, Bsh1236I, Ehel.

Results: A total of 17 haplotypes were detected from 50 individuals. Haplotype B (found with Bsh1236I enzyme) was detected in only Mediterranean species of Sphyraenidae family (*S. sphyraena*, *S. viridensis*), indicating that this haplotype is a Mediterranean specific haplotype for this family. Haplotype and nucleotide diversity values for each species were calculated from the restriction fragment data. Average haplotype diversity (0.70222) and genetic diversity (0.0035788) within species was high. The average genetic divergence between barracuda species was calculated 0.02673. The highest level of genetic variation was determined in the *S. sphyraena* (0.8222). Five out of 17 haplotypes were observed only in Mediterranean barracuda species. The highest value of pairwise inter-group nucleotide divergence was detected between the lessepsian *S. pinguis* and Indo-Pacific *S. putnamae* species (0.080572). The genetic relationship between barracuda species is summarized with a Neighbour joining dendrogram that in the first clad, the *S. sphyraena* and *S. viridensis* species clustered as the closest clades, while the *S. pinguis* sample was in the neighbouring clad. The *S. putnamae* clustered as the most divergent, and *S. pinguis* clustered as a closest taxa to the Mediterranean species in comparison to other Indo-Pacific species. If we relate the pattern of phylogenetic relationship to migration possibility to the Mediterranean, the Indo-Pacific *S. jello* may migrate to the Mediterranean in the future, but the another Indo-Pacific species *S. putnamae* does not seems to be forthcoming.

Acknowledgements: This study was generated from the PhD thesis of Deniz Yağlıoğlu and funded by MKU-BAP (Project no: 04 D 0103).

Keywords: Sphyraenidae, Barracudas, Mediterranean, Indo-Pacific, mtDNA, ND 3/4 gene.

The Phylogenetic Survey on Turkish *Salix* L. inferred from cpDNA and nrDNA data setPelin ACAR¹, Funda Ö.DEĞİRMENCİ¹, Zeki KAYA¹,¹Dep. of Biological Sciences/Graduate School of Natural and Applied Sciences, METU,
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Aims of the study: The genus *Salix* L. is represented by more than 500 species in the world. Naturally, about 27 *Salix* sp. are found in Turkey. This genus has been commonly used as biomass production for energy, phytoremediation and pharmacological products. The traditional methods for identifying the species based on morphology are insufficient to classify them. The objective of this study is to reveal the phylogenetic relationships of native willow species in Turkey by using chloroplast and nuclear DNA regions.

Material and Methods: The sequence data are obtained from non-coding chloroplast (*trnT-F*), encoded chloroplast (*matK* and *rbcl*) and nuclear (*ITS* and *ETS*) regions of *Salix* species (25 taxa). The molecular diversity and phylogenetic analyses were performed by the MEGA software.

Results: Sequence data of both cpDNA (4552bp) and nrDNA (999bp) regions had high number of variable sites and most of them were parsimony informative sites. The resulting cpDNA and nrDNA phylogeny revealed that Turkish willow species tree for all studied regions are mostly monophyletic with having two well supported clades as subgenus *Salix* and subgenus *Vetrix*. Such a combined markers enabled reliable subgenus-level classification (subg. *Salix* and *Vetrix*). The phylogenetic tree constructed with cpDNA sequence data differs from the nrDNA tree in regard to the taxa positions which can be explained by the intensive hybridization and introgression gene transfer events among *Salix* species. The phylogenetic analyses with molecular data have produced results showed the complex relationships among Turkish willows. This study provides detailed information about molecular phylogenetic relations with a large number of Turkish *Salix* species for the first time.

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Keywords: *Salix* L., molecular phylogeny, *trn T-F*, *matK*, *rbcl*, *ITS* , *ETS*.

Comparative Study of the Anti-inflammatory Effects of Sub-extracts of the *Capparis ovata* Water Extract (COWE) Used as an Alternative and Complementary Treatment for Multiple Sclerosis

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Aim of the study: Multiple sclerosis (MS) is a chronic inflammatory, ademyelinating and neurodegenerative disorder of the central nervous system. There is still no complete cure for MS, and it remains entirely non-treatable disease with no effective treatment. In the present study ethyl acetate, butanolic and dichloromethane sub-extracts of the COWE (*Capparis ovata* water extract) were tested for its anti-inflammatory effects on selected proinflammatory and inflammatory genes believed to be important in MS pathophysiology using SH-SY5Y cells.

Material and Methods: The human neuroblastoma cell line SH-SY5Y was purchased American Tissue Culture Collection. SH-SY5Y cells were grown in monolayer culture in DMEM:F12 medium containing 10% FBS, 0.5% penicillin/streptomycin at 37°C in a humidified atmosphere comprised of 95% air and 5% CO₂. Cell viability was assessed using lactate dehydrogenase (LDH) activity in the media conditioned by the crystal violet cell staining. In these cells, levels of the chemokine (C-C motif) ligand 5 (CCL5), C-X-C motif chemokine 9 (CXCL9), C-X-C motif chemokine 10 (CXCL10), glial fibrillary acidic protein (GFAP), interleukin 6 (IL6), matrix metalloproteinase 9 (MMP9), nuclear factor kappa-light-chain-enhancer of activated B cells (NF-κB1), tyrosine-protein phosphatase non-receptor type 11 (PTPN11) and tumor necrosis factor-α (TNFα) were determined by quantitative reverse transcriptase-PCR assay (qRT-PCR).

Results: We have found that the butanolic, dichloromethane and ethyl acetate sub-extracts significantly inhibited the expression of NF-κB1, CXCL10, CCL5, CXCL9, IL6 and MMP9 genes in SH-SY5Y cells. The butanolic and dichloromethane sub-extracts treated SH-SY5Y cells decreased TNFα, GFAP, and PTPN11 mRNA activity while ethyl acetate fraction was increased. Results support that the butanolic and dichloromethane sub-extracts of the COWE extract have more powerful potential to serve as an alternative or complementary therapeutic agent in MS treatments.

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Keywords: *Capparis ovata*, ethyl acetate sub-extract, butanolic sub-extract, dichloromethane sub-extract, multiple sclerosis, anti-inflammatory.

Evaluation of Anti-quorum Sensing Potential of *Origanum onites* L. and *Thymbra spicata* L. var. *intricata* P.H.Davis. Essential Oils

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Aim of the study: To evaluate quorum sensing (QS) inhibitory activity of *Origanum onites* and *Thymbra spicata* var. *intricata* essential oils (EOs) using strains of *Chromobacterium violaceum* (CV12472 and CVO26) and *Pseudomonas aeruginosa* (PAO1). The leafy parts of *O. onites* and *T. spicata* var. *intricata* are known as “kekik” in Turkey and these two species are commonly used for the production of tea, condiments, and EOs as well as aromatic water against various diseases.

Material and Methods: The plant samples were purchased from local market in Mugla, Turkey. The EOs of air-dried aerial parts of the plant samples were obtained by the hydrodistillation method by using a Clevenger-type apparatus. Anti-QS activity of EOs was determined using biosensor bioassay with CV026. Inhibition of QS-regulated violacein production assay was carried out qualitatively using CV 12472 and quantitatively using CV 026. We also investigated the effect of the sub-lethal concentrations of the EOs on swarming/swimming migration of *P. aeruginosa* PAO1.

Results: The minimum inhibitory concentrations (MIC) of the test EOs against bioreporter strains (CV 026 and CV 12472) were 0.78 µl/ml. The inhibition of pigment production was also detected in *O. onites* EO with 11 mm zone against CV 026. No effect on pigment inhibition was observed by *T. spicata* var. *intricata* EO at tested concentrations. The EOs were found to contain a high level of violacein inhibition activity. The EOs at >50 µl/ml treatment inhibited the growth of *P. aeruginosa* PAO1. Swarming migration was inhibited by 29.0%, 38% and 47% at 12.5, 25.0 and 50.0 µl/ml *O. onites* essential oil treatment, respectively. These swarming migration inhibition ratios were 33.0%, 38.0% and 44.0% at 12.5, 25.0 and 50.0 µl/ml *T. spicata* essential oil. The EOs inhibited the swimming migration of PAO1 in the range of 11.0-17.0%. Our results which suggest that thyme EOs can inhibit QS and QS related virulence processes.

Keywords: *Origanum onites*, *Thymbra spicata* var. *intricata*, Anti-QS, Violacein pigment, Swarming/swimming migration.

Identification of the Cytochrome P4502D6 in the Metabolism of 5-Aminosalicylic Acid: *in vitro* Investigations of Potential Co-Prescription Interactions

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Aim of the study: 5-aminosalicylic acid (5-ASA) which is an effective drug that is currently used for treating diseases such as inflammatory bowel diseases (IBD) and particularly ulcerative colitis. It is well known that it is mainly metabolized by the acetylation via Phase II enzymes. However, there are no clear evidence about the metabolism of 5-ASA with various microsomal drug metabolizing enzymes, particularly cytochrome P450s. Thus, this study was undertaken to investigate the possible metabolism of 5-ASA (different way from the acetylation) by the microsomal drug metabolizing enzyme of cytochrome P450 2D6 (CYP2D6).

Material and Methods: A new method was developed, optimized and applied for the spectrophotometric measurement of 5-ASA. First, 5-ASA was reacted with nitrite in acidic medium and the excessive nitrite residues that may cause side reactions were removed with sulfamic acid. After the removal of residual nitrite, the resulting diazonium salt was coupled with phloroglycinol reagent in alkaline medium. Water-soluble azo dye formed by combining diazotized 5-ASA and phloroglycinol reagent in an alkaline environment. Absorption of yellow-orange color which exhibits maximum absorption at 430nm was measured. In order to determine the activity of the CYP2D6 on 5-ASA, it was incubated with the pure CYP2D6 enzyme (microsomes) in the presence of NADPH for 60 min at 37 °C, and the remaining 5-ASA was measured as described above. Standard curve derived with use of pure 5-ASA was used to calculate the enzyme activity. The activity measurement was also performed in the presence of prototype CYP2D6 inhibitor to validate the activity measurement.

Results: It was determined that CYP2D6 catalyze the 5-ASA at 0.280 ± 0.04 pmol/min/pmol CYP2D6 rate. Thus, the 5-ASA was metabolized by this enzyme which plays a major role in drug metabolism. In addition to the drug metabolism, CYP2D6 also metabolizes several endogenous substances, such as hydroxytryptamines and neurosteroids in the brain and liver tissues. Our results strongly suggest that the 5-ASA is a substrate for CYP2D6. Within the knowledge of the fact that the 5-ASA is used by ulcerative colitis patients for a lifetime. Therefore, it is clear that drug-drug interactions and endogenous interference with the neurosteroid metabolism might be very likely for the patients. Further studies should be carried out to clarify the uncertainties and to define the potential dangers for the patients.

Acknowledgments: This work supported by Pamukkale University PAUBAP-2015FBE042.

Keywords: 5-Aminosalicylic acid (5-ASA), Cytochrome P4502D6, Metabolism, Drug metabolizing enzymes, Drug Interactions.

Investigation of Effects of Chaste Tree (*Vitex agnus-castus* L.) on Diabetic Wound Healing in Rats

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Aim of the study: Man used to use plants for feeding and treatment for disease since the early ages. The plant variety used also increases day by day. We also investigated the effect of Hayıt (*Vitex agnus-castus* L.), a medicinal herb in our study, on the diabetic wounds on rats for whom we have developed experimental diabetes. In our study, both male and female rats were used and 5 groups were formed: control, SHAM, 65 mg / kg, 265 mg / kg and 465 mg / kg. The extracts in dose-adjusted doses were injected into the wound area for 21 days. In 21 days, wound areas were measured and the results were compared.

Material and Methods: For the study, an approval has been obtained from Pamukkale University Animal Experiment Ethics Committee no. 45403 at the 2016/05 meeting. In our study, healthy female and male rats of Wistar-Albino genus and leaves of viticulture plants were used. To cause experimental diabetes, (STZ) (Sigma, St. Louis, Mo., USA) was given at rats. After leaves were dried, milled with the aid of blender (Waring Commercial Blender, USA) and then plants separated in small pieces were extracted with ethanol (Merck) for 6 hours at 55 °C in a water bath (Nucleon Water Bath). The solvent in the solution was evaporated on a Rotary Evaporator (IKA RV10, Germany) at 50 ° C. The remaining water in the extract was frozen in a lyophilizer (Labconco Freezone 6) machine. The obtained extract which calculated according to the group weights, was injected into the wound area for 21 days with water.

Results: As a result, we found that differences between in groups and in male and female rats. Also measured heal length show that our result is effective. When the groups were compared with each other, the best healing rate of 265 mg / kg among female rats. In male rats, this dose was determined to be 465 mg / kg. Also in 465 mg/kg male rats' wound completely *Vitex agnus-castus* L. Is effective for wound healing when is used truly doses.

Acknowledgements: This study was supported by Pamukkale Scientific Research Unit (BAP Turkey) Project No: 2013FBE049.

Keywords: *Vitex agnus-castus* L., plant extract, diabetes, wound healing, rat.

Potential cytotoxic and anti-inflammatory effects of asetonic extracts of leaves of *Datura stramonium* and fruits of *Pyrus elaeagnifolia*

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Aim of the study: It is known that plants have been used in the treatment of various diseases since ancient times. There are numerous reports related to therapeutic effects of extracts and compounds of plants. Environmental factors can affect the contents of same plant species. Therefore, it is important to study the therapeutic potential of plants from different environmental and ecological conditions. The aim of study was to determine the potential cytotoxic and anti-inflammatory effects of asetonic extracts of leaves of *Datura stramonium* and fruits of *Pyrus elaeagnifolia* gathered from Turkey (Edirne and İzmir, respectively) against different human cancer cell lines.

Material and Methods: Plants were collected from Turkey and dried in shade at room temperature. Then the leaves of *D. stramonium* and fruits of *P. elaeagnifolia* were powdered and extracted twice with aseton at 55°C for about 6h by slight shaking. After the extracts were filtered, filtrates were concentrated in a rotary evaporator. The stock solution (8 mg/ml) of plant extracts were prepared in 10% DMSO in growth medium. Serial dilutions were performed to obtain different extract concentrations in growth medium. The cytotoxic effects of plant extracts were investigated by MTT assay on human lung (A549), breast (MCF-7) and prostate (PC-3) cancer cell lines. Cells were seeded at a density of 2×10^4 cells/well in 96-well microplates for 24h. After that, dose curve and time course experiments were carried out. The anti-inflammatory effects of plant extracts on A549 and Burkitt's lymphoma (Daudi) cells were determined using Sandwich ELISA assay kits for IL-6, IL-1 α and TNF- α . Cells (2×10^5 cells/well in 24-well microplates) were treated with plant extracts at 0.3 mg/ml for 6h. Concentration of each cytokine in supernatants obtained from treated and untreated cells were detected according to the manufacturer's protocol.

Results: The both plant extracts (0.8 mg/ml) exhibited cytotoxicity less than 20% on A549 cells. However, the extract from leaves of *D. stramonium* at 0.8 mg/ml caused 75% and 85% cytotoxicity against PC-3 and MCF-7 cells, respectively. Based on time and dose curve analysis, the extract even at 0.2 mg/ml resulted in 60% cytotoxicity against MCF-7 cells after 48h incubation. On the other hand, the extract from *P. elaeagnifolia* at 0.8 mg/ml displayed less cytotoxic effect against MCF-7 (70%) and PC-3 (45%) cells. In addition, the concentrations of IL-1 α in the supernatants of A549 and Daudi cells treated with both plant extracts (0.3 mg/ml) were significantly lower than the control cells. When IL-6 concentrations in the supernatants of treated cells were compared to control cells, there was no significant differences. The TNF- α concentration of Daudi cells treated with *D. stramonium* extract (0.3 mg/ml) was found to be 50% less than that of control cells; however, no significant difference was observed in A549 cells. The extract from the fruits of *P. elaeagnifolia* did not cause significant changes in the concentrations of TNF- α in both treated and untreated cells. To our knowledge, this is the first report demonstrating the cytotoxic and anti-inflammatory activity of extracts especially from *P. elaeagnifolia*.

Acknowledgements: This work was supported by a grant (BAP 15/006) from Muğla Sıtkı Koçman University.

Keywords: cytotoxicity, anti-inflammatory, cancer cell line, *Datura stramonium*, *Pyrus elaeagnifolia*.

Some biological activities of five *Asteraceae* species from Turkey

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Aim of the study: To evaluate antioxidant, antimicrobial, anti-biofilm activities and quorum sensing (QS) inhibition potential of the aqueous and ethanolic extracts of five *Asteraceae* species from Mugla. These naturally grown *Asteraceae* species are widely used in Mugla region as vegetables.

Material and Methods: The *Asteraceae* species used in this study are freshly harvested vegetables such as *Scolymus hispanicus* L., *Centaurea urvillei* D.C. subsp. *stepposa* WAGENITZ, *Cirsium arvense* (L.) SCOP. subsp. *vestitum*, *Onopordum illyricum* L. and *Leontodon tuberosus* L. The antioxidant potential was determined by the ferric thiocyanate method (FTC) and the 1,1-diphenyl-2-picrylhydrazyl (DPPH) free radical scavenging assay. The antimicrobial activity of the extracts was evaluated against 15 bacterial strains and *Candida albicans* using the disk diffusion and broth microdilution assays. The anti-biofilm effect of the extracts was measured by microplate biofilm method. *Chromobacterium violaceum* (CV12472 and CVO26) and *Pseudomonas aeruginosa* (PAO1) were used in order to evaluate the QS inhibitory activity of the aqueous and ethanolic extracts of *Asteraceae* species.

Results: Among the evaluated *Asteraceae* plant extracts, *C. urvillei* aqueous extract and *O. illyricum* ethanol extract showed higher antibacterial activity. In addition, antimicrobial activity results have shown that the aqueous extracts of plants are generally effective against Gram-positive bacteria. The anti-biofilm effect was detected at high rates in *C. urvillei* aqueous extract and *O. illyricum* ethanol extract in association with antimicrobial activity. *In vitro* antioxidant activity studies, among the extracts tested, the aqueous extract of *L. tuberosus* and ethanol extract of *O. illyricum* showed significant antioxidant activity. The aqueous extract of *L. tuberosus* had the best ability to scavenge DPPH radical among samples analysed (IC₅₀ 4.36 mg/mL). Anti-QS activity was found in two plant extracts including the aqueous and ethanol extracts of *O. illyricum* and ethanol extract of *L. tuberosus*. Both extracts of *S. hispanicus*, *C. arvense*, and *O. illyricum* stimulated violacein production by *C. violaceum* CV 12472 in a non-specific manner. The ethanol extracts of *C. urvillei* and *L. tuberosus* inhibited swarming motility by 42.9% and 52.4%, respectively. These data confirm that *O. illyricum*, *C. urvillei*, and *L. tuberosus*, which are also used as edible vegetables, may be useful for drug development.

Keywords: *Asteraceae*, Antioxidant, Anti-biofilm, Anti-QS, Violacein, Anti-swarming.

Construction of *Clostridium acetobutylicum* strain with enhanced production of *n*-butanol

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Aim of the study: develop recombinant stress tolerant strain of *C. acetobutylicum* SGM with increased butanol production.

Material and Methods: microbiological (condition of cultivation of microorganism optimizing), spectrophotometrical (bacterial culture optical density measuring), genetic (chemical mutagenesis, transformation, electroporation), biochemical (chromatographic analysis of fatty acid composition of cell membrane, chromatographic identification of solvents) and molecular-genetic techniques (DNA extraction, PCR and overlap extension PCR, restriction analysis, molecular cloning).

Results: Chemical mutagenesis was done for improvement of the strain for better *n*-butanol tolerance and production. Obtained mutant *C. acetobutylicum* 5H produce 20 % more butanol, inherit butanol tolerance (2,5% w/v) stably and have their cell membrane lipid composition changed. Genetically engineered plasmid pCB20pg was constructed. pCB20pg contains thiolase promoter and *groES* operon, which determine starch utilisation and heat shock proteins synthesis respectively. In order to prevent DNA destruction by restriction enzymes, using induced *C. acetobutylicum* methylase gene-expression system) methyl groups were added. Methylated plasmid was injected into *C. acetobutylicum* 5H. ABE-fermentation of *C. acetobutylicum* SGM (which contains pSOLAMY) resulted in 24.02 g/L of *n*-butanol (49% more than original strain) in 72 hours (using AMYLEX® 4T and Viscoferm® to reduce the viscosity) in 13% rye media (w/v), while total solvent production reaches 37.22 g/L (105% more than original strain).

Acknowledgements: Marina A. Titok, Emily I. Kolomiets, Elena V. Bolotnik, Tatyana Kirpicheva.

Keywords: Butanol, recombinant strain, biofuel, ABE-fermentation.

Disintegration of Waste Activated Sludge by Thermo-Chemical Pre-treatment

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Aim of the study: The activated sludge process is one of the most commonly used biological processes for treatment of both domestic and municipal wastewaters. Inevitably, the formation of large amounts of excess biomass (waste activated sludge, WAS) is the most important disadvantage of the activated sludge process. Anaerobic sludge digesters are commonly used to treat the waste sludge. However, the slow hydrolysis stage limits the efficiency of digesters. In order to improve the sludge digestion process, combination of thermal pre-treatment with potassium permanganate oxidation (called as “*thermo-chemical pre-treatment*”) was investigated in this study.

Material and Methods: Thermo-chemical disintegration of WAS was performed by using potassium permanganate in order to improve the solubilization of sludge, prior to the sludge digestion. For this aim, the influences of potassium permanganate dosage was investigated in the range of 250 – 1500 mg/L within one hour disintegration period. Pre-treatment experiments were conducted without any pH adjustment at 100 C. According to the results of the thermos-chemical pre-treatment experiments, optimal potassium permanganate dosage was found to be 250 mg/L. In order to determine the effects of chemical sludge disintegration on anaerobic sludge digestion, the biochemical methane production (BMP) tests were performed in mesophilic batch reactors.

Results: It was determined that the chemical sludge disintegration was enhanced the biogas (38%) and methane gas (34%) productions. Thus, the sludge disintegration via potassium permanganate was improved the anaerobic biodegradability by increasing the sludge solubilization.

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Keywords: Disintegration, Potassium permanganate, Sonication, Waste activated sludge.

Obtaining Biogas From Animal And Agricultural Energy in Nevsehir City

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Aim of the study: In this study; Nevşehir province's biogas energy production potential has been determined and it has been aimed to draw attention of the public to the importance of biogas usage in our country both in terms of environment and energy.

Material and Methods: In the survey, the number of existing bovine, ovine and poultry animals specified in the Nevşehir Agricultural Master Plan of 2003, and the field crops produced in Nevşehir were calculated according to the potency of the biogas field.

Results: As a result of the research; in the province of Nevşehir, it was determined that a total of 9.540.436,82 m³ / year biogas could be obtained from animal organic matter and agricultural products. Instead of using oil; it was determined that CO₂ emissions of 24.805.135,73 / year would be reduced as a result of the evaluation of this biogas. In Nevşehir, 150.728,4 tons / year fertilizer from cattle, from small cattle; 58.079 tons / year from manure and poultry; and as a total of 223.835,19 tons / year fertilizer, including 15.027,79 tons / year fertilizer, can be obtained. The use of these fertilizers in agriculture will provide both a significant reduction in the use of chemical fertilizers and increased productivity in agriculture. As a result of agricultural products grown in Nevşehir province such as barley, wheat, corn straw and alfalfa, kernels and vetch grasses, it will be possible to obtain a total of about 14.589 m³ of methane gas. Since 1 m³ of methane gas per day is sufficient for cooking a family of five, this potential will meet the need to cook about 14.589 family members a day. In our country, the burning of animal manures in the countryside and the use of energy in the hands of both energy loss and biogas is used as a reason to lose the fertilizer to be gained. Considering the potential of animals and the existence of agricultural land in our country; it is obvious that the dissemination of biogas plants, particularly in rural areas, will provide great benefits in terms of sustainable ecological balance and economic gain and clean energy efficiency.

Acknowledgements: This work was supported by Scientific Research Found (BAP) of Nevşehir Hacı Bektas Veli University.

Keywords: Nevşehir, Biogas, Animal and Agricultural Energy, Clean Energy.

Impacts of Climate Change on Biodiversity of Plant Pathogens

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Aim of the Study: Climate change is thought to cause some behavioral and metabolic changes in plant pathogens as well as in all other living organisms. With the decrease in precipitation, increase in the amount of CO₂ in the atmosphere and changes of ozone level could be seen as visible part of the iceberg. Plant pathogens adapt more quickly to changing environmental conditions than plants. For this reason, some countries whose economies based on agriculture will be in danger and perhaps starvation problems will begin. The number of studies on this subject is relatively scarce. The aim of this study is to compile and discuss the studies on plant pathogen biodiversity resulting from global climate change.

Material and Methods: This report used observation method and study literature method. Current studies in this area have been compiled and discussed. And the data obtained from databases of European and Mediterranean Plant Protection Organization (EPPO) and The American Phytopathological Society (APS) were evaluated. This report presents an interpretive review of the literature in biodiversity of plant pathogens.

Results: Plant protection is the science and practice of managing pests, diseases and weeds that damage crops and other plants, and which can have a devastating effect on farmer livelihoods. Pathogen development, survival rates, and interferences with host susceptibility are predicted to affect the impacts of disease on crop plants. The change in biodiversity of endophytic microbial organisms living in the soil will indirectly affect the effects of plant pathogens on plants. With these changes, many plant pathogens will spread to new geographical areas and will be able to infect new hosts. Studies have shown that climate change is adding new challenges to plant protection. Because of changes in the distribution of different pathogens to new areas with climate change, the fungicide market will definitely change. Not only chemical control methods but also biological control methods will change because the effectiveness of biological management agents varies with different environmental conditions. Evaluating and estimating the efficacy of current control methods under changing climatic conditions for overcome the predicted changes will be of great strategic importance.

Keywords: Climate change, pathogen biodiversity, temperature, plant pathogens.

The Expected Impact of Global Warming and Climate Change on Insect Biodiversity

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Aim of the Study: Global warming and climate change are one of the biggest international problems. It is considered to affect all living things either positively or negatively. As the insects are poikilotherms, it is biologically reasonable to expect that climate warming will have strong effects on insect biodiversity either directly or indirectly. Growth and development of insects are influenced by changes in the ambient temperature. Therefore, in this study, we intended to review the effect of global warming and climate change on insect biodiversity. For this purpose, we wanted to attract people's attention to understand how the problem is big and devise appropriate measures to mitigate the effects of change in climate on insect biodiversity avoiding being a factor that causes global warming.

Material and Methods: Insects represent almost half of the biodiversity based on so far described numbers of species and are important on ecosystem structure and function. Global warming and changes in climate may influence insects alike all the living things. Of course, this will also have some consequences on the environment. In this study, it was aimed to reveal the effect of global warming and climate change on insect biodiversity. In this context, some behaviour and biological characters of insects such as population dynamics, geogophysical distribution, migration, overwintering, development, longevity, fecundity, voltinism, herbivory, pest outbreaks, pest invasion, parasitism, predatory and synchrony between plants and insect pollinators are discussed with available knowledges and literature.

Results: Insects are important individuals in ecosystem, behaving as herbivores, pollinators, predators and parasitoids and are poikilotherms. Thus insect's body temperature is variable and depends on ambient temperature. And therefore climate change can impact insects at different levels. In general increased temperature affects the pest population dynamics, development, reproduction, diapause, voltinism, winter mortality, survival rate, growth rate, migration and movement of insects. Studies have shown that increased temperature tends to have positive effects on insects. These positive effects can be expected as extension of geographical distribution, increasing of overwintering, rapid population development, increasing voltinism and fecundity, increased risk of pest's invasion by migration. Many insect species, for example, are predicted to expand their geographical range to higher latitudes and altitudes as a result of global warming. Positive physiological responses to increased temperatures will allow for rapid insect growth and movement. Additionally, mild winters would allow reduce insect growth time and reduction in overwintering deaths. In addition to these positive impacts, global warming and climate change may affect insects negatively such as changing insect-host plant interactions, affecting the synchrony between insect pests and their predatory and parasitoids, insect biodiversity and extinction of some species and reducing effectiveness of plant protection managements. It maybe expected that changes in climate will result in causing both temporal and spatial mismatches between plants and herbivores, plants and pollinators, and hosts and parasitoids. As a result, forecasting of changes in geographical distribution and population dynamics of insect pests will be useful to adapt the pest management strategies to mitigate the damage of climate change on crop production and biodiversity.

Keywords: global warming, insect biodiversity, population dynamics, temperature.

Autumn 2015 Plankton Bloom in İzmit Bay (Marmara Sea)Halim Aytekin ERGÜL¹, Serdar AKSAN¹, Merve İPŞİROĞLU¹¹Department of Biology / Faculty of Arts and Science, Kocaeli University, Turkey
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Aim of the study: Spring plankton blooms in İzmit Bay is a regularly occurring phenomenon. Autumn plankton blooms in İzmit Bay on the other hand are unforeseeable and usually related to an unexpected cause. This study aims to determine cause of autumn 2015 plankton bloom in İzmit Bay and its causative species.

Material and Methods: İzmit Bay is a semi-enclosed coastal ecosystem located in the most industrialized area of the Marmara region (Turkey). The 49-km long bay with an area of 300 km² has three basins connected by shallow and narrow passages.

Surveys were carried out to take surface marine water for quantitative analysis of Nitrite-N (NO₂⁻-N), Nitrate-N (NO₃⁻-N), Ammonia-N (NH₃-N), Silica (SiO₂) and Orthophosphate (o-PO₄³⁻) and phytoplankton identification in 5 different stations throughout İzmit Bay. Temperature, salinity, dissolved oxygen (DO), turbidity, pH and Chlorophyll-a (Chl-a) levels were measured in the water at the same stations for each samplings. tubular plankton chamber was used for pre-identification under an inverted microscope while plankters were alive. Then phytoplankters was quantified via Nageotte counting chamber under a light microscope.

Results: Total of 10 different phytoplankton species were identified in autumn 2015 plankton bloom in İzmit Bay with *Prorocentrum micans* identified as dominant species (Over 1 million individuals/L). Red tide sightings and excessive plankton biomass measurements were limited to northern part of the middle basin of İzmit Bay.

Relatively long lasting and strong north-easterner winds blew for 5 days just before the plankton bloom in the study area. Because of the geographical conditions of İzmit Bay, strong north-easterner winds could cause an upwelling by re-suspending aggregated nutrients stored in surface sediment. These winds determined as the triggering cause of the autumn 2015 plankton bloom in İzmit Bay.

Keywords: Plankton Bloom, Upwelling, İzmit Bay, *Prorocentrum micans*.

Benthic Macroinvertebrate of Koycegiz Lake (Mugla, TURKEY)Huseyin SASI¹, Mine AKMAN²¹ *Basic Sciences Department, Fisheries Faculty, Muğla Sıtkı Koçman University, Turkey*² *Institute of Science, Muğla Sıtkı Koçman University, Turkey*

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Aim of Study: Koycegiz Lake is important wetland area and has given myriad of benefit in West Mediterrean Basin. The aim of this study was to provide that the physico-chemical datas were evaluated and the water quality classes were determined in chosen stations on Koycegiz Lake. Also, benthic makroinvertebrates in Lake were determined by the evaluation of biological datas.

Materials and Methods: This study was carried out between October 2009 and July 2010 on Koycegiz Lake in Mugla Province. Water samples were taken from seven stations on Koycegiz Lake seasonally and investigated about the physico-chemical characteristics. Benthic macroinvertebrate were also collected from those seven stations of Koycegiz Lake. Water samples and macroinvertebrates were collected at the same time. Temperature, dissolved oxygen, pH, electrical conductivity parameters were measured in the field. Water quality levels were determined according to Klee (1991).

Results and Discussion: According to the study results, it was detected that Koycegiz Lake has 2nd class water quality and it is a characteristic eutrophic lake. As a benthic macroinvertebrates, 6 taxa belong to classes Crustacea, 11 taxa belong to classes Gastropoda, 3 taxa belong to classes Bivalvia, 2 taxa belong to classes Polychaeta, 1 taxa belong to classes Hirudinea and 9 taxa belong to classes Insecta were identified. The collected benthic macroinvertebrates were identified according to their species or genus levels. Then Frequency, Dominancy were calculated (Kocatas, 1994), and Similarity analysis were done (Birol, 2007).

Acknowledgement: This study has been sponsored by Mugla Sitki Kocman University through the University grant no 09/47-BAP.

Keywords: Koycegiz Lake, Water quality, Benthic macroinvertebrate, Gastropoda.

Bird Diversity in Düzce Efteni Lake in TurkeyAkif KETEN¹, Erdinç SARCAN²¹Wildlife Ecology and Management, Düzce University, Turkey²Düzce Unit, Ministry of Forest and Water Affairs, Turkey

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Aim of the study: Wetlands, as well as tropical forests, are the most biomass-producing ecosystems in the world. Wetlands, many bird species sheltering, feeding and breeding are one of the important habitats. Any interference with wetlands directly affects the living things around here. The aim of the current study is to determine bird species in Efteni Lake in Duzce.

Material and Methods: In the past, which has 580 ha area Efteni Lake, in the 1970s reduced up to 25 ha and the present work later in the year 1992 has reached 170 ha area. Totally 764 ha areas including Efteni Lake has been managed as “Efteni Lake Wildlife Reservoir Area” since 2005. For this study, observations were conducted between 2006 and 2016. Observations were done, using 10x50 binocular and 20x45x60 scope.

Results: A total of 151 bird species were determined, and 55 of these species were described as important bird species for Efteni Lake. Among bird species, *Aythya nyroca* (Gülden.) was NT status, *Aquila clanga* Pall. was VU status and *Oxyura leucocephala* (Scop.) was EN status. For bird study, index of similarity was computed 0,90 for a period of 10 years. Maximum numbers of species have been identified in August, and individual in February.

Keywords: Wetland, biodiversity, Sorensen index.

Determination of Water Quality and Diversity of Macroinvertebrates: A Case Study in Asi River Basin

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Aim of the study: The Asi River Basin is a transboundary basin with a total area of about 24660 km² of which 69 percent is located in the Syrian Arab Republic, 23 percent in Turkey and 8 percent in Lebanon. This study was carried out that determined and compared ecological situation of Asi River Basin by evaluated of water quality based on benthic macroinvertebrates according to both of Regulation on Management of Surface Water Quality and Water Framework Directive.

Material and Methods: Benthic macroinvertebrates samples were collected at 10 stations in Asi River Basin in 2016 by using bottom kick net method. Samples were sieving and fixed in 70% alcohol *in situ*. Some parameters (temperature, pH, dissolved oxygen, biological oxygen demand, ammonium nitrogen, nitrate nitrogen and total phosphorus) which are listed in Regulation on Management of Surface Water Quality were measured. Temperature, pH and dissolved oxygen were measured *in situ* by Hach Lange (HQ40D). At the same time, water samples were taken and transported to laboratory with cold chain for analysed biological oxygen demand, ammonium nitrogen, nitrate nitrogen, total phosphorus, fecal coliform and total coliform by using standard methods (ASTM, 1985; APHA, 1992). Macroinvertebrates samples were identified at level of family on stereomicroscope in laboratory. BMWP and ASPT indices were calculated for determined ecological status of basin. And also Margalef and Simpson values, dominance and frequency of macrozoobenthic families were calculated.

Results: In basin, totally 934 individuals belong to 22 taxa were identified. Karaafrin Stream had the most taxonomical diversity with 13 taxa and followed by Bozafrin Stream, Afrin Stream and Asi River with 11, 10 and 9 taxa, respectively. And Karasu Stream was determined as the lowest taxonomically diverse with 1 taxa. Values of Margalef and Simpson Indices were between 3.06-0 and 0.85-0, respectively. According to BMWP and ASPT indices values, Asi River Basin was classified as heavily polluted. Generally, Oligochaeta (24% of dominance) and Chironomidae (50% of dominance) individuals were composed of zoobenthic community. These taxa are found in polysaprobic and alpha-mesosaprobic stream region. Also, coliform bacteria even fecal-origin were determined at all stations in Asi River Basin.

Acknowledgements: This study was supported by ESOGU-BAP (Project number: 201623D25)

Keywords: Asi River Basin, Water Framework Directive, macroinvertebrate.

Effect of depth on body size distribution of whiting, *Merlangius merlangus*, in the south-eastern coast of Black Sea

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Aim of the study: The study was carried out to investigate body size distribution of the whiting in different water depths in the south-eastern coast of Black Sea.

Material and Methods: With this aim, whiting samples were collected using multifilament gillnets with mesh sizes of 32, 34, 36 and 38 mm in the four different depth strata (0-14 m, 15-29 m, 30-49 m and 50 m $\geq$) from March 2013 to February 2014. Average weight and length of whiting collected from four different depth strata and ranges of weight and length were compared.

Results: The results showed that there were difference of average weights between for 0-14 m and 15-29 m, for 0-14 m and 30-49 m, for 15-29 m and 50 m $\geq$ depth strata ($p < 0.05$). However, it has been found that in terms of average length there was no significant difference ($p > 0.05$) among depths. In addition, the weight range was larger in the shallow waters, while the length range was larger in the deeper waters.

Acknowledgements: This study was supported by the Scientific Research Fund of Ordu University with the project number TF-1225. I am grateful to Taner Topçu for all of his and help throughout the data collection.

Keywords: Black Sea, Whiting, *Merlangius merlangus*, Depth, Weight, Length.

Evaluation of Water Quality Values of The Northern Coastal Line of Gökova Bay (Muğla-Turkey)Mesut PERKTAŞ¹, Nedim ÖZDEMİR², Mustafa DÖNDÜ¹¹ Department of Fisheries, Graduate School of Natural and Applied Sciences, Muğla Sıtkı Koçman University, 48600, Muğla-Turkey² Department of Basis Sciences, Faculty of Fisheries, Muğla Sıtkı Koçman University, 48600, Muğla-Turkey
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Aim of the study: The purpose of the current study is to investigate the water quality in Gökova Bay, which is threatened particularly in summer months by visitors to the region, to determine the factors affecting the water quality and to investigate the northern coastal line of the Bay.

Material and Methods: In the current study, some physico-chemical parameters of the selected seven stations along the northern coastal line of Gökova Bay were monthly investigated throughout a year between November 2014 and October 2015 and then evaluated. The chemical analyses of the water samples collected from the selected stations were carried out in accredited Water Analysis Laboratory in Research Laboratories Center of Muğla Sıtkı Koçman University. The analysis of the samples revealed that water temperature of the sample is in the range of 14,90-28,85 °C; pH 7,55-9,24; dissolved oxygen 4,05-7,02 mgL⁻¹; saturated oxygen 51,20-91,30 %; electrical conductivity 23908-53918 µScm⁻¹; salinity 13,14-35,69 ‰; solid suspended matter 1,00-143,00 ortho phosphate BDL-0,1119 mgL⁻¹; total phosphorus BDL-0,0259 mgL⁻¹; nitrite nitrogen BDL-0,0123 mgL⁻¹; ammonium nitrogen 0,0129-0,1565 mgL⁻¹; nitrate nitrogen BDL-1,3969 mgL⁻¹.

Results: When the results of the analysis were examined, it was determined that as a result of intense tourism activities, overuse of coastal lines, maintenance of boats in boat yards and daily boat trips, deteriorations in water quality values in the samples collected from some stations and increases in the amount of environmental pollution occur.

Acknowledgements: This research was financially supported by the Muğla Sıtkı Koçman University Scientific Research Projects Coordination Unit, Turkey (BAP- 14/088)

Keywords: Gökova Bay, Physico-chemical parameters, Environmental impacts, Coastal line.

Gastropoda, Oligochaeta and Chironomidae Limnofauna of Van Lake Basin, TurkeyNaime ARSLAN¹, Deniz MERCAN¹, Burcu BARIŞIK¹, Deniz Anıl ODABAŞI²¹Department of Biology, Faculty of Art and Science, Eskişehir Osmangazi University, Eskişehir, Turkey² Department of Basic Sciences, Faculty of Marine Science and Technology, Çanakkale Onsekiz Mart University, Çanakkale, Turkey
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Aim of the study: Lake Van, which is situated in Eastern Anatolia, is not only the world's largest soda lake by area but also is the world's fourth-largest closed lake by volume. It is a close basin but has includes a large number of lakes and river (such as lakes Nazik, Nemrut, Sodali, Gövelek, Keşiş, Küçük and Aygır); however, there has been no study about their invertebrates fauna. In order to determine Gastropoda, Oligochaeta and Chironomidae limnofauna in Lake Van Basin, this research was conducted in October 2011, June 2012 and June 2014.

Material and Methods: Eight lakes in Van Lake Basin (Nazik, Nemrut, Sodali, Gövelek, Keşiş, Küçük, Aygır and Van lakes) were studied in October 2011, June 2012 and June 2014. Benthic invertebrates were collected from the lakes by hand net (with 500 µm mesh size) and Ekman grab (one haul per station at depths of 1–12 m). All collected samples were fixed in 4% formaldehyde in the field and then transferred to 70% ethyl alcohol. Temperature, dissolved oxygen, and pH of sampling sites were measured *in situ*.

Results: In this study, 2164 benthic invertebrate individuals belonging to 60 taxa (2 gastropoda, 13 Oligochaeta and 45 Chironomidae species) were identified from eight lakes. The highest number of species were detected in lake Keşiş (27 taxon), while the fewest species were detected in Lake Van (5 taxon). In the study area, the most frequent species are determined as; belonging to Gastropoda *Melanopsis costata* (62.5%), belonging to Oligochaeta *Psammoryctides albicola* (50%) and belonging to Chironomidae *Cricotopus* (C.) *fuscus* (75%), *Cladonytarsus mancus* (62.5%) and *Polypedilum scalaenum* (50%). All the species identified are new records for eight lakes.

Acknowledgements: This study supported by Eskişehir Osmangazi University, BAP (Project number 201119008 and 2013-277).

Keywords: Van Lake Basin, Oligochaete, Chironomidae, Gastropoda.

Invasive Freshwater Fish of Kocaeli Province/TURKEYSerdar AKSAN¹, Halim Aytekin ERGÜL¹¹Department of Biology, Kocaeli University, Turkey
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Aim of the study: Identifying invasive non-native fish species in several rivers and artificial and natural freshwater reservoirs of Kocaeli Province and determining co-existing native species in the same ecosystems constitutes the aim of this study.

Material and Methods: Kocaeli is located in north-west Anatolia around İzmit Bay. The province is the most densely industrialised and one of the most populated region of Turkey. Kocaeli has several artificial reservoirs for irrigation and drinking water supply for 1.8 million residents. Fish samples were taken place between April 2016 and February 2017 from 8 reservoirs and 2 streams. Samples were collected by electrofishing (SAMUS 725M) from suitable waterfronts, river mouths and dam walls of lakes and shallow regions of streams. Collected samples immediately overdosed with 2-phenoxyethanol and transported to the laboratory for species identification. Also, morphometric measurements of each sample were taken upon identification.

Results: In total 19 different species from 6 different families were identified throughout the study. *Carassius gibelio* were present in 6 different localities and determined as the most wide spread invasive species for Kocaeli province. Other invasive species were *Lepomis gibbosus*, *Pseudorasbora parva* and *Gambusia holbrooki*

Other species which were co-existing with invasive species were, *Alburnus alburnus*, *Blicca bjoerkna*, *Carassius auratus*, *Cyprinus carpio*, *Esox Lucius*, *Gobio gobio*, *Leucaspis delineates*, *Rhodeus amarus*, *Squalius pursakensis*, *Rutilus rutilus*, *Phoxinus phoxinus*, *Petroleuciscus borysthenicus*, *Squalius cephalus*, *Oncorhynchus mykiss*, *Silurus glanis*.

G. holbrooki were sampled in streams with low flow speed. *C. gibelio*, *L. gibbosus*, *P. parva* were sampled in artificial reservoirs in Kocaeli province.

Keywords: Invasive species, Freshwater fish, Kocaeli.

Investigation of Inhibition Kinetics of Some Heavy Metals on Glucose-6-Phosphate Dehydrogenase Enzyme from Turbot Gill Tissue

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Aim of the study: Glucose-6-phosphate dehydrogenase (G6PD) catalyzes the first and rate-limiting reaction of pentose phosphate pathway producing NADPH, involved in the transformation of glucose into ribose, which is necessary for various biosynthetic reactions. Erythrocytes use pentose phosphate pathway in the production of NADPH; and in case of G6PD deficiency, NADPH levels significantly decreases. Thus, inhibition of G6PD activity may cause several deficiencies within the body.

Material and Methods: In this study, G6PD enzyme of Turbot (*Psetta maxima*) gill tissue was partially purified and effects of some heavy metals on enzyme activity was examined. The homogenate of turbot gill was initially prepared for the purification of the total G6PD enzyme from the extract. Ammonium sulfate precipitation and dialysis steps were performed. Enzyme activity was measured spectrophotometrically at 340 nm.

Results: Optimum values of ionic strength, pH and substrate concentrations for turbot gill G6PD were examined. Inhibitory effects of some common heavy metals, namely Ag^{+1} , Cr^{+3} , Ba^{+2} , and Zn^{+2} on the enzyme were also investigated. Each of the heavy metals showed inhibitory effect on enzyme activity. I_{50} values of tested heavy metals were determined as 0.03 mM, 2.5 mM, 0.97 mM, and 0.8 mM, respectively.

Keywords: Glucose-6-phosphate dehydrogenase, inhibitor, heavy metal, turbot.

Length-Weight and Disc Width-Weight Relationships of Long-Nosed Skate (*Dipturus oxyrinchus*) Obtained from Northeastern Mediterranean

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Aim of the study: Long-nosed skate, *Dipturus oxyrinchus* (Linnaeus, 1758) is a demersal species found on sandy or muddy substrate at depths of 100–1000 m. There is no more biological data for *D. oxyrinchus* from the northeastern Mediterranean. In this study, total length-weight and disc width-weight relationships of long-nosed skate were examined for the first time in a population of the North-eastern Mediterranean Sea.

Material and Methods: *Dipturus oxyrinchus* specimens were captured as by-catch species from a commercial fishing vessel between May 2015- June 2016 at a depth of 200 to 380 m from the Antakya Bay (Hatay, Turkey). Fish samples were transported to the ecophysiology laboratory in Faculty of Fisheries, Firat University where they were identified, sexed and photographed. Each fish was measured for total length to the nearest 0.1 cm and weight (W) to the nearest 0.1 g. Data were subjected to statistics analysis by using the IBM SPSS Statistics ver. 22.0 for Windows (IBM Corporation and Others, 2013).

Results: A total of 244 (103 male and 141 female) *D. oxyrinchus* were collected. Minimum-maximum length and weight of caught fishes were determined as 8.0-93.5 cm and 8.5-3828 g for females and 14.6-80.1cm and 9.53-2091 g for males respectively. Total length-weight relationships of *D. oxyrinchus* were found as $W=0.0017*TL^{3.19}$, $r^2=0.974$, $SEb=0.033$ for all individuals, $W=0.0023*TL^{3.11}$, $r^2=0.980$, $SEb=0.037$ for females and $W=0.0009*TL^{3.34}$, $r^2=0.967$, $SEb=0.061$ for males. According to *b* values, all individuals, females and males showed a positive allometric growth (t-test: $p < 0.05$).

Acknowledgement: This work was supported by Scientific Research Projects Coordination Unit of Firat University. Project Number: SUF.15.04.

Keywords: *Dipturus oxyrinchus*, long-nosed skate, length-weight relationship, disc width-weight relationship, Antakya Bay, northeastern Mediterranean

Occurrence of trypanorhynch cestod (parasite larvae) in blackmouth catshark, *Galeus melastomus* Rafinesque, 1810 (Scyliorhinidae) from Gulf of Antalya, Turkey

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Aim of the study: In the present study, we seek to clarify the status (prevalence and mean intensity) of endo-parasite infection in blackmouth catshark (*Galeus melastomus*) from Gulf of Antalya in Turkey.

Material and Methods: This study was carried out during Sept. and Oct. 2016. Blackmouth catshark samples were collected using troll operations (1st operation date: 26 Sept. 2016, No of fish: 30, TL: 32.65±5.01 cm, W: 142.64±62.57 g, Deep range: 610-640 m, Time: 1 hour, location: N36°41,190-E31°12,920/N36°41,360-E31°09,900' and 2nd operation date: 26 Oct. 2016, No of fish: 10, TL: 34.71±7.94 cm, W: 177.08±101.96 g, Deep range: 610-640 m, Time: 1 hour, location: N36°41,190-E31°12,920) and labelled in separate plastic bags. The mean total length and mean live weight of the examined blackmouth catshark were TL: 33.17±5.83 cm and W: 151.25±74.42 g, respectively. Endo-parasitological examinations, evaluation and identification were conducted utilizing standard techniques. All parasite samples were rapidly removed and stored in a buffered 4% formaldehyde and 90% ethanol solution. In this study the parasitic trypanorhynch cestode larvae were removed from hypaxial muscle tissue (posterior part of the cloak between the lower part of the caudal fin: musculus ventralis lateralis) of blackmouth catshark, *Galeus melastomus*.

Results: After morphological examination all parasite specimens were identified as *Grillotia* sp. Guiart, 1927 (Grillotidae) belong to Trypanorhyncha order. According to the keys to the cestode parasites of vertebrates; some diagnostic specifications were found in similar such as the elongate scolex, two bothridia, inclined apically, sessile, patelliform or cordiform, margins free, and rims thickened features. Moreover the plerocercoid stages of this type of cestodes are commonly found in teleost fishes however, adults occur in chondrichthyes. *Grillotia* sp. recorded as a fish parasite from different localities including Atlantic, Mediterranean, and Pacific and Australia waters. The detailed parasitism status of blackmouth catshark were described as the number of fish N: 40, total length of uninfected fish TL_{ui}: 30.95±2.06 cm, live weight uninfected fish W_{ui}: 26.86±7.56 g, number of infected fish N_i: 7, total length of infected fish TL_i: 43.63±6.60 cm, live weight infected fish W_i: 266.22±130.36 g, total no of cestode N_c: 363, prevalence P: 21.67±11.79%, mean intensity MI: 58.50±20.51. The literature showed that there was no report on cestode infection of blackmouth catshark in Turkish waters. Thus, this is the first documented report on the occurrence of *Grillotia* sp. in blackmouth catshark caught in the Gulf of Antalya, Turkey.

Keywords: Parasites, blackmouth catshark, *Galeus melastomus*, Antalya, Turkey.

Otolith Dimensions-Total Length Relationships of Atlantic Stargazer (*Uranoscopus scaber* Linnaeus, 1758) Captured from Northeastern Mediterranean

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Aim of the study: Atlantic stargazer, *Uranoscopus scaber* is widespread in the Mediterranean and Black seas as well as along the Atlantic coast of Europe up to Portugal and the Bay of Biscay. This species is a bottom species that is found at depths ranging from 15 to 400 m. Atlantic stargazer is caught in large numbers by bottom trawl but has minor commercial value in Turkey. This study provides the first information on the otolith dimensions-fish length relationships of *U. scaber* inhabiting Iskenderun Bay, northeastern Mediterranean Sea.

Material and Methods: Fish specimens were captured by commercial trawler at a depth of 80 to 100 m from the Iskenderun Bay (Hatay, Turkey) between May 2015 and December 2015. Fish specimens were transported to the ecophysiology laboratory in Faculty of Fisheries, Firat University where they were identified, sexed and photographed. Each fish was measured for total length (TL) to the nearest 0.1 cm and weight (W) to the nearest 0.1 g and then the otoliths of the fish samples were removed. Right and Left Otolith lengths (OL), breadths (OB) weights (OW) were measured from each specimen nearest 0.001 mm and 0.0001g respectively. Although the difference between right and left otoliths in biometric measurements was statistically insignificant ($P>0.05$), both otoliths were used for evaluation. The otolith dimensions-total length relationships were examined by using the following equation: $y = a + bx$.

Results: A total of 150 fish specimens (67 female and 83 male) were collected. Mean lengths were 17.21 cm in the all individuals, 18.67 cm in the females and 16.04 cm in the males; mean weights were 89.61 g in the whole population, 115.59 g in the females and 66.78 g in the males. The difference of the total length and weight between the female and male fishes was not statistically significant ($P>0.05$). According to the regression analysis results, a moderate or strong positive relationship between the total length-otolith weight, total length-otolith length, total fish length-otolith width, fish weight-otolith weight, fish weight-otolith length, fish weight-otolith width, fish age-otolith weight, fish age-otolith-length, fish age-otolith width was determined. According to Harkönen (1986) there is a high correlation between total length and otolith length and that is generally a linear relationship.

Keywords: *Uranoscopus scaber*, Atlantic stargazer, otolith biometry, Iskenderun Bay, Northeastern Mediterranean

Acknowledgement: This work was supported by Scientific Research Projects Coordination Unit of Firat University. Project Number: SUF.17.01.

Parasitic Copepods (Crustacea, Copepoda) on Marine Fishes of The Antalya Bay, Turkey

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Aim of the study: In this study, four species of parasitic copepods, collected from six different marine fish species belonging to four families (Clupeidae, Serranidae, Sparidae and Mullidae) captured in the Mediterranean waters off Antalya Bay, Turkey, were reported. General morphology and key diagnostic characters of each species of parasitic copepods were described by using light microscopy images.

Material and Methods: Fish samples were caught by bottom trawling (R/V “Arama I”) seasonally between July 2015 and March 2017 in Antalya Bay, Turkey. Six fish species belonging to Clupeidae, Serranidae, Sparidae and Mullidae were examined. All fish specimens were weighed and measured. The gill filaments, eyes, fins, body surfaces of each fish specimen were examined under a dissection microscope. The parasite specimens were removed from the gill filaments of the host and preserved in 70% ethyl alcohol. The collected parasite specimens were examined, measured and photographed with a stereo zoom microscope equipped with a digital camera. The parasites were identified to species level by using Delamare-Deboutteville & Nuñez-Ruivo (1954), Pillai (1964), Papoutsoglou (1976) and Toksen et al. (2012).

Results: Four species of copepod parasitic, belonging to two different parasitic copepod families, Lernanthropidae and Hatschekidae established by Kabata (1979), were found on the gill filaments of six fish species. Lernanthropid copepods were: (1) *Mitrapus oblongus* (Pillai, 1964) from *Etrumeus golanii* Di Battista, Randall & Bowen (Clupeidae) and (2) *Sagum posteli* Delamare-Deboutteville & Nunes-Ruivo, 1954 from *Epinephelus aeneus* (Geoffroy Saint-Hilaire) (Serranidae). The last two parasitic copepods were: (3) *Hatschekia pagellibogneravei* (Hesse, 1878) from *Dentex maroccanus* Valenciennes (Sparidae) and *Diplodus annularis* (Linnaeus, 1758) (Sparidae) and (4) *Hatschekia mulli* (Hesse, 1878) from *Mullus barbatus* Linnaeus (Mullidae) and *M. surmelatus* Linnaeus (Mullidae). Among the parasitic copepods collected, *H. pagellibogneravei* was found on *D. maroccanus*, and *H. mulli* on *M. barbatus* for the first time in Turkish Seas. In addition, *E. golanii* is a new host record for *Mitrapus oblongus*.

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Keywords: *Mitrapus oblongus*, *Sagum posteli*, *Hatschekia pagellibogneravei*, *H. mulli*, fish, Mediterranean, Turkey.

Relation between Seasonal Migration and Fishing of Bluefish (*Pomatomus saltatrix* L, 1766) Population in Turkish Coasts

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Aim of the study: In this study, reproduction characteristics, feeding migration and fishing activities related to migration of bluefish were identified. In addition to, we have some suggestions have been made for fisheries management of bluefish which have high economic value for Marmara and the Black Sea coastal fisheries.

Material and Methods: This research was carried out between 2013 and 2014 by monthly periods in the fishing areas of Marmara Sea and Black Sea including the Dardanelles and the Bosphorus. In order to identify general characteristics of bluefish fisheries, three field studies were carried out. These are; experimental trawl surveys (in the Bosphorus and West Black Sea coast), sampling from all of the ports and shelters Black Sea and Marmara Coastal area), and face-to-face interviews with professional fishermen using different fishing methods, respectively. Length-frequency measurements, gonadosomatic index values, reproduction period and gonadal development stages were determined of blue fish population.

Results: Majority (99% and 82.3%) of the bluefish are fishing with purse seine nets in the Marmara and Black Sea. Besides, the pelagic trawl and bottom trawl are 10-15% of total catch in the Black Sea. In fact, all three fishing methods are non-selective. The fisheries of bluefish mostly were caught between October and December period. During this period there is an intensive catch on juvenile and young individuals between 0 and 1 age groups. The rates of discard catch which were landed in this period was found in high rates as 54.5%, 68.7% and 69.1% for purse seine, pelagic trawl and bottom trawl, respectively. Discard catch consist of fishes 0 and 1 years old. The reproduction period is peak in June. According to these results, the bluefish population has mixed migration pattern and batch fecundity reproduction characteristics. The bluefish population is completed of the traditional autumn-winter migration between the end of November and early December from the Black Sea to the southern waters such as Marmara Sea and the Aegean Sea. The most important transition corridor is the Bosphorus for both the spring-reproductive migration of the bluefish population from the Marmara Sea to the Black Sea and also the autumn-return migration from the Black Sea to the Marmara Sea. In these passes, most of the fishing pressure comes from the entrance and exit points of the Bosphorus. For this reason, a special fishing management plan should be established for the Bosphorus, Marmara Sea and Black Sea for a sustainable bluefish fishery.

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Keywords: Bluefish, migration strategy, fisheries management, Black Sea, Marmara Sea.

Seasonal Changes of Chlorophyll-A Values of the Freshwater Sources Feeding in Gokova Bay (Mugla-Turkey)

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Aim of the study: The purpose of the current study is to investigate the water quality in Gokova Bay, which is threatened particularly in summer months by visitors to the region, to determine the factors affecting the water quality and to investigate the freshwater sources feeding the Bay. In the contest, the chlorophyll-a concentration represents the main link in the food chain.

Methods: This study was conducted between November 2014 and October 2015. A total of 3 stations (1 located in Kadın Creek, 1 located in Akcapınar Creek and 1 located in Camlı Creek) were selected for the research and monthly a sample of water was analyzed to calculate the concentration of chlorophyll-a.

Results: The results showed values of chlorophyll-a ranged from a minimum BDL to a maximum of 9,82 mgL⁻¹ for Kadın Creek, of minimum BDL and maximum 5,85 mgL⁻¹ in Akcapınar Creek and a minimum BDL to a maximum of 6,29 mgL⁻¹ Camlı Creek. According to Karydis 2009 eutrophication scale for Kadın creek's stations values bad, Akcapınar creek's stations values between Good-Bad Camlı Creek's values bad. For these creeks the higher concentration of chlorophyll-a were found in the summer season that coincide with the increase of human activities and boat tourism and an raise of production of phytoplankton that can be explained with the high addition of nutrient in the water due to human activities. When the results of the analysis are considered, it becomes clear that during the high seasons, because of the increasing tourism activities, increasing population and pesticides and herbicides used for agricultural purposes, the quality of the freshwater sources deteriorates in some stations and environmental pollutions are observed. So different the co-operation of public institutions and civil society organizations must necessary to undertake future measures of conservation and preservation of this area.

Keywords: Gokova Bay, Freshwater Sources, Chlorophyll-a, Environmental Impacts, Tourism activities.

Spatio-Temporal distribution of the bathyal Shark species of Antalya Bay, Eastern Mediterranean

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Aim of the study: The present study examines, for the first time, the assemblage of demersal sharks along the depth gradient from 200 to 900 m on the bathyal ground of the Antalya Bay in the North Levant (i.e. Turkish Mediterranean Sea) and analyzes the variations in their distribution, diversity and dominance by depth and season.

Material and Methods: Samples were collected during the monthly surveys from July 2010 to June 2011, with the R/V “Akdeniz Su”, and sampling area was divided in seven bathymetric strata (200-900 m: 100 m interval). A standard otter-trawl was used. For each haul, sharks were sorted by species and, species abundance (n) and biomass (kg) data were noted. The parameters number and weight of the species for swept area (km⁻²), the species abundance (D, number of individuals/km⁻²), species biomass (BI, kg/km⁻²), the abundance of recruits (D_R, number of juvenile/km⁻²), adults (D_A, number of adults/km⁻²) and mature (D_M, number of matures/km⁻²) indices were standardized using the software AdriaMed Trawl Information System (ATrIS; Gramolini et al., 2005) for each haul. The maps of distributions of these indices were drawn with Surfer 12. Significant tendency in indices by the depth stratum and season were tested using a non-parametric correlation (Spearman) analysis. Shark assemblages in bathyal grounds were compared using univariate and multivariate techniques. Univariate techniques were performed using SPSS version 17.0 (SPSS, 2008). The null hypothesis of no difference in abundance and in biomass between strata and seasons was tested with the 2-factor analysis of variance (MANOVA). Prior to analysis, the data were square root transformed and the assumption of the homogeneity of variance was tested by Levene's test.

Results: A total of 13 734 shark individuals belonging to 8 species from 7 families was collected over the 87 hauls, having a total duration of 121 hours and covering a total sampling area of 9.565 km⁻². *Etmopterus spinax* was the dominant species with 10 659 individuals. Second dominant species, *Scyliorhinus canicula*, ranged from 300 to 899 m. The distribution of *Galeus melastomus* was similar with *E. spinax* (300-899 m). *S. blainvillei* (n:218) ranging from 200 to 699 was collected on the upper slope (<500 m) with 85%, and on the lower (≥500 m) with 15%. According to the results of two-way MANOVA, while stratum was a significant parameter for D, BI and TL of the four species, season was not significant parameter (p<0.05). TL of the species increased in parallel with depth (p<0.01). Depth was negatively correlated with D and BI values of *S. canicula* but positively with BI value of *G. Melastomus* (p<0.01). Depth was negatively correlated with juveniles of *E. spinax* and *G. melastomus* and positively with the adults in terms of abundance (p<0.01). While DR and DM of *S. canicula* decreased in parallel with depth (p<0.01), Depth was not correlated with DR and DM of *S. blainvillei* (p>0.5).

Keywords: Shark, *Etmopterus spinax*, *Scyliorhinus canicula*, *Galeus melastomus*, *Squalus blainvillei*, Antalya Bay.

The sustainability of *Psetta maxima* populations threatened by bottom trawl fisheries in the Black Sea

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Aim of the study: This study aimed to determine the amounts of non-target turbot (*Psetta maxima*) under the minimum landing size caught by bottom trawl in the Black Sea.

Material and Methods: Samplings were performed in 2016 on board commercial fishing vessel and its bottom trawl nets. During the study, a total of sixty one operations were performed at the depths of 22 to 52 m. Turbots under the minimum landing size were counted and thrown back into sea as alive by the researchers. Data was standardized as number/hour (catch per unit effort (CPUE)). Average CPUE values calculated for each month, and differences between these values were determined with the ANOVA test.

Results: During the samplings, a total of 670 turbot ranging from 11 to 39 cm were caught. While average 13.1 ± 13.7 n/h turbot was caught in the all of operations, highest value of turbot were caught (15.3 ± 14.1 n/h) in September. In addition, the ANOVA test determined that the CPUE value of September was significantly different from the other months ($p < 0.05$). All of turbot found in the other fish were observed to die in the sorting procedure on the deck. It was observed that dolphins scavenged for turbot thrown back into sea as alive or died. The unnecessary catching of fish under the minimum landing size is a waste of biomass that must be caught as an adult individual in the future. This situation should be considered as a threat to the sustainability of the turbot. Small turbot need to be removed from the bottom trawl net using super shooter before they reach the deck. However, it is possible to be banned the bottom trawl fishery in Black Sea in September when the discard value is high.

Acknowledgements: This study was funded by Recep Tayyip Erdoğan University Research project Fund (Project number: 2015.53001.103.03.07). Also we thank to fishermen for their helps in the sampling.

Keywords: Discards, Bottom Trawl, *Psetta maxima*, turbot, Black sea.

The Variations of Mercury and Aquatic Organic Matter in Lake Sediment Cores From Köyceğiz Lake (TURKEY)

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Aim of the study:Mercury pollution is a local, regional, and global environmental problem that negatively affects ecosystems worldwide. The Koycegiz Lake is located in the south-west of Turkey within the boundaries of Mugla. The most sensitive regions of Turkey for environmental problems are those known as having important touristic potentials. Köyceğiz Lake is one of these regions. Coal-fired utility boilers (power plants) are the largest source of mercury emissions in the region, followed by tourism, agricultural activities and fishing. The aims of this study are to determine mercury pollution in sediment of Köyceğiz Lake and to investigate the relationship between Hg and organic matter in sediment cores from Köyceğiz Lake using some hypotheses

Material and Methods: In present study, five stations were selected in Köyceğiz Lake. Sediment core samples were taken by Uwitec Corer in February 2017. The upper 20 cm of each core was sliced into 2 cm sections using core cutter. Physicochemical parameters were examined in sediment core.

Results: The Köyceğiz Lake region is particularly sensitive to mercury pollution. Mercury concentration was determined between 0,04-18,27 µg/g. The impact of mercury emissions and deposition is exacerbated by sediments and lake characteristics in areas with abundant organic matter regions such as forests and wetlands that result in higher mercury inputs and transport to elevated concentrations in aquatic food webs. The highest percentage of organic matter was found to be 36%. Generally, the concentration of mercury was high in sections where the percentage of organic matter was high.

Keywords: mercury pollution, Köyceğiz Lake, Sediment Cores, Organic Matter.

Trophic ecology of pike perch (*Sander lucioperca* Linnaeus, 1758) as revealed stable carbon and stable isotope ($\delta^{13}\text{C}$ and $\delta^{15}\text{N}$) in Lake Eğirdir (TURKEY)

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Aim of the study: The impact of introduced piscivores on local fish population is continuously taken attraction from all over the world. In this study we performed a stable isotope study in Lake Eğirdir, Turkey, in order to understand the role of pike perch (*Sander lucioperca*) in food web structure of the lake. The perch was introduced in the lake almost fifty years ago, which has caused serious ecological changes in the food webs.

Material and Methods: We collected the perch and other fish species at four sites during spring and fall of 2010. The contribution of prey items to the tissue of pike perch was analyzed with SIAR mixing model.

Results: The carbon (-17.69 ± 0.54) and nitrogen (13.61 ± 0.66) signatures of the perch (34.91 ± 8.69 cm, 459.03 ± 325.91 g) did not change much over the entire lake and season. The pike perch, as expected, occupied the top of the food webs with trophic level of 4.03 (mean of 3.89 ± 0.13). The contribution of freshwater lobster and crabs was substantially higher (0.11-0.60 min-max, 0.60 mean) than that of fishes (0.00-0.33 min-max, 0.33 mean) during spring, whereas the contribution of fishes was higher (0.08-0.61 min-max, mean 0.35) during fall. Among the fishes, contribution of *Carassius gibelio*, *Pseudophoxinus egridiri*, *Capoeta pestai* and *Gambusia holbrooki* contribution was relatively higher than those of other fishes. Aggregating stable isotope data over seasons and sampling sites indicated, however, that contribution of fishes was relatively higher (mean 0.67). Among the fishes *Gambusia holbrooki* and *Cyprinus carpio* contribution was higher. The results of this stable isotope study had contrary results of those obtained for gut contents analysis in the lake, which indicated that perch preyed on mostly *Atherina boyeri* and *Knipowitschia caucasica*. This stable isotope study showed that the perch had a great impact of all the fish species of the lake.

Acknowledgements: This study was supported by the Republic of Turkey's Ministry of Food, Agriculture and Livestock, General Directorate of Agricultural Research and Policies (TAGEM/ HAYSÜD/ 2010-09-01-01). We would like to express our thanks to the Fisheries Research Institute, Eğirdir and all the members of the project team for their help during field study.

Keywords: $\delta^{13}\text{C}$, $\delta^{15}\text{N}$, Lake Eğirdir, Pikeperch, *Sander lucioperca*.

Vertical Distribution of Lead (Pb) in Sediment Cores Taken From Köyceğiz Lake (TURKEY)

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Aim of the study: Lead is one of the more toxic metals for aquatic life. Natural resources of lead are rock erosion, atmospheric input from volcanic eruptions and dust derived from soil. Besides natural resources, lead inputs to the aquatic environment from antropogenic activities. Sediment is an important material used for determination of metal pollution in aquatic environments due to their chemical-physical properties, such as particle size, organic matter, pH and process including adsorption/desorption. The Köyceğiz-Dalyan region was announced as a specially protected area by the Council of Ministry on 12.08.1988 because it has a special and important ecosystem. However, this region is rapidly polluted due to extensive tourism and agricultural activities. The aims of this study are to determine vertical distribution of lead pollution in sediment cores taken from Köyceğiz Lake.

Material and Methods: In present study, five stations were selected in Köyceğiz Lake. Sediment core samples were taken by Uwitec Corer in February 2017. The upper 20 cm of each core was sliced into 2 cm sections using core cutter. Physicochemical parameters were examined in sediment core. Concentrations of Pb were measured by Atomic Absorption Spectrophotometer (AAS)

Results: Determination of lead distribution in core sediments can provide information about the current and background levels of contamination and may provide historical evidence of the anthropogenic effect in the aquatic environment. Lead concentration was determined between 15,43-25,22 µg/g. The finding of the study revealed that Pb concentration was found the highest at the station where domestic wastewater is discharged.

Keywords: Lead pollution, Köyceğiz Lake, Sediment Cores, wastewater.

Biodiversity of Bacteria Isolated from Home-Made Wine and Vinegar

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Aim of the study: Wine is an alcoholic beverage made grapes fermented without the addition of sugars, acids, enzymes, water. It has been consumed by human beings in religious ceremonies since ancient times. Vinegar is sour juice that is used as a sweetener in meals, in salads, or as a preservative such as brine. It has historically had a great variety of industrial, medical, and domestic uses are still commonly practiced today. The aim of this study was to determine the bacterial biodiversity of home-made wine and vinegar using classic and molecular methods.

Material and Methods: Home-made wine and vinegar samples were collected from the villages of Aydın. Bacterial growth was realized on HS (Hestrin-Schramm) Agar at 30°C for 72 h. After incubation, each different colony were isolated and stocked in skim milk. Morphological, cultural and biochemical identifications were made according to the Bergey's Manual of Systematic Bacteriology. For molecular identification DNA isolation of the samples were made according to De Boer and Ward (1995). After isolations DNA concentration and purity was measured with nanodrop spectrometer (Thermo Scientific). 16S rRNA PCR reactions were carried out at initial denaturation 95°C 5 min, denaturation 94°C 40 sec, annealing 50°C 40 sec, extension 72°C 40 sec with 35 cycles and a final extension at 72°C 10dk. Reagents concentrations were 10X Taq Buffer, 0.5M dNTP mix, 10 pM from each primer, 7.5 mM MgCl₂ and 1U Taq polymerase with the final volume of 25 µl. PCR products were sent to the sequencing (GATC BioTech, Germany) after electrophoresis at 1.4% agarose gel at 90 V 40 min.

Results: In this study, a total of 50 samples were isolated from home-made wine and vinegar. According to the morphological characterization, 6 of these samples were found to be Gram positive rod shaped bacteria, 22 of these samples were found to be Gram-negative rod-shaped bacteria and 22 of these samples were found to be Gram-variable. PCR results of these samples were sent to the sequencing (GATC BioTech, Germany). It is expected to be found *Gluconacetobacter* sp., *Acetobacter* sp., and *Lactobacillus* sp. Molecular identification will be made by compairing sequence results with Genbank using BLASTn software.

Acknowledgements: This study was carried out at Adnan Menderes University Biology Department Microbiology Laboratory.

Keywords: Wine, Vinegar, Bacteria, Biodiversity, 16S rRNA.

Biodiversity of Fungi in Strawberry Fields in Anamur, TURKEY

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Aim of the study: Strawberry is a delicious and aromatic fruit which can be consumed as fresh and also is suitable for industry. However, strawberry is exposed to many fungal diseases that end with the loss of the product up to 15% before harvest. The aim of this study is to determine the fungi that present in the field whether or not pathogenic.

Material and Methods: One hundred twenty three samples were collected from different strawberry fields in Anamur in April 2016. Samples were inoculated on PDA and RBA after collection and incubated at 27°C 7 days. Morphological identification was made according to the shape and color of the colonies, mycelium and spore structures. For molecular identification; DNA isolation was made according to Doyle and Doyle (1987)'s 2X CTAB DNA isolation method. ITS gene region was used to identify species on a molecular level. ITS region was amplified with using universal ITS primers in PCR. PCR products we sent to sequencing and sequence results were aligned with the sequences in GenBank using BLAST software.

Results: According to morphological and molecular methods ten different fungal genera were found on strawberries. These genera were *Rhizopus oryzae*, *Alternaria alternata*, *Fusarium proliferatum*, *Aspergillus niger*, *Trichoderma atroviride*, *Cladosporium cladosporioides*, *Talaromyces allahabadensis*, *Syncephalastrum monosporum*, *Syncephalastrum* sp. and *Bortyis cinerea*. Another set of PCR products were sent to the sequencing and results were expected to be obtained shortly.

Acknowledgements: This project was supported by Adnan Menderes University Scientific Research Department (Project No: FEF-16022).

Keywords: Fungal Biodiversity, ITS-PCR, Strawberry, Anamur, TURKEY.

Detection of Bean common mosaic virus in Bean (*Phaseolus vulgaris*) seeds growing in Antalya Province, Turkey

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Aim of the study: In this study, detection of *Bean common mosaic virus* (BCMV) in bean seeds which is important for fresh consumption and seedling was investigated. 59 seed samples were collected from producers in Antalya province for the investigation.

Material and Methods: *Bean common mosaic virus* (BCMV) was identified by applying Double Antibody Sandwich Enzyme Linked Immunosorbent Assay (DAS-ELISA) and Immunocapture Reverse Transcriptase-Polymerase Chain Reaction (IC-RT-PCR).

Results: As a result of the study, BCMV was detected in a total of 51 seed samples. Some of the seed samples which were positive in DAS-ELISA tests were used for IC-RT-PCR for the identification of BCMV. In IC-RT-PCR method, approximately 850 bp of the coat protein gene was amplified with specific primers and BCMV specific bands were obtained at the expected levels.

Acknowledgements: We are thankful to Hesna KÖK from Suleyman Demirel University for technical assistance.

Keywords: Bean, seeds, BCMV, DAS-ELISA, IC-RT-PCR.

Detection of *Lettuce Viruses* in Ankara (Turkey) ProvinceFiliz Randa ZELYUT^{1*} and Filiz ERTUNC¹¹Ankara University, Faculty of Agriculture, Department of Plant Protection 06110 Ankara, TURKEY

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Aim of the study: Intensive lettuce production is done depending on the weather conditions especially in Nallıhan, Beypazarı, Ayaş, Çubuk and centrum districts of Ankara, because of the soil and climate characteristics suitable for lettuce production. This study investigated the viruses infecting lettuce. As a result lettuce mosaic virus (LMV), *Tomato spotted wilt virus* (TSWV), *Cucumber mosaic virus* (CMV), *Mirafiori lettuce big vein virus* (MiLBVV) and *lettuce big vein virus* (LBVV) were investigated serologically, symptomologically and by molecular assays.

Material and Methods: A total of 324 samples of lettuce were obtained from the region where approximately 23.340 decares of lettuce were produced. A total 324 samples were collected from the field and all samples were tested for CMV, TSWV, LMV and MiLBVV using specific antiserum in a double-antibody sandwich enzyme linked immunosorbent assay (DAS-ELISA) serological test.

Results: CMV and TSWV were not present in the research area and were not detected in the collected lettuce samples. On the other hand 39 MiLBVV, 6 LBVV and 25 LMV infected plant samples tested positive for MiLBVV, LMV and LBVV antisera respectively. Specific primer pairs were used for the detection of LMV, MiLBVV, LBVV in RT-PCR and bands of the coat protein gene amplified by this primer pairs was obtained. A 800 bp, 469 bp and 296 bp fragments of LMV, MiLBVV and LBVV respectively representing the coat protein region were observed under the UV light. The prevalence rates of the factors detected in Ankara lettuce cultivation areas were calculated as 3.01%, the infection rates were calculated as 12.04% for MiLBVV and 7.72% for LMV.

Acknowledgements: This research is funded by TUBITAK Project coded as 214O639.

Keywords: Virus, DAS-ELISA, RT-PCR, Lettuce, Ankara.

Determination of Sensitivity of *Trichoderma* Species Against Some Fungicides

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Aim of the study: *Trichoderma* is known as the most widely used antagonist in biological control and has almost all the land and natural habitats in nature especially in areas containing organic substance. Suppression of pathogenic fungal agents in plants may not be possible using antagonists alone. Therefore, antagonists should be applied in combination with fungicides against soil-borne pathogens. In this application form, fungicides are expected to be less effective against antagonists such as *Trichoderma*. Aim of this study was to determine the sensitivity of *Trichoderma* species against some fungicides which used to soil pathogen: *Rhizoctonia solani*.

Material and Methods: *Trichoderma* species (*T. asperellum* TZ17, *T. asperellum* TZ20, *T. atroviride* BOZ6, *T. crassum* VG66, *T. croceum* BOZ26, *T. gamsii* VG47, *T. hamatum* ÖT16, *T. harzianum* LO52, *T. harzianum* TZ14, *T. inhamatum* PT12, *T. neokoningii* A15, *T. spirale* KB51, *T. strigosum* LO43, *T. virens* KB51) and some fungicides [Rizolex-T® (Tolclofos methyl+Thiram, 20+30 %), Celest-max® (Fludioxonil, 100g/l), Rizolex® (Tolclofos methyl, 50 %)] had been tested in this study. Different concentrations of fungicide (0, 10, 30 and 100 ppm) was added separately to 100 ml of sterilized PDA medium immediately after cooling before solidification under aseptic condition and mixed thoroughly to give the required concentrations. The control was maintained without fungicide. Prepared medium was aseptically poured in sterilized Petri dishes, four replicates were used for each treatment. Equal disks (8 mm diameter) from *Trichoderma* species 7 days old culture were placed onto the middle of the agar plate. Inoculated plates were incubated at 22-25°C and mycelial growth was measured daily. Sensitivities of isolates to fungicides were calculated according to Abbott's formula.

Results: Pesticides had an effect at different rates in all doses on antagonists. As the doses of the pesticides increased, the rate of colony development decreased accordingly. According to the results of the study, *T. spirale* KB51, *T. croceum* BOZ26, *T. crassum* VG66 were found to be the least susceptible antagonists whereas *T. asperellum* TZ17 showed the highest sensitivity with different doses of the three fungicides. On the other hand, while *T. gamsii* VG47 affected by Rizolex and Rizolex-T, *T. strigosum* LO43 also affected by Rizolex-T and Celest-max pesticides. Generally, antagonists have shown similar reactions in terms of susceptibility to different doses of the three fungicides, which are considered as a general behavior towards the chemical pesticides. According to another result obtained in the study, some antagonists such as *T. spirale* KB51, *T. croceum* BOZ26, *T. crassum* VG66 generated less conidia than other *Trichoderma* and were found to be the least susceptible to fungicides.

Acknowledgement: This article was obtained from project named "Biological Control of *Rhizoctonia solani* and Its Integration with Chemical control In Potato growing" that had been carried out between 2006 and 2010 and supported by TAGEM (General Directorate of Agricultural Research and Policies in Turkey)

Keywords: *Trichoderma*, Pesticides, Sensitivity.

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Aim of the study: *Pythium* species, belonging to Oomycetes, are ubiquitous organisms distributed worldwide. Most of them are saprobes living in soil and in water, while some others are significant plant pathogens causing pre- and post-emergence damping off, root rot or fruit rot on many agricultural crops. Since they infect their hosts by their motile zoospores, they prefer and can be found abundantly in soil with higher moisture. There are also some species having mycoparasitic activity and they can be used as biological control agents against plant pathogens. In this research, *Pythium* species in soils with different vegetation types in Turkey were determined.

Materials and Methods: Samples of different soil types were taken from irrigated fruit orchards and vegetable fields, non-irrigated cereal fields and forests in different regions of Turkey. Selective VP3 medium and surface soil dilution plate (SSDP) method were used for the isolation of the *Pythium* species. Morphological characteristics of the isolates were determined by water cultures and they were identified according to current keys. Molecular techniques were used to confirm the identifications. As a result, kinds and distribution of *Pythium* species in different soil and vegetation types in Turkey were given. In addition previous studies on *Pythium* species in Turkey were carefully reviewed and added to the species and hosts list.

Results: *Pythium* species were readily isolated from all soil types, while plant pathogenic species were more common in irrigated agricultural lands. Among them, *P. ultimum* was the most common species. *P. deliense* is another important pathogenic species causing damping off on plants such as vegetables and sugarbeets. *Pythium* isolates producing only hyphal swellings were frequently isolated from all soil and host types. Mycoparasitic species with ornamented oogonia were also widespread especially in vegetable and sugarbeet fields.

Acknowledgements: Supported by the Scientific Research Projects Coordination Unit of Süleyman Demirel University (Project No: 1511-YL-07, 2078-D-09)

Keywords: *Pythium* spp., soil-borne, pathogens, mycoparasites.

Fungal Biodiversity of Strawberry Fields in Aydın, TURKEY

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Aim of the study: Strawberry is a kind of delicious and aromatic fruit which can be consumed as fresh and also is suitable for industry. However, strawberry is exposed to many fungal diseases. The aim of this study is to determine the fungi that infect strawberries in the field.

Material and Methods: Three hundred forty seven strains were obtained from the sick plants which are collected from five different areas in April 2015. Different fungal strains were isolated on RBA and PDA. After incubation period morphological identification of species was realized. For molecular identification, ITS-PCR was used. DNA isolation was made according to Hillis and Moritz (1990). ITS-PCR was carried out with universal ITS primers. PCR products were sent to sequencing and sequence results were aligned using BLAST software.

Results: From these 347 samples 11 morphologically different kinds were identified according to morphological and molecular methods. These species were *Rhizopus oryzae*, *Alternaria alternata*, *Fusarium* sp, *Aspergillus niger*, *Trichoderma atroviride*, *Cladosporium cladosporioides*, *Talaromyces* sp, *Lichtheimia corymbifera*, *Syncephalastrum monosporum*, *Syncephalastrum* sp and *Bortyitis cinerea*.

Acknowledgements: This study was realized in Adnan Menderes University Biology Department, Microbiology laboratory and financially supported by Adnan Menderes University Scientific Research Projects Department (Project No:FEF-14019.). Also we want to thank Assoc.Prof.Dr. Can YILMAZ for his technical help.

Keywords: Fungal Biodiversity, Strawberry, ITS-PCR, Aydın, Turkey.

Genomic DNA Analysis for the Nod-Gene of Nodule Bacteria, Isolated from Various Territories

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Aim of the study: Nodule bacteria form a highly specific symbiosis with alfalfa, resulting in the atmospheric nitrogen binding and transferring it into plant uptake form. Plant-microbial interaction means active genetic processes in both genomes. Genotypic characteristics of microsymbionts are essential to create symbiotic pairs (the rhizobium strain and the host plant species). The nucleotide sequences analysis of symbiotic genes is an important approach to study the origin and diversity of rhizobia as well as to form highly effective plant-microbial systems. Therefore, the aim of our research is to evaluate the symbiotic potential of nodule bacteria isolates obtained from various sources.

Material and methods: The objects of our study were 16 strains of nodule bacteria which were isolated from the nodules of lupine (*Lupinus albus*) and alfalfa (*Medicago x varia Martyn*) on the territory of Mongolia and Russia. Two strains of *Sinorhizobium meliloti* from the collection of the Research institute of agricultural meteorology were used as a control. All molecular and genetic experiments were carried out according to a standard procedure.

Results: The presence of the NodD gene was revealed by genomic DNA analysis in some samples but not in all ones. After isolation the further PCR amplification was performed. The absence of the NodD gene in the nodule bacteria genomic DNA of the Lupine White (*Lupinus albus*) was established by electrophoresis method. The NodD-gene in genomic DNA of nodule bacteria (the size of 900 bp) was found only in two strains from the Russian Williams Fodder Research Institute. The other strains, including control variants, contain a fragment of the size of 300 bp. It is necessary that a further sequencing of all nodule bacteria should be performed.

Acknowledgements: The research was conducted at the department of microbiology and immunology, faculty of soil science, agrochemistry and ecology in Russian State Agrarian University, Moscow, Russia. The study was carried out by Nefedova Daria Alexandrovna, PhD student, under the supervision of scientific adviser – Silitskaya Olga Valentinovna, Ph.D Biology.

Keywords: Nodule bacteria, DNA, PCR analysis.

Herbal Alternatives to Synthetic Root Canal Disinfection in Human Teeth

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Aim of the study: An infected root canal system is a unique niche for the selective species of microorganisms. One of the major objectives of a root canal treatment is to disinfect the root canal system. Irrigation is carried out to reduce the number of bacteria in the root canals. A wide variety of synthetic antimicrobial agents have been used over the years as endodontic irrigants. The ideal root canal irrigant should (i) have a broad antimicrobial spectrum and high efficacy against anaerobic and facultative microorganisms in biofilms, (ii) dissolve necrotic pulp tissue remnants, (iii) inactivate endotoxin, (iv) prevent the formation of a smear layer and dissolve it, (v) be biocompatible and systemically nontoxic. Sodium hypochlorite (NaOCl) is one of the most widely used endodontic irrigant thanks to its ability to destroy a broad spectrum of microbes. However, many complications and undesirable characteristics such as tissue toxicity, allergic potential, and inability to remove the smear layer are reported. Chlorhexidine is another commonly used antimicrobial agent with a wide spectrum antimicrobial activity and biocompatibility. However, it does not have tissue dissolving capabilities, may lead to dryness of the oral cavity burning sensation of the mouth and discolouration of teeth. The major side effects of these synthetic antimicrobial agents used in root canal irrigation are immune suppression, hypersensitivity, allergic reactions and resistance of microorganisms to these drugs; also some are mutagenic and cytotoxic. Therefore, there is a need to provide extensive researches to find plant based alternatives to the conventional agents. The aim of this presentation is to review the herbal agents reported to be effective in root canal disinfection.

Material and Methods: A PubMed search was made with the keywords; herbal, dentistry, root canal, and endodontics were selected for this review.

Results: More than 400 studies were available, which have investigated many plants with a potential source for new therapies in endodontics. Herbal agents such as *A. nilotica*, *A. barbadensis*, *A. lappa*, *A. indica*, *carvacrol*, *C. sylvestris*, *A. sativum*, *M. recutitia* L, *C. sinensis*, *C. limonum*, *M. citrifolia*, propolis, *P. guajava*, *P. corylifolia*, *R. damascena*, *R. lancia*, *S. persica*, *S. aromaticum*, *M. alternifolia*, *C. longa*, *G. glabra* can be used as an alternative intracanal medicament and can be used as potential root canal irrigants because of their anti-inflammatory, antimicrobial and immune-modulating activity. Propolis and *M. citrifolia* were found to be effective against *E. faecalis* (most common bacteria in secondary root canal infections).

Keywords: Chlorhexidine, herbs, irrigation, root canal, sodium hypochlorite.

Identification of Genetic Diversity of Cucumber Mosaic Virus in Pepper Fields in Şanlıurfa, Turkey

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Aim of the Study: Understanding genetic structures of virus populations with their genetic diversities and their evolutionary mechanisms is an important aspect of controlling viral diseases. Cucumber mosaic virus (CMV) is common in most pepper fields in Turkey. CMV infections have been frequently reported from Turkey on different plant families showing mild to severe symptoms. Genetically CMV may be divided into two major subgroups, I and II, based on genetic diversities on some sequence structure, and subgroup I can be further divided into subgroups IA and IB. The aim of this study is to determine the genetic diversity of CMV in pepper fields in the Şanlıurfa province.

Material and Methods: In 2013-2014, surveys were performed in 36 different pepper fields in Şanlıurfa. Leaf samples showing virus-like symptoms were taken from pepper plants and placed in polyethylene bags and stored at -20 °C until use. DAS-ELISA test was used first to identify viruses. CMV-positive samples were then tested by RT-PCR according to two different CMV-specific gene region (RNA1 and RNA2). The PCR product fragments were digested by *MluI* endonuclease restriction enzyme. The bands observed on agarose gel after restriction fragment length polymorphism assay (RFLP).

Results: In this study, the presence of CMV virus in field grown pepper plants was determined by DAS-ELISA and RT-PCR methods. The PCR products of the RNA1 and RNA2 gene regions were not cut by the *MluI* enzyme in RFLP process. This indicates that all of the tested pepper plants infected with CMV virus subgroup IA. The result of the study is consistency with previous studies carried out in the region however with this study subgroup-based diagnosis was made. CMV is transmitted by aphids from infected plants to healthy plants. The detection of genetically the same CMV strain from different regions suggests that the pathogen-vector-host relationship is preserved.

Keywords: Genetic diversity, CMV, RNA1, RNA2, Subgroup IA, RT-PCR.

Isolation, Identification and 16S rDna Analysis of *Micromonospora* Bacteria from Van Lake BasinMetin ERTAŞ¹, Kerem ÖZDEMİR¹¹Yüzüncü Yıl University, Faculty of Science, Department of Molecular Biology and Genetic,
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Aim of the study: *Micromonospora* bacteria were isolated from soil and sediment samples of Van Lake Basin. Phylogenetic analysis of species based on 16S rDNA, phylogenetic positions were determined.

Material and Methods: Dilution plate method was used for isolation. As a result of isolation 141 *Micromonospora* bacteria were purified. Moisture and pH values of sediment and soil samples were determined. according to the color group the purified isolates were divided into 11 color groups. 141 isolates for numerical taxonomy were tested for 83 characters. Phylogenetic trees were constructed according to 16S rDNA analysis.

Results: As a result of the tests applied for numerical taxonomy, a total of 7 major and 15 minor clusters were formed based on 78% similarity rate. In addition, screening electron microscopy (SEM) of isolates are reveal the spore-chain morphology and identified. Maximum Likelihood and Bayesian algorithms were used to determine the genetic distance between species. The species that we thought were *micromonospora* species clustered in one branch and morphologically in *micromonospora* were clustered in a different branch.

Acknowledgements: I would like to express my gratitude to Yüzüncü Yıl University, Scientific Research Projects Department for the support given to this project with the 2014-FBE-D092 project.

Keywords: *Micromonospora*, Van Lake Basin, 16s rDNA.

Isolation, Identification and Phytase Production Capacities of the Marine Derived Fungal Strains from Mediterranean Sponge and Sediment Samples

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Aim of the study: Marine microbial diversity presents a rich source for new microorganisms that have various biological activities. In recent years many studies have been conducted on the marine derived bacteria and archaea. However, very little is known about the marine derived fungal (MDF) strains. In this study, we aimed to isolate and identify MDF strains from sponge and sediment samples that are collected from Aegean and Mediterranean Seas. Furthermore, since the some terrestrial fungal isolates are the commercial producers of the phytase enzyme, we also aimed to investigate the phytase production capacities of the isolates.

Material and Methods: Sponge and sediment samples were collected by SCUBA diving within the scope of TUBITAK SBAG 109S361 project and brought to the laboratory in the cold chain in cold boxes. Isolation was carried out using 4 different modified media; M1, M6, Malt Extract agar and Medium A. Isolates were identified using polyphasic approach. Phenotypic characteristics and ITS sequence analysis used for identification purposes. Since the some terrestrial fungal isolates are the commercial producers of the phytase enzyme, phytase production capacities of the isolates were also investigated. Extracellular phytase activities of the isolates were determined using modified phytase screening medium (MPSM). The clear halo surrounding the colonies in MPSM were evaluated as a semi-indicator of the phytase activity.

Results: A total of 110 marine derived fungal strains have been isolated from marine sponges (73 isolates) and sediment samples (37 isolates) respectively. ITS sequences of the isolates were deposited in the GenBank. *Penicillium* sp. (%56), *Cladosporium* sp. (%20) and *Aspergillus* sp. (%11) strains were the most prevalent in the samples. It is determined that 45 of the 110 strains (40.9%) were in the phytase production capacity. Furthermore, 31 of the 73 sponge isolates (42.46%) and 15 of the 31 sediment isolates were present activity on the MPSM medium. According to the best of our knowledge, this study describes the isolation and identification of marine derived filamentous fungal strains for the first time. Furthermore, phytase screening results demonstrates that MDF strains present a rich microbial source for phytase production.

Acknowledgements: This study was supported by TUBITAK (TBAG 112T047) and Ege University Scientific Projects Foundations (14 Fen 004).

Keywords: Phytase, Marine derived fungi, ITS-PCR, *Sponge*, *Sediments*, Biodiversity.

Molecular Characterization of *Acanthamoeba* species in Water Resources of Ordu Province in Turkey

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Aim of the study: The aim of this study was to perform the molecular identity of *Acanthamoeba* species in water samples collected from Ordu province in Turkey.

Material and Methods: The samples (roughly 500ml) were filtered by a cellulose nitrate membrane with a pore size of 0.45 µ. The filter was poured onto non-nutrient agar plates coated with *Escherichia coli*. DNAs were extracted and the occurrence of *Acanthamoeba* DNAs were tested by the genus-specific primer. Phylogenetic tree was drawn by comparing all data sets between our sequences and the small subunit (SSU) rRNA references sequences from GenBank by Bioedit and MEGA version 5.05.

Results: A total of 39 out of 75 samples (52%) were positive for *Acanthamoeba* species. The water samples from Ordu center (12/6), Ünye (18/10), Fatsa (24/12), Perşembe (21/11) were found positive for the contamination of *Acanthamoeba*. *Acanthamoeba* strains represented the members of sequence type 4 (T4) and T5 in the Neighbor-Joining (NJ), Maximum-Parsimony (MP) and Maximum-Likelihood (ML) trees. Phylogenetic tree showed that Haplotype-I was placed in the same lineage with *Acanthamoeba tringularis* with 96%, 98% and 95% bootstrap values in the NJ, ML and MP trees, respectively. Haplotype-II appeared to sister to *Acanthamoeba polyphaga* with 97%, 99% and 96% bootstrap values in the NJ, ML and MP trees, respectively. Haplotype-III was placed in the same lineage with *Acanthamoeba lenticulata*. This relation was supported with 96%, 85% and 95% bootstrap values in the NJ, ML and MP trees, respectively. This is the first study for the detecting of *Acanthamoeba* sp. in investigated area.

Keywords: *Acanthamoeba* sp., waterborne parasites, Ordu, (SSU) rRNA.

Molecular Identification and Plasmid Content Analysis of *Lactobacillus pentosus* and *Lactobacillus paraplantarum* Strains Isolated from Naturally Fermented Pickles

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Aim of the study: In this study, *Lactobacillus paraplantarum* and *Lactobacillus pentosus* strains isolated from naturally fermented pickles were tested for plasmid content and antibiotic resistance after molecular identification.

Material and Methods: A total of 55 pickles were collected randomly from 17 different regions of Turkey. Suspicious Lactic Acid Bacteria colonies (161) were isolated from deMan, Rogosa and Sharpe (MRS) agar for further biochemical and morphological identification tests. Suspicious 35 isolates were identified based on *recA* gene and 16S rRNA PCR amplification followed by sequencing. The plasmid contents and antibiotic resistance properties of isolated *L. pentosus* and *L. paraplantarum* strains were determined. Isolation of plasmids were achieved with a modified commercial plasmid DNA extraction mini kit. Disc diffusion method for antimicrobial resistance profiles of isolates were performed with antibiotics including erythromycin, penicillin, ampicillin, gentamycin, rifampicin, clindamycin, amoxicillin / clavulanic acid, ampicillin sulbactam, oxacillin, and aztreonam.

Results: 14 *L. pentosus* and 2 *L. paraplantarum* strains were identified based on *recA* gene and 16S rRNA PCR followed by 16S rRNA sequencing. Both *L. pentosus* and *L. paraplantarum* isolates contained an average of 1 plasmid and had up to three different plasmids. The percentage of antibiotic resistance and susceptibility for all isolates were as follows: Penicillin 93.5 and 6.5%, gentamicin 93.5 and 6.5%, rifampicin 62.5 and 37.5%, clindamycin 93.5 and 6.5%, amoxicillin 6.5 and 93.5%, ampicillin sulbactam 6.5 and 93.5%, erythromycin 0 and 100%, oxacillin 100 and 0%, aztreonam 100 and 0% and ampicillin 0 and 100% respectively. No relationship was detected between antibiotic resistance and plasmid content for tested isolates.

Acknowledgements: This study was supported by Kahramanmaraş Sütçü İmam University Scientific Research Projects Coordination Unit (Project Number: 2013 / 2-24).

Keywords: *L. paraplantarum*, *L. pentosus*, Molecular Identification, Plasmid, Antibiotic Resistivity.

Molecular typing of *Staphylococcus aureus* from fish and ground beef

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Aim of the study: *Staphylococcus aureus* can cause several diseases in humans and animals. The aim of this research was to confirm *S. aureus* from fish and ground beef samples by the species-specific fragment (Sa442) and thermonuclease gene (*nucA*), to characterize the *S. aureus* isolates by polymerase chain reaction based restriction fragment length polymorphism (PCR-RFLP) of the coagulase gene (*coa*), and to investigate the presence of toxic shock syndrome toxin gene (*tsst*) and exfoliative toxin genes (*eta*, *etb*), to determine phenotypic virulence determinants such as production of slime and beta-lactamase as well as antimicrobial resistance profiles of *S. aureus* from meat samples.

Material and Methods: Of the 36 *S. aureus* isolates, 19 were from fish samples including freshwater fish (*Oncorhynchus mykiss*) and seawater fish (*Sparus aurata*) and 17 were from ground beef samples. Phenotypically identified *S. aureus* isolates were also confirmed as *S. aureus* using the *S. aureus* specific fragment (Sa442) and *nucA* gene. For molecular typing of all *S. aureus* isolates based on the PCR-RFLP assay, amplification of the *coa* gene of isolates was carried out. The PCR products of the *coagene* were digested by both *AluI* and *HaeIII* restriction endonuclease enzyme according to manufacturer's instructions. Phylogenetic analysis was performed using NTSYS-pc (version 2.10) software package. Similarity among the isolates was determined using the Dice's similarity and a dendrogram was constructed with the unweighted pair group method using arithmetic average (UPGMA) clustering. Some virulence associated genes (*tsst*, *eta*, *etb*) of *S. aureus* were examined using single PCR. The slime production and beta lactamase activity of *S. aureus* isolates were examined using Congo Red Agar and acidometric strip method, respectively. Resistance to various antimicrobial agents of isolates was detected on Mueller Hinton Agar by disk diffusion method.

Results: PCR-RFLP typing based on the polymorphism of the *coa* gene was used to discriminate the *S. aureus* isolates from fish and ground beef samples. The 36 *S. aureus* isolates produced only one amplicon followed by the amplification of the *coa* gene. The PCR product of the *coagene* revealed five different amplicons in size ranging approximately 442 to 730 bp. In *S. aureus* isolates, seven and six different RFLP profiles were generated by digestion of *AluI* and *HaeIII* restriction enzymes of the *coagene*, respectively. None of the *S. aureus* isolates from fish and ground beef was found to be positive for *tsst*, *eta* and *etb* gene. All isolates were positive for slime production. Besides, 41.7% of isolates produced beta-lactamase. The highest frequency of resistance to ampicillin (91.7%), followed by tetracycline (22.2%), vancomycin (16.7%) and erythromycin (8.3%) was detected in *S. aureus* isolates. A total of 94.4% of *S. aureus* isolates were resistant to at least one antimicrobial agent and 44.4% of them to at least two or more antimicrobial agents.

Keywords: *Staphylococcus aureus*, *nucA*, Sa442, RFLP, antimicrobial resistance, food.

Phenotypic and Genotypic Characterization of *Lactobacillus* spp. Isolated from Dairy Products and Determination Probiotic Properties

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Aim of the study: Lactic acid bacteria include quite a lot of number of species. LAB have various strains which called lactobacillus, streptococcus, lactococcus and leuconostoc are important dairy products consequently LAB used to be called "milk-souring organisms. Lactobacillus spp. is one of the most significant genera of LAB that play a major fermentative role affecting the aroma, texture and acidity of the product. Their crucial importance are having metabolic capabilities and probiotic properties. In this research, it has been aimed that isolation lactobacillus spp. from different sources and identification and also determination of their probiotic properties.

Material and Methods: In this research, a total of nineteen yoghurt, three cheese and one kefir samples were collected from the Tekirdağ, Edirne, Hatay, Van, Antalya in Turkey, were used to isolate and identify the lactobacillus spp. using conventional phenotypic (Gram reaction, catalase reaction, cell morphology, gas production, hydrolysis of arginine, Growth at different temperatures and different salt concentration) and genotypic methods. Some probiotic properties (antibacterial activities to *Escherichia coli* ATCC 25922, *Listeria monocytogenes* DSM12464, *Staphylococcus aureus* ATCC6538, *Enterococcus faecalis* ATCC51299, *Salmonella Enteritidis* ATCC 13076, hydrogen sulphur and hydrogen peroxide production, toleration of acid pH:3 and bile salt 0.3 %, sensitivity to antibiotics: penicillin G, chloramphenicol, erythromycin, gentamycin, kanamycin, streptomycin, tetracycline, vancomycin and hydrophobicity ability to xylene) was determined.

Results: As a result of phenotypically and genotypically characterization procedures, they were determined 20 *Lactobacillus delbrueckii subsp. bulgaricus*, four *Lactobacillus paracasei subsp. paracasei*. The isolates showed 99% similarity to reference strains. They have lowing hydrophobicity characteristics, All isolates generally have bacterial inhibition effect to reference strains. Some part of the isolates were proven to produce hydrogen peroxide. Our study demonstrated some important strains of *Lactobacillus* spp. isolated from yoghurt, cheese and kefir, they have potential probiotic properties.

Acknowledgements: This work was supported by the Namık Kemal University Scientific Research Projects Unit (Project No: NKUBAP.23.GA.16.082).

Keywords: dairy product, yoghurt, cheese, kefir, *Lactobacillus* spp.

Production of Bacterial Cellulose and Isolation of Acetic Acid Bacterium from Wine Vinegar

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Aim of the study: The objective of this study is to isolate acetic acid bacterium from local wine vinegar of Çal (Denizli) region for determining its potential to produce bacterial cellulose. The structure of bacterial cellulose was also analysed by SEM.

Material and Methods: In this study, wine vinegar produced from Çal (Denizli) region grapes in 2015 by Çal Vocational High School, Pamukkale University was used for bacterial isolation. Carr and Frateur's (CaCo₃-Ethanol) indication methods were followed for isolation protocol of acetic acid bacteria. Gram(-) rod shape bacteria selected from Carr and Frateur's media were grown in Hestrin-Schramm (HS) broth for bacterial cellulose biosynthesis under static incubation conditions (30°C). Pellets formed on the surface of HS medium were collected and washed by 0.1 M NaOH solution in water-bath for separating bacteria and medium from the pellets. After water-bath pellets were freeze-dried for Scanning Electron Microscopy (SEM). Dry and wet weights of bacterial fibrous endproducts were taken in order to determine the water holding capacity.

Results: Isolate obtained from wine vinegar main source were called as acetic acid bacterium as a result of the inoculation in Carr and Frateur's (CaCo₃-Ethanol) media and named as strain S1. Strain S1 was then inoculated in Hestrin-Schramm (HS) medium for controlling the pellet formation on the surface. Jelly pellets were freeze-dried for Scanning Electron Microscopy (SEM) and weighed before and after freeze-drying for determining the water holding capacity. Water holding capacity of the sample is calculated as 24.459 gr (wet weight:24.585; dry weight:0.1260). According to SEM analyses, freeze-dried sample showed cellulose-like fibrous patterns.

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Keywords: Acetic acid bacteria, Bacterial cellulose, Isolation, SEM.

Synergistic Antimicrobial Activity of Boric Acid and Biosynthesized-Hydroxyapatite against Oral Pathogenic Microorganism

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Aim of the study: Hydroxyapatite (HAp) is a calcium phosphate similar to the human hard tissues in morphology and composition. It has excellent biocompatibility and is able to promote osteoconduction and osseointegration for dental applications. Turkey has the largest boron deposits in the world. Boric acid has been used in medicine as a bactericide, a fungicide, and an antiseptic since the 1860s. This study is aimed to demonstrate the in vitro antimicrobial properties of boric acid and hydroxyapatite from fish scale by-products (HAp) against pathogenic strains and investigate the synergism of the combination of boric acid and HAp.

Material and Methods: Hydroxyapatite was synthesized by using the fish scales as by-product of a seafood processing company. Boric acid has been provided commercially. The antimicrobial activity of synthesized hydroxyapatite and boric acid were tested by agar well diffusion assay against *Candida albicans* ATCC 10239, *Staphylococcus aureus* ATCC 25923, *Streptococcus mutans* ATCC 25575 and *Streptococcus sanguis* ATCC 10556 which were provided from Culture Collection of Mugla Sitki Kocman University (MUKK).

Results: As an expected result, HAp showed no antimicrobial against tested microorganisms. Boric acid was found to be highly active against *C. albicans* with 29 mm zone of inhibition (ZOI). When combining the HAp and boric acid together, ZOI was measured as 35 mm for *C. albicans*. ZOIs of the HAp and boric acid combination were 20, 19 and 18 for *S. aureus*, *S. sanguis* and *S. mutans*, respectively. Results verified the synergism between boric acid and HAp. The addition of boric acid to the suspension of hydroxyapatite resulted in faster elimination of the bacteria. It can be concluded that, boric acid has great potential to enhance the antimicrobial properties of HAp for dental applications.

Keywords: Hydroxyapatite, Boric acid, Antimicrobial, Pathogen, Dental.

The Antistreptococcal and Antibiofilm Activities of *Citrus bergamia* Risso et Poiteau Oil, an Alternative for Oral Infections

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Aim of the study: In this study, the antistreptococcal and antibiofilm activities of the volatile oil obtained from *Citrus bergamia* (bergamot) fruit peel were investigated. The fruit is sour, and its aromatic peel is used in Earl Grey tea and in perfumery. This study is important for determination an alternative antistreptococcal and antibiofilm agents used in food and medical industry.

Material and Methods: The volatile oil of bergamot fruit peels were obtained with hydrodistillation method. The antibacterial and antibiofilm activities were investigated against oral streptococci; *Streptococcus mitis*, *Streptococcus sobrinus*, *Streptococcus parasanguinis* and *Streptococcus sanguis*. The antistreptococcal activity of the volatile oil determined with disc diffusion and tube dilution methods. The antibiofilm activity of the oil on the test bacteria was studied by crystal violet assay. Antibiofilm activity was also monitorized by Scanning Electron Microscopy (SEM).

Results: The volatile oil of *C. bergamia* show strongly antistreptococcal activity. The greatest inhibition zone is seemed on *S. sanguis* (33 mm). This inhibition zone is near to the inhibition zone at amoxicillin (43 mm). The other inhibition zones of the volatile oil are 28 mm on *S. mitis* and *S. parasanguinis*, and 21 mm on *S. sobrinus*. The minimum inhibitory concentrations of the oil were determined between 1.25 mg/ml and 2.5 mg/ml on the test bacteria. The maximum antibiofilm activities were observed on *S. sobrinus* (95.82%) and *S. sanguis* (91.63%) at 2.5 mg/ml concentration. The results showed that the volatile oil of bergamot fruit peel have significant antistreptococcal and antibiofilm effects on oral streptococci. These activities are important for dental and medical industry as well as in the food processing.

Keywords: *Citrus bergamia*, *Streptococci*, antibiofilm activity.

The Effect of *Glomus intraradices* on Gossypol Synthesis of *Verticillium dahliae* Inoculated Cotton Plants

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Aim of the study: *Verticillium dahliae*, a soil borne pathogen, occurs worldwide and many herbaceous plant species are known to be susceptible to disease. Arbuscular mycorrhizal fungi are beneficial organisms that colonize plant roots and have many benefits to plants. In this study, the effect of mycorrhizal fungus *Glomus intraradices* on gossypol synthesis in *Gossypium hirsutum* cv. "Carmen" - *Verticillium dahliae* plant - pathogen system at pot conditions.

Materials and Methods: *Glomus intraradices* inocula incorporated 2–3 cm below the seeds at pots containing the mixture of autoclaved soil, sand, and pumice (1/1/1, v/v/v). After the germination of seeds, plants were inoculated with *V. dahliae* artificially at 10 ml of 10⁶ spores ml⁻¹. At the end of the experiment, symptoms were evaluated based on a 0–4 scale: where 0=Healthy plant, 4=severe wilting and detached leaves. Treatments were only pathogen, only mycorrhizal fungus and their combinations. Gossypol was extracted weekly periods and amounts were measured spectrophotometrically.

Results: Mycorrhizal fungus colonisation was reached at 52.5% at eighth weeks. Accordingly, mycorrhizal colonization reduced the severity of disease in plants. Gossypol amounts were increased with colonisation in mycorrhizal fungus treatment compared to control weekly. Gossypol amounts were more increased mycorrhizal fungus plus pathogen treatment. Gossypol synthesis was induced with *V. dahliae* inoculation while it started to decreased at sixth weeks. As a result, It has been determined that gossypol has a certain impact on the disease resistance during eighth weeks.

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Keywords: *Glomus intraradices*, *Verticillium dahliae*, cotton, gossypol.

The Effect of Increasing Mycorrhiza Applications on Nutrition of Pak Choi (*Brassica rapa* L. subsp. *chinensis* L.) Plant

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Aim of the study: The study was done to determine the effect of increasing mycorrhiza application on some macro nutrient element contents of Pak Choi (*Brassica rapa* L. subsp. *Chinensis* L.) plant. Owing to Pak Choi plant that is an exotic plant and economically valuable for our and a lot of country in the world.

Material and Methods: Research was designed as 3 replications according to randomized block experimental design. Pak Choi seedlings became 2 to 3 true leaves (21 days for pak choi after seed sowing) they were planted to pre-prepared places in high tunnel cold greenhouse with 10 × 10 cm intervals and 10 plants in each parcel. Then five mycorrhiza doses (I. dose: 0 mL /plant, II. dose: 15 mL / plant, III. dose: 20 mL / plant, IV. dose: 30 mL /plant and V. dose: 40 mL /plant) were applied a month before harvesting and plants were harvested 54 days after seed sowing. Some macro and micro nutrient elements (P, K, Ca, Mg, Fe, Cu, Mn and Zn) contents of plants were determined via ICP-OES instrument. Analysis results were evaluated SPSS 21 statistically program.

Results: According to the experiment results, important increases in some macro and micro nutrient element contents of Pak Choi plant were determined with increasing mycorrhiza applications. The contents were determined as P (0.38%, 0.42 %, 0.45 %, 0.49 % and 0.51 %), K (4.01 %, 4.30 %, 4.41 %, 4.56 % and 4.70 %), Ca (1.83 %, 2.01 %, 2.06 %, 2.20 % and 2.36 %), Mg (0.14 %, 0.15 %, 0.15 %, 0.16 % and 0.16 %), Fe (309 mg/kg, 417 mg/kg, 678 mg/kg, 1009 mg/kg and 1696 mg/kg), Cu (5.49 mg/kg, 6.10 mg/kg, 6.53 mg/kg, 7.05 mg/kg and 7.63 mg/kg), Mn (45.90 mg/kg, 52.23 mg/kg, 60.20 mg/kg, 70.40 mg/kg and 80.00 mg/kg) and Zn (32.23 mg/kg, 35.40 mg/kg, 37.00 mg/kg, 40.70 mg/kg and 46.86 mg/kg) at I. dose: 0 mL /plant, II. dose: 15 mL /plant, III. dose: 20 mL /plant, IV. dose: 30 mL /plant and V. dose: 40 mL /plant, respectively. These P, K, Ca and Mg contents increases were determined significant at the level of 5 %, statistically. The highest nutrient element contents of Pak Choi plant were obtained V. dose: 40 mL /plant applications for P, K, Ca, Mg, Fe, Cu, Mn and Zn nutrient elements.

Keywords: Mycorrhiza, macro and micro element, Pak Choi (*Brassica rapa* L. subsp. var. *Chinensis* L.), exotic vegetable.

The Effect of Increasing Mycorrhiza Applications on Some Biological Properties of Baby Carrots (*Daucus carota* L.) Plants

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Aim of the study: The study was done to determine the effect of increasing Mycorrhiza application on some biological properties of baby carrots plant.

Material and Methods: A pot experiment was done according to randomized block experimental design, with three replications in greenhouse conditions. Soil samples filled in pots 4 kg soil / pot. Baby carrots seeds were sown as pots. Three plants were left in each pot. Some chemical properties of soil sample as, pH: 6.5, EC $\times 10^6$: 700, organic matter: 3.9 %, lime: 5.2 %, exchangeable potassium (K_2O : 128 kg.da⁻¹), available phosphorus (P_2O_5 : 9.25 kg.da⁻¹) and texture: Clay (C). Six Mycorrhiza doses (I. dose: 0 mL /pot, II. dose: 120 mL / pot, III. dose: 150 mL / pot, IV. dose: 180 mL /pot, V. dose: 210 mL /pot and VI. dose: 240 ml/ pot) were applied and plant samples were harvested 60 days after sowing. Some biological properties of baby carrots plants (tuber diameter, height of leaf, number of leaf) were determined. Analysis results were evaluated SPSS 21 statistically programme.

Results: According to the pot experiment results, important increases in some biological properties of baby carrots plant were determined with increasing Mycorrhiza applications. The root diameter were determined as 9.79 cm, 11.09 cm, 12.58 cm, 13.80 cm, 14.25 cm and 14.25 cm; height of leaf 12.98 cm, 15.11 cm, 15.00 cm, 16.07 cm, 17.79 cm and 16.81 cm; number of leaf 7.11 cm, 7.44 cm, 6.99 cm, 7.89 cm, 7.66 cm and 8.11 cm at I. dose: 0 mL /pot, II. dose: 120 mL / pot, III. dose: 150 mL / pot, IV. dose: 180 mL /pot, V. dose: 210 mL /pot and VI. dose: 240 ml/ pot, respectively. These root diameter and height of leaf increases were determined significant at the level of 5 %, statistically. The effect of Mycorrhiza application on number of leaf was not found statistically significant.

Keywords: Mycorrhiza, root diameter, height of leaf, baby carrots

The Effects of Fungi in The Loggerhead Sea Turtles Nests, (*Caretta caretta* L.), at İztuzu Beach (Dalyan, Turkey)

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Aim of the study: The loggerhead sea turtle, *Caretta caretta*, is a least concern species being monitored by many conservation bodies. The primary factor affecting the continuation of the formation of sea turtles is known as the threats to the nests. These factors can be divided into biotic and abiotic. Wave erosion and industrial wastes are the most important factors affecting the success rate of hatching in sea turtle nests located on beaches. In addition to these factors, nest temperature, moisture and microorganisms found in sand are among the factors affecting success. The fungi colonizing the nesting sand and eggs were tried to uncover the possible effects of the nesting sea turtles.

Material and Methods: The nesting beaches of İztuzu at Dalyan (Muğla), one of the nesting beaches of the loggerhead turtle *Caretta caretta* in the Turkey. Turtles nest annually between May and August. All samples were taken at 2015 nesting season. Our 16 nest sands from 50 cm deep and above had been chosen for sampling. Sand samples were gathered on two separate field trips. We collected both samples using known laying time or ending of incubation time. Samples were taken from eggs with sterile injectors from undamaged eggs. The samples were inserted into sterile urine containers and brought to the laboratory by cold chain. The samples were refrigerated at +4°C. Then transported to the microbiology laboratory within 24 hours. Sand samples were shaken for 1 minute after dilution. All samples transferred to Sabrouth Dextrose Agar (SDA) by spreading method. The samples for inoculation were left for incubator.

Results: Three species of fungus were identified from the sampling of the sand. Dominant species were *Aspergillus* sp., and sub-dominant species were *Fusarium* sp.. Two of them were found in all the nests. In the embryonic period, *Aspergillus* sp. was also isolated as a dominant species. *Fusarium* sp. was detected as subdominant. In the embryonic distribution, 63% of the eggs were unfertilized eggs and 37% were fertilized. Embryos in fertilized eggs were studied in three stages as early, middle and late. In total, infections were detected in 66% of dead embryos in the samples.

Acknowledgements: This study was supported by the project of 2015FBE046 by Pamukkale University coordinator of scientific research.

Keywords: Loggerhead, *Caretta caretta*, Nest, Microbiology.

The Exchanging of Leaf Micromorphological Characters in *Pyracantha coccinea* Depends on Traffic Intensity

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Aim of the study: There are many pollutants that emerge from urban roads due to exhaust gases, car wheels, and vehicles. These pollution sources affect the development of living things in the environment they are in, the accumulation of pollution factors in the living bodies, and some living things cause significant deformations. These accumulations and deformations that occur in the plants are used for the purpose of detecting the pollution coming from the traffic. The use of plants as biomonitor is mainly through determination of the amount of pollutants in the plant. However, pollutants harm plants, organs, tissues and cells. These damages can sometimes be seen, and most of the damage is not visible to the naked eye. In this study, it was aimed to determine the variation of leaf micromorphological properties of *Pyracantha coccinea*, which is used extensively in landscape studies in many parts of Turkey depending on the traffic intensity.

Material and Methods: Stoma images of leaf samples collected from the regions where the traffic intensity is at different levels were obtained by electron microscopy. The measurements made on these images were measured Stoma Length (SL), Stoma Width (SW), Stomatal Density (SD), Pore Aperture (PA) and Pore Length (PL). The obtained data were evaluated as statistics and it was attempted to determine how these characters changed according to traffic intensity.

Results: As a result of the study, it was determined that the traffic intensity affected all the characters studied at statistical level of 99.9% confidence level. Stoma Length (SL), Stoma Width (SW), Pore Aperture (PA), and Pore Length (PL) were found to be statistically insignificant in areas with low traffic and no traffic. It was determined that these values are higher in areas where traffic is heavy. The highest values for Stomatal Density (SD) were obtained in areas where the traffic was less density.

Acknowledgements: All authors work equally.

Keywords: *Pyracantha coccinea*, leaf, micromorphological characters, traffic, stoma.

Adsorption Equilibrium Studies on the Raw Çaldıran Diatomite (Çaldıran/Van) of Heavy Metal (Lead)

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Aim of the study: The aim of the present investigation was to study the sorption mechanism of Lead(II) ions onto original diatomite and to determine the equilibrium and kinetic parameters of the process. With this aim in mind, sorption isotherms have been measured at different temperatures and the Langmuir, Freundlich and Dubinin–Radushkevich (D–R) model parameters and the thermodynamic parameters determined. The kinetic adsorption results have been analyzed using pseudo-first-order, pseudo-second-order reactions, intra-particle diffusion model and elovich kinetic model, respectively.

Material and Methods: Washing process; diatomite sieved at a mill and then passed through a 230 mesh sieve was dried at an oven for 5.5 h. 100 g diatomite was mixed with a stirrer in 1.7 L distilled water for 12 h. Then, the mixture was left 12 h. The solid phase was then separated by filtration, which was left at room temperature for 168 h to dry. The dried diatomite was passed again from a 230 mesh sieve. Adsorption of lead ion to original diatomite at 25 °C, 35 °C and 45 °C was investigated at three different concentrations (25,40,55 ppm) and pH 5.5. After adding 2.5 g diatomite (adsorbent) to metal solutions (1L) whose concentrations and pHs were fixed, they were placed in a thermostatic water bath to keep temperature constant and mixed constantly by mechanic stirrers for 360 min to achieve adsorption. After 5 to 360 minutes periods, the solution was filtered and then the remained heavy metal amount in the solution was detected by AAS. From these data, adsorption isotherms as well as kinetic and thermodynamic parameters were calculated. Diatomite was characterized by several techniques such as FTIR, X–Ray, SEM, BET, TGA, surface area and chemical analysis etc.

Results: The surface area of diatomite used in this study was calculated as 48 m²/g. The adsorption capacities of the original diatomite Pb(II) ions increased linearly with increasing initial concentrations of these ions. It was found that adsorption process fitted Freundlich isotherm. In Temkin isotherm model, increase in K_T values as temperature increases leads to increasing of maximum adsorption capacity and strengthening of relationship between adsorbent and adsorbate. In Dubinin-Radushkevich (D-R) isotherm, an E value of higher than 16 kJ/mol indicates that sorption process is chemical adsorption. From kinetic models, it fits pseudo second order kinetic model. ΔG^0 values are negative for Pb(II) adsorption on original diatomite and these values indicate that adsorption is spontaneous. These values decrease with an increase of temperature. Furthermore, better adsorption is obtained at higher temperature. In conclusion, it was found that diatomite can be used for removal of heavy metals (lead) from wastewaters.

Keywords: Environmental toxicology, Diatomite, Lead, Adsorption.

OP316
Biodiversity of Turkish Marine Sponges

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Aim of the study: This study aims to show the latest situation in Turkish marine sponge biodiversity. Studies on marine sponge diversity in the coastal areas of Turkey are limited. A total of 136 species of marine sponges have been recorded in the Turkish seas, with 82 species from the Aegean Sea, 63 species from the Sea of Marmara, 51 species from the Levantine Sea, and 18 species from the Black Sea.

Materials and methods: The number of Turkish sponges was determined by checking the literature. Sampling was also carried out by scuba diving with a maximum diving depth of 40 m. All samples were fixed in alcohol (70%). Species were identified at the Zoological Museum of Amsterdam, the Netherlands, using the method described in detail by Van Soest et al. in 2000.

Results: In total 136 species of marine sponges have been recorded in the Turkish seas. Seven of them have been recorded in studies by us as new to the sponge fauna of Turkey. These are the species *Haliclona sarai* (Pulitzer-Finali, 1969); *Scalarispongia scalaris* (Schmidt, 1862); *Hyrtios collectrix* (Schulze, 1880); *Dendrectilla tremitensis* Pulitzer-Finali, 1983; *Dictyonella incisa* (Schmidt, 1880); (*Axinyssa aurantiaca* (Schmidt, 1864); and *Halichondria* (*Halichondria*) *contorta* (Sarà, 1961). A new *Hymedesmia* species, *Hymedesmia* (*Hymedesmia*) *anatoliensis* sp. nov., is also described by us from the western coast of Turkey. The first report of sponges from the coasts of Turkey dates back to 1885, in which 5 sponge species were reported from the Strait of Çanakkale. The latest report on sponges of the Turkish coasts is from 2016, in which 5 sponge species were reported from the Black Sea. This study summarizes the biodiversity of the marine sponges of Turkey. In the Greek Aegean Sea, in contrast, more than 200 sponge species have been reported. Therefore, it is expected that the number of known sponge species of Turkey will increase significantly with further fieldwork.

Keywords: *Hymedesmia*, new species, Demospongiae, Turkey.

Clonal Almond Breeding by Crossing in Turkey

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Aim of the study: This project was conducted to breed nematode-resistant clone rootstocks in almond that is limited in our country. Throughout the three-year-study (2012-2014), some targeted rootstock candidates were obtained after hybridization between almond and plum.

Material and Methods: Some characteristics which are strong growth ability, compatibility to other almond cultivars, nematode resistance and rooting were gathered in hybrid almond types. In hybridization studies, one almond cultivar (Ferragnes) and two plum species (Myrobalan and *Pissardi nigra*) as female parents and two plum (Myrobalan and *Pissardi nigra*), two almond cultivars [Ferragnes and AB3 (*Amygdalus orientalis* Mill. Type)] as male parents were used. Totally, a six-combined hybridization was made. Those were; Myrobalan x Ferragnes, Myrobalan x AB3, *Pissardi nigra* x Ferragnes, *Pissardi nigra* x AB3, Ferragnes x Myrobalan and Ferragnes x *Pissardi nigra*. Nematode-sensitive parents (AB3 and Ferragnes) were not cross-hybridized. Pollen vigor, pollen germination, fruiting ratio and nematode-resistance were investigated in parents. Seedlings that were gained by six-combined hybrids (F1) were planted to area with the spaces of 1 x 0,5 m Growth, grafting success, budding affinity, nematode-resistance of seedlings and rooting of cuttings were examined. Some characteristics of hybrids such as budding affinity, nematode-resistance and rooting of cuttings were considered and results were evaluated according to the weight-rank method.

Results: In consideration to selected characteristics, the highest scored hybrids [FS2 (810), FS19 (810), FS22 (780), FS23 (720) and FC4 (720) were evaluated as nematode-resistant almond rootstocks clone candidates.

Acknowledgments: This study was supported by the Scientific and Technological Research Council of Turkey (TÜBİTAK) with project number 111O133.

Keywords: Almond, clonal rootstock, hybridization, affinity, nematode.

Determination of the Allelopathic Effects of Jojoba (*Simmondsia chinensis* Link Scheinder) and Lavender (*Lavandula angustifolia*) Plants on the Seed Germination and Hormone Development of Different Cultivated Plants

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Aim of the study: Today, in parallel with the sharing of risks related to the use of synthetic pesticides in agricultural areas, organic agriculture has begun to gain importance and allelopathic potentials of jojoba (*Simmondsia chinensis*) and lavender (*Lavandula angustifolia*) plants have been searched for since this production line is likely to gain more importance in the near future. The percentage of germination of seeds and the amount of hormones were examined.

Material and Methods: Jojoba (*Simmondsia chinensis*) and lavender (*Lavandula angustifolia* M.) leaves were collected and dried in seasonal periods. The dried leaves were shredded by blender and the seeds were crushed in press and weighed 4g on a precision scale and extracted with solvent (n-hexane) for 6 hours in a Soxhlet device. From these seeds, the fuller, firm-looking and similar-sized ones were selected and placed into the petri dishes prepared with filter papers in a way to be 10 each in a controlled manner. The seeds were moistened by adding 8 ml of extracts of jojoba and lavender plants at different successive concentrations (5%, 10%, 15%) with control (distilled water) and allowed to germinate for 1-4 days at 25°C on average. For hormone analysis, 2 g of samples were taken. 10 ml of 98% ethanol was added into them and were mixed in the homogenizer for 2 minutes. They were kept in the water bath at 40 ° C for 1 night. At the end of this period, centrifugation was carried out at 4000 rpm for 5 minutes. The organic phase was removed and completely evaporated at 40 ° C on a rotary evaporator until it dried.

Results: When the plant extracts used were examined in general, they highly caused to inhibition of germination. In studies, it was suggested that the high rate of inhibition in germination experiments under laboratory conditions was due to petri-experiments. In germination inhibition, enzymes such as α -amylase, lipase and protease have been observed to be suppressed by allelochemicals in the extracts. In experiments with germinated seeds, root thickening and discoloration were observed in addition to the inhibitory effect of lavender extracts on radicle and plumula length, and it was concluded that these phytotoxic effects were caused by allelochemicals contained in the extracts.. Gibberellic acid is one of the most important growth regulators used to break the dormancy. Hormone analysis results indicate that gibberellic acid levels are high in lavender seed and leaf extracts (lavender seed: $461,10 \pm 3.55$, lavender leaf: 816.52 ± 25.21), while the ratio of abscisic acid (ABA), which suppresses germination, is also high in jojoba leaf and lavender leaf extracts (jojoba leaf: 3.98 ± 1.25 , lavender leaf : 3.13 ± 0.56) These results are in line with previously obtained germination rates and can be regarded as another indication that plant extracts inhibit seed germination.

Acknowledgement: This study was supported by Pamukkale Scientific Research Unit (BAP, Turkey) Project No: 2014FBE010

Keywords: *Lavandula angustifolia*, *Simmondsia chinensis*, germination, hormone.

Determination of the Aphid Species Feeding on Wheat and Their Population Growth In The District of Çumra and Karapınar (Konya)

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Aim of the study: This study was conducted to determine the aphid species causing yield loss of wheat and their population growth through the growing season between 2014-2015 and 2015-2016 at two localities in Konya which is including Çumra and Karapınar.

Material and Methods: Studies were conducted in Çumra and Karapınar, to determine aphid species and also population distribution. The observations of aphids were done from the 1st of April till the end of growing season and performed by weekly counting of aphids on randomly selected 20 plants. All counting is monitored during the growing period 2014-2015 and 2015-2016. Collected aphids were examined in laboratory and aphids were preserved in 1.5 ml tubes, containing 70% alcohol, until identification. Aphids were identified by Prof. Dr. Meryem UYSAL from Selcuk University.

Results: During the growing period 2014-2015 only *Rhopalosiphum padi* (L.) and *Sitobion avenae* were found feeding cereal aphids on wheats both Çumra and Karapınar localities. In addition this localities the aphid population exhibited lower densities during to growing period. In 2015-2016 period at Çumra locality *R. padi* (L.), *S. avenae*, *Diuraphis noxia* and *S. elegans* were found on wheats. The first aphids colonized wheat plants in early May, and their abundance was low throughout the early season, began to increase in late May and peaked in early June. In this period *D. noxia* was found as a common harmful insect. Also it was observed that after tillering stage and on the 1th of June 2016, the population reached the peak point by 7.8 aphids/per plant and remained on that level until hard dough stage. In 2015-2016 period at Karapınar locality *R. padi* (L.), *R. maidis*, *S. avenae*, *D. noxia* and *S. elegans* were found feeding cereal aphids on wheats. In this locality all aphids was found less than 2 aphids/per plant on weekly counting and *R. padi* was determined in lower densities on leaves in mix with *R. maidis*.

Keywords: Cereal aphids, wheat, population growth, *D. noxia*.

Different Plant Extracts Effect Proliferation and NO Activity in NSCLC Cell Lines

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Aim of the study: Geophyte is a general name given to plants which under the ground body such as bulbs, tubers and rhizomes, gained ability to store nutrients. *Cyclamen* L., belonging to the Primulaceae family, is a tuberous perennial geophyte, and some taxa of this genus have been used for their biological activities in folk medicine. In Turkey, this genus is represented with 12 taxa, 5 of which are endemic. Nitric oxide (NO) is a potent pleiotropic mediator of physiological process such as smooth muscle relaxant, neuronal signaling and regulation of cell mediated toxicity. It is a diffusible free radical, which plays many roles as an effector molecule in diverse biological systems including neuronal messenger, vasodilatation, antimicrobial and antitumor activities. Although NO radical is involved in host defense, over production of this radical contributes to the pathogenesis of some diseases. *To the best of our knowledge*, this study is the *first to investigate* the effects of some *Cyclamen* taxa on proliferation and NO inhibitory activity in LPS-activated non-small cell lung cancer (NSCLC) cell lines.

Material and Methods: In the present study, three *Cyclamen* taxa; *C. pseudibericum* Hildebr. (endemic), *C. mirabile* Hildebr. (endemic) and *C. persicum* Mill. were collected from different localities in Turkey. The tubers of plants were air-dried and grounded to fine powder and then extracted with ethanol. The effect of three *Cyclamen* taxa on cell viability of human NSCLC cell lines (H1975 and HCC78) was determined by using CellTiter Glo assay. Experiments were conducted along with control and seven different concentrations (1, 10, 30, 50, 75, 100, 200 µg/ml) of the test extracts. The nitric oxide assay was performed as described by Yang et al. (2009). After preincubation of H1975 and HCC78 cells (5×10^3 cells/well) with LPS (1 µg/ml) for 24h, the plant extracts (1, 10, 30, 50, 75, 100, 200 µg/ml) were added and incubated for 48h. The quantity of nitrite in the culture medium was measured as an indicator of NO production. Amount of nitrite, a stable metabolite of NO, was measured using Griess reagent.

Results: Among the three *Cyclamen* tuber extracts evaluated, the highest cytotoxic activity was obtained from *C. persicum* compared to other two *Cyclamen* taxa. We found that *C. persicum* has cytotoxic effects on H1975 and HCC78 cell lines and IC₅₀ values are 17.27 µg/ml and 34.15 µg/ml. Inhibition of NO production was measured as nitrite in the cell free culture supernatant. NO production by LPS-activated cells was found to be significantly inhibited by the plant extracts in a dose dependent manner. Among the different *Cyclamen* taxa, *C. persicum* exhibited the significant reduction of nitrite level to 203.75 µM at the concentration of 200 µg/ml in H1975 cells. The amount of nitrite in HCC78 cells was found as 198.75 µM at the concentration of 200 µg/ml for *C. pseudibericum*.

Keywords: *Cyclamen*, proliferation, nitric oxide assay, LPS, NSCLC cell lines.

Ecological Properties of the Lichenized and Lichenicolous Fungi in Çamlıyayla, Mersin, East Mediterranean, Turkey.

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Aim of the study: In this study, morphological and anatomical properties of some lichen samples were studied collected from Çamlıyayla East Mediterranean in Turkey.

Material and Methods: The lichen and lichenicolous fungi specimens were collected from 33 localities in Çamlıyayla (Mersin) between 2009-2012. Vouchers are deposited in Erciyes University Herbarium Kayseri, Turkey (ERC). The specimens were examined with an Olympus SZX-7 stereomicroscope and a Leica DM-1000 light microscope. Specimens were examined in water, 10% KOH and Lugol's solution. In general, spot tests were made to determine the compounds in the lichens, which are necessary for identification.

Results: As a result of lichenological exploration of Çamlıyayla located in The Mediterranean region in the border of İçel province a total of 174 taxa of lichenized and lichenicolous fungi belonging to 69 genera are determined. 126 taxa are new to Çamlıyayla (İçel).

Acknowledgements: Erciyes University Scientific Research Projects Unit contributed to this project. (FBY-11-3656).

Keywords: Çamlıyayla, Biodiversity, Ascomycota, lichen flora, lichenicolous.

Ecology of *Candelariella* Distributed in TurkeyZekiye KOCAKAYA¹, Mehmet Gökhan HALICI²¹ Bozok University, Boğazlıyan Vocational School, Department of Organic Agriculture,
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Aim of the study: The genus of *Candelariella*, one of the 4 different genus belonging to the family Candelarieaceae, is lecanorin or biatorin type apothecia and contains 8 or more spores in the ascus and also secondary compounds including pulvinic acid and its derivatives. Approximately 50 *Candelariella* species are known worldwide, and in Turkey 17 species.

Material and Methods: The morphological and anatomical characteristics of the samples collected from 81 provinces of Turkey were determined under the microscope, ecological characteristics were evaluated with notes taken in the field. Collected species were identified, recorded and deposited in Erciyes University and Bozok University herbarium.

Results: As a result of field and laboratory studies, the ecological environment in which the species are found and the types of substrates on which they develop have been identified. 17 species belonging to the genus *Candelariella* have been determined to distribute and ecological characteristics in Turkey. Ecological similarities and differences between species spreading in the world and in Turkey have been determined.

Keywords: Candelarieaceae, *Candelariella*, biodiversity, ecology, Turkey.

Effects of *Cyclamen graecum* and *Prospero autumnale* on growth performance of rainbow trout (*Oncorhynchus mykiss*)

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Aim of the study: The hormones, antibiotics and various chemicals are used to reduce the risks that negatively affected fish health in aquaculture. But, both ecological concerns and consumer health considerations have led fish producers and researchers to use natural materials more. Plants are used in food, medicine, pharmaceutical dye, insecticide, cosmetics and other sectors in recent years, research into the use of plant extracts as supplementation in diet has gained rapid in aquaculture. The aim of this study was to evaluate effects of diets including different *Cyclamen graecum* and *Prospero autumnale* extract levels on growth performance of rainbow trout (*Oncorhynchus mykiss*).

Material and Methods: *Cyclamen graecum* (C) and *Prospero autumnale* (P) were collected from Antalya and Denizli provinces at flowering season. Plant materials were dried in shade at room temperature and extractions were prepared using ethanol solvent in Pamukkale University, Faculty of Science, Department of Biology laboratory. Experimental diets were formulated to contain without *Cyclamen graecum* and *Prospero autumnale* extracts control (C), and with 0.05% (C0.05), 0.1% (C0.1) and 0.2% (C0.2) *Cyclamen graecum* and 0.05% (P0.05), 0.1% (P0.1) and 0.2% (P0.2) *Prospero autumnale* extract. Average body weight of fish samples was 14.44±2.03 g in initial of experiment. The rainbow trouts were stocked randomly in 21 rectangular fiberglass tanks (400 L) in groups of ten per tank with three replicates for each treatment. All groups feed was given three times per day, and experiment continued for 60 days. Water temperature held at 15.01±0.06 and pH was 7.91±0.02. The one-way ANOVA was used for statistical analysis.

Results: Final mean weights (FMW) of Control, P0.05, P0.1 and P0.2 groups were significantly greater than C0.05 (P=0.0344) and this group was also statistically lower than Control, P0.05 and P0.2 groups in specific growth rates (SGR). Feed conversion ratio (FCR) of C0.05 was higher than those of other groups (P=0.0208). Growth performance of rainbow trout (*O. mykiss*) was influenced by *P. autumnale* extracts. Further studies are required to evaluate the effect of other geophyte plants on the growth and health parameters of rainbow trout.

Acknowledgements: The study has been supported by TAGEM with the project number TAGEM/HAYSUD/2015/A11/P-01/7.

Keywords: *Cyclamen graecum*, *Prospero autumnale*, Growth performance, *Oncorhynchus mykiss*.

Identification of a symbiotic Nitrogen fixing bacteria from *Cronanthus orientalis*

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The aim of this study: Nitrogen (N) is considered a limiting nutrient for sustainable plant growth in many ecosystems. In N-poor soils, legumes have an advantage as they are able to fix nitrogen biologically from the atmosphere through a symbiotic association with soil bacteria collectively called *rhizobia*. This symbiotic interaction between legumes and their associated *rhizobia* is presently considered to be the main global contributor of biologically fixed N to the terrestrial ecosystem. In this study, we identified and characterized *Rhizobium* nodulating in *Cronanthus orientalis* grown in Izmir region (Turkey).

Material and method: we isolated bacteria from nodules of *Cronanthus orientalis* from Izmir region Turkey. The phylogenetic analyses were performed by using sequences of two housekeeping genes (16S rRNA and recA) and two accessory genes (nodC and nifH).

Results: One *Rhizobia* nodulating in *Cronanthus orientalis* was isolated and DNA sequencing results reveal that isolate may be closed to *Mesorhizobium opportunistum* genus based on the multiple sequence alignment and phylogenetic analysis and also it is certainly a member of alphaproteobacterium. The bacterium is only one and new genus isolated from *Cronanthus orientalis*.

Acknowledgments: We would like to thank Ege University for the financial support BAP-2012 Fen 015

Keywords: Endemic legumes, N fixation, nod Genes, *Cronanthus orientalis*.

Inventory Methods of the Wild Edible Mushrooms for Sustainable Forest Management Planning

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Aim of the study: Wild edible mushrooms such as *Lactarius sp.* are important non-wood forest product (NWFP) worldwide. Due to the increasing interest on these naturel resources in the national and international market, multiple-use forest planning is an alternative approach for the sustainable management of such products. The most important issue about integration of these products into sustainable forest management plans is the existence of a comprehensive inventory. Here, first step is to determine mushroom diversity in the planning unit. The second one is to predict the spatial distribution areas of important mushroom species. The last one is to estimate the mean annual yield of the related mushroom. Also, the integration of wild mushrooms into forest management plans requires to develop appropriate inventory methods of these mushrooms. However, current forest inventory is not an efficient method to estimate the diversity, abundance and distribution of these wild mushrooms. Thus, forest inventory has expanded its scope from only timber inventory to NWFP inventory. The primarily aim of the present study is to evaluate the appropriate inventory methods for mushroom species. These methods were undertaken for diversity, the geographic distribution and the potential amount of wild mushrooms separately.

Material and Methods: In this study, first of all the potentially available inventory methods for mushroom species were introduced based on the literature review. In addition, a case study of *Lactarius sp.* mushrooms in the Kızılıcasu planning unit in the Province of Kastamonu was conducted. To determine spatial distribution areas and productivity of *Lactarius sp.* in the study area, 153 temporary and 30 permanent sample plots were established respectively. All permanent plots were sampled during four years in mushroom season with a week interval. All sample plots, 10x10 sized, were selected randomly from different range of aspect, slope, elevation and stand characteristics in order to capture high variation in mushroom abundance. While each temporary plots was sampled only once, the permanent sample plots were sampled in the mushroom season of 2008, 2009, 2010 and 2012. To determine spatial distribution areas of related mushroom, absence or presence of *Lactarius sp.* was just monitored in each temporary plots without removing the fruiting bodies. To determine *Lactarius sp.* productivity, all *Lactarius sp.* cap diameter larger than 2cm were collected, and fresh weight and number of collected *Lactarius sp.* in each plot were recorded.

Results: Reviewed studies showed that there are many kinds of inventory methods used for the inventory of wild mushrooms. However, the selection of a useful sampling method depends on the type of information needed, time available, budget appropriate, topographic condition and overall objectives of the inventory such as spatial distribution, biodiversity and productivity. A case study of *Lactarius sp.* introduced the potentially appropriate sampling methods to predict spatial distribution and productivity of mushroom for sustainable forest management planning.

Acknowledgements: Monitoring of the plots was financed by KTU under project No: 2008.113.01.1. (759). We also wish to thank TUBITAK (The Scientific and Technological Resource Council of Turkey) for the financial support of through a PhD student fellowship.

Keywords: *Lactarius sp.*, mushroom diversity, spatial distribution, mushroom productivity, inventory, sustainable management

Investigation of the Antimicrobial Effect of Cleaning Products

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Aim of study: Surface cleaners, shampoos, shower gels, hand sanitizers, liquid soaps, dishwashing detergents are the cleaning products we use in daily life. Because water was not enough to provide hygiene. Soap and detergents perform cleaning and foaming of the washing process by reducing surface tension. Soaping for 15 seconds with soap provides enough hygiene for daily life by removing the existing microflora, together with the dirt containing most of the lipids, together with the soap. The products here used to provide personal and environmental hygiene. In this study, we investigated whether the products affect the human skin microflora and some pathogen microorganisms.

Materials and Methods: The antimicrobial activity of the products was investigated in some *Candida* species isolated from pathogenic samples (*Candida albicans* ATCC 10231, *Candida utilis* ATCC 9950, *Candida glabrata*); Gram negative bacteria (*Pseudomonas aeruginosa* ATCC 35032, *Escherichia coli* ATCC 35218, *Klebsiella pneumoniae* ATCC 13882, *Enterobacter aerogenes* ATCC 13048, *Serratia marcescens* ATCC 13880, *Salmonella typhimurium* ATCC 14028, *Proteus vulgaris* ATCC 33420; Gram positive bacteria (*Staphylococcus aureus* ATCC 25923, *Bacillus subtilis* ATCC 6633, *Micrococcus luteus* ATCC 9341). Disk diffusion method was used and the resulting zone diameters were measured. Nutrient Agar and Malt Extract Agar were used for activation of bacteria and yeast, respectively. The cultures were incubated at 30-37°C overnight. The inoculum size of each group of bacteria and yeast were prepared by using a no. 0.5 McFarland tube. It was kept to solidify at room temperature for a while and then holes were made on top with a sterile stick. 0.1 g of the cleaning products was dissolved homogeneously in 5 ml of distilled water. These holes were filled with 50 µl of cream samples. At the end of incubation time, the diameters of the inhibition zones formed on the Mueller-Hinton Agar was evaluated in millimeters.

Results: As a result of the study, antimicrobial activity was found in the products used. The highest antimicrobial activity was observed in shampoo, shower gel, surface cleaner and dishwashing detergent, while the least antimicrobial activity was; liquid hand soap, hand sanitizers. It was an unexpected result that the antimicrobial activity of the liquid hand soap we used most in daily life has the lowest effect. Because hand washing with hand soap is one of the cheapest and widespread hygienic measures to prevent infectious diseases it is more important to look at how the hands are washed, not with what. The observation of the highest antimicrobial activity in the dishwashing detergent was an important and expected result for the cleaning of many materials we use in everyday life.

Acknowledgments: This study was carried out at the Microbiology Laboratory of Biology Department, Faculty of Science and Letters, Adnan Menderes University.

Keywords: Hygiene products, Antimicrobial activity, Disk diffusion method.

Length-Weight Relationship and Growth Features of the Red Gurnard *Chelidonichthys cuculus* (Triglidae) from Izmir Bay, Aegean Sea

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Aim of the study: The red gurnard *Chelidonichthys cuculus* is identified as a possible commercial species and monitoring programmes should be carried out to get biological parameters for their stock assessment purposes. In this study, age, growth parameters and length-weight relationship of red gurnard in the Izmir Bay (Aegean Sea) were studied.

Material and Methods: The sampling was based on several bottom trawl surveys between December 2013 and October 2014 from Izmir Bay. Age, growth and length-weight relationship of 363 red gurnard samples, of which 180 female and 183 male, were analysed.

Results: Total lengths were ranged from 10.9 to 30.9 cm and from 14.1 to 29.5 cm for females and males, respectively. Weights were ranged from 8.09 to 79.25 g and from 11.20 to 80.30 g for females and males, respectively. The observed maximum age was 4 for both females and males. The length-weight relationships were calculated for females, males and both sexes as $W=0.1844 \times L^{1.9297}$, $W=0.3713 \times L^{1.722}$ and $W=0.2679 \times L^{1.8173}$, respectively. The von Bertalanffy growth equations were determined for females, males and both sexes as $L_t=47.14006 [1-e^{-0.11328(t + 1.78514)}]$; $L_t=40.95231 [1-e^{-0.144101(t + 1.70457)}]$ and $L_t=44.45026 [1-e^{-0.123977(t + 1.79154)}]$, respectively.

Acknowledgements: Thanks to the Scientific & Technological Research of Turkey (TUBITAK - 212T115) for financial support.

Keywords: Red gurnard, *Chelidonichthys cuculus*, length-weight relationship, growth parameters, Izmir Bay, Aegean Sea.

Mitigating Effects of Ascorbic Acid and Potassium Nitrate on Salt-induced Oxidative Stress in Tomato Plants

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Aim of the study: To determine roles of ascorbic acid (AA) and potassium nitrate in tolerance of tomato (*Lycopersicon esculentum* Mill.) to salt stress, the protective effects of ascorbic acid and potassium nitrate against salt-induced oxidative stress in the leaves of tomato were evaluated.

Material and Methods: The study was carried out in the field of application of Mugla Sıtkı Kocman University on tomato (*Lycopersicon esculentum* Mill.) that is widespread Muğla; Köyceğiz, Ortaca and Fethiye. Two seedlings of same size were planted into each pot filled with 2 L of a medium including peat and sand in 1:1 ratio. The experiment was carried out under natural conditions with an air temperature of 25–30°C during the day and 18–25°C during the night. Nutrition solution was replaced with fresh solution every 4 days during the growth period. The experiment was carried out with three replications. On day 21, two levels of potassium nitrate (10 and 20 mM K) and ascorbic acid (1 and 2 mM AA) and at different concentration combination of mentioned applications (15 mM K+1,5 mM AA) were started by adding sodium chloride (NaCl:125 mM) to the nutrient solution. Also, the same applications were made in the control group. After three weeks of treatments, leaves were collected. Fresh leaves were analysed for total chlorophyll (TCh), carotenoids, dry-weight (DW), membrane permeability (EC), relative water content (RWC), proline, malondialdehyde (MDA), superoxide dismutase (SOD), peroxidase (POD), catalase (CAT), hydrogen peroxide (H₂O₂).

Results: The results showed that salinity had a deleterious impact on plant biochemical and physiological parameters studied. The applications of potassium nitrate and ascorbic acid alleviated this adverse effect by increasing leaf relative water content and dry weight under stress conditions. Moreover, the activities of antioxidant enzymes (SOD, POD and CAT) as well as total chlorophyll and carotenoid content of plants were increased, although the MDA and proline contents were decreased after AA and K applications. The exogenous applications of potassium and ascorbic acid through either way significantly alleviated the adverse effects of salinity on growth and biochemical parameters of tomato plants. These higher levels of antioxidant enzymes might be attributed to their property to help develop the plant's resistance against oxidative damage.

Keywords: Antioxidative enzymes, *L. esculentum*, potassium nitrate, ascorbic acid, salt-stress.

Modeling relative risk infected plants using Poisson log linear modelAbdullah YEŞİLOVA¹, Evsel DENİZHAN², Sultan ÇOBANOĞLU³¹Biometry and Genetic/Agriculture Faculty, Yüzüncü Yıl University, Türkiye²Plant Protection/Agriculture Faculty, Yüzüncü Yıl University, Türkiye³Plant Protection/Agriculture Faculty, Ankara University, Türkiye

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Aim of the study: In the Poisson regression, the dependent variable is a risk ratio or a relative risk can be estimated as well as count data. Dependent variable is very suitable for modeling the occurrence of rare events such as infected plants.

Material and Methods: Sampling were conducted the coastal band of Van lake in 2013. It was construct two way contingency table between varieties (*Triticum aestivum* and *Secale cereale*) and location (Muradiye, Ahlat, Erciş, Doğu Beyazıt and Iğdır) in the this study.

Results: The reference parameters taken were as follows: *Triticum aestivum* for varieties, and Muradiye for location. The risk of infected plants for *Secale cereale* is 3.75 times higher as compared to *Triticum aestivum* and this difference was found statistically significant ($p < 0.05$). The risk of infected plants for Ahlat location is 0.934 times higher as compared to Muradiye location ($p > 0.05$), the risk of infected plants for Ahlat, Doğu Beyazıt is 0.940 times higher as compared to Muradiye location ($p > 0.05$), the risk of infected plants for Erciş location is 1.002 times higher as compared to Muradiye location ($p > 0.05$), and the risk of infected plants for Iğdır location is 1.101 times higher as compared to Muradiye location ($p > 0.05$). It was determined that all of the comparison for location were statistically insignificant.

Keywords: poisson regression, log linear model, infected plant, relative risk .

Physiological Effects of The Brown Seaweed (*Ascophyllum nodosum*) and Humic Substances on Growth and Some Enzyme Activities of Pepper Plants Growing under Salt Stress

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Aim of the study: Seaweed extract (SW) products known as the Brown algae and Humic acid (HA) are utilized commercially in the fraction of soluble dust. In this study, we examined that physiological and biochemical parameters for instance product yield, DW%, protein, proline, LPO and antioxidative enzyme activities of pepper plants (*Capsicum annuum* L.) were considered under salinity condition.

Material and Methods: A entire design experiment with triplicates was planned at application area of the Muğla Sıtkı Kocman University, Turkey. A greenhouse pot investigate was enforced from 02 March to 20 May 2015 with pepper plants (*Capsicum annuum* L.). Three seedlings of same size were planted into each pot filled with 20 L of a medium including peat and perlite in 1 to 3 ratio. Pepper plants treated with salt and various levels of seaweed and humic acid. Experiment design: Control, Salt (100mM), 3 different doses of humic acid (0.5; 1; 1.5 g L⁻¹), seaweed (1; 2; 3 g L⁻¹), salt+humic acid (0.5; 1; 1.5 g L⁻¹) and salt+seaweed (1; 2; 3 g L⁻¹) with 3 repetitions; as a whole 42 samples. The control group was only irrigated by nutrient solution and irrigation water. During the study, dry matter %, total yield, total protein and proline, MDA (lipid peroxidation), and SOD (superoxide dismutase), POD (peroxidase), CAT (catalase) activity, were analysed in the leaves.

Results: MDA, proline, SOD, POD and CAT activities were increased with salt treatment when the control group was compared with the pepper seedlings of the sample leaves. On the other hand, dry matter, total yield and protein contents were notably decreased. However, these parameters increased with all treatments of both HA and SW. These increases were highest in pepper plants applied with high doses of HA for both dry matter and product yield (1.5 g L⁻¹). Highest content of proline was found after the treatment of salt (109.02 unit mg protein⁻¹) while least decrease was observed in the HA3 treated samples (44.82 unit mg protein⁻¹). Salt treated samples showed highest increase in SOD activities (57.80 %) while least decrease was shown by HA3 treated samples (44.30 %). POD activities showed highest increase by salt (54.48 unit protein⁻¹) while least amount by HA3 (6.62 unit protein⁻¹). Salt caused highest increase in CAT activities (25.22 unit protein⁻¹) while HA3 caused least (8.87 unit protein⁻¹).

Keywords: Oxidative stress, Antioxidative enzymes, *C. annuum* L., Seaweed, Humic acid.

Pistachio Rootstocks Breeding by Crossing *Pistacia khinjuk* Stocks and Some *Pistacia* Species for The Irrigated Area

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Aim of the study: This study was carried out from 1999 to 2001 in Gaziantep to obtain vigorous Pistachio rootstocks with high bud take characteristics.

Material and Methods: At the beginning of the experiments, in the 1999, the parent plants were determined in the surrounding of Gaziantep. For this purpose seed of 13 *Pistacia khinjuk* types were collected and sown. These parents were re-selected according to the growth rate of their seedlings. The male parents were selected during the same years by studying their positive characteristics as males. Four different types of *Pistacia khinjuk* have been used as female parents, and 5 different *Pistacia vera*, 5 *Pistacia khinjuk*, 5 *Pistacia atlantica* and 5 *Pistacia terebinthus* have been used as male parents. Both interspecific and intraspecific hybridization was used. Thus 80 hybrid combination was obtained. Hybrid seeds were sown in plastic containers in greenhouse. Some characteristics of hybrids such as seed germination rate, height growth, diameter growth, budding success, root weight and fringe of seedlings were considered and results were evaluated according to the weight-rank method.

Results: Among seven months old seedlings of *Pistacia khinjuk* parents, the best results were obtained from FB2XA3 (855 points), OB5XA3 (840 points) and OB5XA4 (825 points).

Acknowledgments: This study was supported by the Scientific and Technological Research Council of Turkey (TÜBİTAK) with project number TARP 2190.

Keywords : *Pistacia*, Pistachio, Rootstocks breeding, Crossing.

Population Density of Overwintering Larvae of Carob Moth [*Apomyelois* (= *Ectomyelois*) *ceratoniae* Zell. (Lepidoptera: Pyralidae)] in Pomegranate Orchards in Southeastern Anatolia

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Aim of the study: Carob Moth [*Apomyelois ceratoniae* Zeller (Lepidoptera: Pyralidae)] is a key pest in pomegranate orchards in Southeastern Anatolia Region of Turkey. The pest causes significant damage and reduces marketability of fruits, and is difficult to control using insecticides. The pest overwinters at different larval stage in infested pomegranate fruits. Therefore, infested fruits hanging on the trees or fallen to the floor are important for Carob Moth's summer population in pomegranate orchards. In addition, removing infested fruits from orchards is vital in order to control the pest. In this study, we aimed to determine the overwintering larvae population density in pomegranate fruits remaining on or under the trees.

Material and Methods: This study carried out in two pomegranate orchard located in Şanlıurfa Central and Suruç County during 2016-2017 winter periods. The trial was designed in a randomized complete block design with five replications. For this purpose, 20 hanging fruits and 20 fallen fruits were collected in each row. The infested and uninfested fruits registered individually. The infested rate with Carob Moth is calculated. Also overwintering larvae numbers were determined from collected infested pomegranate fruits.

Results: As a result of the study, infestation rate of fallen fruits in Central and Suruç County were determined as 52% and 26% respectively while hanging fruits were 25% and 15% respectively. Moreover, the density of the pest overwintering larvae population in the fallen fruits were determined as 9.50 larvae/10 infested fruits and 12.00 larvae/10 infested fruits respectively, while the numbers of overwintering larvae density in hanging fruits were 6.40 larvae/10 infested fruits and 6.80 larvae/10 infested fruits respectively. Removal of those infested pomegranate fruits from the orchards in winter are very important to reduce the population density of the pest in summer period in pomegranate orchards.

Keywords: *Apomyelois ceratoniae*, pomegranate, overwintering larvae, population density, pest management.

Proteolysis-Antiproteolysis System and Possible Mechanism of the Divergence of *Lymnaea stagnalis* and *Planorbarius corneus*

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Aim of the study: The aim of the study was to determine the divergence time of these two species of mollusks, the possible ancestor of hemocyanin, and the search for common targets in human and mollusks trypsin molecules for the antimetabolite - ethionine.

Material and Methods: To determine the divergence time, the www.timetree.org database was used, the NODE TIME search mode (search for divergence time for two species of mollusks). In the MEGA 5.2 program 64 nucleotide sequences of histone H4 organisms of various taxonomic groups were introduced. The dendrogram was constructed using the Neighbor-Joining method. There is an assumption that the hemocyanin originated from tyrosinase. Therefore, on the server www.weblogo.berkeley.edu/logo.cgi, logos of motifs from the amino acid sequences of the hemocyanin of mollusks and tyrosinases *Biomphalaria glabrata* and *Planorbarius corneus* were generated and compared. With the help of molecular docking technology, the correspondence of the L-ethionine ligand to two structures of the trypsin protein (*Homo sapiens* and *Biomphalaria glabrata*) on the server www.dockingserver.com was studied. In the hemolymph and hepatopancreas of pulmonary freshwater mollusks, the activity of trypsin-like proteinases was determined, as well as the content of proteinase inhibitors (α 1-antiprotease inhibitor and α 2-macroglobulin) using N- α -benzoyl-D,L-arginine paranitroanilide as a substrate at pH values of incubation media were 3.0, 3.6, 3.8, 6.1, 7.2, 8.0 and 9.0. The preparation of ethionine was administered at a concentration of 1 mg/g of mollusk mass.

Results: The divergence time of *Lymnaea stagnalis* and *Planorbarius corneus* was 182 million years. This time refers to the Toar era (182.7 - 174.1 million years ago). Then, as a result of volcanic eruptions, a lot of carbon dioxide got into the atmosphere, the average annual temperature of the Earth increased. Algae and bacteria were rapidly multiplying, consuming oxygen dissolved in water, which was manifested by the formation of black shales. As a result, a long period of relative oxygen deficiency arose for living organisms, including pulmonary mollusks. It can be assumed that *Lymnaea stagnalis* had some advantages in transporting oxygen compared to *Planorbis corneus*. When aligning the sequences of hemocyanins and tyrosinases, a motif (H - - - WHR), which is present in hemocyanins and tyrosinases, was found. H (His) corresponds to 6 amino acids on the logotypes of hemocyanins and tyrosinases, WHR (Trp, His, Arg) - 14, 15 and 16, respectively. The presence of this general motive may support the assumption of the origin of hemocyanins from tyrosinases, when the amount of bioavailable oxygen in the environment has decreased. When comparing the results of 2 docking, it was found out that 6 amino acids of trypsin in *Homo sapiens* and in *Biomphalaria glabrata* bind to ethionine. Amino acids for *Homo sapiens*: Asp 189, Ser 190, Gln 192, Ser 195, Val 213, Cys 220. Amino acids for *Biomphalaria glabrata*: Asp 224, Ser 225, Gln 227, Ser 230, Val 248, Cys 254. High values of trypsin-like activity were detected at pH values of the incubation medium in the range of 3.6-9.0, and the amounts of the α 1-antiprotease inhibitor at pH 3.6-3.8 and α 2-macroglobulin at pH 3.0. Ethionin had a different effect on the proteolysis-antiproteolysis system, which probably depended on the type of oxygen transport in pulmonary freshwater mollusks.

Acknowledgments: to Associate Professor V.V. Khrustalev for consultations on methods of bioinformatics *in silico*.

Keywords: *Lymnaea stagnalis*, *Planorbarius corneus*, proteolysis, *in silico*.

**Screening of Bread Wheat Genotypes For Resistance to Crown and Root Rot Disease
Causal Organism *Fusarium culmorum* (W.G. Smith) Under Irrigated Condition**

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Aim of the study: *Fusarium culmorum* is a soil-borne fungus causing crown and root rot on different small-grain cereals, in particular wheat and barley. In order to control of this disease, application of fungicides are inadequate in some cases besides their hazardous effects for environment and living organisms. As an alternative solution to chemicals, development and screening the resistant wheat varieties has been emphasis in the plant defence studies.

Material and Methods: In 2015-2016, the study was conducted in Experimental Area of Bahri Dağdaş International Research Institute-Konya. In the study, totally 25 bread wheat genotypes at regional yield level were included to be evaluated for resistance to *F. culmorum* in irrigated field conditions. The genotypes, had developed for irrigated areas in breeding studies. The experiment was set up according to randomized complete block design with 4 replications for each entry. The wheat seeds were sown in the previously contaminated soil with *F. culmorum*. At the end of growing period, the resistance levels of genotypes to *F. culmorum* were determined considering the 0-10 scale.

Results: According to evaluation based on scale values, the plant genotypes were divided into 3 groups that were susceptible (≥ 3 scale value), moderately resistant (scale values between 1–3), and resistant (≤ 1 scale value). As a result, 9 genotypes were grouped as resistant, while 12 of genotypes were moderately resistant against *F. culmorum*. The rest of genotypes were taken to susceptible group with scale values above 3.

Keywords: *Fusarium culmorum*, Resistance, Wheat.

Similarities of Lichen biodiversity in Erciyes Mountain (Kayseri, Turkey) and James Ross Island (Antarctica)

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Aim of the study: After collecting lichens from the alpine and subalpine zones of Erciyes Mountain located in Central Anatolia and James Ross Island located in the eastern coasts of Antarctic Peninsula; similarities in species level in lichen biodiversity are observed and this is here discussed.

Material and Methods: The lichen specimens on soil, mosses and volcanic rocks were collected from the subalpine and alpine zones of Erciyes Mountain between 2002-2005 and also they are collected from similar habitats in James Ross Island located in the eastern coasts of Antarctic Peninsula. The morphology of lichens were studied under dissecting binocular microscope. The anatomy of the thallus and apothecia were studied under compound microscope. The asci and ascospores were observed from the sections when sections were mounted in water and shapes, sizes were recorded. Chemistry of the specimens includes spot tests.

Results and Discussion: In the alpine and subalpine zones of volcanic Erciyes Mountain (summit 3917 m); as a result of orographic and harsh climatic conditions; there is a sparse vegetation cover in many areas when compared with more lower altitudes. Climatic conditions in Antarctica is also very harsh; and the volcanic structure of the rocks are also similar with Erciyes Mountain; because of this it is very logic to compare the biodiversity of Antarctica with the environments in the alpine and nival zones of Erciyes Mountain located in Erciyes Mountain. From the first observations; I reported here that 24 taxa are present both in James Ross Island (Antarctica) and Erciyes Mountain (Turkey): *Acarospora badiofusca*, *Bellemeria alpina*, *Caloplaca cerina*, *C. saxicola*, *C. stillicidiorum*, *Candelariella aurella*, *C. vitellina*, *Cladonia pyxidata*, *Collema tenax*, *Lecanora crenulata*, *L. dispersa*, *L. polytropia*, *Lecidea atrobrunnea*, *L. lapicida*, *L. patavina*, *L. stigmatae*, *Megaspore verrucosa*, *Peltigera rufescens*, *Physconia muscigena*, *Rhizocarpon geminatum*, *Rhizoplaca melanophthalma*, *Tephromela atra*, *Umbilicaria decussata* and *Xanthoria elegans*. These species are mostly common in higher altitudes in temperate regions of the World although they are present in much lower altitudes in the polar regions.

Acknowledgements: This study was financially supported by Erciyes University. The Czech Republic base, Johann Gregor Mendel Station (Antarctica) is thanked for hosting me 2 months.

Keywords: Biodiversity, Antarctic biodiversity, lichens.

Some Biological Characteristics of the White Grouper *Epinephelus aeneus* from the Iskenderun Bay, Northeastern Mediterranean

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Aim of the study: The white grouper *Epinephelus aeneus* has remarkable economic importance in *Epinephelus* genus for the Mediterranean fisheries. No detailed study has been carried out on the growth features of *E. aeneus*; therefore, our study was aimed to elucidate length-weight relationship and age, growth parameters of *E. aeneus* from the Iskenderun Bay, North eastern Mediterranean.

Material and Methods: A total of 143 white grouper samples, of which 94 female and 49 male, were captured by long-liner fisheries from the Iskenderun Bay between October 2015 and December 2016.

Results: Among all white grouper, total lengths were ranged from 18.5 to 82.6 cm and from 50.7 to 89.2 cm for females and males, respectively. Weights were ranged from 29.13 to 6750 g and from 1443.6 to 8600 g for females and males, respectively. The maximum age was observed as 11 and 12 for females and males, respectively. The length-weight relationships were calculated for females, males and both sexes as $W=0.0066 \times L^{3.1347}$, $W=0.0058 \times L^{3.1618}$ and $W=0.0067 \times L^{3.129}$, respectively. The von Bertalanffy growth equations for white grouper were determined for females, males and both sexes as $L_t=97.77328 [1-e^{-0.160404(t-0.275477)}]$; $L_t=134.1657 [1-e^{-0.088285(t-0.118111)}]$ and $L_t=118.5386 [1-e^{-0.115186(t+0.02774)}]$, respectively.

Acknowledgements: Thanks to the Scientific & Technological Research of Turkey (TUBITAK – 214O575) for financial support.

Keywords: White grouper, *Epinephelus aeneus*, length-weight relationship, growth features, Iskenderun Bay, North eastern Mediterranean.

Sorption Kinetic and Equilibrium Studies of Methylene Blue on Diatomite (Çaldıran/Van)

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Aim of the study: Diatomite are substances that are studied as adsorbents. Diatomite is used in many industrial areas as filling material, isolation material, adsorbent, corrosive and surface cleaner due to its physical and chemical specifications. It is a cheap alternative for activated carbon due to its high permeability and porousness. Dye stuffs are used for products in textile industry. In organic pollution, especially dye stuffs are mainly consist of water pollution. Dye stuffs are the most common water pollutants found in industrial waste waters. Most of the are toxic and carcinogen and they threat human health and natural living in water resources when they interfere with water.

Material and Methods: Washing process; diatomite sieved at a mill and then passed through a 230 mesh sieve was dried at an oven for 5.5 h. 100 g diatomite was mixed with a stirrer in 1.7 L distilled water for 12 h. Then, the mixture was left 12 h. The solid phase was then separated by filtration, which was left at room temperature for 168 h to dry. The dried diatomite was passed again from a 230 mesh sieve. Adsorption of lead ion to original diatomite at 25 °C, 35 °C and 45 °C was investigated at three different concentrations (25, 35, 45 ppm) and pH 5.15. After adding 3.5 g diatomite (adsorbent) to Methylene blue solutions (1L) whose concentrations and pHs were fixed, they were placed in a thermostatic water bath to keep temperature constant and mixed constantly by mechanic stirrers for 260 min to achieve adsorption. After 5 to 260 minutes periods, the solution was filtered and the remaining metal amount in the solution was detected by UV-Vis spectroscopy at 663 nm. Adsorption isotherms, kinetic and thermodynamic parameters were calculated from these data. Diatomite was characterized by several techniques such as FTIR, X-Ray, SEM, BET, TGA, surface area and chemical analysis etc.

Results: The surface area of diatomite used in this study was calculated as 48 m²/g. The adsorption capacities of the original diatomite methylene blue increased linearly with increasing initial concentrations of these ions. It was found that adsorption process fitted Freundlich isotherm. In Temkin isotherm model, increase in K_T values as temperature increases leads to increasing of maximum adsorption capacity and strengthening of relationship between adsorbent and adsorbate. In Dubinin-Radushkevich (D-R) isotherm, If the value of E is between 8 and 16 kJ/mol then the adsorption process follows by chemical ion-exchange. From of kinetic models, it fits pseudo second order kinetic model. ΔG^0 values are negative for Methylene blue adsorption on original diatomite and these values indicate that adsorption is spontaneous. These values decrease with an increase of temperature. Furthermore, better adsorption is obtained at higher temperature. In conclusion, it was determined that diatomite can be used for removal of methylene blue removal from wastewaters in textile industry.

Keywords: Environmental toxicology, Diatomite, Methylene blue, Adsorption.

Taxonomic, ecological and phylogenetic investigation of lichens belonging to *Acarospora cervina* group in Turkey

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Aim of the study: In this study, it is aimed to examine taxonomic, ecological and phylogenetic relationships the lichen samples belong to *Acarospora cervina* group, which is widely spreaded in our country.

Material and Methods: Many samples of lichens belonging to *Acarospora cervina* group were collected from different parts of Turkey. The external morphology has invariably been studied under dissecting binocular microscope. The anatomy of the thallus and apothecia were studied under compound microscope. The asci and ascospores were observed from the sections when sections were mounted in water and shapes, sizes were recorded. Chemistry of the specimens includes spot tests. DNA isolation was performed by using Qiagen DNeasy plant mini kit. PCR analysis was performed by using ITS (ITS1 and ITS4) and mtSSU (mrSSU1 and mrSSU3R) primers. The phylogenetic analysis of lichen samples belonging to *Acarospora cervina* group were performed by using the Maximum Likelihood method of the Mega 6 (Molecular Evolutionary Genetics Analysis) software program.

Results and Discussion: The taxonomic and ecological characteristics of lichen samples belonging to *Acarospora cervina* group were compared with each other. Sequence results of DNA-isolated lichen samples were used to examine the region of interest between species. The phylogenetic analysis for ITS and mtSSU sequences are performed with the investigated samples and also with the samples obtained from Genbank. The analysis are conducted by the help the maximum likelihood method in order to reveal the phylogenetic relationships between our studied samples. When we examine the Maximum Likelihood dendrogram, it is observed that species are separated into two main branches. The species which is considered out group forms one of the branches, while *Acarospora cervina* group are grouped together.

Acknowledgements: This study was financially supported by FDK-2015-5927 coded Erciyes University project.

Keywords: Lichens, ITS, mtSSU Maximum Likelihood, Phylogenetic analysis, *Acarospora cervina* group.

The Ameliorative Effects of Potassium applications on Tomato Plants Growing under Heavy Metal Stress

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Aim of the study: The major objectives of our study were to determine the interactive efficiency of potassium treatments in restoring the metabolic alterations resulting from heavy metal stress in tomato plants.

Material and Methods: The experiment with tomato (*Lycopersicum esculentum* Mill.) was conducted under glasshouse conditions in Mugla (Turkey) from the middle of February to the middle of June 2011. Seedlings were planted in a mixture of sand and peat in (1:1, v/v) ratio to directly 5 L plastic pots and manually irrigated every other day with a nutrient solution. On day 14, heavy metal and potassium treatments were initiated by watering Hoagland's nutrient solution containing defined concentration of heavy metals and potassium to seedlings. The basic nutrient solution used in this experiment was a modified Hoagland and Arnon formulation. Heavy metal treatments consisted of CuSO₄·5H₂O, ZnSO₄·7H₂O, CdCl₂·H₂O, Pb(NO₃)₂ and MnSO₄·H₂O introduced separately. In the experiment, the treatments consisted of Cu at 250 µM; Zn at 250 µM; Cd at 25 µM; Pb at 250 µM; Mn at 250 µM, the treatments of mentioned metals combined with K (as KNO₃:20mM) and a control comprising nutrient solution without any heavy metals. Each treatment was replicated three times in a randomized block design and each replicate included 3 plants (i.e., 9 plants per treatment). In all of the analyses, leaves were sampled from the mid section of each plant in order to minimize age effect. After three weeks of treatments, leaves were collected. Fresh leaves were analysed for total chlorophyll (TCh), carotenoids, dry-weight (DW), Membrane permeability (EC), relative water content (RWC), proline, malondialdehyde (MDA), superoxide dismutase (SOD), peroxidase (POD), catalase (CAT), hydrogen peroxide (H₂O₂).

Results: All heavy metal treatments caused significant decrease in relative water content and DW% of leaves. The applications of fertilizers with potassium alleviated this adverse effect by increasing leaf relative water content and dry weight under stress conditions. Moreover, K applications significantly ameliorated the photosynthetic pigments concentration under heavy metal stress. All treatments also caused an increase of antioxidative enzyme activities (SOD, POD and CAT), but the application of Zn+K resulted in considerably higher enzyme activities as compared to those plants irrigated with other treatments. Additionally, highest proline content of tomato leaves was found after the treatment of Pb (57.91 nmol g⁻¹ FW), while least increase was observed in the Mn+K treated samples (38.63 nmol g⁻¹ FW). According to control, Cd+K (14.05 nmol g⁻¹ FW) treated samples showed highest value in MDA levels while least value was shown by Mn+K (7.84 nmol g⁻¹ FW) treated samples.

Keywords: Antioxidative enzymes, *L. esculentum*, potassium nitrate, heavy metal, proline.

The Effects of Hydro-thermal Treatment on the Dimensional Stability of Particleboard Produced from Wheat Stalks

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Aim of the study: In Turkey, approx. 20 million ton wheat stalk, totally 61 million ton, agricultural wastes are produced. There are a plenty of national and international study on the utilization of annual plants in the production of wood-based panels such as particleboard and fiberboard. Most of them reported that mechanical properties of the panels met the standard value while their physical properties (thickness swelling (TS) and water absorption (WA)) could not met the standard value. Moreover, the panels made from annual plant stalks have higher TS and WA as compared to panels made from wood particles. For this reason, poor water resistance of the panels made from annual plant stalks is main reason which limits the use of these panels. The main objective of this study was to improve dimensional stability of particleboards produced from annual plant which is one of the drawbacks for the wood-based panel industry and increase the use of annual plants in the production of wood based panels.

Material and Methods: Wheat stalks were used as experimental materials in the study. The wood particles will be supplied from a commercial particleboard plant. Hydro-thermally treated and non-treated annual plants particles were add at 10%, 20%, 30%, and 40% to the wood particles and then particleboards were produced under laboratory conditions. The WA and TS properties of the produced particleboards were measured according to EN 317 (1996) standard.

Results: The results showed that the hydro-thermal treatment improved the dimensional stability of particleboards produced from wheat stalk.

Acknowledgements: This study was supported by Düzce University Research Fund Project Number : 2017.02.03.550.

Keywords: Particleboard, annual plant, hydro-thermal treatment, dimensional stability.

The Effects of Simulation Techniques Used in Visual Quality Analysis on the Participants

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Aim of the study: Visual evaluation studies are based on evaluating the visual characteristics, fictions of a space or an object perceptually in the context of functional relationships (with all sense organs, especially eye). Photographs are often used in studies conducted on the basis of visual quality assessment criteria. These photographs are presented for the evaluation of the subjects by improving them with simulation techniques (depending on the visual quality evaluation criteria).

Material and Methods: In this study; the sample images generated by the simulation technique are divided into three groups in terms of quality. Simple simulated images were used in the first group, moderately simulated images in the second group, and images simulated at the good level (close to the real image) in the third group. Obtained images were evaluated by questionnaire.

Results: According to the results of the evaluation, the visual quality value of the space or object is emerging. However, the extent to which the resulting values reflect the objective results depends on the quality of the simulation. As a result, the importance of the quality of the simulation has been emphasized.

Keywords: Scenic quality, simulation techniques, photomontage.

The Lichenized Fungus Genus *Gyalolechia* (Teloschistales, Ascomycota) in Turkey

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Aim of the study: This study has been made to examine as phylogenetic relationships of some species belong to genus *Gyalolechia* Trevis., which widely spreaded in our country.

Material and Methods: Samples of lichens belonging to genus *Gyalolechia* were collected from different parts of Turkey. Total DNA was extracted from apothecia by using the DNeasy Plant Mini Kit (Qiagen) according to the manufacturer's instructions. PCR analysis was performed by using ITS (ITS1 and ITS4). ITS sequence results of lichen samples were analysed by using Clustal W option in the BioEdit program. The phylogenetic analysis of lichen samples belonging to genus *Gyalolechia* were performed by using the Maximum Likelihood method of the Mega 6 (Molecular Evolutionary Genetics Analysis) software program.

Results: *Gyalolechia* was recently established to accommodate a monophyletic group of crustose lichens of Teloschistaceae that were formerly placed in the large genus *Caloplaca*. Members of this genus usually have well developed thalli which are crustose, squamulose or lobate. In this study, numbers of samples belonging to this genus collected from Turkey. After morphological examinations; molecular analyses of ITS nrDNA were carried in the samples. This genus is represented by 25 species in Turkey and 6 of them are present in Turkey: *G. flavorubescens*, *G. flavovirescens*, *G. fulgida*, *G. juniperina*, *G. klementii* and *G. subbracteata*. In this presentation we will discuss the morphological and ecological characters of these species along with distributional data of the species in Turkey.

Keywords: Lichens, ITS nrDNA, biodiversity, Teloschistaceae, Anatolia, Turkey.

Thermo-Mechanical and Electrical Properties of Nanofibrillated Cellulose-PVA and Nanofibrillated Cellulose-Silica Composites

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Aim of the study: In this study, nanofibrillated cellulose was isolated from bleached eucalyptus kraft pulp and then treated with Pulpzyme HC 2500 enzyme prior to high-pressure homogenization to lower energy consumption. After nanocellulose isolation, three nanocomposite (NC, NC-PVA and NC-Si) were fabricated using organic PVA (Polyvinylalcohol) and inorganic silica polymer via the casting method.

Material and Methods: The Dynamic mechanical thermal analysis (DMTA) tests were carried out to determine the thermo-mechanical characteristics (storage modulus) of the produced nanocomposite films. The dielectric properties of the prepared films were determined with Impedance analyzer by measuring dielectric loss (ϵ''), dielectric modulus (ϵ') real and imaginary parts of electric modulus (M' and M'').

Results: NC-Si composites revealed higher thermo-mechanical performance between 100°C-150°C when compared to NC-PVA. The ϵ' , ϵ'' and $\tan\delta$ decreased as the frequency increased until the high frequencies. The imaginary parts of electric modulus (M'') decreased after adding PVA and Si leading to extra electrical dipole polarization. The NC and NC-PVA exhibited a singular relaxation process, while the NC-Si showed a double relaxation process. As a result, the NC-Si composites revealed higher thermo-mechanical performance when compared to NC-PVA.

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Keywords: Nanofibrillated cellulose, nanocomposites, PVA, silica, DMTA, dielectric properties.

***Aegilops triuncialis* subsp. *bozdagense* (Poaceae), a new subspecies from South-Western Turkey**

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Aim of the study: The genus *Aegilops* L. consists of ca. 25 species in the world. It constitutes the primary and secondary gene pool for cultivated wheats. In the Flora of Turkey, Davis (1985) reported 15 species. Subsequently, two *Aegilops* species have been added from Turkey (Güner *et al.*, 2000; Cabi & Doğan, 2009; 2012). Clearly Turkey is now one of the center of diversity for *Aegilops* with 17 species (Cabi & Doğan 2012). The objectives of the current paper are to describe a new *Aegilops* taxon from Turkey, show its relationships with other subspecies in the *A. triuncialis*.

Material and Methods: We carried out extensive field studies between 2006 and 2009 and collected a large number of specimens for revising the genus *Aegilops*. In addition, population size, phenological traits and ecological preferences of the species in the genus were observed during the field studies. Particular attention was paid to an *Aegilops* specimens collected from Bozdağ Mountain, Southwest Anatolia (B2 Denizli sensu Davis, 1965) in 2007. Upon closer examination and going through the Flora of Turkey (Davis, 1985) and other relevant floras, such as *Flora Orientalis* (Boissier, 1884), *Flora of Syria, Palestine and Sinai* (Post, 1933), *Flora of Iraq* (Bor, 1968), *Flora Iranica* (Bor, 1970) and the latest monographic treatment of van Slageren (1994), these specimens were identified as a new subspecies of *Ae. triuncialis*. All the authors of plant name are given according to Brummit & Powell (1992).

Results: This new subspecies, described here, differs from other subspecies by having lateral spikelets without any awns. Glumes have three teeth up to 0.5 cm, the middle one being shorter than the others.

Acknowledgements: We wish to thank the curators of the following herbaria: ANK, GAZI, HUB, ISTE, VANF, E, K, BM, for allowing us to study their *Aegilops* collections, also many thanks to the authorities of TIGEM Ceylanpınar State Farm for their help during field excursions and the Scientific and Technical Research Council of Turkey (TUBITAK-TBAG-105 T 171) for their financial assistance.

Keywords: *Aegilops*, new subspecies, Turkey.

***Arabidopsis thaliana* and wheat AP endonucleases contain the NIR function**

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Aim of the study: Apurinic/aprimidinic (AP) endonucleases are important DNA repair enzymes involved in two overlapping pathways: DNA glycosylase-initiated base excision (BER) and AP endonuclease-initiated nucleotide incision repair (NIR). In the BER pathway, AP endonucleases cleave DNA at AP sites and 3'-blocking moieties generated by DNA glycosylases, whereas in NIR, the same AP endonucleases incise DNA 5' to a wide variety of oxidized bases. The flowering plant *Arabidopsis thaliana* contains three genes encoding homologues of major human AP endonuclease 1 (APE1): Arp, Ape1L and Ape2. It has been shown that all three proteins contain AP site cleavage and 3'-repair phosphodiesterase activities. However, it was not known whether the plant AP endonucleases contain the NIR activity.

Material and Methods: To characterize the DNA repair activities involved in the BER and NIR pathway we have used affinity-purified the *A. thaliana* and wheat proteins from *E. coli* expressing the His-tagged form of atArp and wArp. To examine DNA substrate specificity of plant AP endonucleases, DNA cleavage activities of atARP and wARP towards 30-mer THF•T and α dA•T duplexes (in which THF and α dA residues were in position 11) were measured under reaction conditions optimal for the hAPE1-catalyzed AP endonuclease and nucleotide incision activity, respectively. The *Arabidopsis thaliana* mutant lines SALK_021478 (*arp*-/-), harboring T-DNA insertions in the ARP gene were used to test the sensitivity to MMS, *t*-BuO₂H and H₂O₂ exposure. Here, we report that ARP proteins from *Arabidopsis* and common wheat (*Triticum aestivum*) contain NIR and 3'→5' exonuclease activities in addition to their AP endonuclease and 3'-repair phosphodiesterase functions.

Results: The steady-state kinetic parameters of reactions indicate that *Arabidopsis* ARP cleaves oligonucleotide duplexes containing α -anomeric 2'- deoxyadenosine (α dA) and 5,6-dihydrouridine (DHU) with efficiencies ($k_{cat}/K_M = 134$ and $7.3 \mu M^{-1} \cdot min^{-1}$, respectively) comparable to those of the human counterpart. However, the ARP-catalyzed 3'-repair phosphodiesterase and 3'→5' exonuclease activities ($k_{cat}/K_M = 314$ and $34 \mu M^{-1} \cdot min^{-1}$, respectively) were about 10-fold less efficient as compared to those of hAPE1. Expression of ARP greatly reduces the sensitivity of AP endonuclease-deficient *Escherichia coli* *xth nfo* and *Saccharomyces cerevisiae* $\Delta apn1 \Delta apn2$ strains to both alkylating and oxidizing agents. Furthermore, homozygous *A. thaliana arp*-/- mutant exhibits high sensitivity to methyl methanesulfonate and *tert*-butyl hydroperoxide, but not to H₂O₂, suggesting that ARP is a major AP endonuclease that removes abasic sites and specific types of oxidative DNA base damage. Taken together, these data establish the presence of the NIR pathway in plants and suggest its possible role in the repair of DNA damage generated by oxidative stress.

Keywords: DNA repair; nucleotide incision repair; base excision repair; AP endonuclease.

OP346
Arid-rare forests of Atropatan (Azerbaijan)

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Aim of the study: Arid-rare forest vegetation type is the undertype of forest vegetation and is characteristic for south dry slopes of region. Bioecological structure of region which arid-rare forest undertype is distributed is different from the regions which vegetation types is large distributed.

Material and methods: Phytocenoses of arid-rare forest undertype is consist of shrubs and trees. Areas which have dry climate are distributed in Nakhchivan AR, Lachin and Zangazur region of Little Caucasus, Zuvand region of Talish.

Results: Dominate and subdominate species of arid-rare forest which spread in researched area are: *Juniperus foetidissima*, *J. polycarpus*, *J. rufescens*, *J. oblonga*, *Crataegus orientalis*, *Pistacia mutica*, *Quercus polycarpa*, *Q. araxina*, *Acer ibericum*, *Cotinus coggygia*, *Punica granatum*, *Cerasus microcuercus*, *Fraxinus excelsior*, *Paliurus spina-christi*, *Rhamnus pallasii*, *Pyrus salicifolia*, *Lonicera iberica*, *Berberis vulgaris*, *Spiraea crehata*. Arid-rare forest undertype is divided to monodominant shrubby friganas, polydominant xerophyte shrubby formation classes and *Juniperusetum-Astracanthetum-Acantholimonosum* and *Crataegusetum-Astragalosum* formations. *Juniperusetum-Astracanthetum-Acantholimonosum* formation. At species content of formation 28 species are distributed; from them 4 species are shrubs, 2 species are subshrubs, 7 species- perennial herbs, 6 species - biennial herbs and 9 species annual herbs. On ecological forms 24 species are erophytes, 3 species are mesoxerophytes and 1 species is mesophyte. At the I layer of phytocenosis is *Juniperus pygmaea*; at II layer *Ast. microcephala*, *Achillea vermicularia*, *Stipa capillata*, *Sedum pilosum* etc., at III layer *A. hohewackeri*, *Thymus trautvetteri*, *Anisantha riparia*. *Crataegusetum-Astragalosum* formation. *Crataegusetum orientalis* phytocenosis is presented with *Astragalosum ornithopodioides* association. Dominant vegetation is *Astragalus ornithopodioides* Lam., abundance in 2-3 points and subdominant is *Crataegus orientalis* Pall. ex Bieb., abundance in 2 points. At the I layer of formation *C. orientalis*, at II layer *Ast. ornithopodioides*, at III layer *Festuca rupicola*, *Thymus trautvetteri*, *Stachys annua*, *Hypericum perforatum*, *Trifolium pratense* were spread. Dominant and subdominant species of arid-rare forest, mainly creeping kinds of junipers form a cover at shrubby areas that they protect from flooding.

Keywords: Arid, vegetation, formation, phytocenosis.

Biolarvacidal and Antioxidant Activity of *Cyclamen parviflorum*Murat TURAN¹ Ramazan MAMMADOV¹¹Department of Biology, Faculty of Art & Science, Pamukkale University, Denizli, Turkey
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Aim of the study: Plants and plant products are rich antioxidant sources and epidemiological studies have revealed the relationship between plant antioxidants, chronic and oxidative diseases. *Cyclamen* genus from the Primulaceae family are using as medical treatment and in folk medicine. The aim of this study was to investigated the antioxidant, biolarvacidal activity of *Cyclamen parviflorum* tubers and leaves. Obtained the findings from this study can increase the overall value of the medical potential of the plant.

Material and Methods: Leaves and tubers of *C. parviflorum* were collected from their habitats in Trabzon, Turkey, in May-June 2015, identified from the book of Flora of Turkey. Each parts (tubers and leaves) were dried at the shadow, room temperature and low humidity. The dried samples are broken up by blender so as to separate small pieces. 10 g of sample was taken and was added to 250 ml of erlenmeyer, then ethanol was added and erlenmeyer's mouth was closed. Erlenmeyers were put in shaker water bath at 49 °C and for 6h, then mixture of plant with ethanol were filtered with Whatmann No:1 paper. This shaking and filtration was repeated three times. The alcohol separated with Rotary evaporator at 48-49 °C then the water drawn out with freeze-dryer at -54 °C. ABTS radical cation scavenging activity, determination of antioxidant activity by β -carotene-linoleic acid, determination of total phenolic contents, determination of total flavonoid contents and biolarvacidal activity against *Musca domestica* and *Culex pipiens* experiments were performed on *C. parviflorum* extract.

Results: In all experiments leaves was found to have higher activity than tubers of *C. parviflorum*. In biolarvacidal activity against *Cx. pipiens*, we found LC₅₀ and LC₉₀ values of extract were 173.44 and 291.50 ppm and against *M. domestica*, we found have no biolarvacidal activity. This is the first study to report on antioxidant and biolarvacidal activity of the extract of *C. parviflorum* against *Cx. pipiens* and *M. domestica*.

Acknowledgements: The study of supported by Unit of Scientific Research Projects (2015FBE002) conducted in Pamukkale University.

Keywords: *Cyclamen parviflorum*, Antioxidant Activity, Biolarvacidal Potential Effect, *Musca domestica*, *Culex pipiens*.

Determination of Genetic Relationship among Local wheat landraces, Azerbaijan Originated wheat cultivars and Some Wild Wheat Genotypes by using ISSR

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Aim of the study: In this study, we aimed to determine genetic relationships between local wheat landraces grown in Turkey and some wild wheat genotypes and Azerbaijani wheat cultivars.

Material and Methods: In this study, genetic diversity among 160 wheat genotypes including 133 local bread wheat landraces originated from different regions of Turkey, some wild wheat genotypes and Azerbaijani wheat accessions were used. They were supplied from “Ankara Field Crops Central Research Institute” and “Azerbaijan National Academy of Genetic Resources Institute” Total DNA was extracted from 300 mg fresh leaf tissue of wheat seedlings. Ten ISSR primers were used to detect the genetic polymorphism among the wheat accessions. DNA bands in the gel photographs were visually scored as present (1) or absent (0) and the data were analyzed using the Numerical Taxonomy Multivariate Analysis System (NTSYS-pc) version 2.1 software package (Rohlf, 2000). To determine genetic relationships, a genetic similarity (GS) matrix was created based on simple matching coefficients and the GS matrix was used to construct a dendrogram using the unweighted pair group method arithmetic average (UPGMA). By using dissimilarity matrix, neighbor-joining (NJ) dendrogram was also generated. Principal component analysis was conducted to determine genetic relationship among the barley genotypes. The partitioning of molecular variance among groups and within population was calculated by the AMOVA in ARLEQUIN ver. 3.0 software (Univ. of Geneva, Geneva, Switzerland) (Excoffier et al 2005).

Results: In this study, 10 Inter Simple Sequence Repeat (ISSR) primers were used to determine the diversity in 160 wheat samples containing wild diploid, tetraploid, hexaploid local, and some hexaploid wheat genotypes from Azerbaijan. As a result of the clustering analysis using UPGMA method, it was determined that wheat genotypes are mainly grouped on species basis and Azerbaijan hexaploid wheat samples were also grouped separately. Similar results were obtained with the principal component analysis (PC). With the Molecular Variance Analysis (AMOVA), 25.37%, 13.96% and 60.67% variation rates were detected between groups, among the populations within the group and within populations, respectively. The intra-population diversity was statistically significant ($p < 0.001$). Considering all the wheat sample studied, the level of genetic diversity was found to be considerably high (91.6 %). Given the rate of polymorphism obtained, the ISSR markers were found to be useful in investigating the genetic diversity of wheat genotypes.

Acknowledgements: This study was supported by Erciyes University research fund with the code of FYL-2015-5956

Keywords: *Triticum aestivum*, wheat, Genetic diversity, ISSR, UPGMA.

Effects of Irrigation Water Quality on Efficiency and Quality Parameters on Tobacco (*Nicotiana tabacum* sp.) Plant

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Aim of the study: This study was carried out to determine the effects of different irrigation water (0.38, 2.00, 5.00, 8.00, 11.00 and 15.00 dSm⁻¹) quality on yield, some quality parameters and soil salinity of tobacco (*Nicotiana tabacum* sp.) plant.

Material and Methods: This salinity experiment was carried out in pots as 4 replicates were placed according to the random parcel trial design. The study was carried out on an area covered with a plastic cover. The plant height, leaf width, leaf height, leaf dry weight, leaf chlorophyll amount, leaf number and nicotine ratios were determined and evaluated at the end of growing period.

Results: The soil salinity has increased with the increase of irrigation water salinity. As the salinity of the irrigation water increased, the plant height, leaf width, leaf height, leaf dry weight, leaf chlorophyll amount and leaf number decreased according to the results obtained at the end of the study. It has been determined that there is a certain increase in nicotine ratios against the decrease of all examined physical parameters in the irrigation water salinity increase. According to the obtained data, it was determined that the tobacco plant was susceptible to salinity. As a result, the salinity threshold value of the tobacco plant was found to be 2.04 dSm⁻¹. Increasing soil salinity with rising salinity of the irrigation water causes to decrease the plant's height, leaf width, leaf height, leaf weight, leaf dry weight, leaf chlorophyll indexes and leaf counts. In particular, this decrease was more pronounced in the amounts after the salinity of the irrigation water of 2 dSm⁻¹. It is desirable to dilute the poor quality waters with good quality waters in order to prevent excessive reduction in plant yield and prevent too much salinization to the soil.

Acknowledgements: This study was supported within the scope of Tübitak thesis incentive scholarship. In a study on irrigation water quality, the effect of salinity on fruit quality, yield, and mineral element status in lemon trees was investigated; Irrigation waters with three different EC values (1, 2.5, 4 dS m⁻¹) were used. As a result of this two-year study, the increase in the salinity of the irrigation water led to a decrease in yield and quality of the fruit.

Keywords: Tobacco, salinity, irrigation water quality, plant growth.

Effects of Salt Stress and Water Amount on Plant Growth and Yield of Purple Coneflower (*Echinacea purpurea* L.)

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Aim of the study: In this study were carried out to determine the effects of salt stress (0.4, 1.00, 2.50, 4.00 and 8.00 dSm⁻¹) and different amount of required water (80, 100, 120 %) on growing of. purple coneflower (*Echinacea purpurea* L.).

Material and Methods: Five salinity levels and three levels of water were used in a factorial experiment with 3 replications. Root dry weight, aerial part dry weight and aerial part/root ratio were determined and evaluated at the end of growing period.

Results: According to the results, purple coneflower is a very sensitive plant species to salinity and its development was interrupted by increasing salt doses. Upper levels of salt stress in the tried doses resulted in plant death. The deterioration in root development was found to be higher than the development of aerial parts in response to the increasing salt doses. Besides the changes in salt concentrations of irrigation water affected root dry weight significantly.

Acknowledgements: This study was supported by Ondokuz Mayıs University, Project Management Office.

Keywords: Echinacea, salinity stress, water stress, plant growth.

Germination of Scarified Seeds of Mediterranean Star of Bethlehem (*Ornithogalum ulophyllum* L.) Under *In vitro* Conditions

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Aim of the study: Conservation of plant diversity is an important issue world over. The genus *Ornithogalum* L. is widely distributed in Europe and the Middle East with 32 species found in Turkish Flora under natural conditions their seeds have poor germination due to seed coat dormancy. Since they bear beautiful white colored flowers with potential in xeriscaping, they form an important part of natural biodiversity that has to be conserved. Mechanism of prolonged dormancy among immature seeds of *O. ulophyllum* has to be studied yet. This study aimed to promote germination on physiologically mature and immature seeds containing more than 50% moisture level

Material and Methods: Three seed germination experiments were conducted. First experiment contained the non scarified seeds stratified on agar solidified MS (Murashige and Skoog 1962) and cultures were maintained at +4°C under dark condition. The 2nd experiment contained the seeds chemically scarified with 98% sulphuric acid and stratified on agar solidified MS medium and cultures were maintained at +25°C, under 16 hours light photoperiod in growth cabinet. The third experiment contained the seeds mechanically scarified with sharp knife and stratified on agar solidified MS medium and cultures were maintained at +25°C, under 16 hours light photoperiod in growth cabinet .

Results: The results showed failure of effectiveness of protocol first and second to germinate the seeds. Whereas, the third technique of mechanical scarification was the most effective to germinate the seeds with >40% germination. The results of the study are very encouraging showing strong seed coat dormancy. The behaviour of the seeds is indicative that a concerted future programme of research may enable longterm conservation of this important plant species.

Acknowledgement: The authors acknowledge support of the Department of Field Crops, Faculty of Agricultural and natural Sciences, Uşak University, Uşak Turkey.

Key Words: *Ornithogalum ulophyllum*, developed germination, *In vitro*, dormancy.

Investigation of Nutrient Contents of Tomato Plants Grown in Greenhouses in Elmali-Antalya Region

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Aim of the study: Tomato production in greenhouses reaches very significant volumes in Antalya and surrounding region, but this production stops due to the extreme heat in summer season, and this situation is a problem for tomato production. In recent years, the number of alternative production facilities established in highland areas is rapidly increasing in order to resolve the problem. Elmali region of Antalya province of Turkey constitute 57% of highland greenhouse areas, and it comes first in the tomato production with 520 ha. However, the studies on the highland greenhouse tomato production increasing in recent years are not sufficient. In this study, that aims to investigate the mineral nutrient contents of tomato greenhouses in Elmali region of Antalya province.

Material and Methods: Leaf samples were taken from according to Geraldson (1937) from 30 different tomato greenhouses in Elmali, Antalya region. Beginnings from above the plants' fifth or sixth leaves were taken archetypally from determined greenhouses. The taken leaf samples were washed by distilled water and dried in a forced air oven at 65°C to a constant weight. After drying; the leaf samples were ground separately in a stainless mill to pass through a 20 mesh screen and kept in clean polyethylene bags for analysis. Dried leaf samples of 0.5 g each were digested with 10 mL HNO₃/HClO₄ (4:1) acid mixture on a hot plate. The samples were then heated until a clear solution was obtained. The same procedure was repeated several times. The samples were filtered and diluted to 100 mL using distilled water. Concentrations of P, K, Ca, Mg, Fe, Zn, Mn and Cu in the digestates were determined by using ICP-OES (Perkin Elmer-Inductively Coupled Plasma (Kacar and Inal, 2008). N was determined by a modified Kjeldahl procedure (Kacar and Inal, 2008).

Results: According to the results; the N and Ca contents of plants were generally sufficient, but it was determined that the P, K and Mg contents were insufficient. It was found that most of samples were sufficient in terms of micro ((Fe, Mn, Zn and Cu) elements contents and generally determined that there was no any problem with regard to micro element nutrition. In conclusion, it was determined that it specifically should be pay attention to applications of P, K and Mg of which are commonly established deficiencies and have importance in terms of plant growth and fruit quality.

Acknowledgements: The Scientific Studies Management Unit of Akdeniz University provided financial support for this project (2013.02.0121.027).

Keywords: Tomato, greenhouse production, mineral nutrients, Elmali-Antalya, Turkey.

ITS2 Secondary Structure and CBC Species Concept: A Case Study on the Genus *Noccaea* Moench (Brassicaceae)

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Aim of the study: The main aim of the current study is to contribute infrageneric classification of taxonomically problematic crucifer genus *Noccaea* s.sl. using secondary structure of internal transcribed spacer 2 (ITS2) region.

Material and Methods: Genomic DNA of 83 specimens from 35 different *Noccaea* taxa were extracted and ITS region amplified. For structural analysis, 5.8S-ITS2-28S regions were annotated using the HMMs-based annotation tool present at the ITS2 database V. Delimited ITS2 sequences were submitted to the RNA folding program Mfold Server and RNAstructure, Version 5.8. The structures and sequences were aligned by 4SALE. Visualization of the secondary structures was drawn using VARNA 3.9. By using ITS2 sequence-structural alignment dataset, phylogenetic tree was constructed using phangorn in the statistical framework R.

Results: In almost all *Noccaea* specimens, which were investigated, has 188 bp long ITS2 sequence. But two taxa have different length (187, 191 bp.). The analysis of ITS2 folding pattern of all specimens produced mostly similar secondary structures with four different hairpin structures. But the length and content of helix are different. The longest one is Helix III and the lowest ones is Helix IV. Although taxa can be identified with distinct fruit character, they can not be separated only using the methods based on compensatory base changes (CBC) species concept. Also the taxa, which grouped together, can have hemi-CBCs, which suggested being useful at population and species level studies. As a result of the study, ITS2 secondary structure analyses and CBC species concept were discussed in detail for the taxonomically difficult genus *Noccaea*.

Acknowledgements: This study was supported by Eskişehir Osmangazi University Scientific Research Projects Coordination Unit (Projects no. 2015/681)

Keywords: *Noccaea*, ITS2, Secondary Structure, rRNA.

Karyomorphological analysis of the *Cynaroidae* section (*Cousinia*, Asteraceae) from Turkey

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Aim of the study: The aim of this study is to examine the chromosome number and morphology of *Cousinia* Cass. taxa belonging to *Cynaroidae* Bunge sections which are spreading naturally in Turkey.

Material and Methods: Plant materials belonging to the genus *Cousinia* were collected from several localities of Turkey. The seeds collected from wild were germinated in petri dishes and root meristems were used to obtain healthy metaphase plates. Samples were pretreated with 0.002 M 8-hydroxyquinoline at 4°C for 8 h. The material was fixed with Carnoy's solution for 24 h at low temperatures (+4°C). Before staining, the material was hydrolysed with 5 N HCl for 1 h at room temperature, stained with 1% aceto-orcin and mounted in 45% acetic acid. At least 10 metaphases were examined per taxa; the best metaphase plates were photographed (100×) with a digital camera, mounted on an Olympus BX53 microscope. We took into account different asymmetry indices to analyze the karyomorphologies of *Cousinia* taxa using KAMERAM.

Results: The chromosome numbers and morphology of the studied six taxa for this section are reported for the first time in here. *Cousinia aintabensis* Boiss. & Hausskn. ex Boiss. & Hausskn., *Cou. arbelensis* C.Winkl. & Bornm., *Cou. birecikensis* Hub.-Mor., *Cou. eriocephala* Boiss. & Hausskn. ex Boiss. & Hausskn., *Cou. grandis* C.A.Mey. ex. DC. And *Cou. vanensis* Hub.-Mor. are diploid with $2n=24$ chromosomes. The basic chromosome number is $x=12$. Besides these, a satellite was specifically observed on the karyotypes of *Cou. arbelensis* and *Cou. eriocephala*. Karyotype analysis informed that the chromosomes are metacentric (m) and submetacentric (sm). *Cou. aintabensis* was found to have the highest coefficient of variation of the centromeric index (CV_{CI}) whereas the lowest were observed in *Cou. birecikensis*. From CV_{CI} values, we can deduce that *Cou. aintabensis* has the more evolved karyotype comparing to the remaining species, unlike this, *Cou. birecikensis* might be evaluated the most primitive due to it's the lowest CV_{CI} and the most simple karyotype.

Acknowledgements: We thanks TUBITAK (Project number: 111T364) for their financial support.

Keywords: Cardueae, Karyotype symmetry, Turkey.

Karyomorphological Analysis of the *Stenocephala* Section (*Cousinia*, Asteraceae) from Turkey

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Aim of the study: The purpose of the present study was to examine chromosome number and morphology of *Cousinia* Cass. taxa belonging to *Stenocephala* Bunge sections which are spreading naturally in Turkey.

Material and Methods: Plant materials belonging to the genus *Cousinia* were collected from several localities of Turkey. The seeds collected from wild were germinated in petri dishes and root meristems were used to obtain healthy metaphase plates. Samples were pretreated with 0.002 M 8-hydroxyquinoline at 4°C for 8 h. The material was fixed with Carnoy's solution for 24 h at low temperatures (+4°C). Before staining, the material was hydrolysed with 5 N HCl for 1 h at room temperature, stained with 1% aceto-orcin and mounted in 45% acetic acid. At least 10 metaphases were examined per taxa; the best metaphase plates were photographed (100×) with a digital camera, mounted on an Olympus BX53 microscope. We took into account different asymmetry indices to analyze the karyomorphologies of *Cousinia* taxa using KAMERAM.

Results: The chromosome number and morphology of *Stenocephala* section were reported for the first time here. *Cou. davisiana* Hub.-Mor., *Cou. ramosissima* DC. and *Cou. stenocephala* Boiss. are diploid with $2n=26$. The basic chromosome number is $x=13$. A satellite was detected in two chromosome pairs, and usually positioned at the short arms of the third and fifth chromosomes of *Cou. ramosissima*. Karyotype analysis indicated that the chromosomes are metacentric (m) and submetacentric (sm). TCL values show a moderately ranges from 18.13 to 24.097 among the taxa. Generally, we can conclude that the species examined in here were exactly different karyomorphologically and they display very characteristic karyotype formulas. If need to make a general inference from asymmetry indices, the taxa of this section have more evolved karyotypes and it can be mentioned conceptionally from the presence of chromosomal rearrangements according to CV_{Cl} values.

Acknowledgements: We thank TUBITAK (Project number: 111T364) for their financial support.

Keywords: Cardueae, Karyotype symmetry, Turkey.

OP356
Lithophyte Plant Diversity of Turkey

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Aim of the study: Rocky areas are one of the most sensitive habitat types in the world. The regions where these habitats are located are the areas that give the fastest response to global climate change. In these areas, resources are limited and living conditions are difficult. From this point of view, the dynamics of populations distributed in these regions may show constant variability. For this reason, the study has concentrated on the mountainous regions. This regions are leading lithophyte rich places in terms of its endemism and plant richness.

Material and Methods: There is no comprehensive study on *Lithophyte*plants and their micro-habitats in Turkey. Plant species distributed in the rocky areas of this lands, including a lot of mountain ranges, were given with life forms, micro-habitats as rock preferences, phytogeographical regions and their endemism status.

Results: As a result of first assessments, 1925 *Lithophyte*plant taxa (16,88% of total flora of Turkey) in 72 plant families were found as related to rocky habitats. The families that are richest in terms of *Lithophyte* plant taxonomy are as follows. *Lamiaceae* family is in the first rank with 245 taxa (12.7%), *Caryophyllaceae* is in the second rank with 211 taxa (11.0%), *Asteraceae* is in the third rank with 134 taxa (7.0%), *Brassicaceae* is in the fourth rank with 128 taxa (6.6%) and *Poaceae* is in the fifth rank with 116 taxa (6.0%).

Keywords: Lithophye, rocky, plant, diversity, Eastern Mediterranean, Turkey.

Macromorphological and Micromorphological Floral Peculiarities of *Acantholimon* Boiss. (Plumbaginaceae) genus from Turkey

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Aim of the study: *Acantholimon* genus belongs to Plumbaginaceae family. Current estimates suggest that the genus includes 200 species in the world (Bokhari 1970). The taxa of this genus have prickly and flapy leaves. Because of that reason, it is hard to separate them at the field without their flowers. This study is made to understand the flower structure related 57 taxa of *Acantholimon* genus, which of 38 are endemic collected from Turkey, in a detailed way by using light and scanning electron microscope (SEM).

Material and Methods: 57 taxa of *Acantholimon* genus were gathered from all over the Turkey at their flowering times. Specimens were kept as herbarium materials. Flora of Turkey was used for their taxonomical description. On the other hand, light microscope and scanning electron microscope were used to determine macromorphological and micromorphological feautres of flowers as regards this genus. For scanning electron microscopy, dried flowers of all taxa were mounted on stubs using double-sided adhesive carbon type. Samples were coated with 10 nm of gold-paladium. Coated kalix, corolla and flower tubes were photographed with a FEI QUANTA 400 F model scanning electron microscope. Terminology of flowers as regards all taxa were made according to Stearn (1992) and Bojňanský&Fargašová(2007).

Results: According to first part of the research, flower macromorphologicaly and kalix, kalix tube and outer bracts were investigated in the point of their micromorphological features. Especially, surface structural characters of sepals, bracts and hair forms as regards tube of flower, sepal and bracts were assesed as discriminative peculiarities. All the determined characters concerning surface ornemantation and hair types of all investigated taxa were important and taxonomically valuable to use in the identifying key for the genus.

Acknowledgements: The authors would like to thank the Scientific and Technical Research Council of Turkey (TUBITAK) for project funding (TBAG-1781 and 212T222).

Keywords: Flower, macromorphology, micromorphology.

Morphogenesis of the buds and morphology of pollen Wild plum (*Prunus divaricata* L.) in Absheron conditionsJeyran N. NAJAFOVA¹

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Aim of the study: There was studied morphogenesis of generative and vegetative buds of *Prunus divaricata* L. introduced in Absheron. It was established that the generative and the vegetative buds of wild plum during a determination phase and in further differentiation were exposed to qualitatively and quantitative changes. The duration of differentiation of generative buds was on average of 219 days, but for vegetative buds this period was 211 days. Wild plum underwent normally all stages of its vegetative and generative development (morphogenesis of vegetative and generative buds, floral, inflorescences, flowering and fructification), so it gives the bases for considering this species as perspective decorative and fruit plant for Absheron.

Material and Methods: The characteristics of morphogenesis of wild plum buds were studied by methods of Bullequin with stereomicroscope MBS-1. The morphology and the vital ability of pollens were studied by Pausheva method. The morphological observations were carried in accordance with the methodology developed in primary Botanical Garden of Russia during the per vegetation period in the following phases: the beginning of buds swelling, the beginning of leafing after every 2-3 days, but in spring and in high season after days. Acetocarmine colors cytoplasm of normal pollen grains into rosy color, and the kernel of a generative cell into pale-red, but sterile pollen grains are not colored and remain yellow.

Results: Vegetative and generative buds of wild plum introduced to Absheron, were laid in the year preceding flowering and were formed, from the stage of meristematic tubercle until whole development within 10-11 months. The duration of differentiation of generative buds was on average of 219 days, but for vegetative buds, this period was 211 days in Absheron conditions. So, it's necessary to conclude that wild plum introduced to Absheron consistently underwent normally all stages of its vegetative and generative development (morphogenesis of vegetative and generative buds, floral, inflorescences, flowering and fructification). In the article had been identified that, the length of polar axis is 34µ., equatorial diameter 30 µ from the polar outline the pollen grains are rounded-triangular and from the equator are elliptic.

Acknowledgements: I would like to express my thanks to the administration of the Botanical Garden of the National Academy of Sciences of Azerbaijan for financial support in carrying out this work.

Keywords: morphogenesis, bud, vegetative, generative, pollen grains, apical meristem.

Morphological, Palynological Properties and Seed Micromorphology of Genus *Reseda* L. (*Resedaceae*) in Turkey

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Aim of the study: In this study morphological, palynological properties and seed micromorphology of the genus *Reseda* (*Resedaceae*) in Turkey in the light of collected specimens from field trips carried out in 46 provinces between 2013 and 2015, is presented.

Material and Methods: Materials used for this study were collected field trips carried out in 46 provinces between 2013 and 2015. Data of all morphological characters is based on the measurements of recently collected specimens. "Flora of Turkey and the East Aegean Islands" and "The *Resedaceae*: A Taxonomical Revision of the Family (final insaltment)" are used for identification. In palynological studies, pollen slides are prepared according to Erdtman method (1960). The followed parameters were measured on fifty pollen grains: Polar axis (P), equatorial axis (E), length of colpi (Clg), wide of colpi (Clt), length of pori (Plt), pollen diameter in polar view (Amb), apocolpia and exine thickness. The pollen images has been taken by Olympus CX41-E330 imaging system. All pollens and seeds are photographed by Scanning Electron Microscope (SEM).

Results: One of the most important diagnostic character of *Reseda* is petal structure. There are three pairs of separate petals in total, consisting of an appendage and lacinia. Pollen grains are isopolar, radially symmetrical, small sized and tricolporoidal. At equatorial view, pollen grains are prolate-spheroidal, oblate-spheroidal and subprolate, and circular at polar view. Apocolpial area is rather narrow. Colpi are long and broad, pori cannot be measured because its limits are not distinct and clear. Exine layer is thin, 1 µm. Sexine and nexine can not be distinguished from each other. Intine layer also very thin and can not be measured. Exine sculpture is reticulate and/or microreticulate. In sectional level, seed ornemantations are also important and helps to differentiate species from each other.

Acknowledgements: The specimens in this study were collected during field trips for the project "Taxonomy of *Reseda* L. Genus (*Resedaceae*) in Turkey" (Supported by Hacettepe University Scientific Research Center, Project No: 013 D04 601 003). We also wish to thank Münevver Pınar, Cahit Doğan, Edibe Baysal and Golshan Zare.

Keywords: *Reseda*, *Resedaceae*, morphology, palynology, seed micromorphology.

Nickel hyperaccumulation in *Bupleurum croceum* Fenzl from serpentine soils in Yahyalı-Kayseri (Turkey)

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Aim of the Study: Serpentine plants are important genetic resources used in the treatment of heavy metals in polluted environments. These plants grow in nickel and chromium-rich serpentine soils and have a high accumulation of metal ($>1000 \text{ mg kg}^{-1}$) in aerial parts, which are called hyperaccumulators. There are about 500 hyperaccumulator plant species in the world, of which 360 are Ni hyperaccumulators. This study was aimed to determine the Ni accumulations of some Apiaceae members growing on the serpentine soils of Yahyalı (Kayseri).

Material and Methods: *Prangos uechtritzii* Boiss. & Hausskn., *Bupleurum croceum* Fenzl. and *Zosima absinthifolia* (Vent.) Link. plants from the Apiaceae family in serpentine soils of Yahyalı constitute the main material of this study. Ni concentrations in the soil and underground and aboveground parts of plants were determined by using ICP-OES device.

Results: It was found that the concentrations of nickel in the soil grown by the plants change between 1150 and 4250 mg kg^{-1} . The concentrations of Ni in the underground and aboveground parts of the plants were as follows: in *Prangos uechtritzii* 367- 9 mg kg^{-1} , in *Bupleurum croceum* 39-4941 mg kg^{-1} and in *Zosima absinthifolia* 149-33 mg kg^{-1} (dry weight). Consequently, it was determined that *Bupleurum croceum* had approximately five times more Ni accumulation than the limit values in aerial parts. Accordingly it is suggested that *Bupleurum croceum* could be added to the list of hyperaccumulator plant as a new Ni hyperaccumulator.

Acknowledgements: We would like to thank Nevşehir Hacıbektaş Veli University Scientific Research Projects Coordination Unit (Project No. NEUBAP-13F28) for their financial support.

Keywords: Apiaceae, *Bupleurum*, Ni-hyperaccumulator, serpentine, Yahyalı, Turkey.

Numerical taxonomy of the genus *Psephellus* Cass.in Turkey

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Aim of the study: This study aims to investigate the morphological variation and phenetic relationships of *Psephellus* Cass. Taxa in Turkey.

Material and Methods: Plant samples were collected from different localities in Turkey during 2010-2012. The samples were dried according to standard herbarium techniques and stored at the Selçuk University Konya Herbarium (KNYA). For numerical analysis, 89 characters for 30 *Psephellus* taxa were selected and used in this analysis. Numerical data were scored and the dendrogram was constructed by these data to show the relationship among the taxa. In addition, the principal component analysis (PCA) was used to demonstrate the presence of morphological variation.

Results: The phenetic relationships and morphological variations among *Psephellus* taxa were determined by the numerical analysis. The dendrogram obtained from numerical analysis showed that most of the taxa are clearly differentiated from the others by morphological characters. PCA analysis shows that *Psephellus* taxa have 95% of morphological variation. According to three-dimensional graphic constructed by PCA, *Psephellus* taxa have big variation and genetic diversity. *Ps. appendicigerus* and *Ps. poluninii* are the most distinct species of the genus. *Psephellus* species should be taken into consideration in relation to evolutionary processes. Owing to the majority of studied taxa are thought to be local endemic or regional species, it will be easier to understand this wide variation, taking account of different habitats, microclimatic conditions and introgression as well as geographic isolation.

Acknowledgements: We thanks TUBITAK (Project number: 109T958) for their financial support.

Keywords: Phenetic relationships, principal component analysis, Turkey.

Species Delimitation and Assessment of Biodiversity: With Emphasis on Some Mediterranean *Silene* L. (Caryophyllaceae) Species

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Aim of the study: Species is often referred as fundamental units in relation to the assessment and organization of the biodiversity. Species delimitation is the identification of the boundaries of such units, and the correct identification of the boundaries of species may have critical impacts on any fields from conservation biology to studies of macroevolutionary dynamics such that rely on the species as unit of analysis. In this study, we assessed the species limits in some groups of Mediterranean *Silene* species, belonging to the family Caryophyllaceae.

Material and Methods: With the increasing possibility of collecting genome wide data for many individuals, the Multispecies Coalescent Model (MSC) has almost become standard for many approaches used for species delimitation based on genetic data. MSC model provides considerable power in identifying boundaries of recently diverged taxa. However, there are also limitations associated with implementation of the model. Here, under a Bayesian framework, we used programmes DISSECT/STACEY implementing MSC model, to estimate the species tree for corresponding *Silene* groups, using data from multiple, low copy number loci.

Results: Our results indicate that, the species diversity in two of the investigated groups is underestimated, and their existing taxonomic classifications are incongruent with those observed from genetic data, while in one of the groups, the results were largely compatible with the current taxonomic circumstance of the group.

Acknowledgements: Swedish Research Council, Lundgrenska Stiftelsen, University of Geneva, Jardin Botanic & Conservatoire, Turkish Higher Education Board, Dicle University Scientific Research Center, The Scientific and Technological Research council of Turkey

Keywords: Multispecies Coalescent, *Silene*, Species delimitation, DISSECT-STACEY.

Species of family *Orthotrichaceae* Arn. (Bryopsida) in bryophyte flora of AzerbaijanTural GASIMOV¹, Vagif NOVRUZOV²¹Institute of Botany, Azerbaijan National Academy of Sciences, 40 Badamdar Highway, Baku AZ1004, Azerbaijan,²Ganja State University, 187 Heydar Aliyev Avenue, Ganja AZ2000, Azerbaijan
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Aim of the study: The species of family *Orthotrichaceae* acrocarpous or cladocarpous. Leaves ovate to narrowly lanceolate. Laminal cells of this genus species isodiametric, thick walled. Setae short or long, capsules usually erect, caliptrae with erect hairs. Mainly corticolous or saxicolous plants. A world-wide family which consist of twenty-three genera. Our aim of the study, based on Herbarium materials (BAK) and site sampling, according to Smith (2004) system, to describe and classify bryophyte species, make modern systematic analysis of *Orthotrichaceae* species in Azerbaijan.

Material and methods: The research sites are different administrative divisions (Samux, Göygöl, Daşkəsən, Tovuz, Ağstafa, Gədəbəy, Şəmkir, Gəncə, Abşeron, Quba, Şəki, Xızı etc.) which located in Azerbaijan. The field work was done 2012-2016 years. The specimens was placed in a plastic bag with a field label data: altitude, collection number, date of collection and information on their ecology and associated habitats. They was then air dried and placed into envelopes and properly labeled for herbarium vouchers. Voucher specimens was databased and deposited in the bryophyte herbaria of the Institute of Botany (ANAS, Azerbaijan). The specimens collections was identified, classified and described morphologically by their diagnostic characters such as leaf arrangement, stem structure, sporophyte characters and rhizoids using the relevant identification guides and available monographs of Greven (1995), Игнатов (2003), Smith (2004) and Kürschner (2011). Further examinations was done through microscopy analyses.

Results: A systematic analysis of the collected samples and based on literature researchs were define that the family of *Orthotrichaceae* consist of 3 genus and 20 species in bryophyte flora of Azerbaijan. Among these species dominated genus is *Orthotrichum* which consists of 18 taxa: *O. affine*, *O. anomalum*, *O. cupulatum*, *O. fastigiatum*, *O. gymnostomum*, *O. lyellii*, *O. obtusifolium*, *O. pallens*, *O. patens*, *O. pumilum*, *O. rogeri*, *O. rupestre*, *O. speciosum*, *O. stramineum*, *O. striatum*, *O. urnaceum*, *O. urnigerum*, *O. diaphanum*). The remaining 2 genus: *Zygodon* and *Ulota* species (*Zygodon viridissimus*, *Ulota hutchinsiae*) are carried monospecific character in bryophyte flora of Azerbaijan.

Acknowledgements: We gratefully acknowledge the financial support of the field studies by Institute of Botany, Azerbaijan National Academy of Sciences). Special thanks belong to prof. Valida Alizade (The director of the Institute of Botany, ANAS), who supported the field work in Azerbaijan.

Key words: *Orthotrichaceae*, mosses, family, genus, species

Successful Breaking Seed Dormancy of Immature Seeds of Charismatic and Endemic *Hyacinthella lineata* L. Under *In vitro* Conditions

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Aim of the study: Ten species of *Hyacinthella* with various shades of charming white to violet colored flowers grow on many diverse habitats under wide variety of conditions on the soils of Turkey. According to United Nations Convention on Environment and Development (UNCED), loss of habitats and species is a major issue in sustainable forest management and conservation of biodiversity worldwide. Very little research has been conducted on conservation of this species that stay dormant underground for a long time. The objective was to multiply these plants to conserve biodiversity in relation to this plant by developing techniques for its restoration.

Material and Methods: This study evaluated germination potential of immature seeds of *Hyacinthella lineata*, an endemic species on MS medium enriched with 0.50 mg/L BAP+0.6 mg/L NAA, 1.00 mg/L BAP+0.6 mg/L NAA and 1.50 mg/L BAP+0.6 mg/L NAA to break seed dormancy.

Results: The highest germination percentage was observed on MS medium containing 1mg/l BAP+0.6 mg/l NAA. The immature seeds growing on control treatments containing MS medium did not germinate. This result was consistent for different concentration of BAP+0.6 mg/L NAA. Generally germination increased in linear line up to MS medium containing 1 mg/l BAP+0.6 mg/L NAA in the culture medium. Thereafter, following concentrations of BAP+0.6 mg/L NAA in MS medium had a significant negative effect on *H. lineata* immature seeds germination. The described protocol could be affectively used for multiplication of this plant for biodiversity conservation by its applications in forestry, horticulture, and landscaping industry.

Acknowledgements: The authors acknowledge support of the Department of Field Crops, Faculty of Agricultural and natural Sciences, Uşak University, Uşak Turkey.

Keywords: *Hyacinthella lineata*, endemic, regeneration, immature seeds, dormancy.

The Contributions to Revision of *Gundelia* L. in TurkeyMetin ARMAĞAN¹,¹Medicinal and Aromatic Plants Program/ Buharkent Vocational School, Adnan Menderes University, Turkey

Aim of the study: The genus *Gundelia*, described by Linné, was thought to be monospecific for a long time. *Gundelia tournefortii* was typified by Vitek and Jarvis and the characters of this species have been defined by Vitek and his colleagues. *Gundelia glabra* Miller and *Gundelia rosea* M. Hossain et Al-Taey have been re-established and the species were defined as well. New species have been described nowadays from Armenia, Turkey, and Iran. It is aimed to determine whether the differences among *Gundelia* populations result from variations of either genetical or ecological factors.

Material and Methods: For the current study, the samples from each discovered *Gundelia* populations in different regions of Turkey are being taken. Leaf specimens taken for population genetic studies are dried in silica gel. During fieldworks, general photos representing characteristics of both habitat and plants are taken. Additionally, records of population and localities are kept. The samples dried between presses were stored in the Herbarium of Adnan Menderes University (AYDN) and the Herbarium of the Natural History Museum in Vienna (W).

Results: In Turkey, different taxa are spread through regions except Aegean, Marmara and Black Sea coasts. Nowadays, many researchers interest in *Gundelia* species. The reason behind this is that genus *Gundelia* has different variations on flower colour, the synflorescence compound flowers, habits, bracts and leaves size. So, description characters of *Gundelia* are defined again.

Acknowledgements: I wish to thank to E. VITEK, A. DOĞRU-KOCA and G. ZARE for the samples and data of *Gundelia*.

Keywords: *Gundelia*, morphology, Turkey.

The Endemic Plants of Tunceli (Eastern Turkey)Metin ARMAĞAN¹,

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Aim of the study: Tunceli is located on Anatolian diagonal in Eastern region of Turkey. Geography of Tunceli composes of significant elevations and valleys. Determination of the flora of Tunceli, identification of both endemic and rare plants found in Tunceli, and development of their conservation plans are aimed to be done.

Material and Methods: By field works, samples were collected from different regions of Tunceli during vegetation periods in between 2014-2016. All locality data were taken during the field trip. The Flora of Turkey and the relevant floras were used for identifications of the samples. The voucher species are kept in the herbarium of the Yüzüncü Yıl University, Van (VANF).

Results: Nearly 1600 vascular plants taxa were identified by field works carried out since 2014 and whose aim was to detect the flora of Tunceli. 290 of them are determined to be endemic. 13 taxa are in CR, 23 taxa are in EN and 3 taxa are in EX IUCN categories. *Silene surculosa* Hub.-Mor. which was situated in EX category was recollected and updated as CR regarding IUCN level. Additionally, *Verbascum duzgunbabadagensis* Karavelioğlu, Yüce, Başer, *Gundelia dersim* Vitek, Yüce, Ergin (Dersim Kengeri), *Gundelia munzuriensis* Vitek, Yüce, Ergin (Munzur Kengeri), *Gundelia vitekii* Armağan (Sütlüce Kengeri) and *Gypsophila munzurensis* Armağan (Munzur'un Nefesi) are newly determined endemic taxa from Tunceli province.

Acknowledgements: I am really grateful to Republic of Turkey Ministry of Forestry and Water Affairs, General Directorate of Nature Conservation and National Parks, especially, A.H. Gürsönmez and M. Özel at the same institution in Tunceli.

Keywords: Tunceli, flora, endemic, Turkey.

The Herbarium of V.F. Kuprevich Institute of Experimental Botany and studies on fungal diversity in Belarus

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Aim of the study: Fungi are one of the largest groups of living organisms, but still at the territory of Belarus they have been poorly understood and investigated compared to vascular plants. The purpose of our article is the presentation of fungal biodiversity on the basis of exemplars which the Belarusian mycologists collected for nearly eighty years and which are stored in the Herbarium of V.F. Kuprevich Institute of Experimental Botany (MSK-F) now.

Material and Methods: The used research methods were traditional for mycology and microbiology. Studying of specific structure of fungi was carried out by the conventional field techniques in all geobotanical regions of Belarus. The accounting of species and collecting the material was conducted according to the practical standards: comparative anatomic, morphological. Collections have been preserving, labelling, cataloguing, and organizing for more than 70 years. In the past, we applied the methods of optical microscopy but we now have the opportunity to exploit the techniques of molecular genetic analysis.

Results: The process of replenishment of the Herbarium funds started from a few rust fungi, collected by V.F. Kuprevich in 1940s. Than his follower T.A. Shcherbakova collected in 1954–1956 specimens of rust, smut, and powdery mildew fungi including representatives of the families *Coleosporium*, *Leveille*, *Melampsora*, *Puccinia*, *Uromyces* developing on wild-growing grassy and shrubby plants. In the next years the herbarium began to be replenished with fungi of various systematic groups. The specimens collected in the 1950s–1990s: – by G.I. Serzhanina and O.S. Gapienko (agaricioid fungi, discomycetes, gasteroid fungi, aphyllorphoroid fungi, heterobasidiomycetes); – by E.P. Komarova (aphyllorphoroid fungi); – by A.I. Golovko (aphyllorphoroid fungi, especially *Phellinus*); – by V.I. Nitievskaya and N.I. Chekalinskaya (pathogenic fungi on fabaceous herbs – rust, ascomycetes, peronosporomycetes). The specimens collected in the 2000–2017:– by O.S. Gapienko (agaricioid fungi, discomycetes) and her apprentices E.O. Yurchenko (aphyllorphoroid fungi, especially *Peniophora*), I.A. Khantsevich (agaricioid fungi), N.G. Kordiyako (aphyllorphoroid fungi), Ya.A. Shaparava (agaricioid fungi, especially the *Russulaceae*), T.G. Shabashova, D.B. Belomesyatseva, S.I. Korinyak (anamorphic fungi, ascomycetes) made the main part of the modern Herbarium. Also there are the mycophilous fungi from collection by G. Arnold (2004) as dried cultures on agar. Now in the Herbarium stays on the registry 15357 depository items including 11018 macromycetes and 4086 micromycetes. Besides the materials collected in Belarus also a lot of specimens from different countries are stored in the Herbarium. Collections geography: Belarus, North, West and East Europe, Caucasus, Urals, Sibir, Middle and Southwest Asia, Far East, Caribbeans, Australasia, Africa, South America.

Keywords: herbarium, MSK-F, ascomycetes, basidiomycetes, anamorphic fungi.

The low-doses of ionizing radiation impact on generative phase of *Arabidopsis thaliana*

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Aim of the study: in our researches we study impact of low doses of ionizing radiation on plants generative phase. Ionizing radiation is strong environmental factor which influences on the plants biodiversity and agriculture. Study of radiation acting on flowering phase and harvesting stage is important to science and agriculture. Damages in reproduction function of plants influence on plants biodiversity and nature ecosystems under impact of harmful stress factors. The radiation causes the DNA damages, epigenetic changes in genome, changes proteins space organization. This effects cause genome destabilization in plants organisms too. Low doses of ionizing radiation stochastic effect and impact on signaling hormones pathways of wild ecotype and mutant line of the jasmonic (*Jin*) gene defected plants were investigated.

Material and Methods: The model plants *Arabidopsis thaliana* wild type ecotype *Columbia 0* and mutant line of jasmonic signaling pathways *Jin* were used in our experiment. The experimental plants were cultivated in soil with 18 hours light and 6 hours dark illumination mode at room temperature. The treatment of acute radiation was performed on 32 days old plants, phase 5.10 according to Boyes et al. (2001). The plants were irradiated by X-rays with a dose rate of 89 cGy/sec and a total dose of 5 Gy. The chronic radiation was performed using the ¹³⁷CsCl radiation with two total doses of 3 cGy and dose rates 10-7 cGy/sec. The plants in the experimental group were grown under chronic radiation during 6 weeks from seeds to flowering. The plants in the control group were grown in the same conditions, but without radiation. The time of flowering were detected in the *Arabidopsis* development phase 6.30. Harvesting of plants was determined by Muller test.

Results: The 6.30 phase of flowering began at 5 Gy treatment plants line *Jin* at 44 day comparing of control group 51 days, experimental plants wild type *Col 0* started 6.30 phase at 60 day and control group at 67 day. Chronic irradiated plants line *Jin* start flowering phase 6.30 at 54 day comparing of control group was 57 days. The Muller test shown that 5 Gy irradiation increase harvest of *Jin* plants but decrease it in wild type *Col O* ($P < 0.05$). We observed that low doses acute radiation caused delay of flowering time in wild type and mutant line. The Muller test results have shown that the acute radiation stimulates harvest of *Jin* plants. But the harvest of wild type was reduced. We concluded that jasmonic acid pathway take part important role in stochastic effect of radiation and signal transduction.

Acknowledgements: Our study supported by IRSES GA-2013-612587 «Plant DNA tolerance»

Keywords: the ionizing radiation, generative phase, flowering, low doses, the stochastic effect, jasmonic acid pathway.

The Positive Impacts of Modern Irrigation Systems on Agricultural Biodiversity: A Case Study of Nevşehir-Derinkuyu District in Turkey

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Aim of the study: This study was carried out with the aim of revealing changes in agricultural product diversity through the use of modern irrigation systems in Nevşehir-Derinkuyu District of Turkey. In order to increase agricultural biodiversity, agricultural application processes have to be done effectively and appropriately. Especially in areas where irrigation technologies are used effectively, the diversity of agricultural production is increasing. Water is indispensable for the life of plants. In this context, the variability of agricultural production is limited only in rains-related agricultural production model. However, the diversity of agricultural production varies with the increase in the interaction with water resources. In particular, the application of modern irrigation techniques ensures that the root zone of the plant is constantly moistened and helps to keep plants from suffering drought stress. Differences in agricultural product design will come into play due to the use of modern irrigation systems such as drip, sprinkler, micro and center pivot irrigation systems.

Material and Methods: This study was carried out by comparing the values obtained from Turkish Statistical Institute of the beans data of Derinkuyu district of Nevşehir with the irrigation practices of years. In this research area, the region of Nevşehir which is the most concentrated due to the diversity of agricultural production is Derinkuyu district. In recent years different kinds of agricultural products have started to be cultivated in this region with the application of modern irrigation systems. The widespread use of irrigation technologies in the region has increased the cultivation of especially dried beans, clover and cookies and has allowed the opportunity to grow in different agricultural products that are not cultivated at all.

Results: In this research area, The amount of dry bean cultivated in the irrigated area of Nevşehir in Derinkuyu district in 2012 year was 25 decare in the total amount of dried beans was 7.7 thousand tons while the usage rate of modern irrigation methods increased to 40.5 decare and 14.4 thousand tons in the same area in 2014 year. In the 2016 year, 57.5 decare of dry bean production amounting to approximately 23.2 thousand tons. With the use of modern irrigation methods, there is a visible change in agricultural production diversity. With the use of modern irrigation methods, there is a visible change in agricultural production diversity. Farmers in this area have turned to alternative agricultural products and have contributed positively to increased biodiversity in the region. The use of modern irrigation technologies is more impacting on biodiversity and providing all the infrastructure support needed to increase such irrigation practices and increasing agricultural support will inevitably be ignored.

Keywords: Agricultural Biodiversity, Modern Irrigation Systems, Nevşehir-Derinkuyu District.

Bioontologies as a tool for plant research

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Aim of the study: Due to the huge volume of electronic documents, there is an ever-growing need for processing unstructured textual information, improving the quality and efficiency of existing text processing methods. Initially, information retrieval thesauri were developed to adapt information for retrieval and for needs of information and analytical systems, which were supposed to be manually indexed. The modern paradigm of computer resources for information retrieval applications are formal ontologies. Ontologies cover most of the words of a language or domain and simultaneously have an ontological structure that manifests itself in the relations between concepts.

Material and Methods: The most significant bioontologies were observed. GO is a structurally controllable dictionary dedicated to the unification of the terminology of gene and gene product annotations of all biological species. PO is a public structured dictionary of terms for the anatomy and morphology of plants, as well as the stages of their development. ChEBI includes the ontology of natural compounds or synthetic products that affect the processes in living organisms. CL is a structured controlled layer that includes a description of the cellular types of various organism types. KEGG is a series of ontologies that focus on a broad field of molecular biology - from genes and proteins to metabolic and gene networks. SO includes many concepts and controlled dictionaries used to describe the properties and primary annotation of nucleotide or protein sequences, the structural representation of these annotations in genomic databases, mutations in both sequence types and at a higher level. The MGED ontology is used to describe experiments and data on gene expression. MIAME is used to describe expression data. PharmGKB provides information on pharmacogenetics. Cell Cycle Ontology is an extension of existing cell cycle-related ontologies to integrate and manage knowledge about its components and regulatory aspects.

Results: In general, in bioinformatics and system biology, the following tasks can be distinguished, in which the application of ontologies gives a noticeable effect. (·) Interpretation of molecular genetic knowledge, semantic interpretation of methods of data analysis and models in system biology. (·) Prioritization of genes, proteins, biomarkers, etc. (·) Analyzing the similarity and clustering of objects. (·) Support for interoperability and knowledge sharing - unified access to sets of heterogeneous data sources. (·) Creation of new ontologies based on the repeated use of basic canonical ontologies and various types of operations with them, including ontology matching, ontology merging, ontology mapping, ontology alignment. (·) Ensuring consistency and correctness of knowledge representation. (·) Support inductive inference for extracting additional knowledge from a variety of facts and testing hypotheses. (·) Increasing the rationale for bioinformatics methods.

Keywords: plant ontology, bioinformatics, secondary metabolism, plant research.

The diversity of *Pectobacterium* strains isolated in Belarus and worldwide

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Aim of the study: Investigate the diversity and pangenome content of *Pectobacterium* strains isolated in Belarus and worldwide

Material and Methods: *Pectobacterium atrosepticum* (*Pat*) strains 21A and 36A, *P. carotovorum* (*Pca*) strains 3-2 and 14A isolated in Belarus were used. Genomes were sequenced with Illumina technology, assembled with SPAdes followed by manual repeat resolution. Remaining gaps were filled by Sanger sequencing. Roary was used for pangenome analysis.

Results: Genomes of potato pathogen *Pat* are very similar to each other, with average nucleotide identity (ANIm) above 98.8%. For example, the genome of Belarusian isolate 21A is closer to the genome of Chinese isolate JG10-08 than to that of another Belarusian isolate 36A (ANIm 99,95% vs 99,36%). *Pca* genomes are more diverse (ANI values down to 90%). Gene content analysis finds only one small cluster of genes related to phosphonate utilisation present in all strains classified as *Pca* but absent from other *pectobacteria* while much more species-specific genes can be found for other *Pectobacterium* species. We suggest that current *Pca* species should be split into 4-7 new ones better reflecting their genome structure and biology. Numerous mobile elements and genomic islands suggest highly dynamic nature of *pectobacterial* genomes. Analysis of 11 complete genome sequences shows pangenome content of just under 8000 genes (almost twice more than in a single strain) with core pangenome of ~2500 genes. Surprisingly, adding new genomes to this analysis increases pangenome size only marginally, suggesting that *pectobacterial* pangenome should be considered closed rather than open. We conclude that *Pectobacterium* genome diversity shows little dependence on origin of strain isolation, but correlates strongly with plant host range.

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Keywords: *Pectobacterium carotovorum*, *Pectobacterium atrosepticum*, virulence, pangenome.

Use of Next-Generation Sequencing Technologies in Biodiversity Research

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Aim of the Study: When biodiversity was traditionally evaluated, indices such as species richness were assessed. However, with recent developments, criteria such as phylogenetic and functional diversity are taken into consideration. The analysis of environmental DNA through DNA barcoding has been a key application of next-generation sequencing technologies (NGS) in ecological and environmental research. In search of biodiversity, these new technologies are promising. The purposes of these approaches are to characterize organisms that present in a certain sample and identify what roles each organism has within a specific natural environment. This study discusses the advantages and disadvantages of using the next-generation sequencing technologies in biodiversity studies. And current studies on this subject has been compiled.

Material and Methods: This report used observation method and study literature method. Current studies in this area have been compiled and discussed. This report presents an interpretive review of the literature in biodiversity and use of NGS.

Results: Global biodiversity is steadily declining due to some uncontrolled human-induced applications. It is of great importance to monitor the declining and to identify and treat critical areas and species. NGS has enabled simultaneous sequencing of environmental samples and produce enormous amounts of data in relatively short times. At the moment, we are at the very beginning of perfecting this research fields. Metagenomics has become very important in recent years as a new field of research involving the direct examination of genetic material obtained from environmental samples. Consequently, Next generation sequencing technologies have become the preferred choice of researchers in this field as a technology that enables determination of the diversity in environmental samples.

Keywords: Biodiversity, Next-generation sequencing, DNA, Ecosystem.

**Assessment of Chemical Properties of the Soils in the Catena Which Forms Tekirdağ
Değirmenaltı-Muratlı Intersection Ringroad**

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Aim of the study: In this study, the chemical composition of Inceptisol, Entisol and Vertisol type soils in the catena established from the İstanbul entrance of Tekirdağ ringroad to Bağlar district and the Muratlı crossroad have been investigated.

Material and Methods: For determining locations of model profiles, 1 / 100.000 and 1 / 25.000 scaled Tekirdağ Land Soil Inventory topographic maps which were produced by the General Directorate of Soil Water were used. After detailed field observations ten points were chosen to extract soil properties and they were described and sampled based on the genetic horizon designations. Among the sampled soils, Ca, Mg, Na, K and CEC (Cation Exchange Capacity), Organic matter, lime, total N and salt; available Fe, Mn, Zn, Cu are determined as the chemical parameters.

Results: As results, the pH of the soils were generally neutral, the salinity problem was not detected, the scale of the lime was generally less calcified, organic matter was detected moderately and less. Na, Fe and Mn values in Vertisol type soils and CEC, N, Ca, Mg, K, Cu, and Zn values in Inceptisol type soils were observed as lowest values. The highest values were observed for all elements in Inceptisol type soils.

Keywords: Chemical composition, Soils, Catena, Tekirdağ, Türkiye.

Comparison of Four Spatial Interpolation Methods for Some Soil Properties in Corn Grown Areas, Northern Part of Turkey

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Aim of the study: In this study, spatial distribution maps of some soil properties were prepared by using different interpolation methods. There are many different interpolation methods for preparing spatial maps using point data. For preparation maps, firstly the method that gives the most accurate spatial distribution should be determined.

Material and Methods: The soil samples were taken 30 different points and 0-30 cm and 30-60 cm depth of soil profiles in corn grown areas and soil properties such as electrical conductivity, clay and silt values were determined. In order to determine the most appropriate interpolation method, four interpolation methods, Inverse Distance Weight (IDW), Radial Basic Function, Ordinary Kriging (O.K.), and Simple Kriging (S.K.) were compared, and then the soil maps were prepared using the optimal method. The performance of four interpolation methods were evaluated by using cross validation and Root Mean Square Error (RMSE) was used to determine the best method.

Results: In 0-30 cm soil depth, SK method had the lowest RMSE for EC, whereas Clay was best estimated by using OK method. RBF was found to be the optimal method for Sand. In 30-60 cm soil depth, The IDW method was determined the best for EC and the RBF method was the most accurate for Clay and Sand.

It was found that there was no salinity problem in the study area and salinity was higher at 30-60 cm soil depth. Most study area soils were determined to be sandy and need frequent irrigation. Spatial distribution maps should be prepared. In precision agriculture, irrigation and redemation of soils after the best interpolation method has been determined.

Keywords: Geographic information methods, Salinity, Interpolation methods, Ordinary kriging

Variation in Some Soil Properties and Soil Organic Carbon and Total Nitrogen Stock Capacities of Anatolian Chestnut: In Relation to Soil Depths and Altitudes

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Aim of the study: From ancient times to present, chestnut tree is known as one of the most remarkable tree on earth due to its economical and anthropogenic importance. Turkey has 88.443 hectares of chestnut forests (*Castanea sativa* Mill.) and many studies have been carried out to investigate the natural distribution, development, productivity, ecology and diseases (chestnut ink and blight). However, the effects of chestnut tree on soil organic carbon and total nitrogen contents and stock capacities has received less attention. Aim of this study was to study the variation in soil organic carbon and total nitrogen contents and stock capacities of Anatolian Chestnut.

Material and Methods: This study was carried out in the Kastamonu province, Abana and Inebolu Districts, north-east of Kastamonu, Turkey, (41°59' N, 34°01' E). Soil samples were collected from six soil depths (0-5 cm, 5-10 cm, 10-15 cm, 15-50 cm, 20-25 cm, 25-30 cm) at three altitudes of 41 m, 250 m and 305 m. The soil samples were air-dried, ground and pass through 2 mm mesh-sized sieve. They placed into marked plastic bags and kept in a fridge until chemical analysis. The soil samples were then analyzed for soil pH, soil texture, bulk density, soil organic carbon (SOC) and total nitrogen (TN) contents and stock capacities. Soil pH (H₂O) was measured in deionized H₂O using a glass calomel electrode, after equilibration for 1 h in a solution:soil paste ratio of 10:1. Soil texture (sand, silt and clay) was determined by Bouyoucos' Hydrometer method. Soil organic carbon and nitrogen contents were analyzed Kastamonu University Center Laboratory using Eurovector EA3000-Single CNH-S element analyzer. The total soil organic carbon and total nitrogen stock capacities were then calculated by multiplying soil volume, soil bulk density, and the total soil organic carbon or total nitrogen content.

Results: Among soil properties, soil bulk density and clay content increased with altitudes, while soil pH, silt and sand contents decreased. There were clear trends of decreasing soil pH and bulk density with the soil depths, but no clear trends with soil textures. Mean SOC and TN contents decreased with the altitudes and the soil depths. Mean SOC-stock capacity also decreased with the altitudes showing 87,4 t C ha at the altitude of 41 m, followed by 69,8 t C ha at the altitude of 305 m and 66,3 t C ha at the altitude of 250 m. Similarly, mean TN-stock capacity was highest with 6,61 t N ha at the altitude of 41 m, followed by 6,39 t N ha at the altitude of 305 m and 6,07 t N ha at the altitude of 250 m. Both mean SOC- and TN-stock capacities decreased with the soil depths.

Acknowledgements: This research has been supported by the Kastamonu University, Scientific Research Projects Coordination Department, Kastamonu, Turkey (Project Number: KUBAP-01- 2016-23).

Keywords: *Castanea sativa*, soil properties, soil organic carbon, total nitrogen, Kastamonu.

How Can We Evaluate the Speed and Movement Direction of Creep due to Trees?Ali AYDINGeophysics Department, Pamukkale University, Turkiye
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Aim of the study: In this study, we tried to calculate the speed and movement direction of creeps due to trees from two selected area in Denizli, Turkiye. So we developed a method from inclination degrees of trees, and we showed that there is soil movement in searching area in the study area. Environmental factors such as soil creep, snow, wind, rain and sun can cause some effects on trees about growing curved shapes. One way to measure the inclination degrees of a tree is to showing a way for creep speed. Such as landslides, creep occur when sub-surface water flow accumulates at particular points on a slope due to topography or soil hydrological pathways, on the bases, soil moves down slopes under gravity effect and this can be easily seen in many ways. One of them is the formation of small terraces across the slope which is named as creep that cause of motion is not clear and may include several different means of movement.

Material and Methods: In this study, we try to show the landslide (creep) geometry and dimensions. For this purpose, we used the seismic, electric and GPR methods.

Results: Trees on creep area show it most noticeably because they are tilted downslope depends on the session. If it can monitored that we can say the creep speed and the movement direction. So we selected two area for showing this event in Denizli district area. Where trees with curved trunks due to soil creep can be recognized, they may provide a useful indication of slope instability in the working areas. Trees with trunks which are curved downslope to resemble catenaries probably owe their shape to downslope soil creep in the study areas.

Keywords: Creep, Geophysics Methods, Tree.

The Effect of the Amount of CO₂ on *Sansevieria trifasciata* in Indoor Environment

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Aim of the study: Today, at least 80% of the lives of people living in cities pass through indoor environments, and indoor air quality directly affects people's health and performance. Carbon dioxide is a gas that changes rapidly in vivo due to its vital activities. The amounts of CO₂ are increased by the breathing of living things while green plants are reduced by photosynthesis. Therefore, the amount of CO₂ that negatively affects human health and performance in the indoor environment can be reduced by the help of indoor plants. However, since there is not enough work to be done in this subject, it is not known exactly to which level the amount of CO₂ in the indoor environment can be reduced or how much CO₂ is increased by respiration when the light is inadequate. In this study, it was tried to determine how *Sansevieria trifasciata*, which is frequently used as an indoor plant, affected the amount of CO₂ in the environment.

Material and Methods: The plant used in the present study were placed into a glass wall (0,7 m x 0,7m x 1 m) with a volume of around 0.5 m³ which was not air-permeable and the measurements were carried out using an Extech-branded "Desktop Indoor Air Quality CO₂ Datalogger". The glass wall used in the study was placed in the south of building so that it received plenty of daylight. It received direct sunlight between 07:00-11:00 and was illuminated until around 17.00. In the area where the study was carried out, the sun rose around 05.05 and went down at around 20:30. After the plants were placed in the glass wall, a CO₂ measuring device was set to measure the level of CO₂ every 5 minutes. Within the scope of the study, the plants were kept within the glass wall for at least 5 days. It was carried out in June-July when daylight lasts longer. The results obtained were evaluated on graphics.

Results: As a result of the study, it was determined that *Sansevieria trifasciata* consumed more than 10 times more CO₂ than the night respiration by photosynthesis during the day when the amount of CO₂ in the environment was affected by the amount of CO₂ and the amount of CO₂ in the environment was more than 1000 ppm but the CO₂ amount could be reduced up to 500 ppm.

Keywords: *Sansevieria trifasciata*, CO₂, Indoor, Air Quality.

The Evaluation of the Floristic and Growth Environment in terms of Landscape Architecture through the Border of Düzce City Center of Riparian Region of Asar Suyu

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Aim of the study: Urban open and green spaces both remain under threat and decrease because of increasing population, urbanization, migration, and some cultural changes in quality. An important element of the natural landscape water and water-related natural ecosystems is exposed to corruption due to these pressures. The main objectives of this study are; to determine vegetation and habitat features of the urban water corridors, to evaluate determined vegetation and habitat features of urban water corridor in availability of planning or designing studies.

Material and Methods: A landscape has many different types of elements or units, has a more dominant structure than other landscapes as good or bad perceptible extent different direction and variable reveals a unique structure and character of the landscape. The corridor in these components means the relatively narrow strip of a special type that it is different from all areas. In urban areas, road and water corridors emerge as an important component of the landscape. In particular, water corridors attract attention having of natural diversity and lack of fragmentation, degradation and artificial results. Thanks to these features, without a doubt, water corridors are the important component of all cities in the world. These corridors both divide the city into two separate sides, and are assured the ecological connectivity between the two sides of the city. This study will be realized along with "Asar Suyu" is an important component the city of Düzce. This study that will be conducted along with "Asar Suyu" touched contiguous area borders of the city and overlaid the urban development limits of the city, determining of characteristics of the corridor will be carried out as floristic and habitat analysis.

Results: Consequently, vegetation structure and habitat features which plays an important role in the emergence of this structure will have been identified and determined their potentials of the using in landscape architecture in example of Düzce Asar Suyu having both urban and rural features.

Acknowledgements: This work has been supported by funding from Düzce University (DÜBAP Project No: 2016.02.01.490 "Düzce Kent Merkezi Sınırı Boyunca Asar Suyu Riperian Bölgesinin Floristik ve Yetiştirme Ortamı Yapısının Peyzaj Mimarlığı Yönünden Değerlendirilmesi")

Keywords: Floristic and habitat analysis, Urban water corridors, Riparian zone.

Valuation of the Plant Compositions at the Spatial Level: A Case of Göztepe 60th Year Park

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Aim of the study: The most important feature of urban green spaces is that they offer this spaces to its users and the activities provided by these spaces. On the other side, one of the important elements of the spatial components is plants that they constitute urban parks. In this study, it is aimed that the Istanbul Göztepe 60th Year Park will shed light on the new urban landscape planning in addition to the status of plant species diversity at the spatial level and it is aimed to respond to the requests of the users within this scope.

Material and Methods: At the spatial level, it is examined how the plants are used in spaces. In which families the plants are examined to see how many species they have. These datas are used in the creation, evaluation and display of plant composition data via Geographical Information Systems (GIS) in Göztepe 60.Yıl Park located in the city of Istanbul. In this context the classification and density of plants were determined.

Results: As a result according to the analyzes, the types of plants are the main factor in the spaces. *Buxus sempervires* L., which is used as the border element in the determinations for the species in the park that it becomes the most widely used species. In addition, according to the results of density analysis. *Rosa* L. spp. is obtained the spatial density that is used in the rose garden that is the most popular with the mass use intensity.

Keywords: CBS, density analysis, spatial analysis, urban plants.

Habitat Selection of Small Mammals in Soğuksu National Park (Ankara) in Turkey**Safak BULUT¹, Zafer AYAŞ²**¹Department of Biology, Hitit University, Çorum-Turkey²Department of Biology, Hacettepe University, Ankara-Turkey
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Aim of the study: This study was created from data obtained by the capture-mark-recapture method of small terrestrial mammals in *Populus tremula* Forest located in Soğuksu National Park in Central Anatolia Region, in thermophilic deciduous forest, steppes (mountain steppe), conifer plantations and *Abies* (fir) forest habitats. Land studies excluding preview studies were performed for a total of 14 months in 2014 and 2015 so as to cover spring, summer and autumn seasons. 13 small mammal species were recorded during the land studies but data were obtained from 6 species when examining two species of *Apodemus* together in terms of diagnosis difficulties in studies based on the trapping grid method conducted in selected types of habitats.

Material and Methods: 758 individuals from 7 different species were captured in a total of 5250 days in trapping grid studies conducted in a total of 5 different types of habitat by a grid of 5 × 5 traps system. Many parameters such as the habitat types preferred by species, relative population densities, temperature dependent density changes, habitat preferences depending on the months, sex ratios, indicator species according to habitats, similar and different habitats in terms of small mammals, preying pressure on small mammals were evaluated in this study.

Results: 758 individuals from 7 different species were captured in a total of 5250 days in trapping grid studies conducted in a total of 5 different types of habitat by a grid of 5 × 5 traps system. The average capture success in all habitat types was calculated as 14.44%. The most caught species were respectively *Apodemus* spp. (54.9%), *Mus macedonicus* (15.2%), *Myodes glareolus* (12.8%), *Microtus subterraneus* (11.6%), *Crociodura suaveolens* (4.3%) and *Dryomys nitedula* (1.2%). The species affected by temperature data were *M. glareolus* and *D. nitedula*. It was found that *M. subterraneus* showing a large increase in their populations in the autumn was negatively correlated with temperature. When considering the sex ratios, *M. glareolus* was under intense male pressure in steppe habitat. There were no significant differences in other species. Indicator species were determined numerically and *M. glareolus*, *M. subterraneus* and *D. nitedula* were found to be decisive species for different habitats. The habitats showing most similarity to each other in terms of habitat preferences of small mammals were pine plantation area and fir forest, the most different habitat was steppe.

Acknowledgments: I would like to give my sincere thanks to the General Directorate of Nature Conservation and National Parks of the Ministry of Forestry and Water Affairs and the Scientific Research Division of Hacettepe University, which provides financial support.

Keywords: Small mammals, habitat preference, mark-recapture, populasyon dynamics, Turkey

Mammals Determined by Wildlife Camera Trap in Pure Beech Stand in Duzce in Turkey

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Aim of the study: In recent years, increasing the importance of the forests has revealed the requirement more investigation of these habitats. The current study was conducted to determine the species of mammals in a pure beech stand in Duzce.

Material and Methods: It was made observations by wildlife camera traps from fixed- seven points for about two year, from September 2013 to July 2015.

Results: A total of 11 species of mammals was identified, and 950 individuals were counted from 682 of wild animal views. Red fox, Wild boar, Marten and Roe deer are the most dominant species in the area. Wild animals do not show seasonal variations in the stands. Feeding behavior was observed more than the others activities. The species is nocturnal in general. We suggest continuing the sustainable management in beech stands that are rich in terms of wildlife.

Keywords: Wild boar, Forestry, Gölyaka

Traditional Oil Production from Lamiaceae species and Utilization of Oil by Local People in Akseki-İbradı-Manavgat Districts (Antalya-Turkey)

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Aim of the study: The Lamiaceae/Labiatae family members are frequently aromatic plants such as mint, rosemary, hyssop, thyme, lavender, perilla, basil, savory, sage and oregano. This family is one of the most traditionally used and traded families in the world due to its aromatic quality. One of the most commercially known products of this family is oregano and/or marjoram oils and plant parts. Here we illustrate traditional oil production method from marjoram and its use by local people in southern Turkey.

Material and Methods: Study region covers Akseki-İbradı and Manavgat districts of Antalya Province in Southern of Turkey. In this study, we visited villages of study region during summer period of 2016 and interviewed with local people in the study region, local bazaars and tea houses to get information about which Lamiaceae species they use for oil production, local names of these species, used plant parts, methods of oil production and traditional uses of oil. The local people are commercially collected many genera of Lamiaceae such as *Origanum*, *Salvia*, *Thymbra* and *Satureja*. The most widely collected and used species are *Origanum onites* (donkey and/or black oregano) and *Origanum majorana* (oil and white oregano) in the study region. The all process of oil production, from collection of plant material to production of oil, was illustrated. The local people extract essential oil and aromatic water (hydrosol and/or kekik water) from *O. majorana* due to its high oil yield and efficiency by a traditional steam distillation method which is called “imbik” (alembic) by local people.

Results: The local people obtain about 200 ml pure essential oil and 10 L aromatic water from 15-20 kg dried all plant parts of *O. majorana* and 30-40 L water. They generally do not sell pure essential of marjoram. The produced aromatic water is bottled (1 L) and sold around 1 \$ in local street markets. They can produce huge amount of aromatic water (500-1000 L) depends on plant material richness in season. The aromatic water has become a commercially well-known product in recent years especially in western and southern parts of Turkey as a diluted version of pure oil. They use pure oil to cure various diseases such as strong cough, bad cold, wounds, gastrointestinal disorders and skin problems in humans and domestic animals. They apply oil externally on wounds as an antiseptic agent and believe that this cure helps to kill microorganisms and speed up remediation process. Collection of huge amount of plants from wild populations can cause genetic erosion of species. The sustainability of species should be provided by genetic resource conservation programs.

Acknowledgements: We thank to people of Akseki-İbradı-Manavgat (Antalya/Turkey) districts who demonstrated the traditional oil production methods and informed us about utilization of oil.

Keywords: Marjoram, oregano oil, traditional distillation, ethnomedicine.

Methyl jasmonate-mediated induced volatiles in *Pinus brutia* Ten. from Turkey

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Aims of the study: Plants protect themselves against herbivory by deploying a wide array of chemical defenses. Plant volatiles can serve as a chemical defense by recruiting beneficial insects that are natural enemies of the herbivore, thereby providing an indirect protection to the plant. Volatile emissions can be stimulated by exogenous jasmonic acid and by a select group of amino acid conjugates of jasmonic acid taken up through the stems of a plant. In this study, the effects of exogenous MeJA application on volatile emissions from *Pinus brutia* Ten. were investigated.

Material and Methods: We collected headspace samples from trees and analysed the quality and quantity of volatile compounds emitted by treated and control plants.

Results: In total, 10 monoterpenes and 5 sesquiterpenes were emitted by *P. brutia*. Foliar MeJA application clearly affected the volatile profiles of trees from all the trees studied. Our results indicate that exogenously applied MeJA can significantly modify the volatile profiles of *P. brutia*, but also that there are important origin- and species-specific differences in the overall degree of elicitation and compositions of elicited compounds.

Keywords: *Pinus brutia* Ten., MeJA, inducible volatiles, terpenes

Assessment of Significant Water Quality Parameters and Distribution of Benthic Macroinvertebrates on Gediz Basin (Turkiye)

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Aim of the study: The study was aimed to assess the significant water quality parameters which have the major effects on distribution of benthos on Gediz Basin (Turkiye) by using multivariate analysis.

Material and Methods: The study was carried out between the years 2016 and 2017. In total, 24 sampling sites from 15 creeks and 6 dams were selected based on different water mass with a common formation of drainage, depth, width and altitude. The methods and equipments given by TS6469, EN27828, TS EN 28265, TS EN ISO 9391, TS EN 15196, TS EN 8689-1 and TS EN 8689-2 standards were applied for collecting benthic macroinvertebrates. Environmental parameters measured are: water temperature (WT), pH, Conductivity, dissolved Oxygen (dO₂), Ammonium-Nitrogen (NH₃-N), Nitrate-Nitrogen (NO₃-N), Total Phosphor (TP), Total Dissolved Solids (TDS), Total Organic Carbon (TOC), Total Nitrogen (TN) and Ortho-Phosphate (PO₄P). Benthos was identified at family-level. Observed dissimilarity and ordination distance was calculated using Non-Metric Multidimensional Scaling (NMDS). Significant environmental variables were selected by forward selection while p values based on 999 permutations. Inflated variation parameters (VIF) over 10 were excluded. Canonical Correspondence Analysis (CCA) was applied to figure out ordination between biological parameters, environmental variables and sampling sites. All statistical analysis were calculated and graphed by R.

Results: As the result of the current study, 59 families were identified from 19,755 benthos. The most dominant family groups are Chironomidae, Baetidae, Gammaridae, Oligochaeta, Caenidae, Lymnaeidae, Simuliidae, Corixidae, Asellidae, Physidae, Ephemerellidae and Psychodidae respectively. Expanded scores based on NMDS are non-metric R² = 0.952 and linear fit R² = 0.905. Environmental variables except WT, pH, NO₃-N and TDS were found significant (p<0.05). TP and TN were excluded from the ordination analysis because of VIF > 10. Permutation test for CCA under reduced model was Pr = 0.32 (p<0.05). Water temperature, pH and dO₂ were the most significant environmental variables that affected benthos and water quality.

Acknowledgements: This research was supported by TUBITAK-MAM "Determination of Some Basin in Sensitive Areas and Water Quality Objectives in Turkey" Susurluk, Marmara and Meric-Ergene Rivers Basin, 2015

Keywords: Benthos, Macroinvertebrate, Multivariate analysis, Canonical Correspondence Analysis, R

Does Pomegranate Seed Oil Affect Protein Expression Levels

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Aim of the study: Pomegranates with various anti-inflammatory, antimicrobial, and antioxidant effects have several health benefits. The aim of the present study was to provide insight into potential effects of pomegranate seed extract on protein expression levels in rats orally supplemented with pomegranate oil.

Material and Methods: Thirty adult rats at the age of 10 weeks were orally administered pomegranate seed oil extract for three weeks through gavage. Ten rats were used as control treatment. The rats were reared under 12 hour light/12 hour dark photoperiod at $25 \pm 2^\circ\text{C}$ temperature. Water and diet were supplied ad-libitum to control rats, but experimental subjects were administered with pomegranate seed extract oil (100mg/kg body weight) through gavage for three weeks. At the end of 20th day of treatments, rats were anesthetized and sacrificed. Skin tissues were excised for homogenization and protein extraction. The amount of protein in samples from each rat was determined by the Bradford method and equalized prior to SDS-PAGE analysis under reducing conditions. After electrophoresis, protein bands were stained with silver and visualized by Bio-Rad ChemiDoc MP (v.5.1).

Results: Minor differences were observed in protein expression levels of rats because of individual variations among them; however, significant differences were observed in protein expression levels of pomegranate seed oil-treated rats on 10th day as compared to 3rd day. Such differences in protein expression levels can clearly be visualized at approximately 250, 101, 83, 64, 50, 45, 25, and 12 kDa major bands. With regard to protein expression levels, the highest level was observed in samples taken on 20th day. In addition, while two protein bands at approximate molecular weights of 10 and 11 kDa were not visible in samples obtained in 3rd and 10th days, they became apparent in 20th day. This difference was more prominent when the samples from 3rd and 20th days were compared. While the bands between 12-23 kDa were expressed in some of the samples taken in 20th day, they were not seen in control samples. Considering entire findings, it was concluded that pomegranate seed oil might alter expression levels of the proteins such as keratinocyte growth factor (KGF, 20 kDa), fibroblast growth factor (FGF, 7-38 kDa), epidermal growth factor (EGF, 6.3 kDa), transforming growth factor (TGF, 12-12.8 kDa), and platelet derived growth factor (PDGF, 24.4 kDa) in skin tissue of rats. Further research is recommended to better elucidate the effects of pomegranate seed oil on expression levels of above-specified proteins.

Keywords: Pomegranate seed oil, protein expression level, rat, growth factor



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POSTER PRESENTATIONS

PP-101

Amphibian Fauna of Çankırı (Turkey) Province

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Aim of the study: The aim of this study was to determine the fauna of Amphibians within the borders of Çankırı. The field studies was carried out for 20 days. The province area has 94 grids in 1/25000 scaled, and the field survey performed in each scale twice between 2016 and 2017.

Material and Methods: For handling and identification of the amphibians, direct observation method was used. Mostly the humid areas, wetlands were detected for observation. The captured individuals were released in their original habitats after identification.

Results: Within the borders of Çankırı province two Urodela (*Triturus anatolicus*, *Ommatotriton ophryticus*) and six Anurans (*Bufotes variabilis*, *Bufo bufo*, *Hyla orientalis*, *Pelobates syriacus*, *Pelophylax ridibundus*, *Rana macrocnemis*) were recorded from 296 different sampling localities. All species except *Bufotes variabilis*, are the new locality records for Çankırı province.

Acknowledgements: This study is a part of the Biodiversity of Çankırı Province Project and funded by Ministry of Forestry and Water Affairs. And this study represent with the financial support of Ordu University Scientific Research Projects (ODU-BAP).

Keywords: Çankırı, Biodiversity, Amphibia, Turkey

An Overview of Faunistic Aspects of National Parks in TurkeyRasit URHANDepartment of Biology, Faculty of Science and Arts, Pamukkale University, Turkey
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Aim of the study: One of the issues that are gaining importance in the world is the determination and protection of biodiversity. National parks have quite different ecosystems (forest, high mountain zones, steppe etc.) due to their geographical, climatic and geomorphological structures. Despite the fact that there are 40 national parks in Turkey, our knowledge about the faunistic data is very limited. In this study, we planned to give about animal species existed in national parks in our country.

Material and Methods: The main material of this study is the internet and also printed books, articles and magazines. In this study, it is a compilation study by reading many different literature and focusing on important information. The methods, forms and photographs in the se sources have been evaluated.

Results: It is known that there are about 1485 vertebrate species in Turkey, including 161 mammals, 466 birds, 120 reptiles, 22 frogs, 236 freshwater fish, 480 marine fish. These are the species that are nearly extinct and endangered in near future. It is not possible to give exact numbers about the diversity of invertebrates for Turkey because of inadequate studies for some groups. Although not as well known as the vertebrates, approximately 30.000 invertebrate species have been identified in Turkey, and the number of species is estimated to be around 60.000-80.000. In Turkey which is rich in terms of animal diversity, the number of fauna for national parks is not completed so far. These faunistic studies for national parks and protection works must be initiated urgently.

Keywords: National park, Turkey, Fauna.

An Overview of Hydrophilidae and Helophoridae (Coleoptera) Species Diversity in Southwestern Anatolia (Aydın, Burdur, Isparta, İzmir, Manisa)

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Aim of the study: The aim of the present study is to determine the species diversity of Hydrophilidae and Helophoridae occurring in Aydın, Burdur, Isparta, İzmir and Manisa provinces located in Southwestern Anatolia, Turkey.

Material and Methods: Field surveys were performed between the years 2009-2014 in Aydın, Burdur, Isparta, İzmir and Manisa provinces and their districts. Specimens were collected by using sieve, ladle or net with a diameter of 1-2 mm pore, from shallow and stagnant waters; from the edge of water; under the decomposing organic matter; and from the bottom parts of plants which are on the water surface. Diagnosis of beetles was carried out using aedeagophores and some other important morphological characters.

Results: As a result of this study performed in Southwestern Anatolia, totally 95 taxa of Hydrophilidae (68) and Helophoridae (27) were identified. The Turkish Hydrophilidae fauna is currently represented by 95 species and 4 subspecies, and Helophoridae fauna involves 48 species and 2 subspecies. The total number of Hydrophilidae and Helophoridae species recorded from the mentioned provinces comprises nearly 2/3 of the whole Turkish fauna. This is because the investigated area intrinsically provides numerous water sources all resulting with suitable conditions for aquatic beetles.

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Keywords: Hydrophilidae, Helophoridae, Fauna, Southwestern Anatolia, Turkey.

Climate Change and the Evolution of Animal Species: Fuzzy Logic Modeling

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Aim of the study: The emergence and disappearance of some habitats is dependent on climate change. This is accompanied by the migration of animal species from one area to another. Other species are subject to extinction. Some species are spared by human intervention through the organization of assisted migration. Climate change can also affect the cycles of migratory birds that follow the photoperiod and thus affect the proliferation of certain infected insects. These factors are very difficult to model mathematically because they are characterized by complexity and imprecision. In this study, we propose an intelligent tool with fuzzy logic in their analysis.

Material and Methods: The specificity of the fuzzy logic that deals with linguistic variables gives a more precise result from the uncertain. A fuzzy inference system is established with three factors (climatic conditions, habitat change, and introduction of other species) that constitute the input variables. The species is considered as the output variable of the system. A basis of rules is established. The rule base contains all possible combinations between the input variables and the output variables. The basis of the rules is established according to the real data of the environment. The output result is calculated taking into account all the uncertainties and inaccuracies inherent to the nature of the data using defuzzification.

Results: Once the system is established, it will be possible to predict the evolution of species in a given environment from the random introduction of values at the input of the system. It is enough to set parameters at the input to instantly read the species that evolves in this environment and its rate of expansion or extinction.

Keywords: Animal species, climatic change, intelligent systems, fuzzy logic.

Comparison of Biodiversity Parameters of Insects Belonging to Carabidae Family Caught by Pitfall Sampling Method in the Apple Orchards in Isparta Province, Turkey

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Aim of the study: Due to the low natural wealth preserved in Turkey and with the increasing importance of biodiversity in the world fauna identified in Turkey has become more important. In Isparta climate, many agricultural products, including fruits are easily grown primarily due to the suitability of the soil and other similar features. Due to intensive agriculture in these areas, the impact of pesticide use has gained importance as identified in the apple orchard fauna considering. The aim of this study is to obtain biodiversity of insects belonging to Carabidae family in the apple orchards in Isparta province, Turkey.

Material and Methods: This study was carried out in three apple orchards with different coordinate in Isparta, Turkey. The manicured gardens are medicated and maintained and neglected garden. Each land 10 units , including 30 one pitfall traps were placed homogeneously by 20 meter intervals. This pitfall traps are 20 cm deep and 15 cm wide. Pitfall control was done in a week. Insects caught in the trap prepared separately and were transferred to a labeled plastic tube for each trap. The tubes are made separately from the needling of land were added to the collection after tagging and counting.

Results: As a result, ground beetle species belonging to *Dixus*, *Brachinus*, *Carabus*, *Calathus*, *Leistus*, *Amara*, *Poecilus*, *Harpalus* and *Procrustes* genus were obtained.

Keywords: Apple, biodiversity, pitfall trap, ground beetle

Contributions to the Knowledge of Mammals in Çorum Province, TurkeySafak BULUT¹, Burak AKBABA², Ahmet KARATAŞ³¹ Department of Biology, Hitit University, Çorum-Turkey²Department of Biology, Hacettepe University, Ankara-Turkey³Department of Biology, Ömer Halisdemir University, Niğde-Turkey

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Aim of the study: This study aimed to determine mammal fauna of Çorum and important areas for mammals at Çorum. When looking at the sources of mammalian species in Çorum, it is seen that species recordings were given only from systematic studies, and almost related with small mammalian species. A total of 42 mammal species have been identified during the field studies in Çorum province. Of these species, 26 were recorded in previous scientific studies, 16 were recorded firstly in Çorum Province during this study, and new locality records of some species were given. As a result of the literature review, mammal species considered to be in Çorum are presented in Table 1 together with their family names, Latin and English species names and protection status.

Material and Methods: Systematical field studies were carried out at all areas located in the Çorum province between 2009-2010 and 2015-2016, in order to determine the mammals spreading inside the borders. The GPS points of all stations were recorded in UTM format and the records were taken at these coordinates and in the immediate vicinity. Scoutguard SG570V and Bushnell Trophy Cam, passive infrared camera traps were used to determine large mammals during field studies. In addition to camera traps, large mammal fauna was also recorded by using noninvasive methods such as counting scats, footprints and other remaining. In the detection of small mammals, Sherman live capture traps were used. The small mammalian individuals caught in the trap were released after the species identification was made. Individuals who cannot be morphologically diagnosed were identified by using karyotype and skull characteristics in laboratory conditions. Studies for identifying bats species were conducted at three different localities and Pettersson D 500X, ultrasound device was used to record the sound of species. BatSound and BatExplorer computer software were used for further analysis.

Results: A total of 42 mammal species were determined in Çorum Province, Turkey with new records reported for the first time. Field studies were carried out two years between 2009-2010 and 2015-2016. One species of hedgehog and shrew, four bat species, six rodent species, roe deer and three carnivore species were recorded for the first time. We also expanded the known distribution and confirmed the presence of four rodent species in the province. We reported data on distribution and locality information for each taxon.

Acknowledgments: This work has been done by DOKAY Environmental Consultancy Company by the Directorate of Nature Conservation and National Parks of the Ministry of Forestry and Water Affairs and the Provincial Directorate of Çorum Nature Conservation and National Parks.

Keywords: Mammal fauna, Çorum, camera trap, Sherman trap, Turkey.

DNA Barcoding Research on Some Species of the Genera *Ampedus* (Coleoptera: Elateridae)

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Aim of the study: In the scope of the project, DNA barcoding studies were carried out for *A. adlbaueri* Schimmel 1990, *A. circassicus* (Reitter 1887), *A. platiai* Schimmel 1990 and *A. samedovi* Dolin & Agajew 1983 of genus *Ampedus*, which has morphologically very similar species.

Material and Methods: According to the present literature (NCBI database, etc.), nucleotide sequences of Cytochrome Oxidase 1 gene region of the four species were extracted for the first time except *A. elegantulus*. Sequences of COI gene region of species were compared with other species of the same genus in the NCBI database. CO1 sequences of examined species, 5 other species belonging to the same genus, 3 species from the same subfamily, 2 species from different subfamilies, 2 species from other subfamilies and 1 species from the nearby family Buprestidae, obtained by data mining, were aligned. Neighbor-joining analysis was performed according to the Kimura-2 parameters and the genetic distances between species were determined by pairwise distance analysis on this generated data.

Results: As a result of this study, It was determined that examined species are valid species, and the DNA barcoding data are consistent with the data obtained from the morphology. After completion of this project, DNA barcoding studies have been initiated for the first time on the species of the family Elateridae in Turkey.

Acknowledgements: We would like to thank to Hacettepe University Scientific Research Projects Coordination Unit for supporting this study with a project (Project Number: FHD-2015-6337).

Keywords: *Ampedus*, DNA Barcoding, Elateridae, CO1

Exchanging between the Blood and the Digestive System of the Male Yearling Sheep Lipids

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Aim of the study. The transportation of metabolites in blood from gastro-intestinal system is the complex process and can vary to some extent of various factors. This process is associated with the structure of tissues, as well as general physical laws. According to some reports, the pressure (30-40 mm c., Etc.) of capillary of the intestinal pipes and the intestinal mucous membrane is very high from osmotic pressure of the intestinal cavity. So, as a physiological, the process of absorption can not be explained only by the laws of filtration. In other words, the unilateral process of absorption in enterosit and transportation gastrointestinal absorbed metabolites in blood to a different sequence is proof that these processes are complex and varied. Recently, the transportation of metabolites in enterosit membranes, above-mentioned issues, and the effect of the membrane liquid layer are taken into account. Should be noted that, the mechanism of absorption of lipids has been mainly studied on laboratory animals.

Material and methods. Conducting complex catheterization operation on male yearling sheep by the method of A.A. Aliyev, we have implanted chronic catheters in sleeping vein, in liver door vein and in rear empty vein each of lambs. Thus, concentrations of metabolites in the artery and vein of the liver door helped us getting information about their intestinal absorption. Experimental animals were fed with three different forage by Latin square method. 1 share of the group forage was grass, cotton and barley. Oil level was 3% in this share of forage. By the addition of sunflower oil to II and III forage groups, for dry ingredient the amount of lipids in forage's share were raised up accordance with 5 and 7%. The composition of fatty acids of samples have identified by the method of gas-liquid chromatographic in "Хром-5". We have identified the procedure to methyl of fatty acids by the method Stofel. The received research materials have been processed by the method of statistical Student-Fischer.

Results: One of the main indicators of lipid metabolism is the intensity of the absorption of lipids from the digestive system to the liver door vein. The studies show that, the lipids in the control group before feeding are transported (3.8 mg%) from blood to stomach – intestinal system. This trend continues even 5 hours after feeding. Despite this, the process changes after 7 hours of feeding and vice versa 7.6 mg% lipids absorbed from the digestive system to blood. It seems that, the absorption of high molecular fatty acids in the blood and lymph mainly occurs after 7 hours in the yearling sheep of the control group. The absorption of (Second group) lipids in the blood, is a bit different than the first group in the experienced yearling sheep which had added 5% sunflower oil to the forage share. In this group, 6.8 mg% total lipids absorbed from the digestive system to blood before the feeding. By contrast, 5 and 7 hours after the feeding, 8.6 mg% and 12.2 mg% total lipids enter respectively from the blood to the digestive system. It shows that, the absorption of total lipids in the blood is shifted more time after the feed in this group of animals. The absorption of the total lipids in the blood is coincidence the previous period after the feed in the third group experimental animals and organized 39.1 mg%. By contrast, 5 and 7 hours after the feeding the total lipids are transported from blood to the digestive system and the figures are organized respectively 25.4 mg and 14.2 mg%.

Keywords: gastrointestinal system, acids, digestive system, "Хром-5", information.

Extraction and Physicochemical Properties of Chitins from Four Different Insect Species

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Aim of the study: In the scope of the project, chitin was extracted from four different insect species, *Lucanuscervus* (Linnaeus, 1758), *Gryllotalpapygryllotalpa* (Linnaeus, 1758), *Bradyporus (Callimenes) macrogaster* (Lefèbvre 1831) and *Polyphylla fullo* (Linnaeus, 1758), for the first time.

Material and Methods: Sample of each species was powdered using liquid nitrogen and mortar. In order to demineralize chitin, all samples were treated 1M HCL at 95°C under stirring conditions for 1 hour. Then, biomasses were separated through filtration with filter paper. Filtrates were washed with distilled water. After that samples were treated by 1M NaOH at 90°C for 14h to remove proteins. Solutions were filtered again. Then, the samples were washed distilled water and were treated with chloroform-methanol-water (1:2:4, v: v) mixture at room temperature for 1 hour. Finally chitin extracts were left to dry at room temperature for 5 days. The extracted chitins were characterized by using FTIR, TGA and SEM to determine their physicochemical properties.

Results: The bands observed at about 1652 and 1620 cm⁻¹ for amide groups, 1154 cm⁻¹ for oxygen connecting N-acetylglucosamine rings and 1065 cm⁻¹ for C-O bonds in N-acetylglucosamine ring are characteristic to chitin species. FTIR spectra analysis specifies that the method used for separation of chitin from other organic species was successful. Four chitin samples follow similar thermal degradation in three steps which are based on the loss of moisture up to 100°C, then decomposition of main chitin structure with the highest rate and decomposition of residual species. The different behaviours for the third thermal decomposition step for chitin samples are because of the rearrangement of chemical bonds at higher temperatures. No further thermal decomposition were observed up to 800°C. Scanning Electron Microscope (SEM) analysis was recorded for surface analysis of isolated chitin samples. For the chitin isolated from BM, GG and PF have a microfibrillar structure with large porosity, large porous surface is homogeneous for BM as well as it is regional for PF and in addition to large ones, the small porosity was observed for GG and PF. The chitin isolated from LC has different morphology than other isolated chitin samples; it has a complex microfibrillar structure without porosity.

Keywords: Insecta, chitin, extraction, physicochemical, characterization

Leaf Beetle (Coleoptera: Chrysomelidae) Fauna of Hatila Valley National Park (Artvin, TURKEY)

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Aim of the study: The aim of this study was to determine faunal composition and host plant preferences of leaf beetles of Hatila Valley National Park (Turkey) which is one of the most important area in the Caucasus hotspot because it is so rich in terms of faunistic and floristic diversity.

Material and Methods: The study was carried out on different habitat types, including forest, pseudomaqui, shrub, alpine and stream vegetations selected from Hatila Valley National Park in Artvin province, located in northeast Turkey. Field surveys were conducted a total of 7 days in each month from April to October in 2015. Adult leaf beetles were collected from various plants using an entomological sweep-net and mouth aspirator. Plants with leaves showing feeding marks were primarily examined to be able to determine of the host plant(s) of the collected beetles. Leaf beetles were taken to the laboratory, labeled and pinned. All specimens were identified to the species level using the keys and figures in Warchalowski (2010).

Results: As a result of the study, 48 species included in 26 genera belonging to 8 subfamilies were identified. It was determined which species are the most abundant and which are the least. Host plants, some ecological preferences and zoogeographical distributions of the collected species were presented and Turkey distributions were evaluated.

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Keywords: Chrysomelidae, Hatila Valley National Park, Fauna, Turkey.

Life history traits of a *Bufo variabilis* (Variable toad) population from Sapanca, TurkeyAbdullah ALTUNIŞIK¹, Nurhayat ÖZDEMİR¹, Serkan GÜL¹¹Department of Biology, Faculty of Arts and Sciences, Recep Tayyip Erdoğan University, Rize, Turkey

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Aim of the study: The goal of this paper is to reveal the first data on some life history traits (the age, body size and sexual maturity) of a *Bufo variabilis* (variable toad) population from Marmara region (Sapanca, Sakarya) of Turkey.

Material and Methods: In order to determine the age structure of *Bufo variabilis* (Pallas, 1769) population living in Sapanca, the skeletochronological method, which based on counting the lines of arrested growth (LAGs) in cross-sections taken from phalanges, was used. We prepared cross-sections (16 µm) of the phalangeal diaphysis by a freezing microtome (Shandon Cryostat, Germany) and stained them with Ehrlich hematoxylin. Cross-sections with the narrowest medullar cavity were examined for the presence of LAGs under a light microscope and they were independently assessed by two of the authors to provide precise age estimation.

Results: The maximum observed lifespan was 8 years for females (n= 7, mean= 4.28 years, range= 3-8 years) and 7 years for males (n= 23, mean= 3.08 years, range= 2-7 years). Mean body size was found 67.94 and 63.97 mm for females and males, respectively. Age at maturity was estimated as 2 years for males and 3 years for females. Endosteal resorption which is the replacement of the periosteal bone and endosteal bone was observed 10% of the all individuals. According to Independent Sample t t-test, differences in mean age and body size between sexes were not statistically significant (age: $t = 1.878$, $df = 28$; $p > 0.05$; body size: $t = 1.130$, $df = 28$; $p > 0.05$). Age and body size were significantly correlated in both males ($r = 0.835$, $p < 0.001$) and females ($r = 0.944$, $p < 0.001$). In this study, age and body size of a *Bufo variabilis* population living in Marmara region in Turkey were examined for the first time and the results were compared with populations in other regions.

Acknowledgements: This study was supported by Grant BAP (2012.102.03) from Recep Tayyip Erdoğan University.

Keywords: *Bufo variabilis*, variable toad, age structure, body size, Sakarya, Turkey

Morphometric and Karyological Analyses of Three Subspecies of *Meriones tristrami* (Muridae: Gerbillinae) Distributed in Anatolia, Turkey

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Aim of the study: In this study; morphometric features of *M. tristrami blackleri*, *M. t. lycaon* and *M. t. intraponticus* were given with respect to topotypes of these taxa and were compared for the first time using by advanced statistical methods, and also their karyotypes were discussed in details. The validity of the subspecies and possible distinctive traits between the subspecies are presented here.

Material and Methods: The statistical analyses were carried out with PCA and DFA methods and the biometric differences were determined the difference among the subspecies. For karyological stuies, samples that were captured live were brought to the laboratory with transport cages. After the samples were kept in the animal care room for a while, karyotypes were prepared using Ford and Hamerton (1956)'s Colchicine Hypotonic Citrate technique to avoid false diagnosis by looking at their morphology and to determine their karyological traits.

Results: Morphologically, *M. t. blackleri* is recognized white tail tip appeared to be more diverged one among these subspecies. Thus, of the characteristics measured, tail length, tail/head+body ratio, hindfoot length, occipitonasal length, palatal length, interorbital width, and mastoid width were found to be distinguishing characteristics among the subspecies. With respect to UPGMA cluster, *M. t. blackleri* and *M. t. intraponticus* were found to be closer each other, and *M. t. lycaon* was connected to this group and was the most diverged subspecies. All the subspecies have 72 number of chromosome and it was found the numbers of fundamental arms (NF) are 76 in *blackleri*, 82 in *lycaon*, and 84 in *intraponticus*.

Keywords: *M. tristrami*, *blackleri*, *intraponticus*, *lycaon*, biometry, karyology, Turkey.

**Oribatid Mites (Acari: Oribatida) of Park and Garden Areas of Nazilli District Center
(Aydın Province/Turkey)**

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Aim of the study: Mites are important invertebrate groups for food chain in forest and soil ecosystems. Until now, more than one thousand mite species were recorded from Turkey. Suborder Oribatida is an important group for Turkish mite fauna and contain great number of species. This study have been carried out to determine the oribatid mites which spread in park and garden areas of Nazilli district center.

Material and Methods: Litter and soil samples collected from park and garden areas of Nazilli district center between September 2016 and April 2017. In this context, random samples were taken in research areas at monthly intervals. Collected samples were brought in plastic bags, labelled and transferred to laboratory. Then, litter and soil samples were put to extracting device of soil mites which include combined Berlese funnels. 3-5 days later, ethanol bottles were collected, poured into petries and oribatid mites were extracted under a stereo microscope (Nikon SMZ745T). 60% lactic acid was used for decolorizing and cleaning some mite samples. After mite samples were examined with light microscope (Olympus BX50) and identified, they were placed and labeled in storage bottles which contain 70% alcohol and 1-3 drops of glycerin.

Results: After examinations, 14 oribatid mite species which belonging to 12 different families were identified. These; Belba sp. from the family Damaeidae, Carobodes sp. from the family Carabodidae, Cepheus sp. from the family Cepheidae, Cerazotes sp. from the family Ceratozetidae, Cosmochthonius lanatus from the family Cosmochthoniidae, Eupelops nepotulus from the family Phenopelopidae, Galumna sp. from the family Galumnidae, Megemereus sp. from the family Megeremaeidae, Nothrus biciliatus from the family Nothridae, Rhysotritia ardua from the family Euphthiracaridae, Schelariabates fusifer from the family Schelariabidae, Zygribatula sp., Z. cognata and Z. terricola from the family Oribatulidae. Identification of detected oribatid mites has been tried at species level. However, some species were given at genus level which can not be identified at species level. Examination of detected species was carried out in light microscope, their definitions were reviewed, photographs were taken and world distributions were given with literature. The diversity of oribatid mites has been revealed by determining mite species which living in litter and soil in park and garden areas of Nazilli district center.

Keywords: Acari, Oribatida, oribatid mite, Nazilli, Aydın, Turkey.

Pests Diversity Associated to the Tea Plant

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Aim of the study: Tea (*Camellia sinensis* (L.) Kuntze) is the most consumed beverage after water in the world. Tea is an important cash crop of Black Sea Region especially Turkey and Georgia, which is considered as a major agricultural commodity sustaining countries economy. Each tea growing country has its own distinctive pests, diseases and weeds though several of them might have been recorded from more than one region.

Material and Methods: The study was conducted during 2015 and 2016 in experimental plot at Batumi-Kubileti in Georgian and Rize-Artvin in Turkey tea areas. The existing species were attempted to be determined by visiting the study area in certain intervals and scanning the area. For this purpose, ten tea estates were selected from Artvin-Rize (Turkey) and Batumi-Kubileti (Georgia). The survey was conducted for times in a month between April – October. Block of the size 20 x 20 meter in two replications was marked in all the selected tea estates for random sampling. The finding pests were caught and brought to the laboratory for classification.

Results: We found total 16 pest species of tea. They are 10 species in Turkey (*Agrotis segetum* (Denis & Schiffermuller), Noctuidae; *Coccus hesperidum* Linnaeus, Coccidae; *Parametriotes theae* Kusnetzov, Agonoxenidae; *Polyphylla fullo* (Linnaeus), Scarabaeidae; *Pulvinaria floccifera* Westwood, Coccidae; *Aonidiella citrina* (Coquillett), Diaspididae; *Thrips* sp. Thripidae; *Polyphagotarsonemus latus* (Banks) Acarina, Tarsonemidae; *Helopeltis theivora* (Waterhouse) Miridae; *Empoasca onukii* (Matsuda) Cicadellidae and 15 species in Georgia (*Agrotis segetum* (Denis & Schiffermuller), Noctuidae; *Coccus hesperidum* Linnaeus, Coccidae; *Parametriotes theae* Kusnetzov, Agonoxenidae; *Polyphylla fullo* (Linnaeus), Scarabaeidae; *Pulvinaria floccifera* Westwood, Coccidae; *Abgrallaspis cyanophylli* (Signoret), Diaspididae; *Acaphylla theae* (Watt & Mann), Eriophyidae; *Aonidiella citrina* (Coquillett), Diaspididae; *Calacarus carinatus* (Gren), Eriophyidae; *Coccus pseudomagnoliarum* (Kuwana), Coccidae; *Homona coffearia* (Nietner), Tortricidae; *Oligonychus coffeae* (Nietner), Tetranychidae; *Thrips* sp. Thripidae; *Polyphagotarsonemus latus* (Banks) Acarina, Tarsonemidae; *Helopeltis theivora* (Waterhouse) Miridae; *Empoasca onukii* (Matsuda) Cicadellidae). The most important pests of tea in these regions are *Helopeltis theivora*, *Homona coffearia*, *Empoasca onukii*, *Polyphagotarsonemus latus*, *Parametriotes theae* and *Pulvinaria floccifera*.

Keywords: Pests diversity, Tea plant, Turkey-Georgia.

Preliminary Phylogenetic Analysis of Hosts of *Pimpla turionellae* Based on Cytochrome Oxidase I

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Aim of the study: *Pimpla turionellae* is a solitary pupal endo-parasitoid wasp which has been suggested as a biological control agent of agriculturally harmful lepidopteran pests. Having a broad host range makes *P. turionellae* superior to the other biological control agents. Hosts have also effects on the parasitoids. Due to their morphological, physiological and behavioural defence mechanisms, lepidopteran hosts are not passive victims. For lepidopteran species mitochondrial COI (cytochrome oxidase I) region successfully used as a barcoding gene. Objective of the current study is to represent a preliminary analysis for diversity and phylogenetic relationships of hosts of *P. turionellae* based on COI.

Material and Methods: Related literature was reviewed and cross examined to analyse phylogeny and diversity of Lepidopteran hosts of *P. turionellae*. COI sequences of approved species from BOLD taxonomy browser and *Galleria mellonella* and *Achroia grisella* from our laboratory used for analysis. Nodes are annotated with BOLD ID. All COI sequences aligned by Clustal W. Evolutionary divergence between species estimated by pairwise distance in MEGA7. The evolutionary history was inferred using Kimura-2 parameter for Neighbor-Joining (NJ) tree, associated clusters are conducted with 1000 bootstraps in MEGA7.

Results: Fifty-three lepidopteran species, detected by cross examination of literature, were placed in 26 subfamily of 16 family. Cosmopterigidae, Crambidae, Oecophoridae, Depressariidae were represented by only one species. As a result of pairwise distance, the closest species were *Yponomeuta cagnagella* and *Yponomeuta padellus* (0,003) and the most distant species were *Euproctis similis* and *Psyche casta* (0,289). Taking into consideration the NJ tree, Gracillariinae (Gracillariidae), Galleriinae and Phycitinae (Pyrilidae) were branches of the same node. Furthermore, species from Gracillariinae (Gracillariidae) and Galleriinae (Pyrilidae) subfamilies were also placed among branches of Phycitinae (Pyrilidae). We were not able to differentiate Lasiocampiinae (Lasiocampidae) and Ennominae (Geometridae) subfamilies as they were found as branches of the same node. These two subfamilies were found to be closely relative.

Keywords: Lepidopteran hosts, *Pimpla turionellae*, Phylogeny, COI

Prospects of using Black Soldier Fly in biotechnology

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Aim of the study: Nowadays biotechnology as science upcoming trend associated with living organisms cultivation for industrial purposes, is of great ecological and biological value. American fly species – Black Soldier Fly (*Hermetia illucens*) – is an object of the research. The species inhabits countries with warm climate although recently the breeding of the insect in cold regions with climate has been actively discussed. The insects belong to invertebrate species able to grow in pure culture in a closed space of artificial conditions whole-year enabling to be used for biotechnological purposes. Study objective is determining prospects of using Black Soldier Fly in Arkhangelsk region's biotechnology spheres.

Material and Methods: Bioconversion process by Fly's larvae is considered as general biotechnology direction. The species is used for problematic wastes stabilization including pigs and poultry's manure and organic portion of solid biological components, wastes from fish and meat processing; fruits, vegetables, restaurant and kitchen wastes. Thus, larvae's body builds up complex of macro- and microelements, whose percentage depends on diets. It leads to increasing larvae nutrition and using it as food additive for cattle and poultry (protein and fats content $\approx 40\%$). Unlike America and Europe where Fly breeding on an industrial scale in cold climates have been conducted for decades, it has been poorly studied in Russia. In Russia's Northern latitudes studies were conducted only in Arkhangelsk region since 2015 on the basis of LLC "NordTechSad". Research focuses on larvae's and prepupae's biomass producing for introduction in food of agricultural animals and fish as protein and energy food component, and to replace fish meal. Stated list of fly's application is not comprehensive. North American fly can serve as a source of chitin and chitosan. Work on production of polysaccharides is held at Biology, Ecology and Biotechnology Department of NARFU (Arkhangelsk). Previous studies revealed high content of chitin in dead flies - 26%.

Results: Black Soldier Fly is an insect arousing great scientific and practical interest. It has approved itself as a food additive for agricultural animals and aquaculture along with the bioconversion ability enabling to determine ecological focus on improving environmental Arkhangelsk region' condition. Using flies as a source of chitin and chitosan is a new direction in biotechnology, ecology and medicine in the region. Flies breeding in artificially created conditions on the basis of the small innovative business LLC "NordTechSad" and conducting tests of adding larvae as a food additive to animals' meal will ensure development of agricultural and food industry in the region.

Keywords: Black Soldier Fly, bioconversion, food additive, chitin, chitosan.

**Prostigmatid Mites (Acari: Trombidiformes) of Park and Garden Areas
of Nazilli District Center (Aydın Province/Turkey)**

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Aim of the study: Prostigmatid mites, which prefer aquatic or semi-aquatic, grassy soil, soil, lichen, moss and litter habitats as living environment, are very important in the biological food chain. Suborder Prostigmata is one of the cosmopolitan groups around the world and represented by about 150 families. This study has been carried out to determine the prostigmatid mites which spread in park and garden areas of Nazilli district center.

Material and Methods: The main material of this work, which was held between September 2016 and April 2017, is litter and soil samples collected from park and garden areas of Nazilli district center. In this context, random samples were taken in research areas at monthly intervals. Collected samples were brought in plastic bags, labelled and transferred to laboratory. Then, litter and soil samples were put to extracting device of soil mites which include combined Berlese funnels. 3-5 days later, ethanol bottles were collected, poured into petries and prostigmatid mites were extracted under a stereo microscope (Nikon SMZ745T). 60% lactic acid was used for decolorizing and cleaning some mite samples. After mite samples were examined with light microscope (Olympus BX50) and identified, they were placed and labeled in storage bottles which contain 70% alcohol and 1-3 drops of glycerin.

Results: After examinations, 7 prostigmatid mite species which belonging to 6 different families were identified. These; Allotrombidium sp. and Trombidium sp. from the family Trombidiidae, Anystis sp. from the family Anystidae, Bdella sp. from the family Bdellidae, Camerobia sp. from the family Camerobiidae, Cunaxa sp. from the family Cunaxidae, and Tetranychus urticae from the family Tetranychidae. Examination of detected species was carried out in light microscope, their definitions were reviewed, photographs were taken and world distributions were given with literature. The diversity of prostigmatid mites has been revealed by determining mite species which living in litter and soil in park and garden areas of Nazilli district center.

Keywords: Acari, Prostigmata, prostigmatid mite, Nazilli, Aydın, Turkey.

Records of *Ocypus* genus (Staphylininae: Staphylinidae: Coleoptera) from South Aegean Region from Turkey

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Aim of the study: The aim of this study to contribute the phenology, vertical and locality value information about the fauna of *Ocypus* genus in South Aegean Region of Turkey. 8 different species recorded from 22 different localities at between September 2013 and August 2014.

Material and Methods: The material of this study comprises the *Ocypus* specimens which Southern Aegean Region of Turkey 22 localities were selected in the provinces of Afyonkarahisar, Aydın, Denizli, Muğla and Uşak and study were performed by using baited pitfall traps at different heights with 2 month periods. Each specimen identified and turn into a museum material with classic preparation methods. All of the specimens are stored in Entomology Laboratory of Department of Biology in Dumlupınar University.

Results: This family is one of the most important predators in dung. The family is feed on developing fly larva and egg in the fresh dung which this event provides a significant reduction in fly populations. As a result of this study 8 different species has identified belong to genus *Ocypus*. This species are *Ocypus olens* O. Muller, 1764; *O. curtipennis* Motschulsky, 1849; *O. aeneocephalus*, (De Geer, 1774); *O. excisus*, (Müller G., 1950); *O. orientis*, Smetana & Davies, 2000; *O. picipennis picipennis*, (Fabricius, 1793); *O. sericeicollis*, (Ménétriés, 1832); *O. fulvipennis* Erichson, 1840;

Keywords: Coleoptera, *Ocypus*, South Aegean Region, Staphylininae, Turkey.

Sex and Age Ratios of the Overwinter Marsh Harrier *Circus aeruginosus* in Southwestern Turkey

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Aim of the study: The aim of the study is to provide quantitative data on the sex and age ratios of the overwinter marsh harrier in southwestern Turkey and to compare them with those reported in the literature for Europe, in light of the proposed hypotheses for the evolution of differential migration in avian species.

Material and Methods: The study was carried out from 15 January to 15 February both in 2016 and 2017 at Beylerli, Acıgöl, Işıklı, Gökgöl and Karakuyu Lakes in Denizli and Afyonkarahisar districts. The point count and transect line were used to observations. Observed individuals counted as young, mature, male and female and noted for each lake. Each site was visited an average of two times per study period. Age and sex classes were determined according to Ferguson-Lees and Christie (2001).

Results: A total of 194 individual, 112 of which in 2016 and the rest in 2017, have been recorded during the study. It was seen that the female ratios are quite high in all areas: females 70/74.4%, males 16/14.6% and juveniles 14/11% in 2016 and 2017, respectively. These results have shown similar ratios and age classes as in Europe and support body-size and social-dominance hypothesis. The long term monitoring must have been done to get comparable and conclusive results.

Keywords: Marsh harrier, sex and age, migration, Turkey.

Soil Invertebrates in Park and Garden Areas of Nazilli District Center (Aydın/Turkey)Raşit URHAN¹, Büşra AKSU¹, Elif Hilal DURAN¹, Mehmet KARACA²¹Department of Biology, Faculty of Science and Arts, Pamukkale University, Turkey² Denizli Vocational School of Technical Sciences, Pamukkale University, Turkey
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Aim of the study: Members of a widevariety of animal groups live in varioustypes of soil sand litters. These group sare mainly mites(superorder Acariformes), nematodes (phylum Nematoda), flies (order Diptera), insects(class Insecta) and their larvae. The most crowded group is mites. The members of the Acari formes play an important role in biolog ical efficiency of soil. They decompose organic matters, synthesize humus, protect biologic alelement sand contribute to stimulation of fungal and bacterial metabolism in soil. This study have been carried out to reveal the soil invertebrates which live in park and garden areas of Nazilli district center.

Material and Methods: Litter and soil samples collected from park and garden areas of Nazilli district center between September 2016 and April 2017.In this context, random samples were taken in research areas at monthly intervals. Collected samples were brought in plastic bags, labelled and transfered to laboratory. Then, specimens of different invertebrates group swere extracted by forceps. For identification at family level of the specimens, Nikon SMZ745T and Olympus BX50 microscopes were used. Several reference books and theses have been used in family identifications.

Results: Identified in vertebrate groups were classified at family level according to their microscopic and macroscopic properties. After examinations, 38 in vertebrate families which belonging to 3 different phyla were identified. These; Anguinidae, Aphelenchoididae and Rhabditidae from the phylum Nematoda; Lumbricidae from the phylum Annelida; Anthomyiidae, Anystidae, Bdellidae, Camerobiidae, Carabodidae, Cecidomyiidae, Cepheidae, Ceratozetidae, Cheliferidae, Cunaxidae, Cosmochthoniidae, Damaeidae, Entomobryidae, Euphthiracaridae, Eviphididae, Galumnidae, Geophilidae, Hypogastruridae, Isotomidae, Julidae, Laelapidae, Megeremaeidae, Nenteriidae, Nothridae, Oribatulidae, Phenopelopidae, Phoridae, Phytoseiidae, Scheloribatidae, Sciaridae, Scolopendridae, Tetranychidae, Trombidiidae, Zerconidae from the phylum Arthropoda. Examination of specimens of detected families was carried out in light microscope, their definitions were reviewed, photographs were taken and world distributions were given with literature. The diversity of soil invertebrate groups has been revealed by determining various families which living in litter and soil in park and garden areas of Nazilli district center.

Keywords: Soil, Invertebrata, park and garden areas, Nazilli, Aydın, Turkey.

Statistical Analysis of Vertebrate Species Richness in Pond Wetlands of Ukraine

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Aim of the study: Wetlands associated with rural ponds, can be a habitat for numerous vertebrates. We applied multivariate statistics to identify factors determining vertebrate species richness for habitats housing 69 species.

Material and Methods: 30 habitats of amphibians, reptiles, birds and mammals were investigated. We also considered the size of the wetland, quantity, their vegetation overgrowth other factors. Correlation, ANOVA, regression, factor, cluster analyses were used for the study.

Results: Significant positive correlation was found between vertebrate species numbers and habitat area, ponds numbers, their vegetation overgrowth, size of the overgrown part of the water mirror (an indicator of the environmental value of a wetland). The largest contribution to the 1st component (40%) was found to be brought by the overgrown part of the water mirror and the integral projective cover of vegetation. The regression model revealed that the most favored in terms of abundance are habitats of an area of 130-160 ha accommodating 10-12 ponds of projective cover reaching about 30%. Other factors play an important role in supporting the life of certain representatives of the classes of vertebrates. Species richness of birds, inhabiting these wetlands, is fairly closely connected to the development of the structure of the vegetation cover, whereas amphibians and reptiles are dependent on the differentiation of the water surface and microrelief of the terrain. The data obtained can be used for preserving pond wetlands and its biodiversity.

Keywords: vertebrate species richness, wetlands

Study of the Biodiversity of Entomofauna in Relation to Vegetation Distribution and Environmental Factors in Saltwater Wetlands (Sebkhet Bazer, Algeria)

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Aim of the study: The present study aims at assessing entomofauna biodiversity in the Saline wetlands (Sabkhats) located in the northeast of Algeria in the Sebkhat Bazer. To determine the environmental factors their predominant the distribution of insects (Entomofauna).

Material and Methods: An inventory was carried out to study the entomofauna, diversity and distribution in three stations were selected of Sebkhat Bazer, during September 2015 to August 2016. The selected stations in the study area were divided to 9 transects according to distribution of plant and according to the soil salinity in each of stations.

Results: A Total of 7563 insects belonging to 8 orders, 40 families, 56 genera and 62 species were collected from the Sebkhat Bazer. The Highest abundance was noted in Coleoptera species (46.77%) while lowest abundances were noted in Collembola and Orthoptera species (03,23%) respectively. Highest number of (3286) individuals was found in station 2, while the lowest number (1883) individuals was obtained in station3. The Highest abundance of insects (56) were recorded in transect I station 2 and lowest abundance of species were recorded in transectIII station 3. Seasonally changes showed the highest count of species was existence in spring, while the lowest count of species in winter. Diversity and Equitability indices showed highest values in station 2 ($H= 3.172$; $E= 0.781$), while lowest values in station 2 ($H= 2,87$; $E= 0,729$). Similarity Jaccard index (J) showed highest similarity was between station1 transect I and station2 transect I (0,894). There were no significant correlation between the soil salinity and abundance of species and between the abundance of species and distribution of plants in all the 9 transects species / habitats.

Keywords: Entomofauna, Vegetation, Wetlands, Sebkhat Bazer, Ecological Indices, Algeria.

The Most Comprehensive Study on Mammal Biodiversity in Karabük Province (Turkey)Murat DOĞAN¹, Şafak BULUT², Burak AKBABA³, Ahmet KARATAŞ⁴¹Ekoiz Çevre Dan Ltd Şti., Ankara, Turkey²Department of Biology, Hitit University, Turkey³Department of Biology, Hacettepe University, Turkey⁴Department of Biology, Ömer Halisdemir University, Turkey
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Aim of the study: Karabük province in Middle Black Sea Region is located between the Central Anatolian and Black Sea coastal regions, and thus it has different vegetation structures developed under the influence of different climates. This provides different habitat variations for mammalian species, thus creating a rich variety of species within the province. There is no comprehensive scientific study of mammal species that has been distributed throughout the province before. In this study, it was aimed to determine the mammal fauna of Karabük province which is on one of the most important wildlife corridors in North Anatolia.

Material and Methods: Systematical field studies were carried out at all areas located in the Karabük province between 2012-2014, in order to determine the mammals spreading inside the borders. Bushnell Trophy Cam, passive infrared camera traps were used to determine large mammals during field studies. In addition to camera traps, large mammal fauna was also recorded by using noninvasive methods such as counting scats, footprints and other remaining. In the detection of small mammals, Sherman live capture traps were used. The small mammalian individuals caught in the trap were released after the species identification was made. Individuals who cannot be morphologically diagnosed were identified by using karyotype and skull characteristics in laboratory conditions. Studies for identifying bats species were conducted at different localities and Pettersson D 500X, ultrasound device was used to record the sound of species. BatSound and BatExplorer computer software were used for further analysis. The GPS points of all stations, the records those were taken at this coordinates and in the near vicinity had been recorded in UTM format. Species conservation status were organized according to the IUCN, BERN and CITES criteria's.

Results: This was the first long term study on mammals covers whole of Karabük province. Within the scope of this study, a total of 25 mammal species belonging to Erinaceomorpha, Soricomorpha, Chiroptera, Lagomorpha, Rodentia, Carnivora and Artiodactyla were detected. These species were; *Erinaceus concolor*, *Sciurus anomalus*, *Cricetulus migratorius*, *Microtus levis*, *Microtus subterraneus*, *Arvicola amphibious*, *Apodemus flavicollis*, *Rattus rattus*, *Lepus europaeus*, *Ursus arctos*, *Canis lupus*, *Canis aureus*, *Vulpes vulpes*, *Felis silvestris*, *Martes foina*, *Lutra lutra*, *Mustela nivalis*, *Sus scrofa*, *Cervus elaphus*, *Capreolus capreolus*, *Rhinolophus ferrumequinum*, *Rhinolophus hipposideros*, *Myotis myotis*, *Eptesicus serotinus* and *Miniopterus schreibersii*. The diversity of mammal species in Karabük province is remarkable. The data obtained from this study show that this region is a very important area in terms of mammal species. The location data of the species determined in the study form the basis data for more extensive ecological studies and conservation work that can be done in the area and around about the species in the future.

Acknowledgements: We would like to thank General Directorate of Nature Protection and National Parks (Ministry of Forestry and Water Affairs) and Provincial Directorate of Karabük Nature Protection and National Parks for providing legal permission and the necessary support to make this study possible.

Keywords: Camera trap, Sherman live trap, bat recorder, mammal, Karabük

The Ornithofauna and Threats to İnceler Lake

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Aim of the study: The aim of the study is to determine the bird fauna and threats to İnceler Lake with the seasonal distribution, regional status (Resident, migrant etc.) and IUCN criteria's. In addition, threats to lake and birds were also evaluated to get conservation priorities.

Material and Methods: This study was carried out in the İnceler Lake in Denizli province between January to December 2016. In total, 24 field trips were performed and bimonthly observation has been done. Transect, point and random counting methods, binoculars, telescopes and cameras with various brands and enlargement properties were used for observations. Heinzel et al.(1995) and Svensson et al.(2009) bird reference field books were used for the diagnosis of observed birds. Studies were conducted during the daytime between sunrise and sunset. In addition, bird's calls were listened in order to determine nocturnal birds at nights.

Results: As a result of field surveys, 137 bird species were identified in İnceler Lake. Among them, 36 species are residents, 35 species are summer visitors, 32 species are winter visitors and 34 species are passage migrants. According to the IUCN criteria's; 2 species (*Falco vespertinus*, *Vanellus vanellus*) are in NT (near threatened) category, 2 species (*Pelecanus crispus*, *Streptopelia turtur*) are in VU (vulnerable) category and 1 species (*Falco cherrug*) is in EN (endangered) category. The remaining 132 species are in LC (least concern) category. The two-part lake which is about 19 and 70 hectares is a very important area for migratory birds. The intensive agricultural activities around the lake have a negative impact on the region. This area, which was dried up in 1989 but was revived in 2013, has been threatened with again drying due to overuse of groundwater. From time to time illegal and unconscious hunting affects birds negatively. It is essential to preserve lake by removing and/or reduce intensive agricultural activities, hunting and overuse groundwater sources to support biodiversity of the region.

Keywords: Birds, Ornithofauna, İnceler Lake, Denizli, Turkey.

The Second Report of *Stigmaeus livschitzi* Kuznetsov (Acari: Stigmaeidae) in TurkeySalih DOĞAN¹, Sibel DOĞAN¹, Meryem BİNGÜL¹, Orhan ERMAN²¹Department of Biology, Faculty of Arts and Sciences, Erzincan University, Erzincan, Turkey²Department of Biology, Faculty of Sciences, Firat University, Elazığ, Turkey

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Aim of the study: *Stigmaeus* Koch is one of the mite genera in the family Stigmaeidae with 135 species. Up to now, 38 species in this genus were recorded from Turkey. *Stigmaeus livschitzi* Kuznetsov was given before from Harşit Valley in Turkey. Five female specimens of the species were found among the mite specimens collected from Erzurum, Kırklareli and Trabzon. In the present study, we aimed to contribute to the knowledge on mite diversity in Turkey.

Material and Methods: Mite specimens were collected from Erzurum, Kırklareli and Trabzon. Under conditions of laboratory; five female specimens of *Stigmaeus livschitzi* were extracted by using Berlese funnels, cleared in 60% lactic acid and mounted on microscopic slides in Hoyer's medium under stereo microscope. Measurements were taken in micrometers (µm) with the aid of the Leica Application Suite (LAS) Software Version 3.8. and drawings for some parts of the body were made under a Leica DM 4000 microscope.

Results: *Stigmaeus livschitzi* Kuznetsov was known from Russia and Ukraine. It was also recently described from Harşit Valley in Turkey from litter under *Populus* sp. and *Rhododendron* sp. This species resembles to *S. kamili* Doğan and Ayyıldız but can be distinguished from it by having different shape of lateral and marginal zonal shields. This species is also similar to *S. scaber* Summers but differs from the latter by having dorsal idiosomal setae with hyaline sheaths. In this study, five female specimens of *S. livschitzi* were found in moss, a tree bark and litter under *Quercus* sp. from Erzurum, Kırklareli and Trabzon provinces. Drawings and measurements for some body parts of the species were made. The morphological characters of this species were reviewed. This is the second report of the species in Turkey.

Keywords: Biodiversity, Mite, *Stigmaeus*, Locality, Turkey.

Two Newly Recorded Species of Oribatid Mites (Acari, Oribatida) for the Turkish Fauna from the House Dust

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Aim of the study: House dust mites belong to the sub-class Acari in the class Arachnida. Their main habitats in house include ground and wall carpets, fabric covered furniture, velvety curtains, feathered toys, mattresses, pillows, sheets and blankets. The term “house dust mite” is usually used to define *Dermatophagoides pteronyssinus*, *Dermatophogides farinae* and *Euroglyphus maynei* mite species, which invariably live in the house dust and belong to the family Pyroglyphidae (Astigmata). Besides astigmatid mites, some oribatid and prostigmatid mites can live in house dust. The aim of study was investigate the species diversity of the dust mites seen in Erzincan province.

Material and Methods: Within scope of the study, dust samples were collected from 67 houses located at different sites in the city. The dust samples were collected from the carpets, fabric-covered furniture and beddings in homes using a vacuum cleaner with a vacuum applied on an area of 1 square meter for 2 minutes. After the dry sieving process, the samples were weighed using assay balance in per 1 g and studied through lactic acid precipitation method and was examined under a stereo microscope in the laboratory. Mites extracting from the dust samples were diagnosed under a light microscope using the relevant literature. The slide-mounted specimens were deposited in the Acarology Laboratory of Erzincan University, Erzincan, Turkey.

Results: In the present study, it has been evaluated mite specimens collected from houses in Erzincan province. 23 mite species belonging to Astigmata, Prostigmata, Oribatida and Mesostigmata were found in the dust samples. In total, 6 oribatid species have been identified. Two of them, *Haplocthonius simplex* (Willmann, 1930) and *Nothrus borussicus* Sellnick, 1928, have been determined as new records for the mite fauna of Turkey. It is expected that this study contributes to mite biodiversity of Turkey.

Acknowledgement: This study is based on the doctoral dissertation of the first author. We would like to thank the Erzincan University Coordinator of Scientific Research Projects, which financially supported this study (FEN-A-300614-0107) and all the residents for opening their home to us.

Keywords: Dust mite, biodiversity, new record, fauna, Erzincan, Turkey.

Antioxidant Activity and Total Phenolic Content of *Sternbergia candida*

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Aim of the study: *Sternbergia candida* is a bulbous flowering plant belong to Amaryllidaceae and is a rare plant which occurs only in south-west Turkey. Ethanol, acetone and water aerial part extracts of *S. candida* were evaluated for determination their antioxidant activity and total phenolic amount.

Material and Methods: The plant samples were dried, grounded and extracted in ethanol, acetone and water. Total antioxidant capacity of *S. candida* by the β -carotene-linoleic acid, and free radical scavenging activity were determined by DPPH method. Also, total phenolic content of *S. candida* was determined by Folin-Ciocalteu Assay and the results were expressed as mg GAE/L extract.

Results: The results showed that ethanol extract of plant had the highest antioxidant activity. According to DPPH scavenging method, water extract had the strongest scavenger activity. The highest total phenolic content were found in water extract. So, this plants could be considered as sources of antioxidants.

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Keywords: *Sternbergia candida*, DPPH, antioxidant, total phenolic

Change in the amino acid composition of soluble protein fractions of plants of different tolerance for salinity

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Aim of the study: Quantitative correlation of constitutional and enzyme proteins are definitely arranged due to the strict consistency of genetic systems of an organism. Meanwhile, the decoding of proteins of synthesized fractions in salinity conditions is a problem of current interest moreover due to their genotype peculiarity. The given paper presents investigation results for the amino acid composition of soluble protein fractions (water, salt and alkali-soluble) of plants of different tolerance in standard conditions and under the saline stress.

Materials and Methods: Two different genotypes of pea (*Pisum sativum* L.) – glycophyte, petrosimonia (*Petrosimonia brachiata* L.) – halophyte were investigated. Seeds of test plants were soaked in distilled water and then germinated at 27°C during 48 hours. Sprouts were transferred into water culture medium containing Knoppe's solution. When the first green leaves appeared, sprouts were divided into two parts. The first part was used as check samples and the second part was added by NaCl with the final calculation of dead concentrations 2 for pea and 4% for petrosimonia. Protein fractions from solutions were precipitated by trichloroacetic acid with final concentration 5 at 70°C. Dried proteins were subjected to the acid hydrolysis and their amino acid composition was determined by AAA-339 analyzer.

Results: The investigation of the amino acid composition has revealed that the saline stress extremely stimulates the synthesis of protein soluble fractions for both genotypes. In this case the main amount of proteingeneous amino acids is concentrated at the glutamine fraction. The sudden decrease of the total content of bound amino acids for all protein fractions of petrosimonia, when the saline stress is absent, is stipulated by a genetically inherited demand of halophyte in the salt excess introducing of which stabilizes immediately this gap. Hydrophobic amino acids of pea growing in standard conditions are concentrated in the albumin fraction and of petrosimonia are concentrated in the globulin fraction. The amount of polar amino acids is increased independently on test versions with exception of water soluble proteins of petrosimonia. The content of salt and alkali-soluble fractions remains unchanged. The process of introduction of sour amino acids into the protein composition is promoted, mainly it refers to glutamic acid for both versions of pea and for petrosimonia in standard conditions. We have revealed that in proteins of both plants growing in standard conditions the methionine content is significantly low. Under the saline stress the methionine content abruptly increases in all protein fractions of both plants. This fact gives an evidence to believe that methionine takes part in the protein structure stabilization under adverse existence regardless of the salt tolerance of plants. Our experiments have established that the saline stress promotes the increase of proteingeneous proline in the composition of the glutamine fraction for the intolerant type and in the composition of the globulin fraction for halophyte. Thus, primary reactions of plants to the stress are identical for both plants but in time rates of catabolic and hydrolytic reactions change differently, i.e. here of significance are peculiarities and properties occurring during the evolution.

Keywords: Different genotypes, Saline stress, Protein fractions, Amino acid, Glycophyte, Halophyte

Changes In The Level Of Free Amino Acids In Blood Plasma Of Rats With Experimental Allergic Contact Dermatitis

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Aim of the study: Allergic contact dermatitis (ACD) is one of the most common among inflammatory skin diseases. Modern diagnostic methods are imperfect, therefore one of the developing methods is metabolic profiling - simultaneous analysis of a large number of metabolites, their concentrations and ratios. The purpose of this work is to determine the differential metabolic profiles of blood plasma amino acids in animals with experimental allergic contact dermatitis.

Material and Methods: The experiment conducted on male Wistar rats weigh 280-300 g (n=7). The model of allergic contact dermatitis was carried out according to a standard procedure. The active ingredient was 2,4-Dinitrofluorobenzene. The basis is a mixture of acetone: olive oil (4:1). The animals were divided into 3 experimental groups: - control group, control group with basis application, experimental group with application of active substance. The material for the study was a deproteinized blood plasma containing an internal standard. The concentration of free amino acids was determined by the HPLC method with pre-column derivatization with o-phthalaldehyde. Chromatographic separation of amino acids derivatives was achieved using an LCMS-2020 liquid chromatograph (Shimadzu, Japan) with an automatic injector and a fluorimetric detector. Column - Zorbax Poroshell 120 EC-C18. Solvent A: 0.15 M Na-acetate buffer, pH 6.0; Solvent B: Methanol/acetonitrile/water 45/45/10 (v/v). The elution was in a gradient mode from 5 to 100% B. The time of analysis was 45 min. (Flow rate 1 ml/min); Column temperature was 35 °C. The OPA-amino acid derivatives were measured with fluorescence (338/445 nm). Statistical analysis and calculations were performed using Statistica 6.0.

Results: In the group with induced contact dermatitis, the level of some amino acids increased in blood plasma: aspartic acid (1,5 times), glutamic acid (1,5 times), tyrosine (1,51 times), α -aminobutyric acid (2 times), valine (1,56 times), leucine (1,6 times), lysine (1,5 times). At the same time, the level of a number of amino acid derivatives decreased compared to the control group: anserine (3,5 times), carnosine (10 times), 3-methylhistidine (1,7 times). The significant decrease in the levels of carnosine and anserine was interesting. These substances are dipeptides, derivatives of amino acids of histidine and β -alanine. Anserine is a derivative of the methylated form of carnosine. The physiological role of carnosine is not completely determined, but it has been established that it possesses immunostimulating properties, participates in the hypersensitivity reaction in the development of photodermatitis. Carnosine has antioxidant activity and involved in a number of biochemical reactions, such as oxidative modification of proteins and glycation of proteins. The glycation products take a direct part in the reactions of oxidative stress, the activation of inflammatory reactions, including in the development of inflammatory skin diseases (ACD). The findings suggest that the development of ACD can cause a significant imbalance in the spectrum of free amino acids of blood and their derivatives. The results are of interest for assessing the extent of metabolic abnormalities, the specific features of metabolic shifts, and also in the identification of metabolic markers that can be used to study the pathogenesis of ACD and the development of effective treatment technologies.

Keywords: Allergic contact dermatitis, metabolomics, amino acids, carnosine, anserine

Daily regulation of some C₄ and Calvin cycle enzymes in some *dicotyledon species of Chenopodiaceae* family

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Aim of the study: The changes in activities of some C₄ and Calvin cycle enzymes in relation to ambient temperature have been studied in the plant materials, harvested during intensive vegetation period of the *Salsola dendroides* and the *Suaeda altissima* species of the *Chenopodiaceae* family.

Materials and Methods: Leaves and other photosynthetic organs of matured plants grown under natural conditions in Absheron peninsula were used as the study material. Sampling was performed at 3 different times throughout the day: 08:00, 13:00, and 20:00 h. Light intensity, temperature and humidity at the mentioned sampling times were measured to be 47; 1850 and 25 $\mu\text{mol m}^{-2} \text{s}^{-1}$, 22 $\pm$ 1; 38 $\pm$ 2 and 27 $\pm$ 2 °C, and 62; 32 and 41%, respectively. The activities of the photosynthetic enzymes were measured using the methods previously described in (Pyankov et al. 2000; Alfonso and Brüggemann, 2012) with minor changes. The activity of enzymes was followed at 25 °C as the decrease of absorbance at 340 nm. Protein was measured by the method of Bradford (1976), using bovine serum albumin as the standard. All assays of the presented study were performed in triplicate for each sample.

Results: The regulation of some C₃ and C₄ enzymes in the *S. dendroides* and the *S. altissima* species of *Chenopodiaceae* family have been studied during the intensive vegetation period. Activities of PEPC and cytosolic aspartate aminotransferase (AsAT) were shown to decrease in both species in the afternoon and evening. The activity of alanine aminotransferase (AlAT) was high in the *S. dendroides* species in the morning and evening and decreased in the *S. altissima* species by evening. NADP-ME activity was found to decrease in both plants during the day, whereas NAD-ME activity was high in the evening. The study of the activities of the Calvin cycle redox regulated enzymes showed temperature related increases in NADP-glyceraldehyde 3-phosphate dehydrogenase (NADP-GAPDH) activity in both plants, in FBSase activity in the *S. altissima* species and in NADP-MDH activity in the *S. dendroides* species in the afternoon. High temperature, solar intensity, and also salinity, characteristic for the territory where the research was performed, create extreme conditions for the vegetation. Nevertheless, high diversity of *Chenopodiaceae* is observed in such a territory. Tolerance of these species against the mentioned factors, especially high temperature and drought opens wide opportunities for comparative analysis of adaptive properties of these plants.

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Key words: C₄ photosynthesis, Calvin cycle enzymes, *Chenopodiaceae*, temperature

Determination of Antioxidant Capacity of *Sphaerophysa kotschyana* Boiss.

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Aim of the study: The number of method to measure the antioxidants in botanicals, foods, nutraceuticals and other dietary supplements has been increased considerably the last two decade. The antioxidant capacity of halophytic endemic *Sphaerophysa kotschyana* was investigated by various *in vitro* tests.

Material and Methods: Aerial parts of *S. kotschyana* were collected from Tuz Lake environments, dried, and extracted with methanol/dichloromethane. *S. kotschyana* was evaluated by employing various *in vitro* antioxidant assay such as 2,2-diphenyl-1-picrylhydrazyl free radical (DPPH) scavenging, 2,20-azino-bis(3-ethylbenzthiazoline-6-sulfonic acid) (ABTS⁺) radical scavenging activities and Ferric ions (Fe³⁺) reducing antioxidant power assay (FRAP).

Results: ABTS radical scavenging activity of *S. kotschyana* extract was similar comparing standards. FRAP and DPPH activities of *S. kotschyana* extract were lower than activities of the standards. Therefore, ABTS can be used as a cation radical scavenging agent.

Acknowledgements: Authors thank to the plant research laboratory team in Gaziosmanpaşa University.

Keywords: *Sphaerophysa kotschyana*, antioxidant activity

Evaluation of Antioxidant Properties and Phenolic Compounds of *Asparagus acutifolius*

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Aim of the study: *Asparagus* spp. belong to Liliaceae family and they are produced mainly in China, the United States and France. *Asparagus* contains various significant compounds and essential nutrients, including oligosaccharides, vitamins and minerals and it also contains flavonoids and phenolic compounds, which possess strong antioxidant properties. *Asparagus acutifolius* L., belonging to the genus *Asparagus*, is a native, an herbaceous and perennial species. The present work was designed to evaluate antioxidative properties and phenolic compounds of extracts isolated from different part of *Asparagus acutifolius* by ethanol solvent.

Material and Methods: The flowers and leaves of *A. acutifolius* were air-dried, powdered and extracted with ethanol solvent. Total antioxidant activity was assessed by ABTS free radical scavenging and Phosphomolybdenum methods. In phosphomolybdenum method, 0.3 mL of extracts were combined with 3 mL reagent solution (0.6 M sulfuric acid, 28 mM sodium phosphate and 4 mM ammonium molybdate). The reaction mixture was placed in test tubes and the tubes were incubated at 95 °C for 90 min. Then the absorbance of the solution was measured at 695 nm against a blank. For free radical scavenging activity, ABTS solution (7mM ABTS stock solution and 2.45 mM potassium persulphate) and different concentration of extracts were mixed. The absorbances of solutions were read at 734 nm after 15 min. In addition total phenolic and flavonoid contents were determined with absorbances were measured at 760 nm and 415 nm respectively.

Results: In the present study, Among the different parts extracts of *A. acutifolius* evaluated, leaves extract, showed the highest amount of phosphomolybdenum (45.29 ± 14.90 µg/mg) and ABTS ($70.40\% \pm 4.92$) activity. In addition, *A. deltoidea* leaves extract possessed highest total phenolic (54.10 ± 1.99 mgGAE/g) and flavonoid (92.70 ± 0.64 mg QEs/g) content compared to fruits extract. In this study, antioxidant capacities, total phenolic and flavonoid content of ethanolic fruits and leaves extracts of *A. acutifolius* were evaluated. We think that the results showed here will supply new information for further studies in this species.

Keywords: *Asparagus acutifolius*, Antioxidant activity, ABTS, Phosphomolybdenum

Influence of Homogenate of Drone Brood on Biochemical Parameters of Blood and Productivity of Growing Pigs

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Aim of the study: the research was aimed at examining productive and biochemical blood parameters of pigs' blood when introducing homogenate of drone brood to the animals diet.

Materials and methods: In the conditions of the vivarium of the university, a scientific experiment was conducted on pigs of large white breed. Two groups of animals were formed on the principle of pairs-analogues at the age of 35 days, ten animals being in each group. The pigs in the control group received the basic diet; the pigs of the experimental group were fed with the basic diet plus homogenate of drone brood in the dose of 25 mg of dry matter per 1 kg of feed. The time of the experiment was 180 days. In the course of the experiment, the blood from the animals was taken from their tail artery; individually weighing pigs was conducted, the live weight of the animals was determined, average daily gain of live weight according to standard techniques was also taken. At the end of the experiment, the slaughter of animals was done and the square of muscle eye and the fat depth were determined. The laboratory tests were conducted in the biochemical laboratory of the university. In the blood serum there determined: the concentration of total protein, albumin, urea, total cholesterol, high density lipoproteins and triglycerides. The statistical processing of the values was carried out by calculating Stewdent's criteria.

Results: Using drone brood in animal feeding helped to increase average daily gains and live weight of young pigs. The stimulating effect of drone brood on the body of growing pigs was proved, its application significantly affecting on the protein metabolism. In the blood serum of young pigs of the experimental group there was a significant increase in the concentration of total protein by 14.3% and the albumin concentration by 20.3% compared to the control group. Statistically significant decrease of total cholesterol was found by 17.8% in the blood serum of pigs of the experimental group relative to the control values. A significant increase in the concentration of high density lipoproteins by 12.6% relative to the control was stated. The use of drone brood had a anabolic effect: the square muscle of the eye in the carcasses of pigs of the experimental group exceeded that of control by 19.2%, and fat depth is less by 11.1%. Chemical composition analysis of muscle tissue shows that the use of homogenate of the drone brood did not affect water content, but significantly reduced the fat content in the muscle tissue. By the end of experiment the live weight of pigs of the experimental group exceeded that of the control group by 11.5%, and average daily gains exceeded by 12.6%. Thus, the introduction of the concentrate of drone brood in the dose of 25 mg of dry drone brood per kg feed to the diet of pigs shows anabolic effect and stimulates significantly the growth rate of animals.

Acknowledgements: the project was implemented with the support of Fund of assistance to innovation contract number 458ГC1/9751 from 20.04.2015.

Key words: pigs, drone brood, biochemistry, live weight, square of muscle eye.

Inter-individual Variation of Mitochondrial DNA Deletion Percentage in Platelets¹Ayla KERIMOVA, ²Nurten BAHTIYAR, ³Fahri AKBAŞ, ¹İlhan ONARAN, ¹Turgut ULUTIN¹Department of Medical Biology, Cerrahpasa Faculty of Medicine, Istanbul University, Istanbul, Turkey,²Department of Biophysics, Cerrahpasa Faculty of Medicine, Istanbul University, Istanbul, Turkey,³Department of Medical Biology, Faculty of Medicine at Bezmialem Vakif University, Istanbul, Turkey*ulutin@istanbul.edu.tr*

Aim of the study: ATP production and content have shown a possible correlation between an accumulation of the 'common' 4977 bp mtDNA (mtDNA4977) deletion. Functional mitochondria are present in platelets and mitochondrial dysfunction can alter bioenergetic function in platelets. Although many studies have shown very low amounts of 4977 bp deletion with inter-individual variation in fast replicating tissues including blood. As related to blood, these studies are on peripheral blood leucocytes and it is unclear whether this mutation occurs in platelet.

Material and Methods: To better understand this variability, we measured the mtDNA4977 deletion levels in platelets of 23 healthy individuals (aged: 27- 42) as related to ATP production. The deletion in platelet samples was detected in 12 (about 52 %) of the 23 cases with the different frequencies, using a quantitative real time PCR. The percentage of the coefficient of variation (CV) is also higher in samples (about 250%).

Results: No correlation was found between the deletion levels and intracellular ATP content of platelets. Our findings may suggest that inter-individual variation in the mtDNA4977 deletion level of platelets does not seem to have an important impact on mitochondrial dysfunction in relation to ATP production.

Keywords: Mitochondrial deletion, mtDNA4977, inter-individual variation, ATP, Platelet

Metformin-Cisplatin Combination Treatment Alters mRNA Expression of Hexokinase II Gene in LNCaP and PC3 Prostate Cancer Cell Lines

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Aim of the study: Metformin is an antidiabetic drug with anticancer properties. Cisplatin is known as one of the most potent chemotherapeutics for treatment of various types of cancer. In order to overcome cisplatin resistance and toxicity, the drug can be combined with other chemotherapeutics that sensitize tumour cells to cisplatin. The ability of metformin to potentiate cisplatin-mediated killing of cancer cells in vitro, makes it a plausible candidate for combination with cisplatin-based therapy. The aim of this study is to examine the combined effect of these drugs on mRNA expression of Hexokinase II gene participating in glycolysis as well as cancer promotion.

Material and Methods: The effects of drugs on prostate cancer cell lines were analysed using androgen dependent LNCaP and androgen independent PC3. LNCaP and PC3 cell lines were cultured in RPMI-1640 medium and Ham's F12 medium with containing 10% fetal bovine serum (FBS), 1% L-glutamine and 1% penicillin-streptomycin solution, respectively. Cells were treated with either metformin alone in the range of 1–10 mM, cisplatin alone or a combination of these two drugs. Cytotoxicity of drugs were determined with Alamar Blue Assay and IC₅₀ was calculated. The effects of drugs on mRNA expressions were determined by q-RT PCR technique and results were normalized with GAPDH as an internal reference. Statistical analyses were performed by using GraphPad Prism version 6 statistical software package for Windows. All results were expressed as means with their Standard Deviation (SD). Unpaired, two-tailed ANOVA test and $p < 0.05$ were chosen as the level for significance.

Results: IC₅₀ values of cisplatin were calculated for each cell line and found to be 17 μ M for LNCaP and 30 μ M for PC3 cell line. Both alone or combination of drugs were inhibited the proliferation of LNCaP and PC3 cells in a concentration dependent manner. Hexokinase II mRNA expressions were significantly downregulated ($p = 0.05$) in metformin/cisplatin treated cells compared to control groups. This study suggest that metformin and/or cisplatin combination may decrease the tumour promotion as well as glucose utilization of LNCaP and PC3 cells by downregulating Hexokinase II gene expression. In addition to its anticarcinogenic properties, adjuvant role of metformin may be investigated in combination therapy for different cancer types.

Acknowledgements: This study is supported by Scientific and Technological Research Council of Turkey (TÜBİTAK), Project No: 115Z695, Turkey.

Keywords: Cisplatin, Metformin, Hexokinase II, Prostate Cancer, LNCaP, PC3

Theoretical Investigation of Metal Chelating Activity in Phenolic CompoundsAslı ÖZTÜRK KIRAZ¹, İzzet KARA², Yeşim KARA³, Soner ÖZGEN⁴¹*Pamukkale University, Science and Art Faculty, Physics Dep., 20070, Denizli, Turkey*²*Pamukkale University, Education Faculty, Mathematics and Science Educ., 20070, Denizli, Turkey*³*Pamukkale University, Science and Art Faculty, Biology Dep., 20070, Denizli, Turkey*⁴*Firat University, Science and Art Faculty, Physics Dep., Elazığ, Turkey*
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Aim of the study: Flavonoids are generally composed of polyphenol compounds of plant origin with various biological and chemical activities. Since the presence of carbonyl and hydroxyl groups they can coordinate metal ions and form complexes. Flavonoids can chelate metal ions preventing them in the participation to form free radicals, and protect against oxidative stress. Many studies have confirmed that flavonoids can behave as antioxidants because of their chelating properties. In this study, inhibition of free radicals using some flavonoid compounds chelate with the Fe^{+2} and Cu^{+2} are examined to determine their antioxidant effects.

Material and Methods: We have utilized B3LYP/6-31G+(d,p) method to explore the antioxidant effects and structure–activity relationships of some flavonoid chelate with Fe^{+2} and Cu^{+2} . The electronic properties and various molecular descriptors such as the BDE, HOMO and E_{gap} of the chelate complexes have also been obtained and studied, which are relevant to show evidence of antioxidant activity.

Results: Flavonoids are common to chelate iron and copper, by that removing a random factor for the development of free radicals. So quercetin form complexes with Cu^{+2} and Fe^{+2} show strong antioxidant activity. It is also important to understand the properties of the flavonoids chelating with metal-ions for developing new molecules.

Acknowledgements: The authors are grateful to PAUBAP (Project No. 2012BSP004), TUBITAK (Project No. 107T606) and TUBITAK ULAKBIM, High Performance and Grid Computing Center (TRUBA resources).

Keywords: polyphenol compounds, metal chelating activity, electronic properties, antioxidant activity.

Agroflora of the Watered Areas in the Lesser CaucasusZerife TAGIYEVAabayramova@rambler.ru

Aim of the study: Based on the analysis of biological and morphogenetic features of the natural conditions and lands of the north-western slope of the Lesser Caucasus the modern ecological situation in the territories have been learned. As the result of studies, changes in the speed of the soil of the antropogen and natural causes in North-western slope of the Lesser Caucasus, erosion and salinization processes and these negative consequences have been fixed in the administrative regions, soil composition, structure, agricultural areas have been analyzed. According to the study, 11 families, 77 genera and 221 species have been identified on the plant cover of the hay field. 51.58% legumes, 42.53% grains and 5.88% various grasses are organized in the area.

Material and Methods: In the practice, mowing was conducted with grass mowing aggregate, it has been sown and dried in the area and dry weight determined. Agro-technical measures which accepted for the district were taken in the practice area. For the learning agro-chemical characteristics of the experience field lands, before putting experience 0-30 from 5 converted form; 30-60; 60-100 cm layers of soil samples have been taken and analysed. After the first and last mowing, mixed soil samples were taken from 0-30 and 30-60 cm layer phenological observations and biometric measurements taken every cutting out.

Results: The economic efficiency of fertilizers calculated with the method N.N. Baranov for the additional product costs. Rainfall important for the take higher yields of agricultural crops and feed plants in the irrigated regions of the Lesser Caucasus. Provision of poor water irrigation of the region and for age crops don't allow substantial expansion of arable lands. Studies show that, there are humus 2.1%, nitrogen 0.18%, 0.16% phosphorus, 2.58% potassium in 0-20% layer of irrigated chestnut soils. Amount of flexible food items were organized of easy hydrolysis of the 108.2 nitrogen, flexible phosphorus 18.6, exchanging potassium 241.0 mg / kg, in the accordance layer. 80-100 cm layer significantly decreased the amount of nutrients. During the summer months little rainfall and mountain water scarcity prevents cultivation of fodder crops. It becomes clear of perennial informations, rainfall is much important for cultivation forage crops. According to information, much more precipitation rainfall in April, May and June months. Amount of rainfall sharply decreases over the years. Precipitation sharply decreases in July and August months, lack of irrigation water. As a result, the size of the launch and development become weakening of agricultural crops. In showing months, spoil the rainfall at all, lack of irrigation water does not allow plants moisture to ensure the normal manner in the region. The relative humidity is of great importance to cultivate plants in rural agricultural. According to information, much more precipitation rainfall in April, May and June months. Amount of rainfall sharply decreases over the years. Precipitation sharply decreases in July and August months, lack of irrigation water. These plants play an important role in the formation of temporary seasonal vegetation. The main senoz forming of grass cover organized long-term permanent natured perennial grass, bushes, shrubs and kolca pictures are made up of species. According to the study, 11 families, 77 genera and 221 species have been identified on the plant cover of the hay field. 51.58% legumes, 42.53% grains and 5.88% various grasses are organized in the area.

Keywords: mowing, forage crops, senoz, species.

**Analysis of the Modification Changes According to Variation Row of the Leaves in
Quercus castaneifolia C.A.Mey.**

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Aim of the study: In plants arise the morphological adaptation to adapt unfavorable environmental conditions, it is accompanied by the appearance of certain form diversity in vegetative and generative organs. In the article the observed modification changes in the leaves of chestnut-leaved oak were analyzed with mathematical methods.

Material and methods. Examples of plant which was investigation object have been phenological observed constantly in investigation base of the Institute of Dendrology, in march- July months of 2016. In July formed leaf samples have been gathered and morphological investigated. Thus, collected 74 leaves and each of them weighted and were registered. The numbers in non-sequential order was systematized and compiled variation order, established variation curve which reflecting the diversity of variation row, identified the smallest and largest extent of variation according to the width and length of the leaf, analyzed with mathematical methods.

Results: Determined from measurements that, the maximal limit of reaction rate is $l_{\max} = 18.5$ cm, the minimum limit of reaction rate is $l_{\min} = 4$ cm for length of chestnut-leaved oak leaves, calculated the average mathematical figure $\bar{x}$ for length and the limits of the reaction rate was analyzed, so calculated $\bar{x} = 11.56$ cm. Prevalence frequency of options are different, come across external dimensions of variation very rare, decreases the prevalence frequency to the both end side of the line. The number of variants was calculated and defined that, middle members of the variation row is more often found. Calculated the standard deviation of average by mathematical indicator for length of leaves in $\sigma = \pm 1.66$ sm it shows that, each variation may differ from average mathematical indicator ($\bar{x}$ -døn) as approximately ± 1.66 . The main parameters of variation row for width of the leaves were analyzed: average mathematical figure of variation row is $\bar{x} = 5.34$ sm, the maximal limit of reaction rate is $e_{\max} = 8.5$ cm, the minimum limit of reaction rate is $e_{\min} = 2$ cm. The average price is come across more, deviation from maximum and minimum average price of variation is come across less. . Calculated standard deviation of average mathematical indicator for width of leaves: $\sigma = \pm 2.43$. The results give an idea about the modification volatility. The fluctuation of reaction rate is great importance for adapting organisms to the natural environment, so it ensures the keeping and increase of species.

Key words: *Quercus castaneifolia* C.A.Mey., variation row, modification variability species

Biodiversity and Protection of the Hairless Liquorice Species (*Glycyrrhiza* L.)

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Aim of the study: Environmental condition and the biological characteristics which estimates fortitude of the ecosystem. Main biodiversity, their genetic diversity, diversity of ecosystems and landscapes, acclimatization of different species, to cause qualitative change of ecosystem, also to offer create fit food, medicine, paint, ether, adornment phitosenosis which are formed as a result of the effect of the historical evolution

Material and Methods: To study biodiversity of the sweet licorice in the Azerbaijan and world flora; Role of the licorice plant in medical sphere and in different spheres of the national economy is shown. Biodiversity is one of the objective factors evaluating the sustainability of the environment and the ecosystem. Biological diversity is richness, diversity and processes taking place in the life. Here include diversity of living organisms, their genetic differences, as well as differences of groups of organisms, ecosystems and landscapes. All of the above levels of biological diversity are formed a single system closely linked to one another, for example: a decrease of genetic diversity at a result of breakdown of species's area causes destruction of species and decreasing biological diversity of the region.

Results: Considering, acclimatization of separate species, is causing the change of quality of ecosystem thus, the species adapting to climate are growing rapidly and failure other types not to find its natural enemies in a new location. In this case, acclimatization is reduced the biological diversity. The fertility and having different environmental conditions of Azerbaijan nature has created favorable condition for generation of food, medicine, dyes, essential oil, ornamental plants phitosenos which formed as a result of long-running historical geological evolution, rich in content very complex biochemical compounds. The plant kingdom is a source of food of the power of a healthy life for people. Strengthening the country's economic power closed with the organic plant materials. Fabacea legumes s part of the flora of the world covers more than 600 sort and more then 1200 species. These species consisting of grass, shrubs and trees are spread throughout the world. 18 species of liquorice are spread at part of the world flora. 12 species are found in the former Soviet Union, 8 species in Azerbaijan. Sweet liquorice- *Glycyrrhiza glabra* is the most common of them. This half perennial shrubs has a large underground root system. Many small side are separated from the sides of main roots. Various origin ingredients of roots and rhizomes is precious the liquorice. Bodies are flat, a little arm-branched, the height of it reaches to 60-80, sometimes 100 cm. As a result of the researches it was defined that, sweet licorice is highly evaluated in the medical sphere as a pasture plant. The plant is of high significance as Lucerne plant for its nourishment importance.

Keywords: genetic, ecosystem, areal, evolution, biochemical, fitosenoz, protein

Bioecological Characteristics of *Draba* L. Genus Spreaded in the Rocks and Debrises of the North-Eastern Part of Lesser Caucasus

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Aim of the study: The article deals with species composition, distribution patterns and bio ecological features of *Draba* L. genus spreaded in the rocks and debrises of the north-eastern part of Lesser Caucasus. *Draba* L. genus has a special place in rock and debris planting. 300 species spread in the Earth atmosphere. 13 species of it are known in the flora of Azerbaijan.

Materials and methods: The study material is the species of *Draba* L. genus spreaded widely in the rocks and debrises of the north-eastern part of Lesser Caucasus and gained good matches in these areas. A.A.Qrossheym's "Flora of Caucasus" (1950-67), "Flora of Azerbaijan" t. 8 (1961) and A.M.Əsgərov's "Review of the flora of Azerbaijan" (2010), "Review of the flora of Caucasus" t. 3 (2008) have been used in the assignment and naming of plants. The 100m² sample areas have been considered appropriate for the rock and debris planting. But the size of the sample areas changed, depending on the rock sloping. Vegetation natural boundaries are described in the absence of the ability to set 100m² example areas. Description of the sample areas on the separate special forms or general notebook have been as follows: the geographical position of the Earth, condition of the ending (relief, slope's inclination and height, hydration status), the physical condition of the ending (gravel, moving, stones, attrition rate, etc. .); complete floristic list is made. Abundance of species on the vegetation projective cover Drude scale is said in this list. The plant has been dug out in the sample areas to determine its life – form and its morphology described.

Results: The 4 species of the genus *Draba* L. have been found in the study area. Structural features of populations of the Siliquosa *Draba* species have been studied: Latent - (sprout, juvenile) its fruit grows at the end of June/early July. Its seeds' colour is light purple. Generative - lobed leaves - 0,4-0,5sm, width – 0,3sm, hipokotil – 1,5-1,7sm, light green, threadlike roots, 0,7-1sm. True leaves with 115sm length and 0205 sm width appear in juvenile plant. Featherlike leaves are shaped in the immature stage. Leaves - 3-3.5 cm and wide - 0.6 cm. *Drabasiliquosa* M. Bieb. Virgin-leaves fully form (length 4,5cm, wide 0,7cm). Generative – young individuals are characterized with 1-2 floral axis. The length of the leaves 3,5 cm, wide 1,5 cm. In the old individuals the amount of arrows carrying the flower increase and the leaves of the flower base 5,6-6,2 cm, wide 2,5-2,7cm. Senil – dried leaves are in the small biometric size and bending down becoming colourless. The spreaded kinds of genus in the research area : Fam: Brassicaceae Burnett (=Cruciferae Juss.). Genus: *Draba* L. *D. bruniopholia* Stev. (=D. globipha Ledeb.) Needle rooted, perennial, 3-8 sm, blossomin V-VI months. Hemikriptophit, Iran-Turan. (Sp.) In Gadabay alpine zone Has been described in Azerbaijan. Hemixerophit, heliophit, xamophitobligate; decorative. *D. siliquosa* Bieb. Needle rooted, perennial, 5-10cm, VI-VIII. Hemikriptophit, Caucasus. (Pl.) Khoshbulaq, (2000-2800 m) Caucasus. Needlerooted, perennial, 5-10cm, VI-VIII. *D. incompta* Stev. Needle rooted, perennial, 5-10 cm, VI-VIII. Hemikriptophit, Caucasus. (Pl.). Khoshbulaq, alpine zone. Azerbaijan. *D. mollissima* Stev. Needle rooted, perennial, 5-10 cm, VI-VIII. Hemikriptophit, Caucasus. (Pl.). Khoshbulaq, alpine zone. Azerbaijan.

Key words: Rock, debr, family, genus, kind, population.

Biological and Ecological Features and Status of Cenopopulation of the Highlands of the Smaller Caucasus

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Aim of the study: The purpose of current study was to investigate biological and ecological features and status of cenopopulation of 4 rare turf and rhizomatous grains in different ecological coenotic conditions of the North-Eastern part of the Smaller Caucasus.

Material and methods. In 2011-2014 the studies were carried out in Dashkasan district, mountain system Goshgar, the massif Khoshbulag, in Goygol region, the mountain massif Kapaz and at the sloping hillsides of Togana and Chaykendi. The geobotanical description was carried out in order to determine the character of species's distribution in the study area. Researches have been implemented by stationary and route methods. Stationary researches have been carried out in the sample areas of 100 square meters. The geographical position which the species are encountered, the end conditions (relief, slope, etc) are shown in the description of sample areas. The physical condition of the end place and the full floristic list was compiled. The abundance of the area where the species are encountered is marked with a scale of Durudue. The project cover of the populations is estimated according to Kaptan. The structure of the cenopopulation of studied species have been carried out by accepted methods: ability to sprout germination- C, juvenil-y, immature-im, virginil-v and o. The subject of our study was *Agrostis planifolia* C. Koch., *Ag.lazica* Balansa, *Alopecurus laguroides* Ball, *Al.vaginatus* (Willd) Palld. Ex Kunth.

Results: As the results of the studies it was discovered that cenopopulation of species has 4 age periods (latent, virginile, generative, senile) and 9 age ontogenetic states (seedlings, juvenile, immature (except *Ag.lazica*), virginile, generative-young, middle-aged, old generative; subsenile; senile. The complete life cycle, quantity and age composition of cenopopulation was studied in 10 plant associations with different conditions of economic use of pastures. The vitality of separate species was revealed, the ecological optimum, biometric indicators of the structure were defined depending on the type of association, strategy, morphological and biological diversity of species in cenopopulation, as well as bio-ecology, seed and vegetative renewal of communities. It was found that the age composition of cenopopulation of the studied species varied and was associated with biological features of species, botanical composition of herbage, nature of the terrain, altitude, environmental conditions for years and economic use of pastures. The taxonomic status of the systematic position, the distribution area of the investigated species was established as well. Based on phylogenetic analysis, the morphological and biological diversity of species was revealed, the diagnosis of developmental conditions were developed and the main types of developmental cenopopulation spectra were determined.

Key words: Phylogenetic analysis, species, geographical position, North-Eastern part, associations.

Botanical Description *Carum carvi* L. and Introduction in the Institute of DendrologyKamala SADIQOVA

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Aim of the study: One of the global problems of our time is the conservation of biodiversity. Now, great attention is paid to the use of valuable and promising plant in the national economy. The paper analyzes the introduction of Caraway in the Institute of Dendrology. Studied phenophases, economic, nutritional and medicinal value and identified the main of uses *Carum carvi* is a genus of perennial or annual plants which belong to semeistvo Umbelliferae (Apiaceae), a plant does not grow more than 1 meter in height. The genus includes about 30 species *Carum carvi* L. is grown in Egypt, Sudan, Ethiopia, some countries of the Mediterranean, Syria and Turkey, Iraq, Iran, India and Pakistan. Depending on the species of *Nigella Sativa* L is considered an annual plant. The plant likes fertilized soil and sunny sites. *Nigella Sativa* L is able to move any frost, so in winter it doesn't even need to cover.

Materials and methods: *Nigella Sativa* L is propagated by seed. Best of all, the plant develops if the seed sown to produce in the spring, as the top layer of soil still contains a lot of moisture, and cumin likes moist soil. Given the fact that of *Nigella Sativa* L seeds slowly germinate, they need to be soaked in water for 2 days, remembering to change the water from time to time. When the seeds germinate, they need to dry. Prior to sowing seed the soil dig over. Seeds buried for 2, 3 or 4 cm into the soil, it depends on the structure of the soil. Seedlings appear after 3-4 weeks. *Nigella Sativa* L blooms in the early to mid-summer. The flowers of *Nigella Sativa* L small size, white color, consisting of 5 petals. At the time of ripening of the fruit stem becomes first brown, and then completely dries. From the seeds of *Nigella Sativa* L toget the oil. The resulting oil has a tonic, improves cerebral activity properties. The oil of *Nigella Sativa* L calms the nervous system and for colds. Oil of *Nigella Sativa* L is used both internally and externally. In the summer, often in July, the harvest can be carried out immediately after flowering, as soon as the seed coat will be dark and, despite the fact that the plant is still green, the leaves begin to wither from the bottom - a sure sign that the power plants already began to spread seed pods. Plants are cut by sickle at a distance of 5 centimeters from the ground. It is very important to cut the plant in the evening or before dawn, so it was not dew.

Result: The purpose of the study was morphological and biological features and identify opportunities for the cultivation and importance in medicine. Institutions conduct research to identify useful properties of this plant. *Nigella sativa* L is almost irreplaceable natural product for gaining health, strengthen immunity and restore human forces after a long and debilitating illness. In folk medicine it is used to treat a huge number of different diseases.

Keywords: *Nigella sativa* L, propagated, seed, features

Brandt's bat (*Myotis brandtii*) - Species Action Plan with New Some Ecological and Locality Records

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Aim of the study: In the scope of field investigations; the previous records of the species are updated, distribution area is expanded giving new localities and potential presence of the species in the field is detected. The species has been recorded for the first time in Turkey since 2005, after 11 years. The population size, the features of the reproduction and nutrition areas, as well as the threats to the habitat of the species are defined and recorded. "Brandt's Bat (*Myotis brandtii*) Species Action Plan" comprises five years (2017 to 2021) of action targets.

Material and Methods: Literature, field and questionnaire studies were carried out between August and December 2016 within the scope in Rize Province (Turkey) of *Myotis brandtii* Species Action Plan project. The results were supported by field studies. Factors threatening species were identified on the axis of interviews with the local people. In addition to the bats sampling methodology with mist-nets, three full-range bat listening devices (2 Petterson D500x and 1 BatBox Griffin) were used to record the bat sounds of the entire night.

Results: A new locality of *M. brandtii* from İkizdere District was newly recorded. New threats for conservation of this species were determined and listed as below:

- Renovation of house roofs,
- Filling wooden gaps of buildings with styrofoam,
- Replacement of traditional wooden houses with concrete buildings,
- Replacement of traditional wooden beehives "Karakovan" beekeeping with modern beehives
- Habitat loss; degradation of forest areas,
- Human-bat conflict: local people damaging the habitats of bats.

Acknowledgments: This work has been done by EKOİZ Environmental Consultancy Company by the Directorate of Nature Conservation and National Parks of the Ministry of Forestry and Water Affairs and the Provincial Directorate of Rize Nature Conservation and National Parks.

Keywords: *Myotis brandtii*, conservation, Species action plan, treated species, Turkey, Rize

Collecting and Studying of the Introduced Onion Varieties (*Allium cepa* L.)

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Aim of the study. In the thesis were described usage, benefits, collection and studying of different introduced onion (*Allium Cepa* L.) species. On selected species was carried out phenological observations, studied economical-biological features. Separately done some analysis (C vitamin, sugar, dry matter, nitrate) on all species.

Material and Methods. There we selected 1 local (Sabir) and 19 foreign (Purple Onion - Turkey, Valenciana - Turkey, Karatafskiy - Uzbekistan, Red Baron - the Netherlands, Peshpazak - Tajikistan, Ispanskiy mestniy - Spain, Mayskiy - Tajikistan, Hissor - Tajikistan, Sweet Spanish - America, Yellow Globe Danvers - United States, Brown Beauty – Canada, Brown Spanish - Australia, Vigo Osen - Denmark, Casta - Turkey, Beta Panko - Turkey, Red Amposta - Turkey, Panko - Turkey, Metan - Turkey, Erkenci - Turkey) varieties for investigation. Evaluation and studying of selected samples was conducted in field and laboratory condition. Onion plants are light demanding and cold-resistant plants and need to be planted in his field should be open. Therefore, the experiment was carried out in Absheron-open field conditions.

Results and their discussion. There was applied different fertilizers (Ammofos, N və Maxfoli) to all studied varieties. The amount of sugar and vitamin C were high, in bulbs amount of nitrates was normal (80mg/kg) in the varieties from Turkey, the United States and Tajikistan. Varieties from Spain and the United States have more dry matter. Phenological observations and economical - biological characteristics, taking into account the final result can be noted that the condition of Absheron is advisable to cultivate more varieties of onions from Turkey. By taking account phenological observations and economical - biological characteristics, it is advisable to cultivate varieties of onions from Turkey in Absheron condition. It should be considered introduction, development and planting of Onion (*Allium cepa* L.) foreign origin.

Keywords: Variety, introduction, phenological, fertilizer, economical – biological.

Detection of the Dangerous Fire Zones of the Forest Cover of Azerbaijan on the Basis of Space Data and the Fire Influence on the Biological Variety

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Aim of the study: The main goal of our work was with the help of space images to find dangerous zones of fires and determine the biological diversity of the flora of these zones and the influence of the parameters of complex meteorological elements of the forest cover of the Lankaran region of the Republic of Azerbaijan. Forest fires destroy the diversity of species and the diversity of ecosystem, that is, the diversity of ecosystems themselves. As a result of fires, the protective, water-protective and other useful properties of the forest are reduced, the fauna, structures, and in some cases settlements are destroyed.

Material and Methods: The degree of fire hazard of separate sections of the forest fund is determined by the scale of assessment of forest areas in terms of the degree of danger of fire occurring on them, which is based on the scale developed by the scientist I.S. Melekhov. Fire danger of forests is determined by the type of forest, human activity, lightning discharges, spontaneous combustion of peat crumbs and agricultural fields, etc. in hot weather or in the so-called fire season. The composition, quantity and distribution of forest combustible materials depend on the type of forest, and also the moisture content of these materials to a large extent. Different parts of the forest are also characterized by a different fire hazard. Studies were carried out to identify fires in the forest cover of Azerbaijan. To display forest fire in 2015, space images were taken using the spectroradiometer of Modis equipment installed on the Terra and Aqua satellites (4). After a forest fire, forest development takes place in two directions: recovery and disappearance. Time and speed of recovery depends on the degree of harm caused by the fire and on the type of forest. The geographic relief of the area, like the wind, affects the parameters of the fire and the development of a fire. From this it follows that, with an increase in the inclination of the earth's surface from 0 to 150, the propagation velocity increases 1.6 times. With a propensity of 350 the speed of fire spread is 11 times, and increases by 450-41 times. The inclination of the steepness after 200 fire is 1.3 times, and in 450 it increases 3.6 times. The intensity of the fire and the size of the area are expanding dramatically. The burning of green moss, shrubbery, sphagnum, fallen leaves and grains occurs when the moisture content is 26%. Therefore, by the condition of air, a method for determining the degree of fire hazard in the forest requires control over the moisture content of combustible materials.

Results: As a result of the research, a map-scheme of the forest cover was developed, indicating the times of fire hazards of the Lankaran district. On the basis of identification, it was revealed that the high value of the complex indicator corresponds to a low area of fire hazard. With the help of space images dangerous zones of fire are found and biological diversity of flora of these zones is determined.

Keywords: Forest ecosystems, forest cover, biological diversity, fire hazard, space images.

Distribution of *Chalcides ocellatus* (Forskal, 1775) under Current Bioclimatic Conditions

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Aim of the study: *Chalcides ocellatus* that is a species of the genus *Chalcides* presents the wider geographic distribution, but it also is in the western Turkey. Therefore, we wonder whether distribution of *Chalcides ocellatus* will be limited by bioclimatic conditions or not. For this reason, we aim to determine which climatic conditions are preferred by *Chalcides ocellatus*.

Material and Methods: Occurrence data of *Chalcides ocellatus* were collected during fieldwork between 2000 and 2014 years, and a total of 60 samples were used for analysis. Bioclimatic data was downloaded from WorldClim a set of global climate layers (gridded climate data) with a spatial resolution of about 1 km². These data have the highest resolution (30 arc-seconds (~1 km)). Then, the data were masked for Turkey boarder using ArcGIS 10.2. For Ecological Niche Modelling, Maxent version 3.4 was run under 10 replicates. Regularization multiplier and maximum iterations of the optimization algorithm were choose as 1 and 500, respectively.

Results: The average test AUC for the replicate runs is 0.967, and the standard deviation is 0.025. The highest percent contribution of the environmental variables was found as bio-1 (%52.9) and bio-11 (%20.6), and other variables were under 10 %. However, the results of the jackknife test of variable importance showed that the environmental variable with highest gain when used in isolation is bio-11, and the environmental variable that decreases the gain the most when it is omitted is bio-4. Values shown are averages over replicate runs. According to model, distribution of *Chalcides ocellatus* is limited by temperature, and suitable habitats for *Chalcides ocellatus* emerge in the coastal parts of the Mediterranean.

Keywords: Ecological niche modelling, potential distribution, scincidae

Effect of Mulberry Leaves of Local Varieties of Azerbaijan on Improvement of Quality Indicators of Introduced Silkworm (*Bombyx mori* L.) Breeds Crop

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Aim of the study: Sericulture is oldest and profitable one of the agriculture. Approximately 8.3 percent of the country's gross domestic product accounts for agriculture. 39 per cent of the economically active population formed in this sector, the agrarian sector occupies a special place in the non-oil sector. Rich and favorable soil, climatic conditions and the possibilities of producing environmentally friendly products of Azerbaijan have been highly competitive in the world market, create favorable conditions for the production of quality food products. Recently, the head of state has given specific instructions for the development of sericulture and the development of this field was identified as a priority. Currently, one of the most critical issues in the development of sericulture the local varieties of mulberry leaves mulberry silkworm breeds have been introduced to study the impact of productivity indicator.

Material and Methods: The research shows, as the material mulberry silkworm breeds which is considered the most promising and was introduced the China -21 with origin China and China -29, Gulistan-2 with origin Uzbekistan and the Ukraine-1 Ukrainian origin and, the Ukrainian-2 and grown in large areas of republic AzNIIS-7, Baxca tut- and Khanlar-tut leaves varieties were used. At execution of the training, 20-25 mulberry tree leaves were used 4x4 m with scheme in the Ganja experimental –production basis of Sericulture Institute. Evaluation of experiments and their results were carried according to the accepted methods of sericulture. (Abbasov B.H, 2009; Badalov N.H, 1974; Sayidov A.K, Hasanov N.M and ets, 2012; Akhundov Z.A, 1964; Belyayev C.M, 1963; Petkov N., Petkov Z., Vasilyeva Y., 2007). The reliability of the received figures has been worked with biometric ways (Dospekhov V.A., 1985; Q.F.Lakin, 1990). Feeding worms was conducted under the conditions of recommended the agrozootechnical for the Republic of Azerbaijan and worms have been feed with sort mixed leaves at the age of 1- 3. At the end of 3 years of age, of each sex, each of the 4 variants have been formed of 150 worms. Worms of each variant, at the age of 4 with out weight and at the age of 5 , 26 g to each worm is listed by weight 86 % of feed.

Results: The leaf consumption shows difference depending on fodder quality of local mulberry varieties leaves and the biological features of feeding mulberry silkworm varieties. The most leaf consumption of Ukraine-1 of silk worm gender with feeding AzNIIS-7 mulberry leaves in variant -3,403 kg, at least feed China-29 of silk worm gender with feeding Khanlar mulberry leaves in variant -3,403 for 150 worms have been identified. 2. age (alive) of cocoon average weight has changed between 2.03 grams and 1.77 grams. 3. qrena yield of each kilogram missed pedigree has changed rising to 24,7% reached to 80.7 g. This also has been recorded in the version of China-21 mulberry silkworm species which feeding Bakhcha-mulberry sort. 4. In the cocoon wire length has been identified that, the longest wire length 1291 m (Ukraine-1 of silkworm gender with feeding Khanlar-mulberry variant), in the shortest wire cocoon 1050 m (China-29 species with feeding mulberry leaves of Bakhcha). 5. For alive cocoons product output from 1 hectare mulberry plantation has been registered the most high indicator (Ukraine-1 of silkworm gender with feeding Khanlar-mulberry variant 611 kg) the lowest indicator (China-29 species with feeding mulberry leaves of AzNIIS-7 (428 kg). 6. While biochemical content analysis of different mulberry sort leaves has been determined that varieties of mulberry leaves differed from each other for chemical composition in the same agrotechnical care background.

Keywords: Mulberry, qrena, sericulture, pedigree, leaf

Geophyte Diversity of Handüzü Natural Park, Rize, TurkeyHüseyin BAYKAL¹, Vağif ATAMOV², Mustafa ÇOBANOĞLU²¹Plant and Animal Breeding Department/Pazar Vocational School, Recep Tayyip Erdoğan University, Turkey²Biology Department/Science and Art Faculty, Recep Tayyip Erdoğan University, Turkey
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Aim of the study: Handüzü Natural Park, 16 km away from city center, is at the Güneysu district of Rize, Turkey. The main goal of this study is to determine the geophyte diversity of this Natural Park.

Material and Methods: The geophytes, collected from natural populations of different habitats in Handüzü Natural Park, and the photographs of them, taken during the field surveys, are the main materials of this research. The plant materials were collected in 2010-2011 with the periodic field surveys. Some more plant materials were collected and photos were taken at the field surveys, carried out during 2015 and 2016 in vegetation seasons. The plant samples were described by Flora of Turkey and the East Aegean Islands and checked with the Plant List of Turkey, Vascular Plants. All identified samples were compared with the herbarium samples of Hacettepe and Karadeniz Technical University. Samples for each taxa, were dried according to the herbarium rule. After description the samples were stuck on the herbarium cartoons and deposited in the Herbarium of Biology Department, Faculty of Science and Art, Recep Tayyip Erdoğan University.

Results: In the study area, 35 geophytes were determined; 31 of them are *Monocotylodoneae* while 4 of them are *Dicotylodoneae*. *Monocotyledoneae* geophyte taxa are; *Alliaceae* (*Allium cepa* L., *A. djimilense* Boiss. ex Regel, *A. ponticum* Misch ex Grossh., *A. porrum* L., *A. sativum* L., *A. schoenoprasum* L.), *Amaryllidaceae* (*Galanthus ikariae* Baker.), *Araceae* (*Arum italicum* L., *A. orientale* Bieb. subsp. *orientale*), *Asparagaceae* (*Polygonatum verticillatum* (L.) All.), *Colchicaceae* (*Colchicum speciosum* Steven), *Iridaceae* (*Crocus scharojanii* Rupr., *C. vallicola* Herbert., *Iris lazica* Albov.), *Liliaceae* (*Fritillaria latifolia* Willd., *Gagea glicialis* C. Koch., *Lilium ponticum* C. Koch., *Muscari armeriacum* Leichtlin ex Baker, *M. aucheri* (Boiss.) Baker., *Ornithogalum oligophyllum* Clarke, *O. platyphyllum* Boiss., *Paris incompleta* Bieb., *Scilla bifolia* L., *S. monanthus* C. Koch., *S. winogradowii* Sosn.), *Orchidaceae* (*Cephalanthera longifolia* (L.) Fritsch, *Dactylorhiza euxina* (Nevski) H. Baumann var. *euxina*, *D. urvilleana* (Steudal) Baumen et Künkele, *Listera ovata* (L.) R. Br., *Ophrys apifera* Hudson, *Orchis palustris* Jacq.) *Dicotyledoneae* geophytes taxa are as follow *Primulaceae* (*Cyclamen coum* Miller var. *coum*., *C. parviflorum* Pobed.), *Ranunculaceae* (*Anemone narcissiflora* L. subsp. *narcissiflora*), *Oxalidaceae* (*Oxalis acetosella* L.). Some of these geophytes are under risk, according to IUCN threatened categories.

Keywords: Geophyte, Handüzü, Rize, Turkey.

Honey Plants of Tunca Valley (Ardeşen/Rize)

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Aim of the study: In this study we focused on the honey plant taxa list of Sirtayla province, (Ardeşen) Rize, Turkey.

Materyal ve metod: The plant samples were collected during the years 2014-2016 by field surveys from the study area. The collected plant materials were identified by the Turkish Flora and they were dried and stucked on cartoons according to herbarium rules. The herbarium materials have been housed at Science and Art Faculty Herbarium of Recep Tayyip Erdoğan University.

Results: In the study area, it was determined that a total of 87 plant taxa has nectary properties. The taxa that are rich about nectary and has a dense population in the study area are as follow: *Castanea sativa*, *Rubus caucasicus*, *Rubus idaeus*, *Vaccinium arctostaphylos*, *V. myrtillus*, *Laurucerasus officinalis*, *Fagus orientalis*, *Rhododendron ponticum*, *Rh. ungeri*, *Rh. smirnowii*, *Sorbus aucoparia*, *Sambucus ebulus* etc. The main vegetation types in the study area are; forest(1300-1700 m), pseudomaquis (1700-2100), subalpine (2000-2300m) and alpine (2300-2700m) meadows. According to polen analyzes 95% of the polens in the honey are consist of *Castanea sativa* while 1-5% are belong to the families *Ericaceae*, *Rosaceae* and *Brassicaceae*.

Keywords: Ardeşen, Tunca valley, Nectary taxa, Pollen

Important Insect Pests for Ornamental Plants and Their Control Strategies

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Aim of the study: Especially in the last century, the rapidly developing ornamental plant sector has reached a huge volume today, which is measured in billion dollars in the world. According to the 2009 data, a total of 3,359 hectares of ornamental plants are produced in Turkey. As in other sectors of crop production, the production of ornamental plants is also threatened by many animal organisms, especially insects, red spiders and nematodes. These harms threaten appearance and production in ornamental plants, bringing significant losses in quality and quantity. For this reason, it is inevitable to struggle with these living creatures that are harming ornamental plants. In this study, it is emphasized what the harmful effects of ornamental plants are and which cause great economic losses and how to struggle them.

Material and Methods: The main material of this study is the internet and also printed books, articles and magazines. In this study, it is a compilation study by reading many different literature and focusing on important information. The methods, forms and photographs in these sources have been evaluated.

Results: This report focuses on what the harmful effects of ornamental plants are, how they damage plants, and how to struggle these harmful organisms. Important harmful pest insects are: Insects damaging on Leaves (*Thaumetoea pityocampa*, *Hyphantria cunea*, *Lymantria dispar*, *Euproctis chrysorrhoea*, *Diprion pini*, *Chrysomela populi*, *Phylodecta vitellinae*, *Agelestica alni*), Insects Damaging Buds, Exiles and Fine Branches (*Rhyaciona buoliana*, *Gypsonoma dealbana*, *Helicomyia salicis*), Sap-sucking insects (*Cinara cerdi*, *Aphis craccivora*, *Aphis fabae*, *Pineus pini*, *Chionaspis salicis*, *Lepidosaphes ulmi*, *Leucaspis pusilla*, *Pericerya puchasi*), Shell and Cambium Pests (*Scolytus scolytus*, *Scolytus multisriatus*, *Hylesinus crenatus*, *Blastophagus piniperda*, *Blastophagus minor*, *Phloeosinus aubei*, *Ips sexdentatus*, *Ips acuminatus*, *Orthotomicus erosus*, *Doryctria splendidella*, *Agrilus viridis*, *Chrysobothris affinis*, *Pissodes notatus*), Harmful insects in wood (*Buprestis cupressi*, *Aromia moschata*, *Cryptorrhynchus lapathi*, *Cossus cossus*), Insects that damage roots (*Gryllotalpa gryllotalpa*, *Melolontha melolontha*, *Polphylla fullo*, *Hylobius abietis*).

Keywords: Ornamental plant, Plant pests, Harmful insects

Important Ornamental Plant Diseases and Novel Control MethodsRasit URHAN

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Aim of the study: In Turkey and in some countries, ornamental plants have an important place in vegetable production, and it is accepted as an effective sector contributing economy in many countries. Approximately 220,000 hectares of ornamental plants are produced in 145 countries around the world. In terms of climate and soil characteristics of our country, ornamental plants are suitable for growing and at the same time are the source of many ornamental plants. Diseases in plants reduce quality and market value. In this study, it is emphasized the importance of the diseases seen in the ornamental plants and the diseases that cause huge economic losses and how to fight them.

Material and Methods: The main material of this study is the internet and also printed books, articles and magazines. In this study, it is a compilation study by reading many different literatures and focusing on important information. The methods, forms and photographs in these sources have been evaluated.

Results: This report focuses on what are the important fungal, viral and bacterial diseases seen in plants, the types of damage they cause to plants, and how to combat these harmful organisms. Important fungal diseases such as root blight-fungus blight, black root rot, *Fusarium* root diseases, *Verticillium* wilt, sclerotinia, lead mold disease, mildew, ashing, rust diseases, leaf spot disease and control methods are explained. In addition, information about ornamental plant diseases caused by bacteria and viruses is also provided.

Keywords: Ornamental plants, Fungus, Bacteria, Viruses, Plant diseases

Important Species of Mites Damaging Agricultural Plants in Turkey

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Aim of the study: Turkey, which has over 76 million hectares of land, grows field crops in the form of field agriculture on 19.7 million hectares of approximately 23.6 million hectares of agricultural land. In Turkey, 83.5% of the agricultural areas (including the abandoned areas) are cultivated with field crops. In this field, 76% of the crops are grains, 12% are industrial plants, 5% are legumes and 7% are forage crops. As in other sectors of crop production, the production of agricultural plants is also threatened by many animal organisms, especially insects, red spiders and nematodes. In this study, it is emphasized what harmful mites in agricultural crops cause great economic damages and how to control them.

Material and Methods: The main material of this study is the internet and also printed books, articles and magazines. In this study, it is a compilation study by reading many different literature and focusing on important information. The methods, forms and photographs in these sources have been evaluated for last ten years.

Results: In this paper, it was emphasized what harmful mites affecting agricultural crops are, what kind of damage they give to plants and how to fight these harmful organisms. The important mite species of agricultural pests are: Tetranychidae; *Panonychus citri*, *Tetranychus urticae*, *Tetranychus cinnabarinus*, *Tetranychus viennensis*, *Panonychus ulmi*, *Bryobia rubrioculus*, *Bryobia praetiosa*, Tenuipalpidae; *Cenopalpus pulcher*, Tarsonemidae; *Tarsonemus fragariae*, *Tarsonemus pallidus*, *Polyphaga tarsonemus latus*, Eriophyidae: *Aceria sheldoni*, *Aculops lycopersici*, *Phyllocoptrata oleivora*, *Eriophyes pyri*, *Eriophyes vitis*, *Eriophyes padi*, *Eriophyes avellana*. Some types of deformation seen in plants: Leaf erineose, gall formation on leaves, rust on leaves and fruits, bud damage, leaf curling, transport of plant viruses, reduction of cell content in leaves, chemical injection into plants.

Keywords: Agricultural plants, Plant pests, Harmful mites, Acari.

In the Condition of Salt Stress, Differential Expression of Akvaporin Genes in *Mesembryanthemum crystallinum* L. Plant

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Aim of the study: The purpose of our study to determinate differential expression of genes in crystal flower plant and it consists of learning role of this process to adaptation time to chloride salinity of plants. To explore Natrium chlorid impact of basic physiological parameters which characterize the water status of plants. Assess the role of akvaporin in the adaptation of plants to high concentrations of natrium chloride. To explore the differential expression of six genes of akvaporin in the bodies of *M. crystallinum* plants.

Materials and methods: Crystal flower (*M. crystallinum* L.) was used as an object of study. Plants were grown around the 23-25°C in the afternoon and 18-20°C in the night in the fitotron cell. *M. crystallinum* 4-10 weakly plants have been used in the experiment.

The practise is calculated from the beginning. For this purpose, 200 and 400 mM concentration was used. The length of each experiment, 3, 9, 24, 72, 168 hours. 3-4 leaves from the bottom layer was fixed at every point of the experiment. Determination of transpiration intensity of leaves was taken to generally accepted gravitational method Ivanova. For determine free lance prolinin as mainly Bates et al., (1973) method the ninhydrin reactive was used. The RNT separation of crystal flower leaves and roots have been carried out by RNeasy Mini Kit. Polymerase chain reaction was carried out. For getting microsomal membranes, appropriate authorities of plant 300 mM sucrose, 100 mM Tris - HCl (pH 8.0), 10 mM EDTA, 5mM potassium metabisulfite, 5mM dithioeritol, 1mM phenylmethylsulfonyl chloride and were homogenized in 0.6% polyvinylpyrrolidone environment. It was homogenized at 1000D filtration. 10 min centrifuge with it. Determination of protein Bradford (1976) was conducted in accordance with the procedure. Electrophoretic splitting of proteins Laemmli (1970) basis was taken 12.5% PPA buffer mini-Protein cell 3Cell.

Results: The expression of six genes of akvaporin was studied by us: MIPA, MIPB, MIPC, MIPH, MIPF, MIPK. The analysis of amino acid sequences showed that, 4 of them plasma membrane (MIP A, B, C, H), and 2 - tonoplast (MIP F, K) has been localized. The study of *Mesembryanthemum crystallinum* plant, throughout the day in response to the intensity and length of the effect NaCl in various organs McPIP1; 1; McPIP2; 1; McPIP2; 3; McTIP1 2 and McTIP2 2 allows to determine expression of akvaporin genes. 4 gene was Plasma membrane aquaporins McPIP1 ruled out. Its constitutive expression is not depend on the body's location, what time of the day, on the nature of the impact of stressor. In the stress conditions of changing the main physiological parameters of water status of plants. Associated with arthritis the water deficit irrigation of leaf intensity transpiration, SNH, is accompanied by a decrease in osmotic potential. Akvaporin genes of plasma membrane decreasing of transcellular water transmission in succulent bodies. At the same time, it is reflected less in the intensity distribution of water intracellular, so the evidence the stressor tonoplast akvaporin genes would show the weak impact to the expression.

Keywords: differential expression, akvaporin, expression of genes, salt shock

Medical Plants Insects, and Fighting Against Them in Georgia

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Aim of the study: Medical plants play great role in keeping a person's health in a good condition and the spectrum of their usage is high enough. About 4000 species of plants have been recorded in Georgia. Among them-about 400 kinds of medical plants, and many of them are used for preparing phytodrugs in traditional and alternative medicine. Although, nowadays, there are high effective fusionable drugs, plants still are of great importance in medicine. According to Health Protection International Organization data, the need in phytodrugs is very high in the whole world. They rarely cause allergy, are less toxic, do not have accumulation feature etc. Medical plants are damaged by insects that are one of the main tasks of our studying.

Material and methods. Medical plants are highly damaged by different species of insects and this is the reason of plants decreasing and the quality of products obtained from them is poor. Medical plants are damaged by different species of insects. Among all the mentioned insects the most damaging one is the Black Bean Aphid – *Aphis fabae* Scop., that by sucking damages plants, and also, Valeriane and causes a less weight of their roots and decreases the quality. Because of Black Bean Aphid wide distribution, its intensity, negative results, we decided that it was necessary to study the Black Bean Aphid on Valeriane in details and work out such controlling methods that would help us to minimize the quantity of them and assist their natural enemies which decrease the number of insects that quarantees to get ecologically pure product. Studying the insects damaging Valeriane plant, especially the Black Bean Aphid, in Georgian conditions, and the reasons of its distribution, working out the modern controlling methods is a question of great importance.

Results Entomofauna distributed on medical plants in the conditions of Georgia has been published in this thesis for the first time; Black Bean Aphid has been studied in details, its negative impact on Valeriane, western and eastern Georgia climatic conditions influence on the insect distribution has been studied for the first time, on quantity dynamics and development according to this or that phase duration, plant tincture toxics towards the Black Bean Aphid has been studied and their influence on useful entomofauna; ecologically safe controlling methods have been worked out and the implementation of which will decrease insect distribution and provide to obtain ecologically pure product in farms.

Keywords: Medical plants, entomofauna, insects, Georgia.

Morphological and Anatomical Features of *Sphagnum compactum* (Sphagnophyceae /Bryophyta) in Turkey

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Aim of the study: The genus *Sphagnum* is evaluated in a separate ordo (Sphagnopsida) with their unique morphological and anatomical characteristics. These characters used in the definitions are quite diverse and are very difficult due to their wide variation range. The aim of this study is to demonstrate the morphological and anatomical characteristics of *Sphagnum compactum* which is one of the 23 taxa growing in Turkey.

Material and Methods: Materials of this study were collected between 2013-2016 during the revisional project on Turkish *Sphagnum* supported by TÜBİTAK (TBAG, grant no. 113Z631). All the characters (morphology, color, capitula, leaves, stem, cells, sporophytic characters ect.) used in the diagnosis for each plant were evaluated and numerical taxonomy was made by taking the arithmetic average.

Results: Within the scope of this study, morphological and anatomical features of *Sphagnum compactum* which were recorded in totally 22 different localities were revealed by using the distinguishing character. Decisive features of the section include the small stem leaves, uniformly porose branch cortical cells, branch leaves bordered by a resorption furrow(but not roughened at back of the apex), and hyaline cells of branch leaves with pores grouped in 3's at adjoining angles on the inner surface (rather than the outer as in the sect. *Sphagnum*).

Acknowledgements: I want to thank to TÜBİTAK (The Scientific and Technical Research Council of Turkey) for financial support of project (T BAG 113Z631).

Keywords: Bryophyta, *Sphagnum*, *Sphagnum compactum*, Morphology, Turkey

Morphological Features of Section *Acutifolia* (Sphagnophyceae/Brophyta) in TurkeyMesut KIRMACI¹, Fulya FİLİZ¹, Uğur ÇATAK¹¹Biology department/Art and Science Faculty, Adnan Menderes University, Turkey

Aim of the study: *Sphagnum* genus belongs to *Sphagnopsida*, which is one of 6 classis (Takakiopsida, Sphagnopsida, Andreaeopsida, Andreaebryopsida, Polytrichopsida, and Bryopsida) in mosses (Bryophyta). This classis is thought to be evaluated as divisio by some researchers because of some particular morphological properties, special living habitats (mostly acidic environments), lack of peristome teeth (responsible for dispersion of spores), different cellular arrangements (contains chlorophyllose and hyalin cells) and lack of costa (midrib). In spite of this approach, researches show that genus should remain monophyletically in Bryophyta divisio. The diagnosis of sphagnum is difficult due to the wide variation range. Our purpose is to reveal the variation intervals of the taxa belonging to the section acutifolia with spread in Turkey.

Material and Methods: Materials of this study were collected between 2013-2016 during the revisional project on Turkish *Sphagnum* supported by TÜBİTAK (TBAG, grant no. 113Z631). All the characters (morphology, color, capitula, leaves, stem, cells, sporophytic characters ect.) used in the diagnosis for each plant were evaluated and numerical taxonomy was made by taking the arithmetic average.

Results: Thegenus Sphagnums which are placed under 7 sections represented by 23 taxa in our country. Among these, acutifolia is the richest section with 7 taxa and separated from other sections with anatomic structure of green cells. The taxa in the section are diagnosed by using the anatomical and morphological features of the body and branch leaves, the number of branch and the color of the plant and stem.

Acknowledgements: We cordially thanks to TÜBİTAK (The Scientific and Technical Research Council of Turkey) for financial support of project (T BAG 113Z631).

Keywords: Bryophyte, Sphagnum, Acutifolia, Morphology, Turkey

Morphological Features of Section Subsecunda (*Sphagnophyceae* /*Bryophyta*) in Turkey

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Aim of the study: Bryophytes (mosses, liverworts and hornworts), being the second largest group among plants, have an important place in our country's biodiversity with approximately 1000 taxa. Within this large group, the genus *Sphagnum*, also known as peat moss, has a special important role because of ecological and economical importance. The diagnosis of *sphagnum* is difficult due to the wide variation range. Our aim is to reveal the variation intervals of the taxa belonging to the section subsecunda with spread in Turkey.

Material and Methods: Materials of this study were collected between 2013-2016 during the revisional project on Turkish *Sphagnum* supported by TÜBİTAK (TBAG, grant no. 113Z631). All the characters (morphology, color, capitula, leaves, stem, cells, sporophytic characters ect.) used in the diagnosis for each plant were evaluated and numerical taxonomy was made by taking the arithmetic average.

Results: The genus *Sphagnum* represented by 23 taxa in our country, is studied under 7 sections. The subsecunda section is normally differ in the frequent to abundant small, ringed pores along the commissures on the abaxial leaf surface and the absence of large, unringed pores from the adaxial. The branch leaves, at least when flattened, are broader than those in the Cuspidata and the photosynthetic cells differ in shape and position. There are 5 taxa in this section which are *S. subsecundum*, *S. inundatum*, *S. auriculatum*, *S. platyphyllum* and *S. contortum*.

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Keywords: Bryophyte, Sphagnopsida, section *Sphagnum*, Morphology, Turkey

One of the Factors Causing Diversity in an Animal Population: Multiple Paternity

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Aim of the study: If it is very difficult to observe individuals of a species while mating, paternity studies provide an important tool for determining which individuals are contributing to species persistence. Recent advances in genetic analysis have shown that multiple paternity (MP), which occurs as a result of mating of females polyandrously, is frequent in both invertebrates and vertebrates. Frequency of MP shows inter- and intra-specific variability. In this review, we aimed to inform about MP studies on different species and to draw attention to effect of MP on genetic diversity within species and population.

Material and Methods: We searched the literature for studies on MP. We reviewed their results and discussed the possible effect of MP/multiple mating on genetic diversity within a population of a species in light of the results of reviewed articles.

Results: It is clear that paternity studies provide insights into mating behaviours of individuals of a species and their population structures. The prevalence of MP varies widely both from species to species and from location to location within a species but has been documented in various taxa as diverse as snail (*Helix aspersa*), squid (*Loligo pealeii*), sharks (*Squalus acanthias*), salmon (*Salmo salar*), grunion (*Leuresthes tenuis*), frog (*Crinia georgiana*), sea turtles (*Caretta caretta*, *Chelonia mydas*), and mice (*Mus domesticus*). There is common certain belief of the MP/multiple mating that the high frequency of MP implies the possible high genetic diversity and effective population size for a population. Therefore, we can suggest that if it is impossible or difficult to study an animal population genetically, paternity studies should be carried out to obtain indirect information about that population. In addition, it is well known that MP enables the number of offspring produced to increase and new generations to be more viable and variable due to genetic diversity. In conclusion, MP/multiple mating is an evolutionary adaptation. Female individuals benefit from multiple mating and can assure the species persistence by mating multiply.

Keywords: Multiple paternity, mating, genetic diversity, population, species persistence

Ornamental Geophytes of Quba and Qusar districts of Azerbaijan

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Aim of the study: The aim of our study was to reveal the ornamental geophyte diversity of Quba and Qusar districts and identify species with further potential of decoration and use in landscape designs.

Material and Methods: Collection of research materials was implemented in Quba and Qusar districts, which are part of Shahdagh National Park, in the North-East of Azerbaijan, beginning from February till October during 2014-2016. Plant samples with ornamental features, growing in different soil types, in various vegetation groups and at different altitudes were collected and identified based on morphology. For identification appropriate literature were used. Classification of species was crosschecked with APG IV system.

Results: The study territory possesses the floristic richness due to its climate and soil types. Here the climate is mainly warm and temperate with great deal of rainfall (average 498 mm) even in the driest summer months according to Köppen climate classification. Soil types of these districts are mainly mountain-forest brown, mountain light chestnut, meadow chestnut and gray meadow. Geophytes growing in these districts are represented with species belonging to the families of Asparagaceae, Iridaceae from the order Asparagales, and Colchicaceae from the order Liliales. Among them Asparagaceae is the richest family in the number of taxa. It includes the genera *Ornithogalum* L. (*O. ponticum* (Zahar.), *O. sintenisii* Freyn, *O. gussonei* Ten.), *Puschkinia* Adams (*P. scilloides* Adams), *Scilla* L. (*S. siberica* Haw.), *Bellevia* Lapeyr. (*B. macrobotrys* Boiss.), *Muscari* Mill. (*M. tenuiflorum* Tausch), *Lilium* L. (*L. monadelphum* Bieb.), *Fritularia* L. (*F. lagodechiana* Kharkev.), *Tulipa* L. (*T. eichleri* Regel, *T. sylvestris* L., *T. biflora* Pall.) and *Gagea* Salisb. (*G. chlorantha* (M.Bieb.) Schult. & Schult., *G. sarmentosa* K.Koch., *G. liotardii* (Vill.) Sternb.). Colchicaceae are represented with genus *Merendera* Ramond (*M. raddeana* Regel, *M. caucasica* var. *eichleri* (Regel) Baker ex Misch.) and *Colchicum* L. (*C. speciosum* Stev., *C. szovitsii* Fisch. & C.A.Mey). The family Iridaceae includes species belonging to the genera *Crocus* L. (*C. biflorus* subsp. *Adamii* (J.Gay) K.Richt., *C. speciosus* M.Bieb.), *Iris* L. (*I. caucasica* Hoff., *I. reticulata* M.Bieb., *I. pseudocorus* L., *I. spuria* subsp. *carthalinae* (Fomin) B.Mathew) and *Gladiolus* L. (*G. kotschyanus* Boiss.). Among them we can differentiate the following groups based on storage organs: species of *Ornithogalum*, *Puschkinia*, *Bellevia*, *Muscari* etc. are forming bulbs; species of *Colchicum*, *Crocus* – corms; species of *Iris* and *Gladiolus* – creeping rhizomes. Growing habitat is differing greatly. Some of them, such as *Ornithogalum* species are usually grow in meadows, in the edges of forests or under the bushes, from lowland till the middle upland. *P. scilloides* grows in the middle and high upland, such as subalpine and alpine zones, up to 3500m a.s.l. *Lilium monadelphum* grows well in the humid subalpine hill-sides, *F. lagodechiana* occurs mainly in alpine slopes. Species of *Colchicum*, *Gladiolus*, *Lilium* and *Tulipa* can be easily used for garden and park decorations.

Acknowledgements: The authors thank all colleagues from the Institute of Botany ANAS that contributed to the study.

Keywords: Bulb, corm, diversity, ornamental, rhizome, tuber

Plant Collections *in vitro* and Cryobanks - a way of the Conservation and Rational Use of Plant Biodiversity

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Aim of the study: Plant biotechnology use collections *in vitro* to produce sterile test-tube plants, to culture organs, tissues or plant cells, and to isolate protoplasts and the biotechnologies are divided into two groups: first produces intact economically-useful plants, in the second group the end products are biomass cell cultures and/or phytochemicals. Thus, the aim of this article is to review two collections from RF and RB in its broadest sense and to explore its use across many fields of application: from the conservation of endangered species to the storage of economically important crop plants and industrial plant cell culture collections.

Material and Methods: A wide range of biotechnological methods were utilized including: 1) tissue culture; 2) cell culture techniques; 3) molecular genome analysis; 4) cryopreservation for the collection long-term storage 5) documentation, 6) microclonal propagation, 7) patenting, 8) storage, 9) techniques to deposit of rare and endemic plants species, including medicine; 10) exchange of plant genetic resources.

Results: Plant *in vitro* collections of wild flora of Russia and Belarus on the basis of natural sources and existing collections in EurAsEC countries and the experience of their creation were analyzed. Russian collection of the cell cultures was established in the Timiryazev Institute of Plant Physiology Russian Academy of Sciences in 1978. In general this collection has about 100 different cell culture strains and lines. Currently, it contains 242 taxa from more than 20 families of angiosperms. Plant biotechnologies (from plants in the test-tube to protoplasts) are directed toward creating new plant forms, simplifying selection processes, and effectively reproducing and improving valuable genotypes. Seeds and meristem of several rare species from Belarus were deposited to cryobank of the Timiryazev Institute of Plant Physiology of Russian Academy of Sciences for the long-term storage. Common platform concerning creating, maintaining, and utilizing of biotechnological collections was developed: protocols of preservation of genetic resources and deposition at low temperatures of *in vitro* plant banks; protocols for plant clonal micro propagation to obtain high quality planting material; protocols of plant cell and tissue culture using for BAS production: protocols for industrial production of natural herbal remedies for various purposes; protocols for assessing the genetic diversity (GD) parameters of natural populations of protected natural flora for including in the collection.

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Keywords: *In vitro* collection, biodiversity, conservation, rational use

Population Size and Threats of Endemic Beyşehir Frog (*Pelophylax caralitanus*) In Two Distinct Locations

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Aim of the study: Amphibians are known to be sensitive to the ecological changes. Increasing environmental changes in their habitats are one of the most important threat for amphibians and conservation of the amphibian populations and individuals is not adequate enough to protect them. For enhanced conservation, their habitats should be protected and threatening environmental factors should be decreased. In this study, we calculated the population size of the *P. caralitanus* and determined main threats to their population in Gölcük Lake, Isparta and Kuşluca location of Beyşehir Lake, Konya.

Material and Methods: *P. caralitanus* individuals were captured by a dip net or hand after sun set using flash light on each sampling occasions with two or three persons. All individuals were tagged by using digital photography technique. They were kept in a plastic container until they were photographed. Photographs were taken in the field using Nikon D5000 digital cameras. Sex, dates and image numbers were recorded as codes for all individuals. To recognize each individual, dorsal maculation (dot or spot pattern) was used. Afterwards, they were released to the same habitats. All images were transferred to a computer and classified in different folders as date and site. Images of all individuals in folders were matched visually and the images of the same individuals from different folders were recorded using Microsoft Office Picture Manager. To minimize the probability of misidentification, by way addition to photo quality, all images were matched by minimum two different persons, and complete dorsal maculation of the individuals were used for recognizing same individuals. We used the Program Mark for population size estimation.

Results: The capture histories generated from the field surveys. During our CMR study, we captured a total of 1356 individuals from Gölcük Lake and 352 individuals from Kuşluca location of Beyşehir Lake. According to captured female: male ratio were calculated as 1.38:1 for Gölcük Lake and 1.32:1 for Kuşluca location of Beyşehir Lake. Population sizes estimated as 5295±2280 (95% Confidence interval= 2640-12455) individuals for Gölcük Lake and 735±79.9 (95% Confidence interval= 605-921) individuals for Kuşluca location of Beyşehir Lake. Annual capture probabilities were estimated on average 0.22 and 0.16 respectively. This result was indicated that in most cases, we had recaptured about less than one quarter of the breeding individuals for both locations. During the field studies we determined the main threats and classified under four categories.

Acknowledgements: The permissions for field work and handling of the frogs were issued by the Animal Ethics Committee of Pamukkale University and Ministry of Forestry and Water Affairs, General Directorate of Nature Conservation and Natural Parks. This research was supported by Pamukkale University Scientific Research Projects Unit - BAP (Project No: 2010BSP017).

Keywords: Beyşehir Frog, Endemic, Population Size, Conservation

Problems Encountered in Protected Area Management in Turkey

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Aim of the study: The aim of this study is to put forward the protection statues in the protected areas of Turkey, to evaluate the problems encountered in the protection and management of these areas and to propose solutions.

Material and Methods: In this study; the protection statutes of these areas in Turkey have been researched and problems in protection strategies have been presented. In consequence of the implementation problems in these statues by different institutions, the inter-institutional coordination deficiencies are assessed and the problems that the protected areas face within the scope of legal legislation are discussed. Besides, the boundaries of protected areas are determined by Remote Sensing (RS) and Geographical information Systems (GIS) technologies and compared with existing boundaries. As a result, a region declared as protected area, borders, protection statues and management mechanism are evaluated according to related literature information and suggestions for effective protection and management are presented.

Results: Important natural areas in Turkey are protected with 11 different protection statuses. Protected area types and numbers are Protected area types and numbers are consist of 40 national parks, 184 nature parks, 107 natural monuments, 31 nature protection area, 80 wildlife development areas, 58 conservation forests, 1273 natural sites, 16 special environmental protection areas, 14 ramsar areas, 1 biosphere reserve and 11 world heritage sites. Sometimes, several protection statuses are given for a single area. Some of these protection statues are declared in accordance with our national legislation, and some are based on international contracts. The main problem in these areas is complexity of authority between institutions. For example, for two different status protected areas with overlapping borders, the two competent authorities are implementing different protection strategies. This poses a problem for the sustainability and management of the protected area. The decision-making mechanism for the assets in the protection areas is on the initiative of different institutions extending the decision-making process. Therefore, this situation prevents the execution of services related to the region effectively. Another main problem is that protected area boundaries are determined without regard to natural thresholds. In this context, RS and GIS technologies are not used effectively. In addition, the people of the region do not know why and how the area is protected. As a recommendation, protected areas and boundaries should be clearly defined with experts and GIS technologies. Participation of the people in all processes should be ensured. Frame protection action plans to cover all protection areas should be prepared. The management mechanism should be established with the participation of relevant institutions, universities, non-governmental organizations, media and local people.

Keywords: Protection statues, biodiversity, national and international legislation, RS and GIS technologies, nature protection areas, sustainable biodiversity

Some *Sideritis*, *Origanum* and *Salvia* species used as sage in Antalya (Turkey) Province and Theirs Threat Status

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Aim of the study: In this study, some endemic *Sideritis* L. *Origanum* L. and *Salvia* L. plants of Antalya province were collected and identified. The plant specimens prepared for herbarium collections have been stored in Akdeniz University Herbarium. Description, images and International Union for Conservation of Nature and Natural Resources (IUCN) threat status of four endemic and three non endemic used as sage plants are given. These plants are as follows; *Sideritis libanotica* Labill. subsp. *linearis* (Benth.) Bomm. (non edemic), *Sideritis lycia* Boiss. & Heldr. (endemic), *Sideritis pisidica* Boiss. & Heldr. (endemic), *Sideritis stricta* Boiss. & Heldr. (endemic), *Origanum minutiflorum* O. Schwarz & P.H.Davis (endemic), *Salvia fruticosa* Mill. (non endemic) and *Salvia tomentosa* Mill. (non endemic).

Material and Methods: The research material consist of 32 herbarium specimens collected between 2015 and 2016 in Antalya province. Plant samples which have been collected from different places. Collected samples were dried in accordance with standard herbarium tecniques and stored in Akdeniz University Herbarium. After they had been dried, the specimens were first classified at family level and the classification at the generic, species and subspecies (if exists) levels was carried out. In identification of the plants, we have benefited primarily from Turkey Flora (Davis 1982), from floristic and revision studies (Peşmen 1980; Göktürk and Sümbül 1997; Göktürk and Sümbül 2002; Duman et al. 2005). Threat categories of the seven plant taxa were assesed according IUCN Creteria (IUCN 2001).

Results: During the period 2015 and 2016, by evaluating the collected 32 herbarium specimens, 1 family, 3 genera, 6 species and 1 subspecies were identified. Total number of taxa are 7. Of the 7 taxa determined, four taxa are endemic. One of the 4 taxa are endemic to Antalya province. Three of the 4 taxa are endemic to Turkey. Four of the 7 taxa are elements of the East Mediterranean. Three of the 7 taxa are elements of the Mediterranean Elements. Examination of the threat categories of the used as sage plants showed that 1 of them EN, 3 of them VU, 1 of them LC and 2 of them in NT.

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Keywords: Antalya, IUCN, used as sage plants, Turkey

Species Conservation Plan of *Verbascum eskisehirensis* Karavel., Ocak&EkiciOkan SEZER¹, Derviş ÖZTÜRK¹, Kurtuluş ÖZGİŞİ¹, Atila OCAK¹, Onur KOYUNCU¹¹Department of Biology, Eskişehir Osmangazi University, Turkey
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Aim of the study: This study aims to determine species conservation plan of critically endangered species (CR) *Verbascum eskisehirensis* Karavel., Ocak&Ekici which grows in Eskişehir, Turkey. Population size, number of individuals and ecological properties of the species were detected and conservation precautions were determined.

Material and Methods: To detect the population size and number of individuals field studies were done between 2012 and 2013 at the locality of the type specimens of *Verbascum eskisehirensis*. Field studies also were done at the different places, which show similar properties with the type localities. Populations and individual numbers were recorded with GPS data and compared with the data, which observed subsequent year. Also seeds from different populations were gathered and seed germination properties were detected. Seeds were germinated at different media which includes different concentration of Gibberellic Acid and KNO₃.

Results: During two-year project, 238 mature *Verbascum eskisehirensis* individuals were detected. It is also determined that members of this species prefer calcareous, stony substrates. Also it was recorded that, this taxon only distributes between 1350 m. to 1800 m. high. Other locality of this habitat specific species was not found. According to the seed germination experiments, higher germination ratio was found at solution which includes 200 µmol. KNO₃. Also the factors that affect the individuals and population were determined. This species is mainly face with the habitat destructions. This cause dramatically changes in the number of the individuals. Education about the in-situ and ex-situ conservation plans of *Verbascum eskisehirensis* to the local people was given. Also seeds were kept in the seed bank according to their needs.

Acknowledgements: This study was supported by T.C. Ministry of Forestry and Water Affairs, V. Regional Directorate, Eskişehir Branch Office.

Keywords: *Verbascum*, conservation, endemic, Eskişehir, Turkey.

Species Protection Suggestions for *Gypsophila osmangaziensis* Ocak&AtaşlarDerviş ÖZTÜRK¹, Okan SEZER¹, Kurtuluş ÖZGİŞİ¹, Atila OCAK¹, Onur KOYUNCU¹¹Department of Biology, Eskişehir Osmangazi University, Turkey
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Aim of the study: In recent years, many sensitive plant species have been disappear from nature. Also population size of the many sensible taxa remarkably decreased. Because of such these situations, different protection precautions have been improved and applied from researchers. In this study, we aims to determine population changes of the *Gypsophila osmangaziensis* until today and so create a conservation plan in the light of obtained data that like Population size, number of individuals and ecological properties of the species.

Material and Methods: Last 10 years, population sizes and individual numbers of base and new founded populations that by field trips have been determined. Changes of the population sizes, structures were recorded and causes of the upheavels were tried to specify. Also seeds from different populations were gathered and seed germination properties were detected.

Results: Base population of the *G. osmangaziensis* is situated in campus of the Osmangazi University. In recent years, this population are majorly effected from insensible construction works. Population size remarkably decreased from 289 to approximately 100 individuals. Some in situ and ex situ protection plans have been suggested for this population. Also new population of *G. osmangaziensis* was founded at the north side of the Eskişehir-Kütahya way, Ömür location. This locality is more sheltered from base population but effects of the human pressure are seen in here too. Some necessary precautions for protection of this population are suggested.

Keywords: *Gypsophila osmangaziensis*, Protection, *in situ*, *ex situ*, Eskişehir, Turkey

Spreading Helminthiasis of Domestic Geese in the Western Region of the Republic of Azerbaijan

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Aim of the study: Food products of population-meat, egg supply, as well as intensive upbringing features of poultry farming is one of the profitable areas of agriculture. Recently, attention to this industry development has been paid. Individual and farms were established for poultry broiler and breeding water birds. It is known that, geese infected with some helminths from the water birds kept in farms. Young birds are infected more with such infections. As a result, meat, egg productivity goes down, their development weakens, mass casualties occurs in infants. Therefore, we have a goal learning the characteristics of infection with agents targeting different helminths of domestic geese in the western regions of Azerbaijan and the regions Dashkesen, Agstafa, Gadabay which many water birds stored at the individual farms.

Material and methods: In the individual farms of the above-mentioned regions were research throughout the year 2014-2016. In surveys conducted in farms show, there was not attention to the type of stored goose pools and water reservoirs, as well as to the dehelminthization. Helminths penetration rate learned on the basis of examination of intestines of dead geese. Helminthologic cutting inspections were conducted with method of K.I. Skryab. 220 domestic geese intestines belonging to different age groups and dead at the farms were helminthologic examined. During the examination were found 107 helminths in the intestinal samples. Helminths affiliation of the species was compiled on the basis of V.I. Petrechenko determined identity. The storage conditions, intensity of infection and ages of geese were recorded on the basis of the Helminthologic cutting. Intestines have been washed with water and unloaded to the tubs. During the inspections the stomach and liver of geese were reviewed. Helminths discovered in each goose have been parted species, identified and preserved. For this purpose, with 3% formalin, 70% ethyl alcohol and glycerin was used.

Results: As the result of helminthologic studies have been determined that, the domestic geese intensive infected with helminths which stored at the individual farms and pools and water reservoirs in the western regions of Azerbaijan and the regions of Dashkesen, Agstafa, Gadabay. During the helminthologic cutting were found from 220 intestinal samples 107 (ie, 48.6%) different helminths types- trematod, cestod and nematodes. According to analysis of cutting, in 22 intestines (20.6%) trematod-*Echinostoma revolutum* (Frohlich, 1802); in 34 intestines (31.8%) cestod *Drepanidotaenia lanceolata* (Bloch, 1782) and in 51 intestines (47.6%), nematodes – *Amidostomum anseris* (Zeber, 1800) and *Ganguleterakis Dispara* (Schrank, 1790), helminths were observed. There were also mixed helminths in the intestinal samples. Young birds were found more infected with helminths. Studies conducted at the farms, the main reason such in intensive infected with helminths of domestic geese is the living conditions conducive to the development of infections. In the development of biohelminth-cestod, trematod wide spread in the water resources of the intermediate and extraowners.

Keywords: Goose, helminths, intermediate owners, infection, parasites.

Study of Biological Features Some of *Nandina domestica* Thunb. Species in Abseron

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Aim of the study: Plantings – the main elements of architectural compositions in a city accomplishment. Many of such plants are growing in the Mardakan arboretum such as *Eucalytus* L., *Herit.*, *Pinus* L., *Lonicera* L., *Cupressus* L., *Berberis* L., etc. Now it have been inbred as a new ornamental plants, such *Nandina domestica* Thunb.

Materials and metods: The first time in 1970 *Nandina domestica* Thunb. was introduced in the Mardakan arboretum and it was grown up in an open ground. But the next years it is a plant has not acclimatized in soil-climatic conditions Apsheron and it are parishes. In 2008 again in the conditions of the Mardakan arboretum (*Nandina dosmestica* Thunb.) is grown up from seeds which have received from Iran. In research have been studied some bio-ecological features (propagate, morphology of sprouts, dynamics of growth 1-3 summer plants, dynamics of seasonal developpment, stability to external factors, etc.) *Nandina domestica* Thunb. in the conditions of Apsheron. Observation were spent during all vegetative period on following phases: a dormant period, swelling and blooming of leaf-bud, the beginning and the termination of growth of runaways, budding the beginning and the flowering end, setting and maturing of seeds, autumn colorings. The age of the first flowering is noted by supervision over the replaced plants. Acceretion measuruments on height and diameter spent in 10 days from the beginning of growth before its termination. *Nandina domestica* Thunb. - The representative endemically monotype sorts concerns with *Nandinaceae* Horon. family. It is decorative subtropical planth and its evergreen bush with reddish-brown branches and leaves which reaches 3 m height. Leaves difficult, it is thrice-repeated pinnate, leaflets dense, rhombic-lanset, pointed at top, wedge-shaped at the basis, the edge whole that have 8 cm length and 2 cm widths. Cutting 7 cm of length which in the basis is expanded, stalk of the leaf 1 sm lengths. An inflorescence whisk have 15-20 cm of length. Flowers are petalous, small, white, 4 mm in diametr. Fruits diameter reach to 0.5 cm and are berry-figuratively, bright red. The native land – damp subtropics of Japan, China, grows on hillsides. *Nandina domestica* Thunb. highly decorative plant, is used for creation of a composition and apperance of interiors.

Results. The important role in wide spreading introduced plants is played by seed reproduction. For revealing of optimum terms of crops of seeds (*Nandina domestica* Thunb.) in the conditions of Apsheron seeds were sown on beds in garden soil in the autumn (November) and in the spring (March). At autumn crops amicable shoots appeared in the spring – in the second decade of April. Shooting makes 85% at spring crops shoots were observed in the autumn – in the second decade of November, shooting makes 80%. Observations have shown that in the conditions of Apsheron growth *Nandina domestica* Thunb. begins in thesecond decade of April depending on weather conditions and comes to an end in the third decade of September or in the first decade of October. The growth period proceeds 165 days. In the first year seedlings grows slowly, and the next years they grow very intensively. Growth seedlings on the average on years reaches: in the first year – 15 cm, in the second – 35 cm, in the third – 69 cm, in the fourth – 80 cm, in the fifth – 115 cm Lateral branch appear height of 20-25 cm from soil surface. On there-year plants their number varies from 15 to 35, the length – from 5 to 25 see.

Keywords: *Nandina domestica* Thunb, Apsheron, decorative plant.

Study the Biological Characteristics of *Lavandula* L. in Absheron

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Aim of the study: One of the important issues is the introduction and study of such plants in soil and climatic conditions of Apsheron. Soil and climatic conditions of Apsheron favorable for the cultivation of many medicinal and aromatic plants. The climate of the Apsheron peninsula of the Mediterranean type, characterized by the mild subtropical winters, hot, long dry summers, the sunny autumn and the spring cold.

Materials and methods: *Lavandula* L. is exceptional decorative aromatic evergreen shrub. The native land of *Lavandula* L. is the Mediterranean region of the Canary Islands and India. *Lavandula* L. belongs to the family of the genus *Lavandula* L. of the family Labiatae-*Lavandula* L. genus of about 25 species. At the Institute of Dendrology grown 3 species of *Lavandula officinalis* (*Lavandula vera*) *Lavandula latifolia* and *Lavandula angustifolia*. grows in areas where there is enough light friable soil. As you know that lavender belongs to perennial herbaceous plants. Its root is woody branched. The plant *Lavandula* L. is short-lived in natural conditions, it lives about 10 years. In the culture of life and decorative effect of lavender can and should be renewed with regular haircuts. Little pruning should be done immediately after flowering lavender, and at the end of the season - one in which it is possible to significantly shorten the stems, necessarily leaving 4-5 new green sprout. To propagate *Lavandula* L. is easiest with stem (aerial) cuttings. To do this, one of the branches of bushes should be laid horizontally to cover the soil with a horse, and put a weight. A few months in humid and cool conditions strains of lavender will take root and can be separated from the parent plant and transplanted. To propagate *Lavandula* by cuttings rooting stiff or even entire branches that easily break off from the plant. *Lavandula* looks good with many plants. Most often, perhaps, lavender planted near rosemary.

Results: *Lavandula* L. under the condition to watering can be cultivate on the Absheron peninsula. It tolerates winter, even with an absolute minimum of air temperature. In the flowering and fruiting condition it is very the more decorative. Can be use in landscaping architecture (solitary and group planting.).

Keywords: *Lavandula* L., propagation, evergreen, Absheron

Survey of Medicinal Plants from National Park of Gouraya (Bejaia, Algeria) and Their Usage in Traditional Medecine

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Aim of the study: This work reported the results of ethnobotanical survey in national park of Gouraya conducted during year 2011-2012. This study may be also an guide of phytochemical and pharmacological analysis and it can enhance the conservation of plant biodiversity of this protected area

Material and Methods: This study was conducted during year 2011-2012 in the national park of Gouraya witch designated as a natural reserve by the international coordinating council of human and biosphere program of UNESCO in Paris and it classified as protected area in May 1992

Results: Many medicinal plants (36) were recorded and their ethnobotanical aspects were discussed. This survey shows that plants used in the traditional medicine being major source of treatment of some diseases in different parts of Algeria. The list of insects (15) captured directly one the plant are also reported.

Keywords: Biodiversity. Ethnobotany, Gouraya National Park, Insects, Traditional algerian medecine,

The Biodiversity and Genesis of the Garayazi State of Natural Reserve

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Aim of the study: After changing status of The Garayazi State Reserve in the state level in 2003 for the first time there has been made the inventory of formation of flora. As the result of literature data and field research materials there have been determined 73 families, 229 genera and 379 species in Garayazi Reserve.

Materials and methods: There was used itinerary and stationary methods for the research. At the same time there was used floristic, botanical-geography, areology, statistical methods. Researching of area (water system, land cover, relief) collected environmental information about the facts and conducted geobotanical studies. At the working of collected herbaria materials there was used the determinants and internet websites "Флора Азербайджана", "Определитель растений Кавказа", "Флора Кавказа", "Флора СССР", "Flora of Turkey" etc. The names of taxa, nomenclature changes in the works «Международный кодекс ботанической номенклатуры», S.K. Çerepanova, "Конспект флоры Кавказа" and "Нахçıван MR florasının taksonomik spektri" and «International Code of Botanical Nomenclature» classification and types of region.

Materials and methods: The Garayazi State Natural Reserve is located in the North West of Republic, on the bank of the Kur river in Agstafa region. For the protection of riparian forests and restoration the banks of the Kur river The Garayazi State Natural Reserve created in 4855 hectare area in 1978. The area of the reserve was enlarged to 9658 hectare in 2003. The forests of Garayazi and the field of the Garayazi are the main complexes of the reserve. Both banks of the Kur river are covered the forests of tugai of the Garayazi reserve. As the result of literature data and field research materials there have been determined 73 families, 229 genera and 379 species in Garayazi Reserve.

Results : The floristic spectrum of the Garayazi reserve *Poaceae* (36 növ), *Fabaceae* (29), *Rosaceae* (25), *Caryophyllaceae* (23), *Lamiaceae* (21), *Asteraceae* (19), *Ranunculaceae* (13), *Brassicaceae* (12), *Scrophyllaceae* (10), *Chenopodiaceae* (9), *Polygonaceae* (9), *Papaveraceae* (9), *Apiaceae* (7) families are playing a decisive role 58.6 % of the flora of the reserve. There are 157 species (41,4 %) belong to 60 families. On average there are 5.2 species in every family and 1.6 species in every genera. *Araceae*, *Asphodelaceae*, *Smilacaceae*, *Dioscoreaceae*, *Iridaceae*, *Juglandaceae*, *Betulaceae*, *Corylaceae*, *Cannabaceae*, *Santalaceae*, *Ceratophyllaceae*, *Tamaricaceae*, *Rutaceae*, *Anacardiaceae* and etc. the genera was presented only one species. We think the Arctic III age flora has taken its origin from the Turgay type flora. The Turgay flora has completely surrounded the Caucasian areas in the III period. But the Arctic Alpine types could spread widely in the investigation territory in the upper Pliocene Age. In general, the history of the flora and the development of the landscape is connected with the geomorphological history of the flowering plants. The dry climate in the Caucasian territory lasted for a long time. Those arid areas were available for development of some xerophilic species. Arctoalpine and antractics species could enter the flora in the Middle of the Chalk Age. In the Caucasus remainders of the flowering plants of the late Chalk Ages show that all four XMOTE plants cover were formed in the middle of the Chalk Age. The remainders of the *Populus* and *Platanus* show that the flora of the Garayazi State Natural Reserve was formed in this period.

Keywords: Genesis, family, species, genera, flora.

The Bioecological Farmacological Features of Aloe Plant and Its Economic Affect Growing in Closed Condition in Azerbaijan

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The aim of the study: According to the reseach results of Institute of Dendrolgy NAS of Azerbaijan and the literatural information determined that the plant aloe vera grows very beautifully in Institute of Dendrology. In the article the information about cultivating of this plant in different condition, growth, getting juice, chemical contents, selling, using in medicine is given. In the lab of our institution medical botany and physiotherapy the reseach about aloe is going on. Nowadays hair lasion getting of aloe juice is realising and gatheting of necessary documents for getting product is preparing. Our aim is to organize the mass produce of our native product and enriching this product for cheaper price to the chemists and presenting to the use of the people.

Material and methods: Aloe plant is one of the Liliaceal valuable herb. This plant is spread in natural condition in the southern east part of Africa. Aloe arborescens mill which likes light in 50-150 sm height bushy plant grows in greenhouse condition. The hool is wooden, the leaves are thick pulpy, the edges are thorny. The length of the leaves are 20-50 sm, width is 2-3 sm. The flowers are red and yellow flowers are red and yellow clusters. The normal development of this plant it needs 20-25⁰ C heat and humid weather and hot sunshine. It cannot bear frost, if the weather is below 0⁰C it decays. Aloe plant developes in light sandy land. As aloe plant demands hot humid climate it is planted in greenhouses. Aloe can be multiplied both seed and hull way. But the world practive shows that as it grows lately, it is useful to grow it in vegetative way. For this aim in january-february the lower part of the hulls of aloe it is cleaned. It is planted in the hole about 60x40 sm in the land. The main product of aloe is its leaves and by this aim 4000 aloes were planted in the area of greenhouses about 0.1 hectares. In the first vegetative period it is possible to gather 1 kg leaves from aloe plant. For the next years the productivity of the leaves of aloe are increased.

Results: According to the latest reseach results tge increasing by vegetative way of aloe we come such conclusion that cultivating 40 thousand aloes in 1 hectares area it is possible to get 40 tons of aloe leaves. It is possible to get 50% juice from 1 hectares area from collected leaves of the product. Economical colculations show that it is possible to get 20 tons juice from 40 tons aloe leaves. The main aim of the reseach is to prepare ecologically pure aloe juice, for sale of aloe juice for the first time in Azerbaijan for Technical Conditions. The scientific reseachs prove that 20 tones aloe juice from 1 hectares bring 400000 manats. Nowadays in the chemists of our republic aloe juice is brought from Russia and sold (50 mg - 4-5 manats). Aloe which we suggest is both cheap and of qualitative local product will prevent the inner currency from azerbaijan and it will remove the dependent of azerbaijan market from foreign market and it will help the opening new work places. It will bring rather income to economical condition of our country. According to the latest desicions of our president new medicine plants are being built. The building of that plants will increase the demand to raw reserve.

Keywords: Plantation, aloe plant, aloe juice, drug

The Bioecological Features of Species of *Nepeta* L. (Lamiaceae) of the Small Caucasus Area.

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Aim of the study: The information has been given about the biological and ecological features of Lamiaceae species spread in Lesser Caucasus in the article. The root system and substratum attitude of the perennial and annual species have been identified. The forms of life of *Nepeta* species were compared.

Nepeta L. is the most polymorphic representative of the Lamiaceae Lindl. - Dead nettle family and there is nearly 250 species in temperate zones of the world. 82 species for the former Soviet Union area by A.I. Poyarkova, 39 species (including 12 new species of them) for Caucasus were described. Most of them are saved in the flora of Azerbaijan yet.

Materials and methods: The research was carried out in 2014-2016 expedition and half stationary conditions. 11 types of species of Lamiaceae widespread in the Small Caucasus were studied as object. The life-forms, and morphological features of plants have been appointed according to system of Serebriakov. Besides with the literature informations, the microscope lens has been used to determine the roots of the plant. Geobotanical and systematic studies have been carried out with generally accepted methods. The species were named in accordance with the nomenclature. The named of family and plants were done for "Flora of Azerbaijan (I-VIII) and Cherepanov.

Results: During investigation it was determined that, the species of flowering frequent are the dominant between Lamiaceae species in Azerbaijan. The blooming dates back to the second half of April until August in the species of *Mussiniana* and *Heterodonta*. In the species of high mountain occurs blooming in the second half of Summer. The annual plants are Spring ephemerals. Roots are mild, thin, short, weak branched in the annual plants. Perennials plants have low or very strong, tree shaped roots, sometimes they are pass to working into the top surface of the land many-headed, to short or reptile rhizomatous. Formation of rhizomatous usually are formed with short or reptile rhizomatous. Our aim is that during learning Lamiaceae family from flora of the Small Caucasus, also to learn the biological and ecological characteristics of (*Nepeta* L.) species. The species of the area are collected and used by local communities for their medicine and essential oil characteristics. As a result of investigations, the taxonomic review of Dead nettle has been drawn for the first time in the flora of the Small Caucasus by us. By gender: *Stachys* L. - 9, *Salvia* L. - 6, *Nepeta* L. - 5, each of the remaining 19 species (35 species) flora of KG species are represented.

Keywords: Small Caucasus, species, *Nepeta* L., flora, biological characteristics.

The Bryophyte Diversity of Archaeological Sites in Aydın and Arouds (Turkey) and Effect on Archaeological Ruins

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Aim of the study: This study was planned to understand of bryophyte diversity of historical place of Aydın and its effect to archaeological ruins.

Material and Methods: Approximately 450 bryophyte taxa were collected from the study area between 2009 and 2016. Totally 130 moss taxa (belonging to 18 families and 47 genera) and 16 liverwort taxa (belonging to 10 families and 13 genera) were identified using relevant flora books, revisions and monographs.

Results: *Grimmia pulvinata*, *Didymodon vinealis*, *Pseudocrossidium hornschruchianum*, *Tortula muralis*, *Bryum argenteum*, *B. capillare*, *B. dichotomum*, *Homalothecium sericeum* and *Pterogonium gracile* were found the most common mosses living and spreading on gneiss rocks in our study area. It is well known that lichens and bryophytes, as pioneer organisms, have an essential role in plant succession. Also, these pioneer organisms might damage historical places. In the research area, it was observed that two types of rock, marble and gneiss, had been typically used for constructing of ancient buildings in Carian Region. Our observation shown that gneiss (metamorphic rock) is more sensitive to corrosion which caused by bryophytes than marble (sedimentary rock) because of its physical structure and wavy surface.

Keywords: Bryophytes; damage; Aydın Region, Turkey.

The Determination of Quantity of Chlorophyllin the Wheat Sorts

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Aim of the study: Wheat as an important food crops occupies an important place among all the other agricultural crops and in the production of cereals in the ancient agricultural land in the area of Azerbaijan. At the modern time of the world population increased steadily, global climate change, the strengthening of the process of urbanization the strategic product wheat has been considered a priority plant in terms of food security for any country. Wheat (*Triticum* L.) in addition to being major food plant, cultivated in large areas, playing an important role for human consumption and it has huge economic importance agricultural plant in the world.

Materials and methods: At the study, 57 wheat sorts which have different biological characteristics were used as the object of the research study. Including 32 local varieties of used varieties, materials of the department of "Grain and beanplants" of NASA Institute of Genetic Resources, 25 CIMMYT (The International Center of Maize and Wheat Improvement) are acquired soft autumn wheat varieties. Research materials were sown with Alpha Lattice design method for each sample material 50, distance of between seed 4cm, between lines distance 25cm. During the vegetation the practice area in accordance with the climatic type of soil was irrigated 4 times and fertilizer twice listed. Information on some structural elements have been collected and analyzed in the investigated sorts. At the research, chlorophyll quantity of leaf was measured with the help of device SPAD 502. In the middle of the last sailing leaf of 10 plants was carried out measurement for each sample. Measuring the amount of chlorophyll in the leaves of the samples, beginning of spike time phase of wheat, every 5 days, was carried out three times.

Results: At the research, measuring the amount of chlorophyll was selected in 57 wheat varieties, the highest 30 wheat varieties (Gobustan (standard), Parzivan 1, Parzivan 2, Taraggi, Akinchi 84, Saba, Shafag 2, Ugur, Aran, Gobustan (AZB), Starshina, CO 970547-7, Zubkov, MV06 - 02, Gloria, TX96V2847, Arlin / Yuma, MV Dalma, Destin, Bezostaya 1 (TR), OK00421, Altai, Mima, LC924 / Petja, Sonmez, Steklovidnaya 24, Vita, Azeri (AZB), SG-S1915, Karahan). The amount of chlorophyll in these 30 varieties of wheat the most 61.3 (Ugur) and the lowest 55.7 (Destin) were combined into five groups. So that, changing between 61.3- 60.9 amount chlorophyll in sorts of Ugur, Azeri (AZB), Vita and on 28 May 2.94-3.61%, on 2 June 22.1-20.5% decreased and the numbers of grains 506-521 in 10 spike, 46-45 gr was between 1000 grains weight. The amount of chlorophyll in sorts Starshina, Altai, Karahan, Taraggi, Mima, Parzivan 2, Steklovidnaya 24, MV Dalma, Gloria, Parzivan 1 changing between 57.8 – 57.1, on 28 May 9.1-2.3%, on 2 June 25.6-16.1% decreased and the numbers of grains 536 – 460 in 10 spike, 51-46 gr was between 1000 grains weight. At the research, chlorophyll quantity of leaf was measured with the help of device SPAD 502. It was determined that, in this phase photosynthesis productivity of the last sail leaf of the vegetative is 5 times higher than below the leaves 2 and 3. The leaf sail is equipped the grain with assimilants, productivity of photosynthesis enters to pedunkl and spike 64% from leaf sail and 12 % from the bellow leaves. At the end of ontogenesis, the amount of chlorophyll was observed in investigated any sort in relation to the natural aging of leaves and grain filling.

Keywords: Sort, wheat, chlorophyll, structural elements, productivity.

The Influence of Regulators on the Seeds of Species Concerning to *Cupressus* L. Type

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Aim of the study: Our aim is to learn the influence of regulators on the growth and gaining of sprouts from the seeds concerning to *Cupressus* L. types. At that scientific work the experiment was carried out on the evergreen cypress type (*Cupressus sempervirens* L.) of cypress species.

Materials and Methods: The experiments on research work were carried out in the laboratories of Dendrology Institute. Working solutions were prepared using sodium salt of organic acid at various percents (0,001% and 0,0001%-li). The stimulation ability is referred to organic acids containing C₁₂-C₁₈. Evergreen cypress seeds (*Cupressus sempervirens* L.) are soaked by keeping them in prepared solution. In the experiment the distilled water was taken as the control variant. The soaking of seeds continued 36 hours. The soaked seeds were kept in the light room at 18-20° temperatures planting in the mixture of peat, sand, turf by 1:2:2 ratio. In containers the growth of sprouts has been observed. The results of experiments were studied in 15-35 days. The influence of sodium salt solution of organic acid on the weight and sprouting of seeds were compared with control variant. The results of experiments were as follows. The weights of 50 seeds initially were 0,40 gr. in the 1st Petri dish, in the 2nd 0,47gr, in the 3rd 0,40gr, in 36 hours their weights accordingly were 0,54 gr, 0,57gr, 0,46 gr. after soaking the seeds in 0,0001% solution in the 1-st dish, in the 2-nd dish 0,001%, in the 3rd dish in distilled water. The influence of sodium salt working solution on sprouting ability of seeds was so. In 20 days there were 9 sprouts in the 1-st variant, in the 2-nd and control the number of sprouts was 10. Accordingly in 35 days the number of seeds and their height were 14 (4,5 sm) in the 1-st variant, in the 2-nd 12 (4,0 sm), in control 14, (4,4 sm).

Result: It concluded on that, 0,0001 %-percent sodium salt solution of organic acid impacts positively on the cypress seed weight, the number of sprouts and height compared with 0,001%-percent working solution and distilled water. As the influence of sodium salt organic acid on the initial development of plant seeds was studied, it is important to learn its further influence on the development stages. It can be supposed that, the seeds soaked with the working solution of sodium salt organic acid will be steady against ecological factors (drought, frost, light, soil fertility) and pests in future.

Keywords: Plant, seed, organic acid, sodium salt, regulators, growth

The Infusorians Land Lowlands of Samur-Davachi and Its Attitude to the Asset Reaction and Food Connections to the Environment

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Aim of the study: At the time speaking about attitude to the asset reaction of the infusorians environment we must take into consideration that, cells protoplasm and between fluid tissue of organism is always weak alkali. Based on this, we can assume that the weak alkaline of the environment is more favorable to the growth and development of free-living infusorium. Though food connections of the infusorians are great scientific and practical importance, but it had been poorly studied. According to the specialists, belonging to all groups Protista, including land ecosystems spend approximately 50% of production which algae consumes. Thus, the first links in the food chain participating in the transformation of organic material, pedobiont infusorians are actively involved in the process of increasing the productivity of the soil.

Material and methods: The environment of water plays an important role in the performance of a life lived PH infusorians. As a result of observations made by us, it was clear that, the general number of growth of land infusorians in the nature occurs weak alkaline of environment and during neutral active action. The increase in PH of up to 7.8 sharply lowers quantitative indexes of infusorians. During studying 10 large individual members of species of *Trithigmostoma* by us, in their cytoplasm have been found from 22 to 60 various digestive *Navicula*.sp diatom algae. Also, other taxonomic groups have been recorded feeding actively with the diatom algae. *Uroticha* and *Longifragma* of the mabsorbed from 9 to 50 have been recorded in the form of the plant cell in endoplasm. Nutrition of many members of equalashes infusorians with diatom and green algae: During observations, it has been noted that the members of species of *Nassula terricola* absorbed from 3 to 8 long threadformed algae and thus form of cell strongly deformed. It is interesting that, the rate of malnutrition is affecting the temperature of the environment.

Results: It has been established that, the optimal price of PH and gas regulations for the development of infusorians of Pedobiont. Food connections with different groups of algae for many species of infusorians were studied. *Chilodontopsis depressa* and *Zosterodasis vorax* of species of the family of *Orthodonellida* are belong to the typical phitofags. In the food vacuole of these species always have been recorded by us *Trachelomonas* sp., *Stephanodiscus* sp. and *Scenedesmus* sp. algae. As the result of many types of passive filtration method of feeding of infusorians these whips are almost universal feed object. On the other hand the free food lived infusorians are the food object for the *Trachelidae* family which actively feed with bacteriophages, *Dileptus terrenus*, *D.alpinus* and other wild species and also multicellular pedobionts, turbellaries and other Tardigrada. It has been repeatedly mentioned by us that, the members of *Litonotus* and *Dileptus* species actively are feeding of Chironomids larvae in the swamped forest lands.

Keywords: infusorians, *Nassula terricola*, species, food vacuole, *Stephanodiscus*, *Orthodonellida*.

The Introduced Coniferous Species on Coastal Zones of the Caspian Sea and Biological Features of Their Stability

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Aim of study: Gardening of Absheron is a priority problem. In the climatic relation Absheron is included in structure of dry subtropics. However the natural vegetable cover has poor quantity of different types of ephemeral plants and efemeroid, undersized bushes sometimes meet. Natural wood types are almost absent. Near saline soils and a coastal zone galofita meet. Due to the above there is a requirement of gardening of adjacent sites. Affine salinity of the soil exert a certain impact on structure of natural flora and demands attentive selection of the introduced breeds for gardening.

Materials and methods: Soil structure of experimental sites is sandy, with the smallest organic structure. Soils of Khazar and Pirallahi districts are located on Absheron peninsula, are difficult in the ecological relation and subject to anthropogenous influence. Soils have chloride, sulphatic and carbonate salinization as the soil sierozemic, and in a coastal zone sandy. Formation of soils depends on several factors - activity of microorganisms, vegetation and some invertebrates and vertebral organisms. For identification criterion of stability of coniferous breeds 5-year saplings of *Pinus eldarica* Medw are used., *Pinus halepensis* Mill and *Pinus pinea* L. 3, 2 and 1 summer conifer, crude and dry mass of needles, dynamics of growth, a damage rate of a conifer in droughty conditions of Absheron have been regularly identified. From the conducted researches it is visible that an watered needles of *Pinus eldarica* Medw., prevails over *Pinus halepensis* Mill and *Pinus pinea* L. in a significant amount. The crude mass of the called types changes in the ratio 65,5; 62,3 and 38,0. Italian Pine realizes water evaporation just 22,1 mg / in 1 hour. The pine types put in coastal zones where care and watering of the introduced plants is regularly carried out the number of crude weight at annual needles changes within 72,1; 71,3 and 75,7 mg respectively. However, evaporation of water is at the level from 30,1 - 20,4 ml in 1 hour. From the obtained data it is visible that the beginning of active growth falls on July, August and September months. The distinctive nature of growth is observed in the territory of the Institute of Dendrology where watering is regularly carried out. With approach of fall growth is gradually slowed down. And growth of the 2nd and 3-year needles remains unchanged.

Result: In droughty and the salinized soils of a coastal zone are often subject to changes 3-year-old needles. High temperature condition of summer, lack of soil moisture, salinity of the soil to some extent exert impact on them. As a result at 3-year-old the needles decreases water-retaining ability and weakening of osmotic pressure. Generally, coagulation of proteinaceous molecules, their hydrolysis and increase in amount of free amino acids changes. Increase and accumulation of an arginin direct influence, on emergence of burns of various degree of needles, and in certain cases early cast of needles. Amino acid accumulation proline, somewhat promotes increase in stability of the called types. From the above it becomes clear that *Pinus eldarica* Medw. endemny and easily adapts to droughty conditions of Absheron. Such types as *Pinus halepensis* Mill and *Pinus pinea* L. natives of the countries Mediterranean regions also show high adaptive property. On the nature of stability Eldarica and Italian pine high-steady, Aleppo medium-stable.

Keywords: Introduction, coastal zone, coniferous breeds, stability.

The Study of the Chemical Composition of *Ruta graveolens* L. Species

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Aim of study: Study of the chemical composition of essential oil and morphological features in stages of development of *Ruta graveolens* L. plants cultivated in Absheron.

Material and Methods: *Ruta graveolens* L. study is based on phenological observations in stationary conditions on Beydeman and I.P.Lapin methods. By description and allocation of morphogenesis phases before other vital forms of plants was used the applied approach. Essential oils received by a hydro-distillation method. It has been identified by component composition of the gas-liquid chromatography method "PYE-Unicam 105". By anatomical studies have found and studied bodies in the vegetative structure and formation of regularity sxizogen and lizogen sites. Chemical and physico-chemical methods in phyto-chemical analysis analysis, using the bioactive substances in plant raw material enables the description and quantitative detection of plants.

Results: In the Caucasus, including the territory of Azerbaijan country cultivated only 1 species of *Ruta graveolens* L. in cultural condition. Height reached up to 40-60 cm is a gray blue medicinal plant. Yellow flowers are collected in thyroid shape or broom shrub group flower form. *Ruta graveolens* L. has in terrestrial part 0,7-1,2% of essential oil. The main components of the essential oil are methyl-p-nonilketon, methyl-p-qeptilketon, pinen, limonen, valerian, sineol and etc. Therefore are existed rutin, furokumarin, terpens, alkaloids. Furthermore, its composition has been identified tannins, resins, apple acid, bitter substances. Kumarin derivatives are typical plants for *Rutaceae* L. family. *Ruta graveolens* L. is 0.5% of kumarin in content, they are found mainly in the form of aqlikons or in the form of esters. Determination of the chemical structure of Kumarin carried out by taking into account their titrometric, polyarografic, spectrophotometric, fluorometric and other methods. By the development process of the plants are accumulated flavonoids collected in the entire inside bodies, which is the most important flavonoid of kversetin qlikozid is rutin. The amount of the Rutin depends on the buds and the fruits of development phase, the amount of rutin in buds is from 9.5% - to 12.5% and the amount of rutin in fruits are from 8% to 4%. *Rutaceae* family is rich with tannins; tannins are accumulated in different part of *Ruta graveolens* L... Their quantity and quality depend on biological factors (fenophases, plant age and etc.). Tannins are found dissolved in plant cells as localized in the Histo chemical reactions. Tannins are accumulated in bodies, branches and roots as in core rays of parenxim cells, as well as gathering in wood. But they are not localized in mechanical tissues and in cork. *Ruta graveolens* L. consisted by resins with essential oils, as well as it becomes part of the various organic compounds mixed with its own smell. Resin consisted by rezinols (diterpen-type carbohhydrogen), resin acids and rezin alcohols (rezinols).

Keywords: *Ruta graveolens* L., morphology, essential oils, component and chemical composition

The Subendems of the Specially Protected Natural Areas of the North East of the Minor Caucasus

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Aim of the study: The analysis of endemic flora of the specially protected natural areas shows that they are non- equally distributed in the protected areas having different life forms. Basing on the literature information some endems status changed into the subendems status. During the investigation it was determined that 16 families, 21 species , 24 kinds in Goy-Gol National Park, 15 families , 23 species , 28 kinds in the EldarShamlığı State Nature Reserve - 10 families , 11species , 11kinds in the Garayazi State Nature Reserve, 12 families, 14 species, 14 kinds of supendem are spread in the Korchay State Nature Reserve.

Material and Methods: The investigation was conducted in Goy-Gol National Park, EldarShamlığı State Nature Reserve, Korchay State Nature Reserve. The research material has been SPNA 's flora and fauna .The stationary and route methods were used in the investigation. The coverage was 250-3600 m above sea level and the area was 28932.6 hectares . At the same time, floristic - systematic, areological, botanical, geographical, fitosenological , statistical methods used in the floristic botany were taken into account . The size of the sample area was 100m². 10 m² sample areas were selected in the territory where the size of the grow area not allowed. Also the small pitches in the sample area of 10m² have been established. In the selection of the sample area the homogeneous rock plants, homogeneous reef plants were taken into account. In some cases, if the sample area is less than 100 m² in size the description of the vegetation measures the boundaries of the natural reserve. The size of the sample areas was taken so that it could fully cover the plant groups which we learned in it. Over 1000 herbarium materials have been collected. SPNA flora's review has been compiled. RV Kamelin [1973] The materials are stored at the Department of Botany of GSU. A.A studies Yunatov .

Results: The analysis of endemic flora of the specially protected natural areas shows that they are non- equally distributed in the protected areas having different life forms. As a whole in the investigation area , 13 families, 24 species, 30 Azerbaijan kinds, 22 families, 37 species, 48 kinds supendems and Caucasus kinds are known. Paleoendems are spread in the EldarShamlığı State Natural Reserve. As a result of the monitoring observations it was established that there are 8 families, 13 kinds of endems according 12 species in the reserve. Basically endems are Iran, Iberia, Turan and Albanian rooted. Here Hirkan, Dagestan and Minor root endems are not founded. 15 kinds of Iran, 6 kinds of Turan, and 5 kinds of Iberia endems and supendems roots are spread. In the Qarayazi Natural State Resere 5 families, 6 species, 6 kinds, in the Korchay State Nature Reserve 5 families, 7 species, 7 kinds are spread. 170 species of Caucasian origin are spread in the four investigated reserves. The subendems of the specially protected natural areas can be used in the role of keeping autoxton and allaxton in the protected regime of nature, floragenesis, as well as in the preparing the system of protection of rare and endangered species. In the formation of SPNA flora the Front and South West Asia xerophytes centers played an important role.

Keywords: Flora, family, species, endemic, subendem, indigenous, allaxton, floragenesis, xerophytes.

The Use of Cryopreservation for Conservation of Endangered Species and Biodiversity

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Aim of the study: The land, air and seas of our planet are home to living things from the tiniest microorganisms to the largest animals, which make up a rich tapestry. The biological richness may differ depending on the mentioned region, and this richness named biodiversity. Biodiversity is the variety of all living things; the different plants, animals and microorganisms, their genetic information and the ecosystems they form. In last decades, a technique has been started to be used for storage of different biological materials. In this review, it was aimed to assess the use of cryopreservation for conservation of endangered species and biodiversity.

Material and Methods: We searched the literature for studies on cryopreservation of different cells, tissues, and embryos for future use. We reviewed the usage of cryopreservation, and discussed the possibility of the use of cryopreservation for conservation of endangered species and species diversity in light of the results of reviewed articles.

Results: Cryopreservation is the slow freezing of cells or tissue to preserve their current state for future use. In freezing protocols, various cryoprotectants with different doses are used in order to keep their vitality and to preserve frozen materials after the freeze-thawing process as if they were fresh. The cryopreservation of sperm has been utilized for years; the first recorded human birth from cryopreserved sperm was in the 1950s. The process has recently begun being used for egg freezing, making way for the more effective technique of vitrification. In addition, cryopreservation of plant cells (or meristems and organs) and embryos has been considered as an important tool for the long-term preservation of species without genetic alteration. As a result, cryopreservation technique may be considered as an effective tool for the conservation and persistence of endangered species to be able to sustain the biodiversity in any region.

Keywords: biodiversity, conservation, species, cryopreservation

The Vegetation of Handüzü-Çağrankaya (Güneysu/Rize), Turkey

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Aim of the study: The goal of this study is to determine the vegetation types of Handüzü-Çağrankaya (Güneysu/Rize) region.

Material and Methods: The classic Braun-Blanquet method was used to determine the vegetation types in the study area.

Results: Three vegetation types were determined in the study area. The first vegetation consist of four associations; *Piceto orientalis-Alnetum barbatea*, *Lauroceraso officinalis-Alnetum barbatea*, *Alneto barbatae-Fagetum orientalisae*, *Piceto orientalis-Fagetum orientalisae*, the pseudomaquis vegetation consist of *Vaccinio arctostaphyli-Rhododendretum pontici*, *Vaccinio arctostaphyli-Ilexetum colchici*, *Vaccinio-arctostaphyli-Epigeaetum galreuteriae*, *Fago orientalis-Rhododendretum pontici* associations. The subalpine meadow vegetation consist of *Nardeto strictae-Alchemilletum caucasicae*, *Nardeto strictae-Thymetum praecoxae*, *Sibbaldieto parviflorae-Nardetum strictae*, *Alchemillo caucasica-Sibbaldietum parviflorae*, *Vaccinio uliginosae-Rhododendretum caucasicae* associations.

Keywords: Biodiversity, vegetation, Handüzü, Çağrankaya, Rize.

Tuqay Woods a Mean of Intrazonal Vegetation Species

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Aim of the study: Being a special type of intrazonal landscape Tuqay forests lie across the plain rivers like narrow strip, it stretches across Kur river and covers massively ribbon like area. Unlike other forests Tuqay forests are peculiarly thick, bushy, bindweed and mostly pathless. Convolvulus, vitis wrapped around the trees, different types of bushy plants – mulberry (*morus*), silverberry (*eleagnus*), pear (*pyrus*), greengage plum (*prunus cerasifera*), black thorn (*prunus domestica*), hawthorn (*crataegus*), hedge rose (*rosa*), barberry (*berberis*), pomegranate (*punica*), *swida opiz* form pathless jungles in Tuqay forests. Grass cover of Tuqay forests are poor. Taking into consideration the actuality of the problem the flora bio variety of Tuqay forests have been researched as intrazonal vegetation. Principal theme of research is to study the bio variety of Tuqay forest on the banks of Kur river in Western regions of Azerbaijan.

Material and Methods: Route, stationary, consecutive, areological, ecological methods have been used in researches. Exploration object is Tuqay forests located around the banks of Kur River that flows through Western regions of Azerbaijan. Existence of big amount of underground fresh water within the areas where Tuqay forests grow, is advantage for the growth of thick forests.

Results: It was revealed that erosion types that differ distinctly from each other exist around Kur River and Tuqay forests have specific features to prevent erosion within this area. Forests form within this area as a result of increase of water level in river and formation of underground water. The climate adapts to this as a result of less atmospheric fallouts. In thin parts of the forest together with delipishpishe, wild chickweed, plantain, ajiqovaq, bozagot, evelik, kendelash, in dry places lame and a lot of other grass vegetation in edge zone wormseed lame form thin and also thick cover. Kur river bank forests that have lost the features of Tuqay forests as a result of unchanging flow of Kur for a long time have gradually become thin and turned into open glade. Main species structure of Tuqay forests existed for many years in width of 3-5 kilometers consist of willow, white poplar, ebony, mulberry, oak, Georgian oak, bubble tree and bushy plants like hawtoun, buckton, tamarisk, wilding pomegranate, blackberry, qaratikan, rubeola and so on. As know, there are 56 types of plants with 14 chapters 27 species in Tuqay forests located on the banks Kur River. For restoration of Tuqay forests it's important to create bank protection with artificial forests for forming regional nurseries suitable for soil and climate especially using the genders of trees and bushes including the genepool of Tuqay. It's important to water the trees in summer month which have survived till this time in Tuqay forests around Kur River not depending on their age. The dams built on Kur River characterizing the manner of Tuqay confirm the importance of this process. Otherwise the assumption of desreasing and damage of existed forests will become true in the future. Though the restoration of natural forests require high amounts, it considers the urgent work for protection of agricultural fields. However the protection and saving of the forests Tuqay must execute on ecological and legal levels.

Keywords: Intrazonal, vegetation, Tuqay, flora, woods.

Opportunities of Lichens in Urbo-Ecosystems Bioindication

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Aim of the study: The bioindikasiya characteristics of lichens of urboekosystems of cities were investigated. On the study of theory and practice of the problem of lixenoindikasiya through lichens England, the United States, the Baltic States (Skye, 1968, Hawksworth, 1973, Gilbert, 1971, Hilston, Малышева, 2004) many research results have been published. In this regard composition of species of lichens, distribution patterns and bioindikasiya characteristics were investigated of some industrial cities (Ganja, Gazakh, Mingachevir, Yevlakh, Dashkesan, Shirvan) of Azerbaijan. With the help of biological systems to biotic and abiotic factors of assessment method of maturing places – called bioindikasiya. The species or groups of coordinating life function of environmental factors are called bioindicators. It is known that lichens are indicators of air pollution and it can be used in environmental monitoring system.

Materials and methods: Studies were conducted in the years 2014-2017. The study was taken as the object of lichens. With the help of biological systems to biotic and abiotic factors of assessment method of maturing places – called bioindikasiya. The species or groups of coordinating life function of environmental factors are called bioindicators. It is known that lichens are indicators of air pollution and it can be used in environmental monitoring system. There was used itinerary and stasionar methods for the research. At the same time there was used floristic-systematic, fitosenoloji, chemical, areoloji, statistical methods. Stationary studies have been carried out within the administrative boundaries of cities. The plan system of the city has been delimited for square metres (1 km) and inside it has been described geobotanic to groups of lichens. In opinion of E. Geramisk lixenosinosiya has been geobotanical description and the synthetic index of polutorant has been made on the methodology basic by XX Trass. 10 x 10 cm is the size of the sample playground. The playgrounds were located in the trunk of the tree and there, where is the lichen location. 3 sample playgrounds have been built in a tree. With the help of system of sample playgrounds Ganja, Mingachevir, Dashkesen, Yevlakh, Gazakh, Shirvan and its surrounding areas composition of species of lixnebiotasiya have been learned and life forms of lichens and environmental groups in these areas have been determined.

Results: There have been determined 22 families, 44 genera and 160 species in the studied industrial cities. Of these species spreaded 32 species in Dashkesen town, 26 species in Kazakh city, 24 species in Mingachevir, 23 species in Yevlakh, 17 species in Ganja and Shirvan cities. The pollution levels of Ganja and Shirvan cities are similar. The species of genera Anaptychia, Acarospora, Arthopyrenia, Melanea, Lecidella Everina, Ramalina are not in urboekosystem. Epifit species are dominant. *Parmeliaceae*, *Physciacia*, *Teloschistaceae*, *Lecideaceae*, *Leconaraceae* are leading families. As a result of implementation of the complex of lixenoindikasiya. With the help of code Ape.I.A.P. the map of pollution was compiled for the atmosphere air of the industrial cities. In the past 20 years the number and medium projective cover of dominant lichens plane, poplar, pine, fir, cypress trees have decreased. As the result of studied lichens which spread at the sample playgrounds in 6 cities were discovered that depending on the ambient air of pollution in the valley the ingredients of species are the same.

Keywords: Lichenes, bioindication, urboekosystem, polerotolerant, lixeno biota

High School Students' Ideas About Endangered Animals

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Aim of the study: One of the most important factors affecting learning is the individuals' ideas about a topic. In this regard, students' ideas have become one of the main topics discussed in education. Students' ideas about endangered animals are of great importance both in biology and environment education. The main reason of this is biodiversity and increasing human effect on environmental problems. Respecting nature, enhancing life quality and protecting biodiversity in the earth are among the principles of sustainable society. Humankind's contemporary and future need for biodiversity is unavoidable. Therefore, it is very important to raise individuals who are conscious about maintaining biodiversity to protect its global richness. The purpose of this study is to reveal high school students' ideas about endangered animals.

Material and Methods: In line with this purpose, 273 high school students were given a measurement tool consisting of open ended questions. Data collected were evaluated according to the content analysis method.

Results: The results showed that students rather evaluated *Caretta caretta*, *Geronticus eremita* and *Ursus arctos* as endangered animals. Students also expressed that human activities were the main reason for endangered animals.

Acknowledgements: The results were discussed with literature information and suggestions were developed.

Keywords: Student ideas, endangered animals, biodiversity education.

PP-185
About Taxonomy of Wild Vegetable Crops of Nakhchivan Autonomous Republic of Azerbaijan

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Aim of the study: Studying of such important themes as area flora for protection of flora biodiversity, revealing useful plants, protection of rare and endangered plants, genofound protection and find new using ways for provide population by environmentally friendly products – fruits and vegetables as well as for improve the economic situation are the actual issues of the day. In particular, scientific research base of right use of wild vegetable crops of flora of the Nakhchivan Autonomous Republic, their botanical analysis, determination of systematic and taxonomic composition and creation of genofound are necessary. At the same time, studying of taxonomic composition of vegetable plants of area for the sustainable development of biodiversity was set as goal of research.

Material and Methods: The research have been carried out in Sadarak, Sharur, Kangarli, Babak, Julfa, Ordubad districts and around the Nakhchivan city of Nakhchivan AR in 2006-2015 years. Objects of research – wild vegetables crops spread in different districts of Nakhchivan AR. Classic-floristic and systematic methods have been used.

Results: 2835 species of *Higher spore*, *Gymnosperms*, *Angiosperms* families spread in flora of the Nakhchivan Autonomous Republic. Combination of three classes (Magnoliopsida, Liliopsida and Equisetopsida) of wild vegetable crops in areas flora have been conducted in results of taxonomic analysis. Magnoliopsida by 8 semi-classes (67%), 20 suborder (77%), 22 order (57.9%), 28 families (61,00%), 125 genuses (86,20%) and 169 species (83,61%), Liliopsida by 4 semi-classes (33%), 6 suborder (23%), 15 orders (39.4%), 17 families (37%), 19 genuses (13,10%) and 32 species (15,89%), Equisetopsida by 1 order, 1 families, 1 genus and 1 vegetable species have been presented as one using species. But, for example, the main places have been taken *Asteraceae* – by 33 species, *Apiaceae* – by 29 species, *Polygonaceae* – by 15 species, *Fabaceae* – by 9 species, *Chenopodiaceae* – by 12 species. All another families are also 41,55% by 1-3 genus. Taxonomy analyses used traditionally by local communities wild vegetable crops in biodiversity of Nakhchivan AR and their spectrums have been conducted. They consist 7,13% and have presented in flora by 2 classes, 11 semi-classes, 26 suborders, 36 orders, 145 genus and 202 species joints in 46 families.

Keywords: Wild vegetable crops, *Faboideae*, taxonomic composition

Antioxidant and Mutagenic Activities of *Mentha longifolia* Hudson Subsp. *longifolia* Ethanol Extract

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Aim of the study: Many natural antioxidant compounds from plants show great potential to preserve the oxidative stability of food products or treatment of many human diseases, but there is a little information about their potential risk to human health. Therefore, understanding the health benefits and/or potential toxicity of these plants is important. This study evaluates the antioxidant and mutagenic effects of *Mentha longifolia* subsp. *longifolia* ethanol extract that are consumed as spices.

Material and Methods: The leaves of *M. longifolia* subsp. *longifolia* were collected by local residents in Adana province of Turkey in August 2012 and the ethanol extract was obtained with soxhlet apparatus. The anti-oxidant activity of extract was investigated by its scavenging effect on 1,1-diphenyl-2-picrylhydrazyl (DPPH) radical and inhibition of β -carotene-linoleic acid bleaching assay. The total phenolic content was determined by the Folin–Ciocalteu colorimetric method and the mutagenic activity was evaluated by using Ames *Salmonella/microsome* test system.

Results: The IC₅₀ values of DPPH radical scavenging of the extract and BHT were 0.25±0.11 mg/ml and 0.184±0.01 mg/ml, respectively. The results of β -carotene bleaching tests found the IC₅₀ values of the extract and BHT to be 0.38±0.8 mg/ml and 0.05±0.012 mg/ml, respectively. The total phenolic content of the extract was evaluated spectrophotometrically and calculated in gallic acid equivalents (GAE) as 95.05± 0.63 mg/ml. In addition, the results showed that the ethanol extract of *M. longifolia* subsp. *longifolia* can be considered genotoxically safe because they do not have mutagenic activity at the tested concentrations.

Keywords: *Mentha longifolia* subsp. *longifolia*, antioxidant, mutagenicity

Assessment of Food Preservative Potassium Propionate (E283) Genotoxicity in Human Peripheral Blood Lymphocytes Using Micronucleus Test

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Aim of the study: Nowadays, food additives have important role for the society's nourishment. The most common additives to appear on food labels are antioxidants, colours, emulsifiers, stabilisers, preservatives and sweeteners. Potassium salt of propionic acid, used as preservative, is a natural acid present in small quantities in many foods. The purpose of this study was to evaluate the potential genotoxic effect of potassium propionate by using the cytokinesis-blocked micronucleus (CBMN) assay in human peripheral blood lymphocytes.

Material and Methods: The study was carried out on human peripheral blood samples taken from three healthy young donors, a man and two women. The peripheral lymphocytes were incubated at 37°C for 72 h and exposed to potassium propionate at 7.81, 15.62, 31.25, 62.50, 125.00, and 250.00 µg/mL concentrations during the last 48 h. The CBMN assay was carried out by adding cytochalasin B (final concentration of 5.2 µg/mL) after 44 h of the culture. A negative control (distilled water) and a positive control (mitomycin-C, MMC, 0.20 µg/mL) were also used. At the end of the 72-h incubation period, the cells were treated with hypotonic solution (0.075 M KCl) and fixed with cold methanol:acetic acid (3:1). Slides prepared from cell suspension were dried and stained in 5% Giemsa. Totally, 3000 binucleated lymphocytes (1000 binucleated cells per donor) were examined per concentration. Cell proliferation was determined utilizing the cytokinesis-block proliferation index (CBPI). Therefore, 500 lymphocytes were scored to evaluate the percentage of cells with 1, 2, 3, and 4 nuclei from each donor.

Results: Potassium propionate significantly increased the frequency of MN compared to the negative control at all the treatment concentrations (except 7.81 and 15.62 µg/mL) in a concentration-dependent manner ($r=0.98$). This food preservative did not induce cytotoxic effect that was evaluated by CBPI on human lymphocyte. The results of this study show that potassium propionate may have clastogenic effect to human lymphocytes *in vitro*.

Keywords: Potassium propionate, food preservative, cytokinesis-block micronucleus assay, human lymphocytes, genotoxicity

Determination of the Virulence of *Pseudomonas aeruginosa* with the Infection of GreenCrops

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Aim of the study: To study the interaction of bacteria *Ps.aeruginosa* c green crops at the population level and determining their virulence before and after infection of the plants (lettuce and Basil) *in vitro*.

Material and Methods: To explore phytobacteriology interaction used 3-week-old plants of lettuce and Basil, grown on Murashige-Skoog medium at a humidity of 70% and ambient light 5,000 Lux infected with the bacteria *Ps.aeruginosa* at a dose of 10^6 m.k./ml (according to optical standard of turbidity) by adding to the nutrient medium under the plant. For the quantitative determination of the studied bacteria in CFU in dynamics (3-5-8-10-13 day after infection) plants were gamogenetically in sterile water and sown on nutrient medium – MPA. To determine the virulence of the studied bacteria was used to culture protozoa *Paramecium caudatum* from the collection of the laboratory ecotoxilogical analysis of soils (LETAP MSU). Microscopic animals infected with pure cultures of bacteria *Ps.aeruginosa* ("VELES"), as well as relevant bacteria isolated from infected plants at a dose of 10^6 m./ml (optical standard turbidity). The results of the relationship between the studied prokaryotes and eukaryotic cells and ciliates were determined in the acute experience to complete elimination of animal cells using light microscopy by the method of hanging drops.

Results: The population dynamics of *Ps.aeruginosa* was different with different vegetation model is increased in the interaction with leaf lettuce and developed according to the logarithmic type in association with the Basil. The studied bacteria were infiltrated in all plant organs, but the highest concentration was in the lower leaves. The impact *Ps.aeruginosa* cells of protozoa was accompanied by complete loss of ciliates within 25 minutes. When the simplest infection with *Pseudomonas aeruginosa* for 25 min was observed a decrease in the activity of the ciliates, throwing trichocyst, deformation of cells and the complete destruction of the cell wall with the release of the inner content into the environment. In the interaction of the protozoan *Paramecium caudatum* bacteria *Ps.aeruginosa* pure culture and isolated from plants, no significant differences were observed. Consequently, bacteria do not lose their virulence in the organism host and maintain it towards living organisms.

Acknowledgements: We thank the staff of the Department of Microbiology and immunology for their valuable advice and assistance during the experiments.

Keywords: *Pseudomonas aeruginosa*, *Paramecium caudatum*, green crops, population dynamics, trichocyst.

Evaluation of the Genotoxic Effects of Monopotassium Glutamate In Human Lymphocytes *in vitro* By Sister Chromatid Exchange Test

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Aim of the study: The steady decline in natural resources has the potential to create a variety of problems, especially in the food and health areas. One of them is increased use of additives in foods. Flavour enhancers are a kind of food additive and their usage are increasing rapidly. They are used in many prepared foods for commercial purposes. Glutamic acids are used as a flavour enhancer commonly. Monopotassium glutamate (MPG) is a potassium salt of glutamic acid. The purpose of this study was to evaluate the potential genotoxicity of MPG by using *in vitro* sister chromatid exchange test in human lymphocytes.

Material and Methods: Peripheral blood obtained from three healthy young donors, a man and two women, was treated with four different concentrations (125, 250, 500, and 1000 µg/mL) of MPG in culture conditions for 24 and 48 h. A negative and a positive control (mitomycin-C) were also applied for each treatment. Replication index was also determined.

Results: According to this test results, MPG significantly increased the SCE/cell ratio at all the concentrations for both 24 h and 48 h periods compared with the negative control. However, MPG did not affect replication index. In our previous study, MPG significantly increased the frequency of micronucleus in the two highest concentrations compared to negative control. These data demonstrated that MPG may have genotoxic risk to human lymphocytes *in vitro* at high concentrations. However, there is a need to be done other genotoxicity tests for this food additive to support these results.

Keywords: Genotoxicity, Food additive, Human lymphocytes, Sister chromatid exchanges.

PP-190
**Integrated Control Measures Against Pests of Trees and Shrubs In Absheron
Condition**

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Aim of the study: The main objects of integrated control measures against pest of trees and shrubs is a natural and ecological methods of population control and reduce them to an invisible level. The main purpose of integrated control measures is his safety in relation to the environment, the use of non-chemical agents according to them has been stored the balance between populations of Agro-ecosystem and phytozoophagies basis of improvement of ecological approach to trees and shrubs endurance against diseases and pests of purposeful use of agro-technical measures to control. During studies found that the use of trees and shrubs species, resistance to pests and diseases reduces the maximum level of pesticide use and play a major roll in amount level of tree and shrub pests.

Materials and metods: During researches became known that in violation of the balance of nitrogen, phosphate and potash fertilizers in the soil there is a massive increase in insects with sucking mouthparts. One of the main elements of the integrated control measure is a biological method, which is based on the use of natural useful fauna. In studies conducted years 2015-2016 revealed that the climate and other favorable conditions, complex entomophagies amount of pest species is limited to 80-90%.

Result: During researched works conducted vat Institute of Dendrology are found that pests of trees and shrubs, some scale insects and aphids at biostimulators which plays an importantrole seven pointed and 14 pointed ladybugs. In the ecosystem in the regulation of harmful species among the main factors is the chemical control. This method of control used only when the above measures are not sufficient to regulate of pest control.

Keywords: plant, pest, disease, entomophagy, fertilizer, Integrated control measures.

Production of Biogenic Amines and Fermentation Metabolites by *Lactobacillus plantarum* Isolated from Naturally Fermented Pickles

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Aim of the study: Biogenic amines can be produced in fermented foods due to metabolic activities of microorganisms. Naturally occurring microbiota is an important factor that may affect the amount of biogenic amines formation during fermentation. The purpose of this study was to determine the production of biogenic amines and fermentation metabolites by *Lactobacillus plantarum* isolates from naturally fermented pickles randomly collected from different regions of Turkey.

Material and Methods: Isolates previously identified as *L. plantarum* were inoculated in deMan, Rogosa and Sharpe (MRS) broth supplemented with 0.2% L-histidine monohydrochloride, L-lysine monohydrochloride, and L-ornithine monohydrochloride for biogenic amine production. Isolates were measured after incubation for the production of three biogenic amines including cadaverine, putrescine and histamine with HPLC analysis. For fermentation metabolites, the same isolates incubated in MRS broth were treated for HPLC analysis of formate, pyruvate, lactate, ethanol, and 2,3-butanediol.

Results: The amount of produced biogenic amines by tested *L. plantarum* strains ranged as: cadaverine: 23-298 mg/L, putrescine: 0-994 mg/L, Histamine: 0-668 mg/L. Total biogenic amine production for each isolate was between 115-1332 mg/L. Production of fermentation metabolites for measured isolates varied as follows: formate: 2.996-64.902 mM, Pyruvate: 0.100-0.980 mM, lactate: 7.113-47.878 mM, ethanol 6.048-20.353 mM, and 2,3-butanediol: 0.111-13.148 mM. Naturally fermented pickles tested in here had *L. plantarum* strains with different biogenic amines and fermentation metabolites production capacity. Strain variability in naturally fermented pickles may cause public health risks of biogenic amines.

Keywords: Biogenic amines, *Lactobacillus plantarum*, Fermentation, Metabolit.

Some Wild Food Plants of Apiaceae Lindl Family Spread in Azerbaijan Flora

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Aim of the study: Study of wild food plants is the main goal of research. Nutritional value of *Carum carvi*, *Pimpinella saxifraga*, *Pimpinella anisum*, *Heracleum antasiaticum*, *Pastinaca sylvestris*, *Pastinaca sylvestris*, *Angelica tatianae* and *Torilis japonica* wild spread in districts of Azerbaijan by ethnobotany methods have been determined.

Materials and methods: Studies are justified on oral information of local population and spent researches by ethnobotany methods in spread plants regions during 2014-2017 years.

Results: *Carum carvi* L. - most popular species among the people. Seeds are capable of precious spice and used in preparations of bread, buns, confectionery, perfumes, cosmetics, pharmaceuticals and soap-boiling and for drinks, liquor-vodka species used for aromatization in tobacco industry and also involved in preparation of cheese products. Additive of ground cumin seeds in milk products increases lactation. Bread was prepared from seeds ground to flour in the Middle Ages. Cumin plants used in marinating of vegetables as additives for improving compounds, for pastry cooking, chopmeat, for cooking potatoes, onions and cheese, curd. *Anthriscus cerefolium* (L.) Hoffm. – green part is sweaty, fragrant aroma reminiscent of anise and parsley. As spice can involve in many dishes. Also used as additive for the preparation of various salads, for this purpose must be used fresh and young leaves. *Pimpinella saxifraga* L. – young fresh leaves used for cook side dish, the vinaigrette (or Russian salad), soup and etc. Used as additive for nice smell fragrant ingredients in rhizomatous in cooking of meat and fish dishes. *Pimpinella anisum* (L.) - all parts of the plant are used as a spice. Dough makes from seeds in confectionery and bakery industries. Gold-colored, fragrant, delicate taste extracts made from flowers. *Heracleum antasiaticum* Manden. - good honey plant, their young, tender leaves and trunks used for garner salads and etc. Fresh or dried roots used as aromatization additives in dishes, lemonades, liquor and others drinks. The newly collected in flowering period leaves and stems are delicious, as well as enriched by biologically active ingredients useful for human. *Angelica tatianae* Bordz - the young shoots, leaf stalk, unopened buds of the plant are used in food. Leaf petioles used for cooking of soup, borscht, unopened buds used for tasty dishes. Plant leaves, shoots and buds dried and marinated. As additive used in salads and dishes. *Pastinaca sylvestris* Mill. – used as additives to potatoes, vegetable dishes, laying to salt and vinegar cucumber and cabbage, conserve of fish products. Spice from forest parsnip causes appetite and promotes digestion. The pure leaf parts were cut, dried and used as the spice. *Prangos ferulaceae* (L.) Lindl. – for pleasant taste pickled and marinated for overflight. Plant improves appetite and served as delicious food plants. *Torilis japonica* (Houtt.) DC. – leaves for their good smell used as additives in dishes and salads.

Keywords: *Apiaceae*, wild food plants, ethnobotany

***Sorghum bicolor* Plays a Significant Role in Food Security**

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Aim of the study: *Sorghum* is a genus of flowering plants in the grass family Poaceae. *Sorghum bicolor* is the cultivation and commercial exploitation of species of grasses within the genus *Sorghum*. These plants are used for grain, fibre and fodder. The plants are cultivated in warmer climates worldwide. The research, is aimed at increasing biomass.

Materials And Methods: The leaves were homogenized in quartz sand with a mortar and pestle. 50 mM TRIS-HCl (pH 8.0), buffer containing 0.01% BSA, 0.5% Triton, 14mM β -ME, 1 mM EDTA and 0.5% PVP was used for the homogenization. 2 ml of the buffer solution was added to 0.5g leaves at +40°C. To determine NADP-MDH activity the enzyme extract was initially activated by DTT for 15 min. The obtained homogenate was centrifuged for 5 min at 10,000g and 100 mM Tris-HCl (pH 8.0) buffer containing 10 mg/ml BSA, 0.5 M EDTA, 20 mM $MgCl_2$, 0.2 mM NADP $\cdot$ H, 1 mM oxaloacetate and 20 μ l enzymatic preparation was used for the determination of the enzyme activity.

Results: The experiments started on the 40th day of the growth of *S. bicolor* plants. The leaves of *S. bicolor* plants, kept in the dark, illuminated for 15 minutes, and illuminated for 1 hour were used in the experiments. NADP-malate dehydrogenase activity was measured in both activated and inactive enzyme extracts. No activity was detected in the leaves kept in the dark, which is consistent with the results of the research carried out by Scheibe et al. Thioredoxins caused redox oxidation of NADP-MDH in illuminated leaves. It is assumed that chloroplasts have only one redox activated NADP-MDH in leaves exposed to light and therefore, malate pump functions only in illuminated leaves. A high NADP-MDH activity was observed in samples illuminated for 15 minutes. The NADP-MDH activity was found to be 6 times higher in activated samples compared with inactive ones. In C4 plants high concentrations of NADP $^+$ inhibit NADP-MDH activity. This effect was not observed in C3 plants. The obtained result is of great physiological importance. Thus, recovery potential of chloroplasts in C4 plants depends on the NADP/NADPH ratio - cofactor of NADP-MDH, which fulfills CO $_2$ fixation in mesophyll cells. The results of the research suggest that expression of the gene encoding the enzyme in *S. bicolor* leaves is light-regulated.

Key words: C $_4$ photosynthesis, *Sorghum*, *Poaceae*, temperature

The Effect of Different Hydrated Ions for Absorption of Water And Puffiness Process in Seeds

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Aim of the study: Monocotyledonous wheat and dicotyledonous pea seeds were used as subject of study. The effect of both the positive ions (Na_2SO_4 , MgSO_4 , NaOH), both the negative ions (KCl , KNO_3 , NH_4NO_3) and one positive, the other negative hydrated (NaCl , NaNO_3 , CaCl_2) ion salts for absorption of water and puffiness process in seeds was studied. The results have been obtained from salts containing different hydrated ions were a bit different. In this case, puffiness of seeds depends on the radius of ions effected, depends on their size. Indicators of pea seeds in each case were higher compared to wheat seeds.

Material and Method: Experiments were conducted in laboratories-in water culture. Monocotyledonous wheat and dicotyledonous pea seeds were used as subject of study.

As stress factors in experiments both the positive ions (Na_2SO_4 , MgSO_4 , NaOH), both the negative ions (KCl , KNO_3 , NH_4NO_3) and one positive, the other negative hydrated (NaCl , NaNO_3 , CaCl_2) ion salts were taken. In order to determine the effect of different hydration ions to germination and puffiness process of seeds after determination of their dry, absolutely dry weights soaked in distilled water (control) and 0.1 and 0.2 M concentration solutions (experience options) and their wet weights were defined with the gravity method within 20-24 hours. Each of the three weights carried out on analytical, torsion or electronic scales. As 0,2 M is a stress concentration, other, higher concentration solutions were not used.

Each of the three weights carried out on electronic scales. Determination of wet weight conducted every 30 minutes during the first 3 hours, and later determination conducted every 3 hours. In this way paper remaining wet all the time serves water supply for seeds placed on it. An average square edging were calculated from the obtained results). Failure was not more than 5%.

Results: The effect of both the positive ions (Na_2SO_4 , MgSO_4 , NaOH), both the negative ions (KCl , KNO_3 , NH_4NO_3) and one positive, the other negative hydrated (NaCl , NaNO_3 , CaCl_2) ion salts for absorption of water and puffiness process in seeds was studied. It was revealed that, with the effect of different hydrated ions, absorption of water and puffiness process in seeds follows the same way as in control, it is characterized by the three-phase curve regardless the composition of salts, what type of hydrate are the ions, as well as the biological characteristics of the seeds. The only difference between the two variants have been quantitative. The effect of different hydrated ions for puffiness process was due to their effect of them for activity of water molecules and their water storage capabilities. Because of small size and high electrical load density of positive hydrated ions delayed the sprouting and puffiness process in seeds due to retaining water molecules more tightly, and reducing their flow and activity on the contrary, because of big size and low electrical load density of negative hydrated ions due to increasing water flow puffiness process was more rapid compared to control. The results have been obtained from salts containing different hydrated ions were a bit different. In this case, puffiness of seeds depends on the radius of ions effected, depends on their size. Indicators of pea seeds in each case were higher compared to wheat seeds. It can be related to big size and protein-richness of pea seeds. Proteins are organic substances with the highest hydration capacity and are subject to permutoid and micellar hydration.

Keywords:hydrated ions, hydration, puffiness, germination

Usage of Bacteria and Their Metabolites in Seafood Processing Technology

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Aim of the study: Nowadays seafood is known to be one of the strongest element of healthy diet. Quality of the nutrients it contains are frequently revealed by scientific researches. However, this tasty and health product is kind of food, which are difficult to prolong quality and shelf life. For this reason, many technics are being studied for this valuable product to reach to consumers with its best quality. Usage of microbiological metabolites as food preservatives is one of fields studied in recent years. This review will focus on microorganisms and their metabolites, are used for food purposive, and their applications in fish processing.

Material and Methods: Comprehensive literature search was conducted on the impact of microorganisms on quality of fish and shelf life. Databases such as ScienceDirect, Scopus and PubMed etc. are used. The data of the last 5 years have been examined and relevant research articles, reviews, books and book chapters have been evaluated.

Results: The recent literature on the usage of microorganisms and their metabolites in fisheries technology has been searched and the important developments recorded up to the day are presented collectively.

Keywords: Fisheries, bacteriocins, nisin, LAB

Areal Types of Representative of *Fabaceae* Lindl. Family Spread on Steppe Plateau of Azerbaijan

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Aim of the study: Species of *Fabaceae* family based spread on summer pasture of Steppe plateau of Azerbaijan covers 6 areal types. Xerophyte areal types includes from 72 species – 26 (36,11%). Second areal type for species number includes 18 species (25,0%), third place takes boreal areal types – 13 species (18,05%). Other areal types are represented by few number of species. So, Caucasian areal type - 8 species (11.1%), ancient (third round) - 1 species (0.72%). Areal types of 5 (6.9%) species of legume forage crops spread on summer pastures have not been defined.

Material and Methods: The research was carried out in 2015-2017 years. Relevant amendments to repetitions and inaccuracies in the names of taxa in V Volumes of Caucasus and Azerbaijan Flora have been given on the based of III Volume of “Conspects of Caucasian Flora” («Конспект флоры Кавказа» in russian version). Field studies have been conducted stationary and semi-stationary on the basis of scientific errand and expeditions, phenological observations. For analyses fodder legume plants on summer pasture of Stepe plateau used materials of scientificaly works of famous scientist-geobotanics. Also for the geographical study of the species used arela classifications of Brown-Blanquetin, M.Q.Popov, N.N.Portenier.

Results: Geographical areal and elements of legume plants have been analysed and determined on the results of our researches and on the base of literature resources. Spread plant areals on Earth are very diverse. Major geographycal elements (the Mediterranean, Iran, Asia Minor, Asia, Atropatan and etc.) of species of *Fabaceae* Lindl. family and their divided into small elements have been identified. Genetic and historical analyses of geographical elements of flora will enable from where, how, by which ways and when plants came on this territory. Combination species in groups according to their geographic location of the areal types consist their geographical elements. Forage legumes on summer pastures of Stepe plateau covers 6 areal types became obvious from spent researches. Xerophyte areal type combines many of the species. Second areal type for species number includes 18 species (25,0%), third place takes boreal areal types – 13 species (18,05%). Other areal types are represented by few number of species. So, Caucasian areal type - 8 species (11.1%), ancient (third round) - 1 species (0.72%). Areal types of 5 (6.9%) species of legume forage crops spread on summer pastures have not been defined, from them 2 species are belonging to *Astragal* genus (*Astragalus euoplus* Trautv, *Astragalus falcatus* Lam.).

Keywords: *Fabaceae* Lindl., Steppe plateau, areal types

Assesment of Vegetation Mosaic and Alpine Landscape at a National Park from Eastern Mediterranean

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Aim of the study: Uludağ is the highest mountain in the Marmara region including Thrace and Northwest side of Anatolian peninsula. The climate of the mountain changes with elevation and causes high “biological diversity”. Due to its altitude (2543 m) and various geological conditions, this mount is endowed with a rich flora containing numerous species and forming several well-distinguished vegetation types. But intensive anthropogenic pressures resulted from winter sport and recreational activities threat the alpine belt of Uludağ Mountain. In this study, we aimed to map the vegetation mosaic of the area about 3000 hectare on which the different activities were planned.

Material and Methods: Black-white aerial photographs (24X24 cm) were taken by plane with 1/ 10 000 scale by General Command of Mapping of the Turkish Republic in August 1992. The longitudinal overlapping of the photographs is 60-90% and latitudinal overlapping is 30%. These photographs were digitized by orthophotography technique in the mapping laboratories of the General Command of Mapping of the Turkish Republic, Ankara. 20 sections representing the whole investigation area were drawn with 1/ 2500-scale according to stereoscopic method. Geographic entities such as rivers, roads, buildings, borders of plant communities, contours etc. which described as “coverage” in GIS were drawn on the sections. Before the performing of GIS and preparing the maps (sections with 1/ 2500-scale), field studies had done by the controlling the borders of plant communities on the investigation site. Areas of 200 square meters and larger were marked on the maps. Outcome maps of vegetation types represented by different plant communities were performed with 1 / 35 500 scales.

Results: In this study, the vegetation mosaic of Uludağ National Park in 1993 was mapped by based on plant communities. Our results suggest that the vegetation mosaic of Uludağ National Park is composed of plant communities which are typical communities of alpine and sub-alpine belts of high mountains. In addition to monitoring the vegetation mosaic and assessing land-use impacts, the results of this study showed that aerial photographs and GIS techniques are important tools for the mapping the vegetation mosaic using plant communities. These vegetation maps can be used as floral database in order to monitor the changes and to set suitable plans and national park management principles in this area in the future.

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Keywords: Vegetation mosaic maps, GIS techniques, Aerial photographs, Uludağ National Park, Turkey

Closing the Distribution Gap of *Lobotes surinamensis* in the Aegean Sea by Citizen Science

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Aim of the study: The present study aims to report occurrence of the thermophilic non-native fish species, *Lobotes surinamensis*, in the Aegean Sea. in cooperation with citizen science.

Material and Methods: On 13 December 2016, a single specimen of *L. surinamensis* was caught by hard-line, at a depth of 80 m on a sandy-mud bottom from close to Tuzla Bight (36.5553° N, 28.0200° E), SE Aegean Sea. Fishermen declared that the specimen approximated 35-40 cm in total length and 1.5-2.0 kg in weight. The specimen was released by fishermen in case it could be dangerous. However, they provided species information as video for, Muğla Sıtkı Koçman University, Faculty of Fisheries. The video was uploaded as an electronic reference and can be viewed online at <https://youtu.be/2xToua9Cj4Y>

Results: Increment in existence of *L. surinamensis* confirms that Aegean Sea changes into hotspot because of faunistic connection between Aegean Sea and Atlantic, as well as Red Sea. This finding revealed that further research to determine and monitoring of a non-native species are required.

Acknowledgements: We would like to thank the Şan Yüçetürün and Ziya Terzioğlu for providing sample.

Keywords: *L. surinamensis*, non-native fish, Aegean Sea

Floristic and Biodiversity of Asteraceae Weeds of Cereals in Algeria

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Aim of the study: The main purpose of this study is to present the floristic and biological characteristics of Asteraceae weeds of cereals in Algeria. For each species, we have determined its biological type, its chorology, its economic interest and the ecosystem services it underpins.

Material and Methods: Asteraceae species in cereal fields were surveyed by stratified sampling. In each field the level of infestation was scored, for each species we noted index of abundance - dominance (+ to 5) according to the scale of Braun-Blanquet (Guinochet, 1973), and the frequency was calculated. Species were identified following the « Nouvelle flore d'Algérie » (Quezel & Santa, 1962-63).

Results: The synthetic analysis of the floristic surveys shows the dominance of Asteraceae family, it is represented by 23 species, belonging into 20 genera. Santa and Quezel (1963) consider it to be the most important botanical family in Algeria, since it contains 408 species which are divided into 109 genera. The biological type for all listed species shows that annuals dominate, nearly 90%. This high annual rate indicates crop habitats often disturbed by agronomic interventions. Most micro-thermal or micro-eurythermal are winter annuals that cycle through very quickly, taking advantage of autumn and winter rains to germinate. The most abundant and frequent Asteraceae species were *Sinapis arvensis* L., *Calendula arvensis* L., *Anacyclus clavatus* Desf., *Scandix pecten-veneris* L., *Cichorium intybus* L., *Scolymus hispanicus* L. and *Sonchus oleraceus* L.. Among the less frequent species, we quote: *Carduncellus pinnatus* (Desf.) DC., *Lactuca scariola* L., *Centaurea acaulis* L. and *Midicago hispida* Gaertn. The Chorological spectra show the importance of cosmopolitan element and influence of Euro-Asian species. Some of this Asteraceae species are medicinal, aromatic or melliferous plants; it is a reservoir of genes, very important for the improvement of plants and biotechnological processes.

Keywords: Asteraceae, floristic, biodiversity, cereal fields, Algeria.

10-Year Observation of Alien Mysids and Amphipods in Belarus

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Aim of the study: Analysis of own and published data for 10-year monitoring of alien mysids and amphipods and updating of recently published data.

Material and Methods: Alien mysids and amphipods have been studying in Belarus since 2006. All the sampling sites were located in public and non-protected areas. No permissions were required for sampling. Samples were taken by hand net (mesh size: 500µm, diameter: 25×25cm) and/or picked by hand from submerged macrophytes, stones, wood and other natural or artificial items floating or submerged in the water. Crustaceans were fixed by 98% ethanol. The specimens were identified based on Căraușu et al. (1955), Morduchai-Boltovskoy (1969) and Dobson (2013). Laboratory operations were conducted at the Canadian Centre for DNA Barcoding (CCDB), University of Guelph. DNA was extracted from whole legs of 380 crustaceans using an automated silica-based protocol with glass fibre filtration plates (Ivanova et al., 2006). The 658-bp barcode region of the mitochondrial cytochrome c oxidase subunit 1(CO1) gene was amplified by Lepidoptera and Folmer primer cocktail (C_LepFolF / C_LepFolR, 1:1) and crustacean primer CrustDF1 / CrustDR1. The polymerase chain reaction (PCR) was performed in 12.5 µL volume containing 6.25µL 10% trehalose, 2µL ddH₂O, 1.25µL 10× PCR buffer, 0.625µL MgCl₂ (50 mM), 0.125µL of each primer (10µM), 0.0625µL dNTPs (10 mM), 0.06µL Platinum Taq polymerase (5 U/µL) and 2µL DNA template. The thermocycling regime used for all reactions was: initial denaturation at 94°C for 1 min, 5 cycles of 94°C for 40 s, 45°C for 40 s and 72°C for 1 min, followed by 35 cycles of 94°C for 40 s, 51°C for 40 s and 72°C for 1 min, and a final step of 72°C for 5 min. Bidirectional sequencing followed CCDB sequencing protocols using BigDye 3.1 (Ivanova & Grainger, 2007).

Results: The revision of publications during 10 years of observation alien mysids and amphipods was done. Some details of records and distribution of alien species were corrected. Nowadays, two species of Ponto-Caspian mysids and nine species of Ponto-Caspian amphipods are known to have established in the water bodies of Belarus. The main hotspot of alien mysids and amphipods in Belarus is the Dnieper River near Niznie Zhary vill., where eleven alien species were recorded. The new records of *Echinogammarus trichiaus*, *Chelicorophium curvispinum*, *Ch. robustum* and *Paramysis lacustris* were pointed out in Belarus. The upper sites of alien mysids and aphipods distribution were revealed in the main waterways in Belarus. DNA sequences were obtained from nine alien amphipods and alien mysid *Limnomysis benedeni*. Identification of *E. trichiatus* was proved by DNA barcoding.

Acknowledgements: This study has been partially completed during the Global Taxonomy Initiative Training Course on rapid identification of invasive alien species for achieving Aichi Biodiversity Target 9 using DNA barcoding techniques and methodologies, that was supported by the Secretariat of the Convention on Biological Diversity and the Japan Biodiversity Fund. Authors would like to express the deepest appreciation Aliaksei Mileika and Tatsiana Rybkina for their help in the material collecting.

Keywords: Alien mysids and amphipods, monitoring, barcoding, Belarus.

Fish of Artificial Waterbodies in Transcarpathia (Ukraine)Myroslav MARKOVYCH¹, Yuliya KUTSOKON²¹Department of Human Anatomy and Histology, Uzhgorod National University, Ukraine²Department of Animal Monitoring and Conservation, I.I. Schmalhausen Institute of Zoology
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Aim of the study: Transcarpathia is a special region of Ukraine; mostly belong to the water basin of the Danube. There are many artificial waterbodies, which include canals and ponds. However, the fish population of these waters is practically unexplored.

Material and Methods: Field researches were conducted in July 2015. Fish were sampled by trawl, 8 m long, 0,5 cm in cell diameter. Total were studied 6 locations, four channels and one pond in plain part of Transcarpathia: near Barkasovo village (48,37N 22,51E), Dragynia village (48,45N 22,44E), Pidgorb village (48,54N 22,35E), Tisauifalu village (48,41N 22,27E), Perekhrestia village (48,13N 22,85E). River Mala Latorytsa near Dragynia village (48,46N 22,45E) was investigated too. Totally were caught 1108 specimen of 15 species including 5 alien and 10 native species. Almost of studied waterbodies were muddy, the water temperature as in July ranged from 24 to 31 °C, mostly with no running water (except river), low transparency and depth 1-1.5 m. The concentration of oxygen was lowest in the pond near the village Pidgorb and was only 2 mg/l, in the channels 5-8 mg/l, and in the river – 11 mg/l.

Results: Among the total number of specimen 55% is native fish and 45% - alien. In various waterbodies percentage of native and alien component is significantly different. So, in the River Mala Latoritsa from 79 individuals of 7 species were no any alien. Obviously favorable conditions for native species were provided with fast current and high oxygen content in the water. Such conditions are typical for the rivers of Transcarpathia. In the other hand, alien species live mainly in stagnant waters or in waters with little current. In the channel near the village Barkasovo was investigated two localities, conditions are much different. The surface of the first was covered with aquatic vegetation by about 95%. There were caught 63 individuals of four species. Of these, only one species was alien, but it was 81% of all surveyed individuals. Another locality surface was covered with aquatic vegetation only 15%. Of the 83 individuals of 7 species caught only 27% of individuals belonging to three alien species, and 73% were aboriginal. In the channel near Dragynia were 365 individuals of 7 species, 60% of the catch belong to the native component that is represented by three species. Pond near the village Pidgorb was the drying with significant rates of nitrites and nitrates in the water, and low levels of oxygen concentration. Among the 345 individuals of 10 species are belonging to 42% of four alien species. Thus 52% of the catches were *Cobitis elongatoides* Băcescu & R. Mayer, 1969, and 32% - *Ameiurus melas* (Rafinesque, 1820). In the channel near Perekhrestia were caught 173 individuals of 9 species, 78% of which belong to 5 alien species. It was found a total of five alien species: *Perccottus glenii* Dybowski, 1877, *Lepomis gibbosus* (Linnaeus, 1758), *Ameiurus melas* (Rafinesque, 1820), *Pseudorasbora parva* (Temminck & Schlegel, 1846), *Carassius auratus* (Linnaeus, 1758). Thus, artificial waterbodies in Transcarpathia are favorable for further invasions of alien fish species.

Keywords: Transcarpathia, artificial waterbodies, alien fishes, native fishes, Ukraine

Occurrence of the Invasive Blue Crab *Callinectes sapidus* Rathbun, 1896 (Crustacea: Portunidae) in the Adriatic Sea in Croatia

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Aim of the study: The blue crab, *Callinectes sapidus* Rathbun, 1896 is euryhaline and eurythermal invasive species in Europe. It has widely invaded European Atlantic coasts and several areas of the Mediterranean, probably brought by ballast waters; yet, it shows an unstable and unpredictable scenario across the Croatian coast. To understand its current invasion status, this study investigated population trends along the Croatian coast over the past 15 years in order to estimate whether its occurrence is of established populations or just provisional.

Material and Methods: Data were obtained from the scientific literature, private communications and direct contacts with fishermen along the Croatian coast.

Results: After the first record (Neretva River delta, 2004), it has been periodically, but rarely recorded across different regions of Croatian coast. Based on personal communications with the fishermen, population in the Neretva River delta showed unstable trend intervals followed by rapid colonization and dispersal. There has increased since the first record (2004-2006), then decreased (2006-2008), raised again (2008-2010), and thereafter decreased (2011-2014). During abundant phase, local fishermen reports catches of 40-50 specimens in gillnet per night during July-September, with impact on both biodiversity and socioeconomics, as they decrease population of *Carcinus aestuarii* and tear fishermen nets and damage the caught fish. Periodical high abundance and catch frequency, the occurrence of ovigerous females and juveniles, indicate evidence of an established population. However, other records were in distant areas and only anecdotal, making way of spreading fairly unclear. The present state along the Croatian coast, however, do not allow reliable comments to be made regarding whether or not it has established population elsewhere out of the Neretva River delta. Further monitoring of this population and the potential dispersal would be of interest, in order to provide better information on its population structure and dynamics in Adriatic waters along the Croatian coast.

Acknowledgements: This work has been partially supported by Croatian Science Foundation under the project IP-2016-06-5251 (LEK-FishRes-CRO).

Keywords: invasive crab, Croatian Adriatic coast, ecological impact, established populations, dispersal.

The Flora Biodiversity of Ravines of the Shamkir river Basin

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Aim of the study: Ravines are common for the most natural geographic areas the north eastern of the Little Caucasus. The ravines are formed as a result of linear erosion and human economic activity. This process involves extensive areas. Therefore, identification of ravines, species composition, use effective and restoration are the actual problems for the development of measure. In this regard, the main of the work is the detection of the ravines of Shamkir region, flora biodiversity of the ravines, the study of species composition and reproduction, the features of Sinantropization processes of various sintaksons of ravine vegetation and evaluation of the intensity; the classification of vegetation ravine; Effective use for the protection of biodiversity vegetative ravine consists of the action plan and restoration.

Materials and methods: There was used itinerary and stasionar methods for the research. At the same time there was used areoloji, ecological, systematic methods. The object of research is the vegetation ravines system of the basin of the Shamkir river. It was obvious that, there are erosion forms which differ from each other in the different slopes throughout the basin of the Shamkir river. The small temporary streams are formed in the slopes as a result of snow and rain. As a result leaner erosion and relief comes down the ravine is formed. As a result of fragmentation of elements and less precipitation of atmosphere rainfalls the climate adapts to this. Vegetation is disappearing as a result of the formation of ravines. At the same time the forms of ravines depend on space of relief. The ravines form different periods are differ sharp to the according to the characteristics. The ravines of the Pleistosen period are attributed to the ravines which there are enough humidity, less heat and less vegetation. The main factor of Pleosten ravines is multi year freezes and indoor vegetation. Perennial frozen air is a cause form of indoor plants. Holocen espurs related to the development of indoor vegetation. This kind of ravines is not size of pleostonravines.

Results: The less development, pearshaped river basins are dominated in the area of the research. The characteristic single-storey ravines are typical for the convex and convex concave denudation relief. There is intense forms of erosion in the watershed basins. They arise as a result of the temporary river flows. These forms differ with their morphology, appearance and the dynamics. The characteristic ravines depth is 22-23 m, width is 12 m in the basin of the Shamkir river. In some cases, ravines are formed in the 3-40 gradient of slope. These ravines form freelance girdle. The natural regeneration of the vegetation goes very low levels in the ravines. During the first year of afforest the sufficiency humidity is cover all the vegetation period in the ravines. In subsequent years, from the starting the second phase of summer, the required humidity of the plant is less than 80-100 cm. In the first year of the afforest, in all parts of the ravines have been observed high germination. In later years, relatively becomes weaker. Restoration with seed is less effective. Only in the favorable years satisfactory results were obtained in the shady parts of the slopes. Restoration of the ravines white acacia, elm, ash, oak, hawthorn, maple, hips give the best results. It is advisable to use of birch, poplar and ash-tree especially in the northern slopes. In terms of economic and forestry it is important the selection of afforest technology of ravines.

Keywords: ravine, vegetation, flora, plants, anthropogenic.

Determination of Heavy Metal Pollution of Muratlı Districts Soils in Tekirdağ Province with Geostatistical Modeling Methods

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Aim of the study: Heavy metal pollution is a very important problem for Trakya region and world soils. In this research was investigated cadmium, chrome, cobalt, lead and nickel pollution of Muratlı districts and maps of heavy metal agricultural soils. Identify the areas where the phytoremediation will take place with this study.

Material and Methods: For this purpose, 50 different agricultural areas for each district and total 50 soil samples were taken from 0-30 cm depth and research area soils in Tekirdağ province. Extractable cadmium, chrome, cobalt, lead and nickel concentration of soil samples were determined with ICP- OES instrument. Analysis results were compared with critical values of these heavy metals concentrations. The study will be made by using the geostatistical modeling package program ArcGIS 10.2. software. In this software has Inverse Distance Weight (IDW) and Kriging methods and they will be applied. 40 point as a observation point, and 10 point as a control total will be taken 50 sampling points. The most appropriate method to work field variables, and will be determined and provided with all area interpolated. Each will be produced separately for maps of heavy metal and heavy metal levels in the region's surface soil analysis results will be supported in the visualition with maps to be made. Some heavy metal pollution was obtained in research area soils.

Results: Heavy metal pollution map was done in this research according to the heavy metal concentrations of the soil samples with geostatistical modeling methods. Consequently, it should be recommended phytoremediation method applications in the research area soils for the improvement of heavy metal pollution.

Acknowledgements: The authors thank Namık Kemal University, Scientific Research Project Funding for their financial support.

Keywords: Soil pollution, heavy metal, Geostatistical Modeling Methods.

Effect of Microbial Consortium on Diesel Oil BiodegradationCaner VURAL¹, Cansu VURAL¹, Tuğba TOPBAŞ¹, Güven ÖZDEMİR¹¹Basic and Industrial Microbiology Section, Dept. of Biology, Ege University, Izmir, TURKEY.
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Aim of the study: Diesel oils or lubricants are derived from crude oil which are used in diesel cars and light commercial vehicle engines. Fuel-borne many environmental issues are constituted about these oils and diesel oils can be considered as non-negligible environmental pollutants. Microbial consortia can play a significant role for degradation of petroleum hydrocarbons. Screening of new microbial degraders on specific hydrocarbons provides new perspectives for removal of hydrocarbons which have several hazards to environment. In this study, we aimed to determine of effects of microbial consortia on diesel oil degradation.

Material and Methods: Crude oil samples were collected from petrochemical industry for selection of active microbial consortium. In order to perform widely screening; *n*-tridecane, *n*-tetradecane, *n*-hexadecane, sunflower seed oil and olive oil were used as a sole carbon and energy source in culture media. Each carbon source was added to flasks with sterilized 50 ml Bushnell Haas medium (added 0.025% yeast extract). Rotary incubator was set to 200 rpm and incubations were performed at 30°C in dark conditions. At the end of incubation period, one flask named as CT-1 was selected. Diesel oil 15W40 is characterized as mineral oil was purchased commercially. Degradation assay was carried out in 50 ml BHY medium added 0.15g and 0.075g diesel oil 15W40. Flasks were incubated at 30°C in rotary shaker at 200 rpm for 21 days. Analytical analyses were performed with Gas Chromatograph. Analyses of diesel oil composition were carried out to determine remaining diesel oil from total amount. Three microbial isolates (CT1-1, CT1-2 and CT1-3) were obtained as consortium members and isolates were evaluated in gram reactions, catalase, oxidase and KOH assays. Lipase and protease activities were screened additionally. Genomic DNA isolations were carried out and molecular biological analyses were performed to identify successful isolates.

Results: CT-1 flask has showed successful degradative activity. GC analyses have showed that degradation rate of diesel oil 15W40 is 93% with CT-1 consortium in 21 days. As members of CT-1 consortium; CT1-1, CT1-2 and CT1-3 were identified as *Citrobacter sp.* (99%), *Pseudomonas japonica* (100%) and *Bacillus sp.* respectively. These isolates can be considered as new microorganisms for diesel oil biodegradation.

Keywords: Biodegradation, diesel oil, microbial consortium.

Effects of the Various Doses of Vermicompost Implementation on Some Heavy Metal Contents (Cr, Co, Cd, Ni, Pb) of Cucumber (*Cucumis sativus* L.)

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Aim of the study: In this study, the effects of the increasing doses of vermicompost implementation [0 % (VC1), 3 % (VC2), 5 % (VC3), 7 % (VC4)] on some heavy metal contents of cucumber (*Cucumis sativus* L. have been investigated.

Material and Methods: The test is conducted under greenhouse conditions as a viol test, and organized according to the randomized parcel design with 3 replicates. The vegetable seeds which have been used for the experiment were obtained from a special company. Testing plants are harvested on the 40th day after planting, and necessary analyses are completed. The heavy metal contents were determined in ICP-OES device (Kacar and İnal, 2010).

Results: With the increasing doses of vermicompost [0 % (VC1), 3 % (VC2), 5 % (VC3), 7 % (VC4)] implementation, Cr, Co, Cd, Ni and Pb contents of cucumber decreased. While the Cr content of cucumber is 65.94 mg/kg with the implementation of VC₁ (control) dose, it decreases to 20.58 mg/kg with VC₄ dose. The plant's Co, Cd, Ni and Pb contents decreases with the increasing doses of vermicompost implementation, as well, and, VC₁ and VC₄ doses of vermicompost are determined as 7.66- 2.09, 1.05-0.71, 47.93- 14.57 and 15.68- 5.01 mg/kg respectively. These results revealed that vermicompost can be used as a fertilization program to protect the plant's quality and to eliminate its heavy metal contents. On the other hand, the use of organic fertilizers such as vermicompost should be extended for the maintenance of soil productivity.

Keywords: heavy metal, vermicompost, *Cucumis sativus* L.

Heavy Metal Accumulation in Kidney of wild *Microtus guentheri* (Danford and Alston 1880) from The Korkuteli-Antalya, Turkey

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Aim of the study: The objective of this study was to determine the concentrations of eighteen heavy metals (Fe, Al, Zn, Cu, Mn, Cr, Sr, Se, Mo, Ni, Sn, Pb, Ba, Co, V, As, Cd and Tl) in kidney from wild rodent *Microtus guentheri* from natural region which is near mine and stone quarry activities in Korkuteli-Antalya. It's well known that specific metals mainly accumulate in particular organs (for example, cadmium accumulates in kidney). This study is first record for heavy metal accumulation in kidney tissue for this species at this region. Heavy metal accumulation levels of kidney in *Microtus guentheri* can be used as monitor for environmental metal pollution.

Material and Methods: We worked with kidney samples of six voles specimens from one season (2016, spring) collected by means of Sherman traps, in Korkuteli-Antalya. Captured specimens were killed by cervical dislocation and kidneys were immediately removed, weighed and frozen at -40 °C prior to chemical analyses in polystyrene tubes. Kidney samples were removed from deep freeze and then allowed to dissolve for a period of time at room temperature. Kidney samples were set at 80-105 °C until completely dry and fixed weight. Also, microwave method was applied for the digestion products of samples. Samples homogenized by milling prior to analyses. Acid microwave digestion was carried out in a Berghof speedwave MWS-2 microwave. From each tissue, 0.5 g homogenates were placed in a teflon digestion vessel with mix: 8 mL 65% nitric acid (HNO₃) and 2 mL 30% hydrogen peroxide (H₂O₂). After digestion the samples were cooled to room temperature and diluted with ultra-pure water. Then, samples were analysed by Inductively Coupled Plasma-Optical Emission Spectrometer (ICP-EOS) For control purposes, the same procedures were carried out for a blind sample on the same conditions. The concentrations of heavy metals were expressed for the kidney samples as milligrams per kilogram (ppm) for dry weight.

Results: From the final data, descriptive statistical characteristics were calculated (mean, standard error) for kidney tissues of *M. guentheri*. The mean concentrations of the metals accumulated in kidney samples of *M. guentheri* as follows (M±Se, n=6): Fe: 579.92±46.50, Al: 247.93±68.96, Zn: 101.41±7.12, Cu: 22.24±1.22, Mn: 12.16±1.49, Cr: 8.61±1.88, Sr: 4.08±1.13, Se: 3.60±0.32, Mo: 2.16±0.22, Ni: 1.19±0.21, Sn: 0.79±0.18, Pb: 0.79±0.13, Ba: 0.67±0.20, Co: 0.55±0.06, V: 0.49±0.05, As: 0.29±0.04, Cd: 0.22±0.05, Tl: 0.03±0.005 ppm. The order of mean concentration of the heavy metals in samples was Fe>Al>Zn>Cu>Mn>Cr>Sr>Se>Mo>Ni>Sn>Pb>Ba>Co>V>As>Cd>Tl. According to this data; The toxic heavy metal pollution began at the vicinity of Korkuteli. Case, is thought to be due to mine sources, like marble and stone quarries and maybe agricultural activities.

Acknowledgements: This study supported by Akdeniz University Scientific Research Projects Coordination Unit with FDK-2016-1421 project number.

Keywords: Heavy metal accumulation, *Microtus guentheri*, kidney, ecotoxicology, biomonitor

Heavy Metal Accumulation in Muscle Tissue of Wild *Microtus guentheri* (Danford and Alston 1880) from The Korkuteli-Antalya, Turkey

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Aim of the study: Different sources, including mining activities are polluting the environment by heavy metal release. The objective of this study was to determine the concentrations of seventeen heavy metals (Fe, Al, Zn, Cu, Cr, Mn, Sr, Ni, Ba, Se, V, Sn, Pb, As, Co, Mo and Cd) in muscle from wild rodent *Microtus guentheri* from natural region which is near mine and stone quarry activities in Korkuteli-Antalya. Prior to this study there was no information available on the heavy metal accumulation in muscle tissue for this species at this region. It's important to determine the heavy metal accumulation levels of muscle in *Microtus guentheri* as biomonitor.

Material and Methods: We worked with muscle samples of six voles specimens from one season (2016, spring) collected by means of Sherman traps, in Korkuteli-Antalya. Captured specimens were killed by cervical dislocation and muscles were immediately removed, weighed and frozen at -40 °C prior to chemical analyses in polystyrene tubes. Muscle samples were removed from deep freeze and then allowed to dissolve for a period of time at room temperature. Muscle samples were set at 80-105 °C until completely dry and fixed weight. Also, microwave method was applied for the digestion produce of samples. Samples homogenized by milling prior to analyses. Acid microwave digestion was carried out in a Berghof speedwave MWS-2 microwave. From each tissue, 0.5 g homogenates were placed in a teflon digestion vessel with mix: 8 mL 65% nitric acid (HNO₃) and 2 mL 30% hydrogen peroxide (H₂O₂). After digestion the samples were cooled to room temperature and diluted with ultra-pure water. Then, samples were analysed by Inductively Coupled Plasma-Optical Emission Spectrometer (ICP-EOS) For control purposes, the same procedures were carried out for a blind sample on the same conditions. The concentrations of heavy metals were expressed for the muscle samples as milligrams per kilogram (ppm) for dry weight.

Results: From the final data, descriptive statistical characteristics were calculated (mean, standard error) for muscle tissues of *M. guentheri*. The mean concentrations of the metals accumulated in muscle samples of *M. guentheri* as follows (M±Se, n=6): Fe: 268.58±54.14, Al: 226.82±97.45, Zn: 67.60±9.11, Cu: 8.56±0.12, Cr: 7.19±1.43, Mn: 5.97±1.42, Sr: 2.73±0.46, Ni: 1.27±0.49, Ba: 0.96±0.22, Se: 0.54±0.05, V: 0.52±0.17, Sn: 0.46±0.11, Pb: 0.36±0.08, As: 0.23±0.06, Co: 0.21±0.08, Mo: 0.17±0.03, Cd: 0.001±0.0008 ppm. The order of mean concentration of the heavy metals in samples was Fe>Al>Zn>Cu>Cr>Mn>Sr>Ni>Ba>Se>V>Sn>Pb>As>Co>Mo>Cd. According to this data; The toxic heavy metal pollution began at the vicinity of Korkuteli. Case, is thought to be due to mine sources, like marble and stone quarries and maybe agricultural activities.

Acknowledgements: This study supported by Akdeniz University Scientific Research Projects Coordination Unit with FDK-2016-1421 project number.

Keywords: Heavy metal accumulation, *Microtus guentheri*, ecotoxicology, muscle, biomonitor

Kinetic Studies of Bioremediation of Hydrocarbon Contaminated Soil

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Aim of the Study: In this study, the removal of Total Petroleum Hydrocarbons from contaminating soil with crude oil obtained from Southeastern Anatolia was investigated and to determine the kinetics of biodegradation of Total Petroleum Hydrocarbons in soil was determined. For this purpose soil which contain "*indigenous soil microorganisms* and "*Aspergillus niger*" were used as biodegradation media.

Material and Methods: The bioremediation of petroleum contaminated soil obtained from Southeast Anatolia of Turkey was investigated using indigenous microbial population and fungus *Aspergillus niger*. The experiments were conducted at 300 °C with various periods, without pH correction (original pH 5.0). At the beginning and at the end of those periods, the samples of soil taken from the media were analyzed in accordance to the Environmental Protection Agency (EPA) analytic techniques. It was determined that removal of Total Petroleum Hydrocarbons in the soil using "indigenous *soil microorganisms* fungus and "*Aspergillus niger*" was good achieved in those incubation periods. Total Petroleum Hydrocarbons removal efficiency was also calculated from soil polluted with crude oil.

Results: The kinetics of Total Petroleum Hydrocarbons removal was evaluated by the integral method, using zero-order, first-order and second-order, integrated kinetics model for the experimental media. By graphical methods zero-order, first-order and second-order, kinetic parameters were calculated. The conformity between experimental data and the kinetic model was expressed by the correlation coefficient R^2 ; the model that successfully describes the kinetics of the Total Petroleum Hydrocarbons removal is the one that has the highest R^2 value. The observed rate coefficients were deduced from the equation with highest R^2 . The regression equations and R^2 values for the three integrated kinetic models, calculated. The degradation rate of hydrocarbons by these methods is dependent on the type of contaminants, metabolic capabilities of the indigenous microbial population, and also on predominant environmental factors.

Acknowledgements: Author would like to thank the Environmental Engineering Department of Ondokuz Mayıs University where this work was done.

Keywords: Petroleum Hydrocarbons, bioremediation, contaminated soil.

Agricultural Waste: Rice Bran as a Carbon Source

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Aim of the study: While industrial raw materials are processed according to a specific purpose, unused materials are arise as waste. In recent years, interest in revaluation of waste materials has increased even more. One of these products is rice bran, which is a by-product of the rice milling industry. In spite of its high potential as a raw material it is currently under-utilized. This study was conducted to carry out enzymatic hydrolysis of rice bran and determine its potential use as carbon source for fermentation studies.

Material and Methods: In the first step, rice bran oil was removed by hexane extraction and dried in the oven maintained at 70°C for 6 h. Enzymatic hydrolysis was carried out for the highest productivity of glucose production using the enzymes and the raw material in an optimum manner. Rice bran was enzymatically solubilized with shaking at 60°C at pH 5.50 for 48 h. Termamyl 120 L (120 KNU/g), hemicellulase from *Aspergillus niger* (≥5 units/mg), cellulase from *Aspergillus niger* (~0.8 U/mg) and AMG 300L (300 AGU/ml) were used. Glucose in the resulting filtrate was determined by Luff Scroll method.

Results: The glucose content was determined as minimum 22±3.11g/L and maximum 27.65±2.40 g/L (at 10% waste concentration). Rice bran has a high potential as carbon source in biotechnological applications.

Acknowledgements: This research has been supported as a AR-GE project (TAGEM/AR-GE-16/41) by TAGEM (General Directorate of Agricultural Research and Policies).

Keywords: rice bran, carbon source, enzymatic hydrolysis

Assesment of Luteolin Genotoxicity and Antigenotoxicity Using Sister Chromatid Exchange Assay *In vitro*

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Aim of the study: There are many different plants that are used for food and medicine in the world. This plant biodiversity is the basis of human health because plants have different phytochemicals. The flavonoid luteolin, a natural antioxidant phytochemical, is present in many green vegetables such as artichoke, broccoli, cabbage, cauliflower, celery, green pepper, and spinach. Luteolin exhibits a wide range of pharmacological properties including anti-oxidant, anti-inflammatory, and anti-cancer etc. The present study was planned for evaluation of potential *in vitro* genotoxic and antigenotoxic effect of luteolin against mitomycin-C (MMC) by using sister chromatid exchange (SCE) assay in human peripheral lymphocytes.

Material and Methods: Peripheral blood was obtained from two healthy volunteers (1 male and 1 female). Whole blood was added to 2.5 ml Chromosome Medium B supplemented with 10 µg/mL bromodeoxyuridine (BrDU), an analog of thymine base. Lymphocytes were incubated with various concentrations of luteolin (0.39, 0.78, 1.56, 3.12, and 6.25 µg/mL) alone and simultaneously with MMC (0.20 µg/mL) for 24 and 48 h. A negative (sterilized distilled water), a solvent (50% methanol) and a positive control (MMC, 0.20 µg/mL) were also maintained. For the scoring of SCEs, 25 cells from each donor, a total of 50 cells per concentration under the second metaphases was scored blindly. Moreover, replication index (RI) and mitotic index (MI) were determined.

Results: Luteolin alone did not significantly change the number of SCEs/cell in all concentrations and treatment durations (24 h and 48 h) compared to negative and solvent controls. On the contrary, simultaneous treatment of luteolin and MMC decreased the number of SCEs/cell at both treatment periods compared to positive control. This reduction was significant at 1.56 µg/mL for 24 h and at the three highest concentrations (1.56, 3.25, and 6.25 µg/mL) for 48 h treatment compared to positive control. On the other hand, Replication index (RI), an indicator of cell cycle delay, was not affected by the luteolin treatments. The higher concentration (6.25 µg/mL) of Luteolin alone significantly declined mitotic index (MI), but all treatments (Luteolin+MMC) enhanced the reduction of MI induced by MMC. Our results suggested that luteolin can be used as an antigenotoxic agent against MMC induced SCE formation, especially at higher concentrations in longer treatment period.

Keywords: Luteolin, Genotoxicity, Antigenotoxicity, Sister chromatid exchange (SCE)

Biometric Analysis of Transgenic Plants of Spring Rape with *cyp11a1* Animal Origin Gene and Bacterial *bar*

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Aim of the study: In our study, we used a mitochondrial gene of the ox (bull) adrenal cortex *cyp11A1* encoding P450scc cytochrome. The experiments in the transformation of tobacco plants by *cyp11A1* gene show its effect on the growth, development and physiological and biochemical characteristics of plants. Therefore, transgenic plants with *cyp11A1* gene of P450scc cytochrome developed based on economically valuable cultures, such as spring rape (*Brassica napus* L. var. *oleifera* D.C.), are of great interest. Earlier, we developed transgenic plants of spring rape, bearing c-DNA of *cyp11A1* gene of P450scc cytochrome and the *bar* gene in their genome. The aim of the present research was to study the effect of *cyp11A1* gene on the genome of transgenic spring rape plants by biometric analysis of a number of morphological characters and productivity elements.

Material and methods: The object of research constituted 525 plants of spring rape in T₁-T₃ generations of eight transgenic lines (*Brassica napus* L. var. *oleifera* D.C.) developed based on the Magnat variety of the Belarusian selection. Transgenic rapeseed lines were developed as a result of *Agrobacterium*-mediated transformation using pCB093 vector carrying two genes: c-DNA gene *cyp11A1* and a *bar* gene. To study the effect of the gene *cyp11A1* on the growth and development of transgenic rapeseed plants resistant to Basta herbicide in T₁-T₃ generations, we selected a number of characters: the plant height, the length and the number of lateral shoots of the main brush, as well as elements of the yield structure -- the mass of 1000 seeds and the number of pods on the main brush. Statistical processing of the experimental data was carried out using a variational analysis; to determine the significance of differences, a two-sample Student's t-test was used. A correlation analysis was used to assess the relationship between the studied phenotypic characters.

Results: In our study, the effect of c-DNA of the mitochondrial gene *cyp11A1* of P450scc cytochrome of a bull (ox) on the plant genome was shown for the first time -- a stable increase in the mass of 1000 seeds in T₁-T₃ generations, as well as the parameters of the main brush (length, the number of pods and lateral shoots). The variation coefficient analysis for three years (T₁-T₃ generations) revealed that the most constant and the least variable characteristics are the plant height and the mass of 1000 seeds. The correlation analysis for the dependence of the mass of 1000 seeds on the remaining productivity elements showed a close positive correlation: $0,3 < r > 0,86$ for T₁ generation, $0,4 < r > 0,52$ for T₂ generation, $0,4 < r > 0,7$ for T₃ generation. Bn9/93/21 line had the highest values of correlation coefficients in generations by most characters. In addition, that line had the highest values of both architectonics characters and the yield structure elements in different generations, which may be due to the effect of the transcriptional activity of heterologous genes *cyp11A1* of P450scc cytochrome and the *bar* gene on the rape genome.

Keywords: *Brassica napus* var. *oleifera* D.C., transgenic plants, biometric analysis, *cyp11A1* gene of P450scc cytochrome, *bar* gene, PCR and RT-PCR

PP-213
Callusogenesis Study on *Thymus* spp.

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Aim of the study: To analyze and to regulate the process of essential oils formation, it is advisable to use biotechnological methods of *in vitro* culture. The study of the morphogenetic potential of various thyme species and its varieties will make it possible to select the optimal object for subsequent studies in the field of secondary synthesis regulation and its intensity increasing. Independence from external conditions and high efficiency of secondary metabolites production *in vitro* make this technology attractive for drug manufacturers. The aim of this work is to study the callusogenesis potential of various species and varieties of thyme.

Material and Methods: Internode and leaf segments of thyme were placed on the Murashige and Skoog nutrient medium (MS) with a different ratio of growth regulators of cytokinin's (BAP, kinetin) and auxin's (2,4-D, IAA) nature for the callusogenesis induction. The frequency of callus formation was considered. The resulting calli were transplanted to fresh nutrient medium regularly after 28-30 days. Explants were cultured at a 16-hour light day.

Results: As a result of the conducted studies it was established that during the cultivation of leaf and stem explants on most analyzed nutrient media, callusogenesis induction occurred already on the 10-14th day. Callus, derived from different types of thyme explants, had morphological differences. From the stem segments, a dense beige callus, sometimes with white areas, was formed. The callus tissue obtained from the leaf explants was also dense and green or light green with a beige areas. The morphological characteristics of the callus did not depend on the used nutrient medium modifications, except for the medium containing 2,4-D. In this case, from the stem and leaf explants, the formation of a watery, loose callus occurred, which easily decays into fragments. When cultivating the primary callus on the medium with a lower auxin concentration, a secondary callus was quickly formed. The transfer callus culture did not have morphological differences depending on the origin, or explant type. The callus tissue had a fairly dense structure, as a result of prolonged cultivation of callus on the medium, accumulation of phenols in callus tissues and medium was observed, after two weeks the callus and nutrient medium acquired a brown, sometimes dark brown color.

Keywords: *Thymus* L., Lamiaceae, thyme species, *in vitro* culture, morphogenesis, secondary metabolites

**Comparative Study of Phenolic Complex *in vitro* Cultures of Species
Linum Usitatissimum and *Linum grandiflorum***

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Aim of the study: Currently, a variety of varieties flax, finds application in many industries, pharmacology, food industry, as well as in the field of landscape and decorative planning and design. The regions of flax cultivation are susceptible to a number of abiotic, biotic, anthropogenic stressors, the resistance to which is determined by the presence of effective antioxidant systems represented in plants by both enzymatic and non-enzymatic antioxidants, to the group of which phenolic compounds also belong. Many aspects of the peculiarities of the phenolic complex of flax of various species have not been sufficiently studied and studies in this direction are of considerable interest in connection with the prospects for the integrated use of various species of this culture. *In vitro* cultures allow to reveal tendencies of accumulation of phenolic compounds also characteristic for intact plants, therefore, callus culture of flax as a convenient object of biotechnological research was the object of study.

Materials and methods: The object of the study was callus cultures of flax fiber (*Linum Usitatissimum*), flaxseed oil (*Linum Usitatissimum*) and flax ornamental (*Linum Grandiflorum*). For the production of callus tissue, hypocotyl segments isolated from sterile shoots were placed on the agarized Murashige-Skuga nutritional medium containing 2,4-D. Cultivation was carried out in the climatic chamber at a temperature of 25 °C, a relative air humidity of 70% and 16 hours. Photoperiod (light intensity 3 000 lux), within 30 days. Total content of the phenolic compounds was determined with a Folin-Denis reagent at 725 nm, the content of flavonoids with a 1% aqueous solution of aluminum chloride at 415 nm, and the content of phenylpropanoids by direct spectrophotometric analysis of the extracts at 330 nm.

Results: Callus cultures of flax fiber stood out in the greatest capacity for the accumulation of phenolic compounds, which is probably determined by the specific features of the cellular and tissue structure of the lub-fiber cultures. In the phenolic complex of the three flax varieties studied, phenylpropanoids predominated, as the most characteristic representatives of phenolic compounds for this culture. The content of flavonols in the phenolic complex was insignificant in all studied objects of the study; however, in the proportion to phenylpropanoids in flax, the decorative share of flavonols was the most close to them. Thus, along with the general tendencies in the accumulation of phenolic compounds, certain peculiarities in their share distribution in the cultures of the studied varieties were also expressed, which is probably due to their species specificity.

Key words: biotechnology, flax, phenolic compounds.

Cryopreservation of *Saccharum* spp. Germplasm Using Droplet-vitrification Technique and Confirmation of Genetic Stability After Cryopreservation Using ISSR Markers

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Aim of the study: *Saccharum* spp. germplasm is preserved as *ex situ* collections. On the other hand, it is too expensive to maintain of big collections and they can also be negative effected from pests and disasters in natural conditions. In this study, our first aim was to develop an efficient protocol for cryopreservation of three lines sugarcane germplasm (Halaii, H83-6179 and NG 57-024) via PVS2-based one step freezing technique. The second aim of this study was to confirm the genetic stability of cryopreserved lines of *Saccharum* spp. using ISSR marker system.

Material and Methods: MS supplemented with 20g l⁻¹ sucrose, 4.44 μM 6-Benzylaminopurine, 3g l⁻¹ gelrite and 3g l⁻¹ charcoal for cultures. Shoot tips of sugarcane were precultured for 24h on MS medium containing 0.625M sucrose and they were then placed in 4-5 μl PVS2 on sterile aluminum foil strips for 30, 45, 60 min. Following treatment with PVS2, the strips including shoot tips in the PVS2 droplets were directly immersed into liquid nitrogen. Rewarming was done after 24 h LN by rapidly removing the foil strips from the cryovials and immediately immersing them into room temperature washing solution (MS containing 1M sucrose) for 15 minutes prior to the transferring the shoot tips onto MS medium. ISSR-PCR were carried out using ten ISSR primers and PCR reactions were performed in a 20 μl reaction mixture, containing PCR Buffer, 2,5mM MgCl₂, 0,4mM of each dNTP, 0,4mM primer, 40ng DNA and 1 unit Taq DNA polymerase. Amplification conditions were as follows: pre-denaturation for 3min at 95°C followed by 35 cycles of 15sec denaturation at 95°C, 30sec annealing at 55°C, 3min extension at 72°C and a final extension for 10min at this temperature. After separation on 1,5% agarose gel, the PCR products monitored under UV light, and documented using a gel image analysis system.

Results: Results from the three sugarcane clones used in an initial evaluation of droplet vitrification indicated that this method is effective for the cryopreservation of *Saccharum* spp shoot tips. 45 minutes of PVS2 exposure yielded the highest regeneration rate for lines Halaii (70.9%) and NG 57-024 (63.3%). However, the best regeneration rate was obtained with 30 minutes of PVS2 treatment for line H 83-6179 (76.3%). Genetic stability was tested using ISSR primers and 100 % genetic stability was detected from lines of Halaii and H 83-6179 and 98,5% genetic stability was detected from lines of NG 57-024 by the ten ISSR primers. The total of 211 (Halaii), 198 (H83-6179) and 201 (NG 57-024) reproducible bands, ranging from 125 to 5500bp, were scored with this technique. However, only three bands (2000, 720 and 625bp) obtained from ISSR VII and ISSR VIII primers were polymorphic for line NG 57-024 between samples of untreated, sucrose pre-cultured, PVS2 treated shoots and cryopreserved shoots. Although there were a few differences of ISSR band profiles, these profiles indicate that three lines of Sugarcane had high rate of genetic stability after cryopreservation.

Acknowledgements: This work was supported by Mugla Sitki Kocman University, Scientific Research Projects Coordination Unit (Mugla, Turkey, MSKU-BAP 16/021).

Keywords: Cryopreservation, Droplet-vitrification, ISSR, Sugarcane.

Determination of the Antioxidant and Phenolic Activities of Jojoba (*Simmondsia chinensis* Link Scheinder) Plant

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Aim of the study: The present study analysed the antioxidant and phenolic activity of jojoba plant, which is industrially grown and has an important place in intensive farming and is used as food and in medicine for the treatment of some disorders because of the different compounds it contains.

Material and Methods: Jojoba (*Simmondsia chinensis*) leaves were collected and dried in seasonal periods. The dried leaves were shredded by blender and the seeds were crushed in press and weighed 4g on a precision scale and extracted with solvent (n-hexane) for 6 hours in a Soxhlet device. The solvent portion of the extracts was removed on a rotary evaporator and the remaining extract was taken up in dark glass bottles for further use in the study and placed in the refrigerator to be stored at +4 °C. The release activities of the extracts were determined using the free radical of 1.1-diphenyl-2-picrylhydrazyl (DPPH). The greater the decrease in absorbance, the higher the antioxidant activity. The total phenol content was determined according to the Folin-Ciocalteu method. The total phenolic content was expressed as Gallic Acid Equivalents (GAE) in mg/ML plant extracts.

Results: The Phenolic compounds contained in *S.chinensis* hexane extracts were characterized using HPLC methods. The phenolic substances comprise the most important groups of natural antioxidants. The free radical elimination activities of the extracts were determined using 1.1-diphenyl-2 picrylhydrazyl (DPPH) free radicals. The lower the absorbance of the reaction mixture of antioxidant and DPPH, the higher the antioxidant free radical elimination activity. The standard free radical elimination activities of jojoba leaf-seed extracts at 5 different concentrations were determined. When the total phenolic content of jojoba extracts was examined, the highest values were determined as 313±2.05 mg GAE/ml for Jojoba leaf and 119.80±1.25 mg GAE/ml for jojoba seed. Jojoba leaf extract is most effective one of the extracts studied in the inhibition of β -carotene-linoleic acid oxidation. However, BHA (85.005%) and BHT (83.250%), which are frequently used in the processing of foods, have a higher percentage of inhibition than all extracts studied. This shows that synthetic antioxidants are more effective. As for the jojoba extracts, the inhibitory effect of the extract obtained from leaf sections are higher comparing to the seed extract.

Acknowledgements: This study was supported by Pamukkale Scientific Research Unit (BAP, Turkey) Project No: 2014FBE010

Keywords: Jojoba (*Simmondsia chinensis* L.Scheinder). Antioxidant capacity, total phenolic content

Effect of Growth Regulators on Morphogenetical Potential *Witania somnifera* L. *in vitro*Ashraf ALRASHIDI¹, Elena KALASHNIKOVA¹, Rima KIRAKOSYAN¹¹ Department of Genetics, Biotechnology, Breeding and Seed Production,
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Aim of the study: The research aim was to study the influence of a nutrient medium hormonal composition on morphogenetic potential of Aswanaganda isolated tissues (*Withania somnifera*) *in vitro*.

Material and Methods: The research object was ashwaganda seeds and plants-regenerants. To obtain a sterile culture, seeds were sterilized with a solution of mercuric chloride at a concentration of 0.1% for 10 minutes, followed by their cultivation on the Murashige and Skoog (MS) hormone-free nutrient medium to get sterile shoots and plants. The plants obtained were subsequently grafted and grown on MS medium containing various growth regulators: cytokinins (BAP, kinetin), auxins 2.4-D, IAA) in various concentrations and combinations.

Results: As a result of many-sided experiments it was found that the most optimal nutrient medium at the stage of micropropagation is the medium containing mineral salts according to the MS recipe, as well as BAP at a concentration of 0.5 mg /l. Under these conditions the average micro-shoot height was 4.7 cm, and the multiplication factor was 13-14, which allows obtaining within 6 months of cultivation, up to 20,000 micro-plants from one primary explant. To obtain quickly a well proliferating callus tissue, it is advisable to add 2.4-D to the medium at the concentration of 2 mg /l in combination with kinetin of 0.5 mg /l. Under these conditions a loose callus tissue is formed, which can later be used to produce suspension culture in order to obtain secondary metabolism substances. To get regenerating plants from callus tissue, it is necessary to apply BAP at a concentration of 0.5 mg /l. The established optimal conditions for cultivation will make it possible to obtain regenerating plants of ashwagandha, as a medicinal plant and a source of substances with highly efficient anticancer activity.

Acknowledgements: The authors would like to thank undergraduate and graduate students of the Department of genetics, biotechnology, breeding and seed production of Russian state agrarian University-MTAA souchastie in performing these studies.

Keywords: ashwaganda, callus tissue, micropropagation, growth regulators, auxins, cytokinins

Hydroxybenzoic Acid as a Potential Regulator of Low-Molecular Antioxidants in Plant Cells

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Aim of the study: Hydroxybenzoic acid widely distributed in plants refers to phenolic compounds of the C₆-C₁ group. It is known that it participates in respiration processes as a precursor of plastoquinones, in allelopathic processes, in the induction of plant resistance to unfavorable environmental factors. Information about its effect on the antioxidant system of plants, in particular the accumulation of phenolic compounds (PC) - antioxidants with high biological activity - are few in number. The aim of the research was to study the effect of exogenous p-hydroxybenzoic acid (HA) on the accumulation of phenolic compounds in plant cells, for example, the callus culture of a phenol-producing tea plant (*Camellia sinensis* L.).

Material and Methods: The object of the study was a heterotrophic callus tea culture grown on Heller's nutrient medium containing glucose (2.5%) and 2,4-D (5 mg / l). At the age of 20 days, it was aseptically held for 2 hours in water (control) or aqueous HA solution (10⁻⁵ M). After exposure, callus was transferred to the main nutrient medium. As PC are products of secondary metabolism, their contents were analyzed 1 and 7 days after exposure. For this, the plant material was extracted with 96% ethanol (45°C, 45 minutes). The supernatant was separated by centrifugation (16000 rpm) and used for spectrophotometric determination of the amount of PC with Folin-Denis reagent at 725 nm. The calibration curve was built for the (-) epicatechin.

Results: Established, that 1 day after impact of HA the total phenol content in callus was 20% lower than in the control variant. This effect can be a consequence of either the catabolism of these secondary metabolites or the conversion of them into more polymeric forms (eg lignin). Seven days after impact the content of the phenolic compounds in both variants was almost twice lower that in comparison with the earlier period of their growth. And in this case their level in callus exposed to action was higher (on 12%) compared to the control. This way, it can be concluded that after exogenous influence of HA in cultivated *in vitro* cells of the tea plant the content of low-molecular antioxidants of phenolic nature increased that possibly is a consequence of activation of their metabolism. This confirms the possibility of using HA as a "regulator" for the accumulation of these secondary metabolites.

Keywords: hydroxybenzoic acid, *Camellia sinensis* L., callus, phenolic compounds.

***In vitro* Cultivation of Some Lamiaceae Representatives**

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Aim of the study: The cell and tissue culture can solve the problem of deficiency of plant raw materials and the conservation of all kinds of medicinal plants in nature. For the analysis and regulation of essential oil synthesis, it is more appropriate to use biotechnological methods of *in vitro* culture. The aim of our research is *in vitro* introduction and characterization of the morphogenetic potential of some representatives of the family Lamiaceae (*Mentha longifolia* (L.) Huds., *Agastache mexicana* (Kunth) Lint & Epling, *Agastache rugosa* (Fisch. Et CA Mey.) Kuntze).

Material and Methods: The seeds of studied species were treated with a 5% solution of sodium hypochlorite (SH, bleach) for 10 and 15 minutes and in a 0.1% solution of mercury (II) chloride (corrosive sublimate, CS) for 5 and 10 minutes. Then the seeds were carried out on the MS nutrient medium to a light room for further cultivation. The plants were cut a month after sterilization. Cuttings were transplanted to solid MS nutrient medium. Further development of the plant was noted. To study the effect of the hormonal composition of the nutrient medium on the efficiency of callusogenesis and somatic organogenesis, explants of various types (leaf, stem and node) were placed on the MS nutrient medium with addition of phytohormones and growth regulators: auxins IAA, NAA and/or cytokinin BAP.

Results: There were no significant differences in seed germination efficiency between sterilization modes for *A. mexicana* and *A. rugosa* seeds. In mint leaves, the maximum exposure reduces the germination rate. After cuttings *M. longifolia* plants roots formed quickly and developed actively. For *Agastache* species there are no significant differences in growth processes in clonal micropropagation under experimental conditions. The reaction to the addition of various auxins and cytokinin into the nutrient medium is similar. All species demonstrated a greater ability for callusogenesis when adding NAA, rather than IAA. The stem organogenesis was performed on all types of explants with some advantage of stem explants. The average frequency of stem organogenesis was in the range of 30-40%. Low efficiency of root organogenesis (below 20-25%) was characteristic for all studied species.

Keywords: Lamiaceae, *Mentha longifolia*, *Agastache rugosa*, *Agastache mexicana*, *in vitro* culture, medicinal herb

***In vitro* Cultivation Potential of *Mentha × piperita* L.**

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Aim of the study: Essential oils of various kinds of mint include a large (more than 100) variety of monoterpenoids of cyclic and acyclic structure, however, as a rule, one or several components predominate in them. *In vitro* culture is one of the main ways of medicinal plants reproduction and improvement. This technology is the main component of the production of planting material and modern cloning biotechnology. Therefore, the aim of this work was to develop a system for obtaining and maintaining *in vitro* sterile plants of *M. × piperita* L., as well as an assessment of their morphogenetic and productive potential.

Material and Methods: For introduction into *in vitro* culture, peppermint seeds were disinfected with 0.1% solution of mercury (II) chloride or 5% solution of sodium hypochlorite, then they were placed on agar nutrient media MS. The sterilization time of peppermint seeds in a 0.1% solution of mercury (II) chloride was 5 or 10 minutes; in a 5% solution of sodium hypochlorite 10 or 15 minutes, respectively. Callusogenesis and somatic organogenesis in explants of mint plants (stem or leaf segments) were stimulated by the addition of phytohormones into nutrient media: MS + 1 mg/l BAP, MS + 1 mg/l BAP + 1 mg/l NAA, ½ MS + 1 mg/l BAP, ½ MS + 1 mg/l BAP + 1 mg/l NAA.

Results: The different variants of sterilization do not have a significant different effect on the efficiency of the germination rate and the seedling height. In this regard, for the sterilization of peppermint seeds, the most sparing sterilization mode 10 minutes in a 5% bleach can be recommended. The studied variants of the hormonal composition of the nutrient medium, as well as the type of explants, do not allow to reveal significant differences in the varieties of peppermint in the field of callusogenesis and somatic organogenesis induction. It can be recommended to increase the volume of the studied material, which will reduce the error of mean.

Keywords: *Mentha × piperita*, Lamiaceae, *in vitro* culture, morphogenetic capacity, medicinal herb, secondary metabolism

***In vitro* Culture of *Mentha pulegium* L.**

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Aim of the study: *Mentha pulegium* (pennyroyal) is a perennial herb that has many uses. It is used in medicine, cosmetics, confectionery industry, and as a flavor. This herb has wound-healing, antiseptic and abortive properties that are associated with the presence of an essential oil and its secondary metabolites. The plant contains up to 2% of essential oils, including pulegone, menthol, limonene, dipentene. Studies show that the content of essential oil and its metabolites may vary depending on location and growing method. So, the cultivation of plants *in vitro* under controlled constant conditions makes sense.

Material and Methods: To study the somatic organogenesis of pennyroyal, we used seeds of variety Sonya. Seeds were sterilized in a 5% NaOCl solution. We used sterilization time - 5, 10 and 15 minutes. As a control group were used non-sterile seedlings. The germination and plant survival were documented. Initially we used MS and B5 nutrient media. When the plants became strong enough, they were cut and planted in MS and B5 medium without or supplemented with hormones. The frequency of somatic organogenesis was considered.

Results: Sterilization of 5% NaOCl solution has no oppressing effect on germination of seeds at any of the studied expositions. After sterilization of seeds with 5% NaOCl solution during 10 min. higher plants were formed, but after processing during 5 min. more leaves and nodes were formed at plants. MS nutrient medium is more suitable for cultivation of pennyroyal plants than B5 nutrient medium.

Keywords: *In vitro*, *Mentha pulegium* L., somatic organogenesis.

***In vitro* Introduction of Medicinal Herb *Elsholtzia ciliata* (Thunb.) Hyl.**

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Aim of the study: Introduction of *Elsholtzia ciliata* and its cultivation *in vitro* is of great importance, since it allows obtaining pure material for growing in soil, supporting the vegetative progeny of plants and analyzing it from a genetic point of view. The aim of this work is to select the optimal conditions for *in vitro* introduction of *Elsholtzia ciliata*.

Material and Methods: The seeds of *Elsholtzia ciliata* were provided by the All-Russian Scientific Research Institute of Medicinal and Aromatic Plants. The seeds were placed on nutrient media after various sterilization modes. For sterilization, we used a 0.1% solution of mercury (II) chloride (corrosive sublimate, CS) and a 5% solution of sodium hypochlorite (SH) for 5, 10, 15 minutes. Seeds were placed on two variants of nutrient media: Murashige and Skoog (MS) and Gamborg (B5). The *in vitro* cultivation was carried out in a light room.

Results: Sterilization with a 0.1% CS solution for various exposures exerted in most cases a substantially more oppressive effect on seed germination energy than sterilization with a 5% SH solution. At the same time no differences in germination rate were observed within the sterilizing agents. So, 5-minute sterilization in a 5% SH solution can be recommended, as the most gentle mode, which ensures high sterilization efficiency. Dynamics of plant growth on MS nutrient medium after sterilization with 5% SH solution and 0.1% CS solution had significant differences in plant height with different exposures. Dynamics on B5 nutrient medium after sterilization with a 5% SH solution and 0.1% CS solution demonstrated no significant differences in plant growth with different exposures.

Keywords: *Elsholtzia ciliata*, Lamiaceae, medicinal herb, *in vitro* culture, morphogenetic potential

***In vitro* Introduction of *Rosmarinus officinalis* L.**

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Aim of the study: *Rosmarinus officinalis* is a well-known aromatic plant used in all countries for various medical and culinary purposes. Rosemary extract has a variety of pharmacological activities, such as antioxidant, antimicrobial, chemoprophylaxis against cancer, antidiabetic, DNA-protective, choleric, hepatoprotective, stimulating and mild analgesic. The introduction of rosemary into *in vitro* culture is of great importance for obtaining a large amount of quality material. The aim of our studies was the search of optimal conditions for introduction of *R. officinalis* into *in vitro* culture.

Material and Methods: The *R. officinalis* seeds used in the work were granted by Conservatoire et Jardins Botaniques de Nancy (France) and by breeding company "Plazmennye semena" (Russia). As sterilizing agents, a 5% solution of sodium hypochlorite and a 0.1% solution of mercury (II) chloride were used. The duration of sterilization was 5, 10 and 15 minutes. After sterilization, the seeds were transferred on the Murashige and Skoog (MS) nutrient medium. Seed germination took place in a light room. To evaluate the plant growth dynamics, measurements were taken at intervals of 7 days. The height of the plant and the diameter of the leaf blade were measured.

Results: No sterilization modes had a proper positive effect on plant development. However, it can be concluded that treatment with a 0.1% solution of mercury (II) chloride with an exposure of 5 and 10 minutes was the best modes for seed germination. The plants developed relative slowly. But it is still possible to note the sterilization with the 5% solution of sodium hypochlorite as the best mode for subsequent plant development. The leaf growth is directly proportional to the height of the plant.

Keywords: *Rosmarinus officinalis*, Lamiaceae, *in vitro* culture, plant sterilization, medicinal herb, culinary herb

***In vitro* Introduction of *Satureja hortensis* L. Varieties**

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Aim of the study: The genus *Satureja* (savory, fam. Lamiaceae) is a valuable medicinal and essential oil plant genus. Recently, the biological activity of essential oils and extracts of species of this genus has been actively studied: antimicrobial, antiviral, antifungal activity, as well as analgesic, antiseptic, anti-inflammatory, antioxidant action etc. Properties correlate, as a rule, with the presence of essential oil, flavonoids and terpenoids. *In vitro* cultivation will allow getting the healthy plant material throughout the whole year. Management of the processes of morphogenesis and of secondary metabolites synthesis should promote greater introduction of this species in agricultural and pharmaceutical practice.

Material and Methods: For the experiments, seeds of two savory varieties were taken – Aromatniy and Satyri. Seed sterilization was carried out with a 5% solution of sodium hypochlorite or 10% solution of hydrogen peroxide with exposures of 5, 10 and 15 minutes. The germination energy and rate were estimated. As a control, seed germination under non-sterile conditions on filter paper in Petri dishes was used. Sterile seedlings of the variety Aromatniy in the phase of 1-2 true leaves were transferred on 4 types of nutrient media of different mineral composition – Gamborg medium (B5), Murashige and Skoog medium (MS), woody plant medium (WPM) and MS with $1/3 \text{ NO}_3^-$. The following indicators of growth dynamics were measured: the plant height, the number of true leaves, the number of side shoots, and the number of nodes on the 1st, 14th, and 28th cultivation day.

Results: For both varieties, it is preferable to use hydrogen peroxide as a sterilizer, with no significant differences between exposures. Most of the sterilization modes of both sterilizers exhibited germination energy and rate, which does not differ significantly from non-sterile control. There were no significant differences between the plants on MS and B5 media. Plants cultivated on MS with $1/3 \text{ NO}_3^-$ medium were shorter than on MS and B5 media. The cultures developed on WPM medium had significantly more true leaves than plants on B5 medium. The intensity of side shoot formation was independent of the medium type. On the average, 2-2.5 lateral shoots and 3-3.6 nodes per plant were formed. There were no significant differences between the variants.

Keywords: *Saturejahortensis*, Lamiaceae, secondary metabolism, *in vitro* culture, medicinal herb

***In vitro* Introduction of Two *Matthiola* Species**

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Aim of the study: *Matthiola fragrans* Bunge is threatened decorative plant belonging to the family Brassicaceae and it is included in the Red List of Russia, Ukraine and Belarus. It has problems with *in vivo* reproduction. *In vitro* cultivation allows obtaining a lot of plants in a short period. Also reintroduction into natural conditions is possible. Using the related not threatened species for study allows getting of primary data for subsequent comparative more purposeful experiments with Red List plants. The aim of our work was studying two *Matthiola* species – *M. longipetala* and *M. fragrans*.

Material and Methods: We used *M. longipetala* (syn. *M. bicornis*) as model comparative object for *M. fragrans*. Seeds of both species have been provided by the Volgograd regional botanical garden. As control of germinating capacity the seeds were placed on filter paper in Petri dishes, they were cultivated in light room. In the *in vitro* experiment the seeds of both species were sterilized with 7,5% or 5% solution of sodium hypochlorite for 5 or 10 minutes, and also 5% solution "Lizoformin 3000" for 5 or 10 minutes. After sterilization the seeds were placed on MS nutrient medium without phytohormones for subsequent cultivation in the light room.

Results: *M. fragrans* seeds did not germinate under non-sterile conditions in contrast to *M. longipetala* with high germinating capacity. This confirmed our choice of *M. longipetala* as a suitable object for *Matthiola* studying. The *in vitro* germinating capacity of *M. fragrans* was very low by processing with 5% solution of sodium hypochlorite with exposition 10 minutes (unfortunately, the best result for this species). The best sterilization mode for *M. longipetala* was 5 minutes exposure in 5% solution of sodium hypochlorite.

Keywords: *In vitro* culture, *Matthiola fragrans*, *Matthiola longipetala*, clonal micropropagation, Red List plant

***In vitro* Morphogenesis of *Ocimum basilicum* Varieties**

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Aim of the study: To date, 350 species of medicinal plants are used actively, of which less than 20% are grown specially, and the rest are wild-growing. For a number of species, in view of the peculiarities of their biology, *in vivo* technologies of reproduction have not been developed (in many cases). Basil is a very significant medicinal plant. The basic properties of the basil are following: antiseptic, spasmolytic, antidepressant, tonic. The aim of this study is to introduce *Ocimum basilicum* L. into *in vitro* culture and assess its morphogenetic potential.

Material and Methods: To study the effect of the hormonal composition of the nutrient medium on the efficiency of callusogenesis and somatic organogenesis in the basil wild population and varieties (Fioletoviy barkhat, Vasilisk, Lubimchik) explants of various types (leaf, stem, node, etc.) were placed on ½ concentration of basic compounds of Murashige and Skoog nutrient medium with the addition of phytohormones and plant growth regulators (auxins IAA, 2,4-D; cytokinin BAP). Results were evaluated after 1 month.

Results: For callus formation in varieties Fioletoviy barkhat and Vasilisk it is optimal to use true leaf explants on modified MS medium with 2 mg/l 2,4-D; for stem organogenesis in all varieties and wild population - node explants (and cotyledons for variety Lubimchik) on modified MS + 1 mg/l BAP; for root organogenesis – leaf explants on modified MS + 0,5 mg/l for variety Vasilisk and wild population, hypocotyles on modified MS + 0,5 mg/l for variety Lubimchik, hypocotyles on modified MS + 0,5 mg/l IAA and 3 mg/l BAP + 0,3 mg/l IAA for variety Fioletoviy barkhat.

Keywords: *Ocimum basilicum*, Lamiaceae, *in vitro* culture, medicinal herb, secondary metabolism, morphogenetic potential

***In vitro* Preservation of *Euonymus nanus* Bieb.**

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Aim of the study: The aim of the research was the preservation of *Euonymus nanus* Bieb. *in vitro*. To achieve this aim it was necessary to optimize the nutrient medium composition for *in vitro* cultivation of vegetative shoots, to search the optimal hormonal composition of nutrient medium for morphogenesis induction as well as to optimize the nutrient medium composition for *in vitro* rooting of *Euonymus nanus*.

Material and Methods: As initial material isolated segments of stem, leaf blade were placed on the Murashige and Skoog (MS) cultural medium supplemented with following growth regulators: 1 mg/l BAP + 0.5 mg/l IBA; 1 mg/l BAP + 1 mg/l IBA; 1 mg/l 2ip + 0.5 mg/l IBA; 1 mg/l 2ip + 1 mg/l IBA. One of the methods of micropropagation is regeneration of plants from callus tissue. Primary explants (stem and leaf blade segments) were cultured on MS nutrient medium with the following hormonal ingredients: 0.2 mg/l BAP + 2 mg/l NAA; 0.2 mg/l BAP + 4 mg/l NAA; 0.2 mg/l kinetin + 2 mg/l NAA; 0.2 mg/l kinetin + 4 mg/l NAA. The formed shoots were subsequently transferred to a nutrient medium for rooting. Rooting of derived plants was carried out on the medium containing ½ mineral salts and vitamins according to MS, sucrose 30 g/l, and 0.5 or 1.0 mg/l IAA. In the course of this work we managed to work out a method of clonal micropropagation of *Euonymus nana*, to obtain large number of regenerated plants, well rooted in non-sterile conditions.

Results: For induction of adventitious shoots development we recommend to use the MS medium supplemented with 1 mg/l BAP and 0.5-1 mg/l IAA. It is established that for induction of a stem morphogenesis, stem segments should be placed on the medium containing 0.2 mg/l BAP and 2 mg/l NAA. Effectiveness of morphogenesis on leaf blade explants was low. For induction of rhizogenesis using the medium with 0.2 mg/l kinetin and 2-4 mg/l NAA is recommend. As primary explants, isolated segments of internodes are preferred. Microclones rooting can be performed on the medium containing ½ mineral salts and vitamins according to MS, sucrose 30 g/l.

Keywords: *Euonymus nanus* Bieb., *in vitro*, clonal micropropagation, morphogenesis

***In vitro* Seed Sterilization of Some *Salvia* Species and Varieties**

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Aim of the study: One of the sources of biologically active substances is the plant cell culture. In this artificial system secondary metabolites of great practical importance can be synthesized. A wide range of biological activity and "softness" of action are the main advantage of pharmacological preparations from natural plant material. The opportunities offered by biotechnology to humanity both in the field of fundamental science and in production are very large and often even revolutionary. So, biotechnology allows to carry out industrial production of necessary substances, considerably facilitates technological processes, helps to preserve plant biodiversity. In this regard, the aim of our work was to optimize the technology of *in vitro* cultivation of different species of the genus *Salvia* L.

Material and Methods: In our study we used several *Salvia* species and its varieties: *S. officinalis* L. (var. Kubanetz etc.), *S. sclarea* L. (var. Voznesenskiy), *S. viridis* L. = *S. horminum* L. (var. Buket, Yarkoe utro), *S. splendens* Sellow ex M.Roem. & Schult. (var. Potpourri). To introduce into sterile *in vitro* culture, seeds of studied varieties and species were used. As sterilizing agents, 0.1% solution of mercury (II) chloride (corrosive sublimate, CS) or 30% solution of sodium hypochlorite (SH, bleach) were used. The processing time was: for CS 5 and 10 minutes, for bleach 10 and 15 minutes. After sterilization, the seeds were twice washed in distilled water. Then the seeds were placed on the solid Murashige and Skoog nutrient medium without phytohormones or growth regulators into Petri dishes. The obtained seedlings with a height of 5 mm were transplanted into tubes.

Results: *S. officinalis* varieties as well as species seeds had a fairly low germination rate after sterilization in comparison with control. The plants grew slowly. An exposure of 5 minutes in a 0,1% CS solution proved to be the best (although this variant gave less than 20...50% for different varieties). In the case of Kubanetz with 15 minutes processing in SH it was no germination at all. *S. sclarea* variety and species seeds possessed high germination in all sterilization modes. When using CS as an agent for sterilization, the germination, as in the control, was 100%. In the case of SH, the germination capacity was also high and was 85 90%. Plants grew quickly. *S. viridis* varieties seeds had the best germination rate (up to 100%) by using CS. The plants grew quickly. For *S. splendens* variety Potpourri the best sterilizing agent was CS with germination rate at level of the control. The plants grew slowly.

Keywords: *Salvia* spp., Lamiaceae, decorative plant, medicinal herb, *in vitro* culture

Influence of Gene *Gpc-B1* of *Triticum turgidum* ssp. *dicoccoides* on Grain Protein Content in Bread Wheat

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Aim of the study: *Gpc-B1* encodes a transcription factor that stimulates the mobilization of nitrogen, iron, zinc, and manganese from the physiologically aging vegetative parts of the plant (Dubcovsky, et al., 2006). Through numerous crossings, *Gpc-B1* was transferred to common winter wheat of Kuialnyk variety of Ukrainian breeding possessing high grain quality and good productivity. The aim of the work was to analyze the effect of the *Gpc-B1* gene on protein content in grain in the hybrid generation F₅.

Material and Methods: For reliability, the determination of protein content in grains was carried out by two independent methods – near infrared spectrometry (NIR) and the Kjeldahl method of quantitative determination of nitrogen. For NIR spectrometry, 50 g of grain was ground on a laboratory mill Perten LM 3100 and measured on an infrared analyzer Inframatic 8600 (Perten, Sweden). To determine the total nitrogen content, 0.800 g of the sample was digested with a digester—the programmable infrared boiling system Behrotest InKjel, using a multistage program and Kjeltabs catalyst, and distilled in an automatic steam distiller S4 (Behr, Germany). Titration was carried out with an automatic titrator TitroLine Easy (SI Analytics, Germany) with 0.1 N sulfuric acid. The nitrogen-to-protein conversion factor was 5.7.

Results: 16 lines, analyzed by IR spectrometry, showed the mass fraction of protein from 14.23% to 16.81%. The mother variety Kuialnyk had 13.49% protein and the paternal line Glupro – 16.90%. The average value for the lines, carriers of the studied gene *Gpc-B1*, was 15.37%, which is 1.88 points more than the protein content in the original Kuialnyk variety (an increase of 13.93%). The Kjeldahl method was used to analyze 44 lines. The values of the mass fraction of protein for the lines were 12.14%–16.18%, Kuialnyk – 12.20%, Glupro—the *Gpc-B1* donor line – 15.84%. Estimating for nitrogen, the average value for hybrid lines was 13.56%, which is 1.36 points higher than that of the original Kuialnyk cultivar (increase of 14.40%). It is worth mentioning line 10, which showed significantly more protein than the original parental form Glupro, which suggests a possible interaction of genes in favor of increasing the protein accumulation. The measurements obtained by two different independent methods are in good agreement. For the first time we have shown that the transferred gene *Gpc-B1* from the wild tetraploid emmer wheat in the genetic environment of the state registered variety Kuialnyk is active and raises the protein content in grain by an average of 14%. The proposed approach seems to be promising and can be used to develop new high-yield and high-quality varieties of bread winter wheat.

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Keywords: *Triticum aestivum*, grain protein content, plant biotechnology, near infrared (NIR) spectroscopy, Kjeldahl method, biofortification.

Introduction of *Mandevilla* Lindl. *in vitro* Culture

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Aim of the study: *Mandevillasanderi* Woodson (syn. *Dipladenia sanderi* Hemsl.) belongs to family Apocynaceae and is a famous decorative plant for garden or greenhouse. *In vitro* cultivation allows getting a lot of genetically homogenous healthy plants. The aim of our work is an *in vitro* introduction of *M. sanderi*.

Material and Methods: The materials for our work were young *M. sanderi* plants. The method we used was developed by Biondo et al. (2004) for a related species *M. illustris* Woodson. The plants were stood in running water for 12 hours, then in soapy water for 24 hours, 1 minute in 70% alcohol, 30 minutes in 0.5% solution of sodium hypochlorite. The subsequent cultivation was carried out on nutrient media with following substances and concentrations: 1/3 of the main components of the MS medium with addition of 0.5 mg/l BA or 0.1 mg/l IAA, or without phytohormones and growth regulators.

Results: At this moment, we conducted research using this method, and positive results have already been obtained. Reducing of sterilization time leads to high contamination. It is necessary to carry out further experiments, since the yield of aseptic plants remains still rather low.

Keywords: *Mandevilla sanderi*, *Dipladenia sanderi*, Apocynaceae, introduction *in vitro*, decorative plant

Investigation of Xanthan Yield of Local Isolate *X. axonopodis* pv. *dieffenbachia*

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Aim of the study: Xanthan gum is an important extracellular heteropolysaccharide that is produced efficiently by Gram-negative bacteria of the genus *Xanthomonas*. It is widely used as a thickening or stabilizing agent in food, pharmaceutical and oil-recovery industries. Because of its wide applications, it becomes important to develop high yield xanthan producer local strain. In this study, a native strain-isolated from anthurium, (*Anthurium andraenum*), *X. axonopodis* pv. *dieffenbachia* were evaluated in terms of xanthan gum production in industrial fermentation media.

Material and methods: Xanthan gum fermentation were carried out with glucose (4%) as a carbon source, at 28°C and initial pH 7.0 in flasks. The effects of agitation rate (180, 200, 220 and 300 rpm) and inoculum size (5 and 10%) on xanthan gum production were investigated.

Results: The data on optimization of operational conditions for fermentation showed that maximum xanthan yield of 6.43 g/L was obtained with 10% inoculum size and 200 rpm agitation rate in rotary shaker after 72 h of fermentation. This study confirmed that xanthan yield depended on bacterial strain, agitation rate and inoculum size

Acknowledgements: We thank The Scientific and Technological Research Council of Turkey (TUBITAK) for financial support (Project Number TOVAG-114O429)

Key words: Xanthan, *X. axonopodis* pv. *dieffenbachia*, inoculum volume, agitation rate

Micropropagation of *Eucalyptus uro-grandis* (*E. grandis* x *urophylla*) Using Synthetic Seed Technic

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Aim of the study: *Eucalyptus* sp. is a widely as a forest tree, covering more than four million hectares in 58 countries. *E. uro-grandis*, a hybrid of *E. grandis* and *E. urophylla*, is an important hybrid for paper products, building materials, and essential oils. Several studies with *in vitro* cultivation of *Eucalyptus* species have been performed with a variety of modifications in the MS medium. This study was aimed to develop an effective micropropagation protocol using synthetic seeds for *Eucalyptus uro-grandis* which were selected for their high growth rate and multiple uses for the wood. The wood is heavy, hard and durable, making the genus a valuable source of hardwood.

Material and Methods: Excised shoot tips of *Eucalyptus uro-grandis* *in vitro* cultures were washed with Ca⁺⁺-free liquid MS medium followed by immersion into a 3% sodium alginate solution in MS maintenance medium. each shoot tips were then pipetted with a drop of Na-alginate into liquid MS medium supplemented with 100 mM CaCl₂. The alginate beads containing a shoot tip were kept for 25 min at room temperature in the 100 mM CaCl₂ solution to ensure complete polymerization of the calcium alginate. Alginate beads were then removed from the CaCl₂ solution and placed on MS semi-solid medium supplemented with 1% sucrose, benzyladenine (0.04 mgL⁻¹), gelrite (1.5 gL⁻¹), with a pH adjusted to 5.6 prior to addition of agar (4.5 gL⁻¹), supplemented with charcoal (10 gL⁻¹). Cultures were maintained at 27±2°C temperature with a 16h light/8h dark photoperiod provided by cool daylight fluorescent lamps (50 µmol⁻¹m⁻²s⁻¹). Growth was recorded 6 weeks after and consisted of the percentage of shoot tips that regenerated at least one elongated shoot with at least two nodes. Statistical analysis of the non-parametric data was carried out by a means test for homogeneity of proportions, and significant differences were identified by the post hoc multiple comparisons test. Discrete data were subjected to ANOVA, followed by the least significant difference test at P≤0.05 to compare means.

Results: All encapsulated shoot tips of *Eucalyptus uro-grandis* showed a high regeneration ranging from 82.2% to 98.5%. The seedlings derived from the encapsulated shoot tips had well-formed shoots and roots and were easily acclimated to greenhouse conditions. Our study demonstrated that alginate beads including shoot tips of *Eucalyptus uro-grandis* might be successfully regenerated in *in vitro* and develop true to type plants in *ex vitro* environment.

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Keywords: Charcoal, Encapsulation, Eucalyptus, MS Medium.

Production of xanthan Gum from *Xanthomonas axonopodis* pv. *begonia* and Its Rheological Behaviour

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Aim of the study: Xanthan gum, a important biopolymer with extensive industrial applications, is commercially produced by fermenting glucose or sucrose using the bacteria of the genus *Xanthomonas*. The present study aimed to investigate the performance of novel local isolate of *Xanthomonas* (*Xanthomonas axonopodis* pv. *begonia*) and standard strain (*X. campestris* DSM 19000 (NRRL B-1459)) in terms of xanthan gum production at different agitation rate and inoculum volume, and gum rheology.

Material and methods: Xanthan production capacity of local isolate *X. axonopodis* pv. *begonia* was studied in terms of inoculum volume (%) and agitation rate (rpm) in an orbital shaker at 28°C in pH 7.2. The rheological behaviors of the 0.5%, 1%, and 2% xanthan gum solution in water were determined in Discovery Hybrid Rheometer-2 (TA Instruments New Castle, DE, USA).

Results: Generally, optimum values for inoculum volume and agitation rate were observed as 5% and 180 rpm. Optimum yields were found 9.65 g/L and 11.19 g/L for *X. axonopodis* pv. *begonia* and standard strain *X. campestris* DSM 19000, respectively. Regarding the rheological behavior gel forming properties and consistency were observed for xanthan from local strain. At all concentration levels, Ostwald de Waele model parameter K was found higher for gum solutions of the local strain. Furthermore, dynamic rheological properties showed that gum from *X. axonopodis* pv. *begonia* demonstrated weak gel behavior at 1% concentration. K' and K'' values of gum from the local strain was higher than standard strain at concentrations higher than 0.5%. The yield and rheological results showed that gum from *X. axonopodis* pv. *begonia* had better technological properties than gum from standard strain.

Acknowledgements: We thank The Scientific and Technological Research Council of Turkey (TUBITAK) for financial support (Project Number TOVAG-114O429)

Keywords: Xanthan gum, *X. axonopodis* pv. *begonia*, rheological behavior

Study on the Vitrification Phenomenon in Plants of the Family Lamiaceae

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Aim of the study: Vitrification is the most frequent problem affecting the success of clonal micropropagation of *in vitro* plants. This phenomenon arises because of the simultaneous effects of many exogenous factors on plants. Developmental defects associated with vitrification are vitreousity and fragility of plants, chlorophyll deficiency, cell hyperhydricity, changes in enzymatic activity and in the synthesis of proteins due to changes in metabolic processes, etc. *In vitro* cultivation of such plants of the family Lamiaceae, *Agastache* J. Clayton ex Gronov, *Plectranthus* L'Hér and *Lavandula* L., leads to the problem of vitrification.

Material and Methods: The material for this study was selected from each of the three mentioned genera, we used *Agastache foeniculum* Kuntze variety Premier, *Lavandula angustifolia* Mill. variety Munstead and *Plectranthus scutellarioides* R.Br. variety Ananasoviy. We conducted morphological and anatomical studies of the obtained plants. Microscopic preparations of the leaves were created by the method of pressure medications. The number and form of trichomes were analyzed, and the number of stomata (pcs./mm²) was counted on the lower epidermis of the leaves. A comparison was made between morphological and anatomical features between vitrified and healthy *in vitro* plants. When analyzing the number of stomata, counting was performed in tenfold repetition. The amount of chlorophylls *a*, *b* and carotenoids in acetone extracts from leaves was determined by spectrophotometric analysis using a spectrophotometer SF-26. The concentration of pigments (mg/l) was calculated by the Holm-Wettstein equation, according to the obtained optical density data (D662, D644 and D440.5). Repetition was twofold.

Results: According to the results of studies, trichomes of vitrified plants were notable for a small size. In healthy *L. angustifolia* plants a lot of large branched hairs (up to 200 µm) and smaller (up to 70 µm) capitated glandular trichomes were observed, however, there were fewer trichomes in vitreous plants, only capitate trichomes were found, which sizes did not exceed 50 µm. The number of stomata in hyperhydricity plants was also less than in healthy ones. Vitrification reduced the level of chlorophylls *a* and *b* in plants, but the ratio between the total amount of chlorophylls and carotenoids decreased. We concluded that vitrification of plants has a significant effect on the morphological and biochemical indicators of plants. This phenomenon reduced gas exchange and plant metabolism, as evidenced by a less number of stomata and trichomes and smaller size of glandular hairs. A preliminary conclusion was made about a decrease in the level of chlorophylls in vitrified plants and a stressful response to influencing factors, expressed in the increased synthesis of carotenoids, which is most likely due to their function of auxiliary pigments in photosynthesis and to prevent the destruction of chlorophyll molecules.

Keywords: vitrification, *in vitro* culture, Lamiaceae, trichomes, stomata, pigments concentration

Studying Morphogenetic Potential and Properties of *Monarda* Secondary Metabolites

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Aim of the study: *In vitro* cultivation, studying morphogenetic potential and properties of secondary metabolites from 4 species of the genus *Monarda* L.: *M. didyma* L., *M. citriodora* Cerv. ex Lag., *M. punctata* L. and *M. x hybrida* Hort.

Material and Methods: In our research we used seeds of 4 different *Monarda* species. Seeds were sterilized with a 5% solution of sodium hypochlorite for 5 and 10 minutes and placed on the solid MS medium. Seedlings with a size of 5 mm were placed into tubes with medium of the same composition. For induction of callusogenesis and morphogenesis we used the plants with the 5-6 true leaves. The primary explants were stem segments (5-7 mm) and leaf segments (5 × 5 mm) that were placed on the MS medium with the addition of growth regulators (2,4-D, BAP, IAA). Antifungal effect of *M. didyma* essential oil was tested on *Fusarium culmorum* Sacc. There were two experiment variants: filter paper disks (d=5 mm) were soaked with essential oil (0.5 µl; 1 µl; 1.5 µl; 2 µl) and placed on the surface of the ½ MS medium; essential oil was added into ½ MS medium (0.5 mg/l; 1 mg/l; 1.5 mg/l).

Results: 10 minutes sterilization was the best variant for *M. citriodora* and *M. punctata* seeds germination and for *M. didyma* and *M. x hybrida* seeds it was the variant with 5 minutes sterilization. We recommend to use the medium with adding 1 mg/l 2,4-D + 0.5 mg/l BAP for induction of callusogenesis on leaf explants; for induction of callusogenesis in stem explants any of the chosen media was applicable. It can be recommended to use the segments of stems as explants for the somatic organogenesis induction. The essential oil of *M. didyma* possesses an antifungal activity and can be used as a biological fungicide.

Keywords: *Monarda*, callusogenesis, morphogenesis, essential oil, secondary metabolites.

The Effects of Different Auxin on the Total Antioxidant Capacity and Phenolic Contents of *Hypericum retusum* Aucher raised under *in vitro* Conditions

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Aim of the study: Use of *Hypericum* species have increased in the past few years due to the antidepressant and antiviral activities found in extracts of those plants. After seed sterilisation and sterilisation, shoot proliferations were performed. The highest number of shoots was obtained on medium supplemented with 0.5 mg l⁻¹ BAP. The study was aimed to evaluate the effects of auxins on antioxidant potential and phenolic contents of methanolic extract of *Hypericum retusum* Aucher (Clusiaceae) plantlets grown under *in vitro* conditions.

Material and Methods: The seed germination and sterilisation procedures were performed as described in our previous study. Following germination, micro-shoots (0.5–1.0 cm length) were separately transferred to Murashige & Skoog medium supplemented with 0.5 mg l⁻¹ N-6-benzylaminopurine (BAP)¹³. According to the results of our previous experiments, the media with BAP (0.5 mg l⁻¹) were separately supplemented with various auxins (0.25 mg l⁻¹ IAA, NAA, IBA) for shoot proliferation¹². All media were supplemented with 30 g l⁻¹ sucrose and solidified with agar (5.5 g l⁻¹, Agar-Agar (Sigma)). They were adjusted to the pH 5.8 prior to autoclaving (120°C for 20 min). The *in vitro* cultures were maintained at 25 ± 2°C for a 16 h photo period (40 µmol m⁻² s⁻¹) provided by mercury fluorescent lamps. All experiments were means of 16 replicates, and the experiments were repeated two times. The free radical scavenging effects of the methanol extracts were estimated according to the method of Blois (1958) with minor modifications¹. The concentration of total phenolics of methanol extracts were determined by using Folin-Ciocalteu reagent and external calibration with gallic acid¹⁵

Results: The antioxidant capacities of the extracts obtained from *H. retusum* Aucher were determined using the DPPH test method. The highest total antioxidant capacity and phenolic contents were observed auxins. The methanol extracts of plantlets grown *in vitro* conditions showed the strongest free radical scavenging capacities at concentrations of 100 and 150 µg/ml.

Keywords: *Hypericum retusum* Aucher, auxins, antioxidant, phenolic.

The Influence of Natural Factors on the Technological Quality of Tea Leaves

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Aim of the Study: The major natural factors of growth and development of tea plants: climate-atmospheric fallouts, temperature, relative humidity of the air and soil—providing plants with water and nutrients. Normal growth and development of the plant depend on how the given natural factors correspond to the plant's needs. The more optimal these factors are, the higher are the qualitative and quantitative indicators of the tea production, which affects the technological quality of the tea leaves.

Material and Methods: On the examples of Chakvi and Gvara, changing the climatic and soil conditions determines the different levels of productivity. Tea sprout is the upper part of the young leaf, which consists of a bud, a stem, and leaf. As for the development, according to the number of normal and deaf leaves, it can be single-leafed, double-leafed, three-leafed, four-leafed and so on. According to tenderness, it can be gentle, slightly rough and rough. The elements of tea sprouts are different from each other with their biochemical and technological dignity, which are subject to different physical and chemical changes and impacts. Separate elements of the tea sprout are characterized by different technological dignities. A bud and the first leaf give the highest quality products, while the second and third leaves are relatively low quality. This is conditioned by the fact that gentle elements of the sprout better subject to technological impacts and contain more quantities of substances on the basis of the fermentation and chemical transformations of which the basic quality indicators of the product are established. The technological dignity of the raw material mainly depends on the quantitative ratio and the qualitative composition of the chemical compounds in the tea leaf. Among the compounds in the tea leaf and finished tea, tea tannins have a significant place. During the technological processes of the tea production, the tannin is characterized with more quantitative and qualitative variability than any other substance. The color of the brew, the flavor and aroma is entirely dependent on receiving high quality production from the raw materials. As a result of determining tannin of the tea plant we have found out that in different seasons the raw material is not equal according to the tannin consistency.

Results: Georgian # 1 and Georgian # 2 from the plantations in the area of Chakvi are characterized with high content of tannins, while in the tea plants from the territory of Gvara the content of tannin is less and it is due to the sum of active temperatures of the Chakvi region, the number of which reached 3500-4000°, while during vegetation period the average daily temperature is 18° and more. The relative humidity of air is 75-78%, whereas the absolute minimum of temperature in the territory of Gvara without snow cover was even lower than 12, which caused some disruption of the process of vegetation. Since tea leaf tannin is the most labile compound in the tea plant, changing the growth conditions affects the tannin content. These are primarily precipitation, relative humidity, air temperature and insolation.

Keywords: tea, sprout, tannin, relative humidity, brew color

The Studies in Turkey on Use of *in vitro* Cultures in the Conservation of BiodiversityYonca SURGUN ACAR¹, Betül BÜRÜN²¹Department of Molecular Biology and Genetics/Science Faculty, Bartın University, Bartın²Department of Biology/Science Faculty, Muğla Sıtkı Koçman University, Muğla
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Aim of the study: Biodiversity is a whole that is formed by genes, species, ecosystems and ecologic events in a region. As a result of factors causing the loss of biodiversity (globalization and urbanisation, human population pressure, introduction of exotic species and new varieties, over-collecting, overgrazing, overexploiting, air-soil-water pollution, erosion, climate change, global warming, severe droughts, salinization, deforestation etc.), the number of endangered species has been increasing day by day. It has been reported that one third of existing plant species in the World is threatened.

Material and Methods: To protect endangered species, *in situ* and *ex situ* conservation strategies have been developed. One of the *ex situ* conservation methods is the micropropagation and the storage of the various parts of plant material in short-, medium- and long-terms by *in vitro* culture techniques.

Results: In this article, the use of *in vitro* culture techniques in protection of rare, endemic and/or endangered species and the studies in Turkey about the topic have been compiled.

Keywords: Biodiversity, conservation, *in vitro* culture, native species, Turkey

Virus Elimination in Plant Tissue Cultures via Cryotherapy TechniqueSeçil KIVRAK¹, Muammer CEYLAN¹, Ergun KAYA¹

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Aim of the study: Pathogen-free stocks of plant materials are important for productivity of agricultural crops and ornamental plants. Clonal propagated plants are particularly inclined to accumulate pathogens which are transmitted to new crops in infected cuttings, tubers and other vegetative propagules. Cryotherapy of shoot tips is a new method for pathogen elimination based on cryopreservation techniques. In cryotherapy, plant pathogens such as viruses, phytoplasmas and bacteria are eradicated from shoot tips by exposing them briefly to liquid nitrogen (-196°C). In this study aimed to indicate one step-freezing methods based on vitrification of cryotherapy for virus eliminations from plants.

Material and Methods: In the vitrification method, cells and shoot tips must be sufficiently dehydrated by the vitrification solution (which hardly penetrates into the cells during the dehydration process) without causing injury, in order to be able to vitrify upon rapid cooling in liquid nitrogen. Several vitrification solutions have been improved by various researchers worldwide. On the contrary, the most frequently used solutions are the glycerol-based vitrification solutions described plant vitrification solution PVS2 and PVS3. The PVS2 solution contains 30% (w/v) glycerol, 15% (w/v) ethylene glycol, 15% (w/v) dimethyl sulfoxide (DMSO) and 0.4 M sucrose (pH 5.8). PVS3 consists of 40% (w/v) glycerol and 40% (w/v) sucrose in basal culture medium. After dehydration using PVS2, samples are moved to a cryotube containing fresh cryoprotectant solution, and immersed in LN. Cryopreserved tubes are rewarmed using hot water (40°C) for 1-2 min, and the vitrification solution is removed from the tube. After removal of the solution, unloading solution is added to a tube, and cryoprotectants are removed from plant tissues for 30 min at 25°C. After unloading, samples are moved from the cryotube, and recultured.

Results: Virus elimination by cryotherapy of shoot tips from infected plants is a coming out method that can be easily tested with species and genotypes for which cryopreservation protocols are available. Regulations of the method might be need for expanding cryotherapy to additional genotypes and for increasing the percentage of pathogen-free regenerants. In gene banks practising cryopreservation the expertise is easily available and cryotherapy could be adopted in pathogen-eradication schemes for species and genotypes that are going to be cryopreserved.

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Keywords: Cryotherapy, Liquid Nitrogen, PVS2, PVS3, vitrification

Water Mint as an Object of Biotechnological Research

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Aim of the study: Mint (*Mentha* L.) is a genus of the family Lamiaceae. It includes approximately 39-42 species. Water mint (*M. aquatica* L.) is used as a medicinal, decorative, insecticidal plant. Essential oil of mint is widely used in perfumery and medicine.

Material and Methods: An overview of the botanical characteristics of mint water, its uses and cultivation is given. Various sources for the study of this species, biotechnological research and the composition of its essential oil were analyzed.

Results: Among the most common ones, there are species that can be used in the preparation of food products, in cosmetics (Japanese mint (*M. japonica* (Miq.) Makino) and peppermint (*M. piperita* L.)), in phytotherapy and aromatherapy (water mint, peppermint, pennyroyal (*M. pulegium* L.)), in pharmacology (peppermint, pennyroyal). *M. aquatica* is capable for spontaneous interspecific hybridization within the genus. It has several chemotypes with different essential oil compositions. Essential oil of water mint contains α -pinene, linalyl acetate, linalool, etc. Therefore, this species is used in flavors, in perfumery, etc. There are a number of studies that report the positive effects of components of various water mint extracts on the human CNS. There are literary data on the agrobacterial transformation of *M. aquatica* in order to increase the synthesis of menthol and menthone. The method of clonal micropropagation based on a culture of isolated meristems can increase the volume and quality of nutrients obtained from plant essential oil. Due to the limited data on the introduction of *M. aquatica* into *in vitro* culture, it is of interest to develop an effective similar technique.

Keywords: water mint, *in vitro* culture, Lamiaceae, essential oil, biotechnology

Ecotourism Planning for Sustainable Management of Protected AreasHarun HURMA¹, Derya İlkay ABDİKOĞLU¹¹Department of Agricultural Economics, Namık Kemal University, Turkey
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Aim of the study: In this study, the initial planning process has been examined for the purpose of the management of ecotourism activities to be implemented in protected areas. For this purpose, strategies, programs and activities has been mentioned in administrative perspective. This approach has a reference for detailed plans.

Material and Methods: Publications such as articles, research reports, etc. about the subject has used for study material. The information obtained through the review of these materials has been compiled and interpreted.

Results: Protected areas are clearly defined geographical areas governed by legal or other effective means in order to protect nature in the long term together with its ecosystem services and cultural values. These areas are host to many ecosystem services, especially biodiversity. Protected areas play an active role in achieving national and local development goals based on the concept of sustainable development. Ecotourism is defined as trips and visits to natural areas recognizing entertainment and nature which providing benefits to local people through socio-economic attendance of them and has low-level visitor impact. Ecotourism is an ideal component of sustainable development strategy in which natural resources may be used for tourism purposes without harming the natural environment. When approached from managerial perspective, ecotourism is part of the strategy of protected area management. When considering the negativities of ecotourism it is clear that it can not succeed without an appropriate planning and management process. These plans cover specific objectives as well as general objectives and aims established for the protected area system. These plans can be customized according to the nature of the protected area and the activity of the ecotourism.

Keywords: Ecotourism, protected areas, sustainable management

Touring Potential and Prospects of Its Development in Adjara

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Aim of the study: In the late years one of the main priorities of Georgia's government supporting of tourism development. According to the forecast of world tourist organization (WTO) by 2015 the amount of tourists will reach 1 billion and the most important segments by 2015-2020 will be: The sun and beach; Sport; Adventures; Tourist and nature; Cultural tourism; Urban tourism; Rural tourism; Cruises; Preserves and parks; Conferences. Adjara is Georgia's one of the most important regions being distinguished with its original climatic conditions. River gorges, meadows, diverse nature and dense woods attract attention of many tourists. The region is characterized with particular abundance of historical and cultural values. Hundreds of historical and architectural monuments admire local and foreign tourists. Rich cultural traditions, hospitality passing through centuries and tolerance towards foreigners, high internal culture and intelligence give us ability to talk about development of tourism's variety in the region (especially in its subtropical zones). Nowadays the best way is using families living near tour routes as "Host families" because the infrastructure in the region is not highly developed and the amount of hotels is not very large. This factor is very important not only for developing of tourism in Adjara but also for attaching population to their living areas in the mountainous region. For this matter the existence of tour centre assuring communication of users of touristic resources and producers is very important. The centre will offer to foreign and local tourists the variety of tourism priorities in Adjara. Tourists will get acquainted to the information they'll be interested in through guide-operators prepared beforehand. Visitors will be located in "host families". Creation of informational database on the web site where also will be placed information about touristic zones, tour routes also about "host families". Creation of informational database on the web site where also will be placed information about touristic zones, tour routes also about "host families" is very important.

Results: It's also possible to print and spread advertising leaflets showing tourism potential and giving information about "host families". Thus, Adjara is important region having good conditions for developing of eco and agro tourism, cultural tourism and pilgrimage. Development of tourist business will solve a lot of problems in Adjara, especially in subtropical region. It will decrease migration and unemployment, will stimulate small and medium businesses, will popularize the cultural heritage of the region, will stimulate producing of agricultural products.

Keywords: Touring potential, Adjara, Visitors, important region, touristic zones.

Tourism-Induced Environmental Pollution in Coastal Areas and Sustainable Use

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Aim of the study: The present study investigates tourism-induced environmental pollution in coastal areas, discusses ecology-oriented management of tourism areas, and makes some suggestions to protect agricultural fields, to make tourism congruous with agricultural practices in these fields, and to minimize environmental damage.

Material and Methods: Throughout the history, coastal areas have been among the most important sites of human and economic activities thanks to their natural conditions and economic properties. These areas offer a wide range of usages with their marine and terrestrial resources. Proper harvesting from naturally and economically versatile areas like coastal areas greatly depends on how much is known about the human and economic conditions of these areas and planning according to these conditions. The results of our previous work on Turkey's Aegean coastal tourism facilities have been examined in this study.

Results: Pressing need for housing and population pressure has caused many problems in these areas over time, which are highly susceptible to natural and human damages. Planning and rational use of coastal areas are of grave importance because they are sustainable economic locations. Climatic properties and natural beauties in these areas have made them more appealing for humans and offered opportunities for the development of sea tourism in coastal areas. The development of tourism has caused many problems in coastal areas, particularly environmental pollution. The most dramatic damage of unplanned and unchecked development of tourism in these areas has occurred in fertile agricultural fields. For this reason, ecological-based approaches and practices are important in tourism activities in coastal areas.

Keywords: coastal areas 1, tourism 2, environmental pollution 3, agriculture 4

Anatomical Study on Translocation of Carbon Nanomaterials Distribution in Leaf and Stem of the Pea Green (*Pisum sativum*) Plant

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Aim of the study: The translocation of nanomaterials across the plants have impact for their development and considerably important on their evaluation. Pea green (*Pisum sativum*) is belong to Fabaceae family which has an economic value in the world. According to this study, pea green leaf and stems were used to investigate the anatomical features related translocation and transmission of C₇₀ single-walled carbon nanotubes (SWNTs). The comparisons and results were obtained and the hyperspectral photographs were taken to make comparisons.

Material and Methods: Pea green seeds were exposed to 4 ml C₇₀ single-walled carbon nanotubes (SWNTs) and 15 ml deionized water mixture for 2 days and they were grown in the pots for 3 weeks. Control group of the samples were also grown in another pot. All the plants watered every day only with water in the morning. After 3 weeks, C₇₀ single-walled carbon nanotubes (SWNTs) exposed pea green plants (leaf, stem, and root) and control group were taken from the pots and they were stored at % 70 alcohol. For microscobical investigation, hand cross sections were taken. Cytoviva Hyperspectral Imaging Microscope was used to take C₇₀ single-walled carbon nanotubes (SWNTs) exposed pea green leaf and stem and control group leaf and stem photographs.

Results: Effects of nanoparticles on biologic systems and for the environment is known according to recent researches. According to this study, by comparing most of the photographs, it can be concluded that, C₇₀ single-walled carbon nanotubes (SWNTs) absorbed and translocated to the leaves and transmitted in big rates while photosynthesis is existing. Some C₇₀ single-walled carbon nanotubes (SWNTs)particules were seen on the stem, especially around the vascular bundles. Black aggregates were found easily around the cells near the vascular bundles. There were a few damaged cells seen on the plant. The pea green plants *except* control group were also morphologically seen healthy.

Keywords: Pea green (*Pisum sativum*), C₇₀ single-walled carbon nanotubes (SWNTs), anatomy

Application of Random Amplified Polymorphic DNA (RAPD) to Detect Genotoxic Effect of Sodium PropionateNazmiye ATASEVEN¹, Fatma ÜNAL^{1*}, Ayten ÇELEBİ KESKİN², Deniz YÜZBAŞIOĞLU¹¹Dept. of Biology, Genetic Toxicology Laboratory, Faculty of Science, Gazi University, Turkey²Department of Bioengineering, Faculty of Engineering, Kırıkkale University, Turkey

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Aim of the study: Due to the increasing of world population, it is necessary to investigate new food sources and preserve them for a long period without affecting their quality and biodiversity. Several methods have been investigated for food storage and many chemicals are being used for preservation as antimicrobial agent. However, these agents were reported as mitotoxic and genotoxic in several test systems. Therefore, they threaten biodiversity in the World. The aim of this study was to investigate the genotoxic potential of sodium propionate (E281), a food preservative, by using RAPD-PCR in cultured human lymphocytes.

Material and Methods: Lymphocytes from peripheral venous blood was obtained from two healthy donors (male and female, non-smokers, aged 24–26 years) not exposed to any drug therapy or known mutagenic agent over the past 2 years. Lymphocytes were cultured for 72 h at 37°C. Cells were treated with 7.81, 15.62, 31.25, 62.50, 125.00, and 250.00 µg/mL concentrations of sodium propionate for 24 and 48 h. In addition, a negative and a positive control (mitomycin-C) were included for each experiment to ensure validity of the assay. Genotoxic effects of the sodium propionate were investigated by using RAPD-PCR technique with arbitrary 10-mer primers. The CTAB (hexadecyltri-methylammonium bromide) method was used for extracting total DNA. After purification, the DNA concentration was estimated by ultraviolet (UV) spectrophotometer at 260 nm.

Result: RAPD-PCR test results indicated that sodium propionate treatment did not induce any changes with primers used. However, genotoxic potential of this additive should also be evaluated by using other genotoxicity assays as chromosomal aberration, sister chromatid exchange, micronucleus, and comet assays.

Keywords: RAPD-PCR, sodium propionate, food additive, genotoxicity, human lymphocytes

Biochar Application Affects Water Content, Lipid Peroxidation and Antioxidant Capacity in Wheat Roots Grown in a Cobalt-Contaminated Soil

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Aim of the study: Biochar (charcoal) is the solid co-product of pyrolysis, the thermal degradation of biomass in the absence of oxygen. Biochar has attracted widespread attention because of its potential use as a soil amendment to improve soil quality, sequester carbon, and enhance immobilization of potentially hazardous chemicals. Therefore, application of biochar in contaminated soil could be a potential management strategy for agricultural sustainability and food security. The information is unknown about the effects of biochar on alleviating the harmful effect of cobalt (Co) stress on antioxidant defense system in *Triticum aestivum* roots. The present study is aimed to study the effects of biochar on water content, proline content (Pro), hydrogen peroxidase (H₂O₂), activities of some antioxidant enzymes and lipid peroxidation (TBARS) were investigated in roots of Co-stressed wheat.

Material and Methods: For this, three-weeks-old wheat plants were treated with 150 and 300 μ M Co stress with/without biochar (10% and 20%) treatments for 7 days.

Results: A decrease in activities of superoxide dismutase (SOD), catalase (CAT) and peroxidase (POX) were observed in response to increasing levels of Co concentration. These changes were observed more pronounced in 300 μ M Co stress-treated wheat roots. However, in Co-stressed wheat, biochar application resulted an alleviation on water content and a decline in H₂O₂ content. Also, when comparison to the plants treated with stress alone, biochar application to Cd-stressed wheat significantly decreased TBARS content and significantly enhanced the activities of SOD, POX and ascorbate peroxidase (APX). It could be concluded that exogenous biochar may have the application possibility for a future practical trial of stress reduction leading to mitigated heavy metal toxicity and improved the water content and the antioxidant enzyme activities in wheat roots.

Keywords: Antioxidant enzyme, Biochar, Cobalt, ROS, *Triticum aestivum*

Changing Membran Morphology Induced by Dichlorvos and Protective Role of Lycopene

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Aim of the study: Pesticides have been widely used in agriculture and household. Studies have shown that both short-term and long-term exposure to pesticides could cause serious toxicity. Among the organophosphorous class of pesticides, dichlorvos (2,2-dichlorovinyl dimethyl phosphate, DDVP) is a commonly used insecticide which is generally used around homes and in gardens. Lycopene, especially, found in red colored foods, is an antioxidant with an ability of scavenging of singlet oxygen and free radicals, thus lycopene can play an important act in oxidative stress caused disorders and cancer. This work evaluates whether treatment with an oxidant (dichlorvos) and antioxidant (lycopene) can effect the membran morphology damages in human erythrocytes with the May-Grünwald-Giemsa method staining method *in vitro* conditions.

Material and Methods: A solution of dichlorvos was prepared in distilled water. The doses of dichlorvos that were used in this study lower concentrations, the medium concentration and the higher concentration were selected based on the earlier studies. Fresh human bloods were collected in ethylenediaminetetraacetic acid (EDTA) in polyvinyl chloride containers and stored at 4 °C for 1-3 h and centrifuged. The supernatant was removed and PBS was added at 4 °C. RBC suspension (100 µL) treated with dichlorvos and/or lycopene at room temperature and only saline solution was given to control group. Histological preparations were used for images of the RBC and staining carried out with May-Grünwald-Giemsa method.

Results: In this study, it was demonstrated that the interaction of dichlorvos and/or lycopene with human erythrocytes. Completely normal erythrocytes cells were detected in control group. The toxic effect of dichlorvos against erythrocytes was shown in Figures. There were no changes in membrane morphology detectable at low doses of dichlorvos when compared with control group. Changes in membrane morphology increased by increasing the exposure doses of dichlorvos. Intact human erythrocytes incubated with dichlorvos showed clearly changes in echinocytic form. It was seen that depending on the lycopene treatment, membrane morphology was negatively affected, in other words changes in membrane morphology was increased. In conclusion, data in this study showed that lycopene treatment partially decreased toxic effects of dichlorvos on erythrocytes but not protect completely. So we must avoid to treatment of dichlorvos which were induced generation of crenated cell-shaped cell. Also *lycopene* should be included in the diet.

Acknowledgements: The authors would like to thank to Fatih Oğuz BEKDEMİR, Muge HİLOĞLU and Gülcan ERKEK for helping us to prepare this study.

Keywords: Dichlorvos, erythrocytes, morphology, lycopene, echinocytes

Characterization of Soil and *Erysimum kotschyanum* Gay. Samples from Honaz Mountain

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Aim of the study: In this work, soil compositions of *Erysimum kotschyanum*'s habitat in which widespread Denizli, Honaz Mountain was determined by soil and CNS analysis. Environmental factors, for examples temperature, humidity, salinity, alkalinity climate, the supply of water, minerals and heavy metals, pH, show significant differences in the production and accumulation of primary and secondary metabolites. So, in this research. we wanted to identify environmental factors around *E. kotschyanum*.

Material and Methods: This study includes analysis of soil and plant samples. Soil profiles from 3 different altitudes were done using pH, salinity, calcination methods. Also, CNS analysis and heavy metals contents (Cr, Cd, Ni, Co, Fe, Cu, Pb) of soil and plant samples were determined.

Results: Our results showed that *E. kotschyanum* preferred high-altitude, non-calcareous, salt-free and slightly alkaline soils. C/N ratio of plant samples may be indicated that plant contain the N containing secondary metabolites. When the heavy metal contents of plant and soil samples are examined, it is seen that the highest amount of heavy metal is iron. But these results do not support that the plant is a hyperaccumulator.

Acknowledgements: Financial support from Scientific Research Projects Coordinatorship of Pamukkale University, Turkey is gratefully acknowledged.

Keywords: Soil analysis, CNS analysis, heavy metal content, *Erysimum kotschyanum*

Cytotoxicity of Turkish Propolis Samples on Human Bronchial Epithelial CellsZüla ATLI ŞEKEROĞLU¹, Zeynep KOLÖREN¹, Ömer ERTÜRK¹¹Department of Molecular Biology and Genetics, Faculty of Arts and Sciences, Ordu University, Ordu
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Aim of the Study: Propolis is a resinous hive product collected by honeybees from various plant sources. It has been reported that propolis has a wide variety of biological actions. The aim of this study was to determine the *in vitro* cytotoxicity of Turkish propolis extracts on human bronchial epithelial (BEAS-2B) cell cultures.

Material and Methods: The 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT) assay was used for the determining of the cytotoxicity of Turkish propolis ethanolic extracts. BEAS-2B cells were treated with different concentrations (1, 2, 4, 5, 6, 7, 8 and 16 mg/ml) of propolis and 72 hours after the IC₅₀ value was calculated.

Results: Our results indicated that propolis showed stronger inhibitory effects at the higher concentrations (7, 8 and 16 mg/ml). The 50% inhibitory concentrations (IC₅₀) of propolis was found approximately at 6 mg/ml concentration. Propolis reduced cell viability by approximately 43, 23 and 13 % in BEAS-2B cells with treatments of 7, 8 and 16 mg/ml.

Keywords: Propolis, MTT assay, BEAS-2B cells, Cytotoxicity

**Determination of Impact of Mycotoxin Enniatin-A on DNA Damage using Comet Assay
*in vitro***Sevcan MAMUR¹ Fatma ÜNAL², Esra ERIKEL², Deniz YÜZBAŞIOĞLU²¹ Life Sciences Application and Research Center, Gazi University, 06830, Ankara, Turkey² Department of Biology, Science Faculty, Gazi University, 06500, Ankara, Turkey
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Aim of the study: Mycotoxins are produced by food borne fungi and are important environmental pollutant and carcinogenic agents occurring in many parts of the World. Enniatin A (EN-A), a *Fusarium* mycotoxin, is the common contaminant in cereals and corn and causes serious loss of products and harm other species. Biodiversity is important at all scales of the agricultural landscape for both human and all the living beings. The role of biodiversity for food and agriculture in improving food security and sustainability is important. Therefore, this study was planned to investigate the DNA damaging effect of EN-A by using comet assay in human lymphocytes *in vitro*.

Material and Methods: Cells were treated with 0.048, 0.098, 0.195, 0.39, and 0.78 µg/mL concentrations of EN-A as well as a solvent [DMSO, 0.5% (v/v) of the culture medium], a negative and a positive (hydrogen peroxide) controls. This study was approved by the ethical committee of the Faculty of Medicine, Gazi University (26.05.2014-277).

Results: It was observed that EN-A significantly increased the comet tail intensity at the three (0.098, 0.195, and 0.78 µg/mL) concentrations, while it increased the comet tail length at 0.195 and 0.78 µg/mL concentrations compared to negative control. When compared to solvent control, EN-A increased the comet tail length at all the treatment concentrations (except at 0.048 µg/mL), however it increased tail intensity at only 0.195 µg/mL concentration. According to these findings EN-A has DNA damaging effects in certain concentrations. However, to be able to interpret the impact of EA on genetic material some additional genotoxicity assays as chromosomal aberration, micronucleus and sister chromatid exchanges should also be conducted.

Acknowledgements: This study was supported by TUBITAK under the project number 114Z713.

Keywords: Enniatin-A, mycotoxin, DNA damage, comet assay.

Determination of Pesticide Residues on Anise Seed (*Pimpinella anisum* L.)Nilda ERSOY¹, Deniz HAZAR², Ramazan S. GÖKTÜRK³, İbrahim BAKTİR⁴¹Department of Organic Agriculture, Akdeniz University, Turkey²Department of Horticulture, Akdeniz University, Turkey³Department of Biology, Akdeniz University, Turkey⁴Department of Plant Science and Technology, International Cyprus University, K.K.T.C.
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Aim of the study: Anise is a cultivated plant which has been grown in our country for many years and also one of the most important plants that are exported besides domestic consumption. Almost all of the anise production is made in the transition region between the Göller Basin and Central Anatolia Region. According to the data of 2015, our annual anise production is 9,050 tons (TÜİK, 2016) and our export value is about 3-4 thousand tons on average. In this study, the pesticide residues on seeds of anise (*Pimpinella anisum* L.), grown in Tefenni / Burdur Province was examined.

Material and Methods: In the study, seeds obtained from anises (Göhlisar variety) cultivated by a producer during the production season of 2012-2013 in Tefenni district of Burdur province were used as material. The samples were taken after about 1 month from the harvest of the plants. For this purpose, seed samples were taken from 10 different sacks choosing randomly from producer's storehouse as one-kilogram and they were mixed. For extractions, 15 grams seed samples were studied three times repetitively. Pesticide standards were prepared with a purity of at least 90%. Extraction and cleaning process of the samples were carried out according to the International Official Methods of Analysis (Lehotay, 2007).

Results: Residue quantities obtained from the research were evaluated as average of 3 repetition in each sample according to Turkish Food Codex (TFC) Regulation on Maximum Residue Limits of Pesticides (Official Gazette No 21.01.2011-27822; Notification No: 2011/2). The TFC residue limits of each pesticide sample are indicated separately in the tables presented. In residue limits determined by using high-precision analytical instruments such as GC-MS and LC-MS/MS, in anise seed samples analyses of total 100 pesticide active ingredients were made in LC-MS/MS instrument and 103 pesticide active ingredients in GC-MS instrument. In this research carried out between 2012 and 2013, detectable levels of the residues were not found in the samples of these two years.

Keywords: Anise, pesticides, residues

Ectoine Improves Oxidative Damage on Water Status, Photosynthetic Efficiency and Lipid Peroxidation Induced by Cadmium Treatment in *Zea mays* (Maize) Leaves

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Aim of the study: The problems arise when cells are confronted with an excess of heavy metal that lead o cellular damage. Plants have evolved a variety of adaptive mechanisms to respond to heavy metal stress including cadmium (Cd) stress. One of the main adaptive mechanisms to stress is the accumulation of compatible solutes. Ectoine, is low molecular weight organic solutes, can be considered to be a heterocyclic amino acid or as a partially hydrogenated pyrimidine derivative (1, 4, 5, 6-tetrahydro-2-methyl-4-pyrimidinecarboxylic acid). To get more information on the responses to Cd in plants treated with ectoine, we aim to investigate the effects of hydroponically ectoine application (50 and 100 mM ECT) on the water relationship, compatible compounds and photosynthetic mechanism in maize exposed to 150 and 300 μ M Cd stress.

Results: Stress caused a reduction in water content (RWC), growth (RGR) and chlorophyll fluorescence (Fv/Fm), but it observed an increase in proline content (Pro) and lipid peroxidation (TBARS). When the high Cd concentration was used, the oxidative damage induced by stress was more severe. ECT treatment alone did not have any effect on TBARS content but it showed an increase in RWC, RGR and Pro content of maize leaves compared to the control groups. However, exogenously supplied ECT alleviated the inhibition of growth and water status during Cd stress. The plants treated with ECT showed a much greater reduction in lipid peroxidation than increasing Cd concentrations-treated plants. Besides, ECT might protect leaves against stress and play a role in improved the rate of photosynthesis and water relations by providing increase in Fv/Fm, RWC and Pro content. Taken together, the results of the present study show that ECT enhances the stress tolerance of maize plants.

Keywords: Cadmium, Ectoine, Heavy metal stress, Osmotic adjustment, Proline, *Zea mays*

Effects of Leachate from Open Dump Area on Underground Water

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Aim of the study: In this study, the results obtained by compiling studies on the effects of leachate waters originating from irregular solid waste landfills on the quality of groundwater were evaluated.

Material and Methods: Solid wastes originated from human and economic activities, have been increasing with the increase of population. The one of the most difficult issues of local government is the control and disposal of solid wastes. There are no regular solid waste storage facilities in many settlements in Turkey. Due to this shortage, one of the preferred and applied methods of disposal of solid wastes at present is irregular storage method. Forest areas and agricultural land, particularly empty fields, are frequently used for random storage of solid wastes for this purpose. However this method has many negative aspects in terms of environmental effects. These effects consist of some environmental problems such as pathogenic parasites, reproduction of vermin and other harmful organisms, diffusion of foul-smelling and other hazardous gases, pollution of underground water and impossibility in monitoring of pollution. Moreover, toxic elements in leachate from solid wastes are transported in various ways to pollute underground and surface water resources and prevent their use as a drinking water source.

Results: When studies on this subject are evaluated, it is observed that shallow wells in the irregular solid waste storage area are exposed to pollution and these resources lose their use as a source of drinking, use and irrigation water. Moreover, in case leakage water is discharged to the creek bed, it is necessary to collect and purify the waste water using a suitable technology in a treatment facility instead of discharging the leaking water to the creek bed.

Keywords: Leachate, underground water, water quality

Evaluation of Genotoxic Effects of Needle-Like TiO₂ Nanoparticles in Human Lymphocytes *in vitro* by Sister Chromatid Exchange Assay

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Aim of the study: Nanoparticles are widely used in electronics, textiles, food, pharmacy, medicine and many other areas. However, these particles accumulate on the nature and on the living beings and threaten biodiversity. One of these nanoparticles, titanium dioxide (TiO₂ NPs) is widely used in laminate, food packaging, paint, textile, toothpaste, sun protectors, food additive, pharmacy, medical diagnosis and drug delivery. However, recent studies show that TiO₂ NPs have genotoxic effects on different cell and cell lines. The aim of this study is to investigate genotoxic effect of needle-like TiO₂ NPs by using sister-chromatid exchange (SCE) assay in cultured human lymphocytes.

Materials and Methods: Lymphocytes obtained from two healthy donors were treated with different concentrations (100, 200, 300, 400, and 500 µg/ml) of needle-like TiO₂ NPs for 24 and 48 h. A negative (ultra-distilled water) and a positive control (Mitomycin-C, MMC) were also maintained. Data obtained from the treatment groups were compared with the negative and positive controls by using Student's t-test. This study was approved by the Ethics Committee of Gazi University Faculty of Medicine (No: 276, 05/09/2016).

Results: Needle-like TiO₂ NPs did not increase the frequency of SCEs at both 24 and 48 h treatment periods in human lymphocytes. This study indicated that needle-like TiO₂ NPs did not induce sister chromatid exchange and cause mutagenic effects in cultured lymphocytes. While some studies show that TiO₂ NPs induce genotoxic effects in different cell and cell lines, some other studies reveal any damage. These differences may be originating from differences in the forms, shapes, and sizes of TiO₂ NPs, as well as differences in repair mechanism and cell line resistance.

Acknowledgements: Thanks to Prof. Dr. Halil İbrahim ÜNAL for donating needle-like TiO₂ NPs that were synthesized in his laboratory.

Keywords: Needle-like TiO₂ nanoparticles, genotoxicity, sister chromatid exchange, human lymphocytes

Histopathological Changes in Manto Tissues of *Physa acuta* Draparnaud, 1805 (Gastropoda: Physidae) Exposed to CuSO₄

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The aim of the study: The aim of this study is to determine histopathological changes in mantle of *Physa acuta* exposed to different concentration of copper sulphate for increased periods according to copper sulphate accumulation.

Material and Methods: *Physa acuta* specimens were acclimated to laboratory conditions for 15 days. After adaptation period, the snails were divided into 4 groups.

Group I. the snail control group not exposed to CuSO₄ concentration

Group II. Snails exposed to 0,05 mg/l concentration of CuSO₄

Group III. Snails exposed to 0,1 mg/l concentration of CuSO₄

Group IV. Snails exposed to 0,2 mg/l concentration of CuSO₄

The sublethal CuSO₄ doses were applied to all experimental groups except the control group for 30 days. In order to determine the histopathological alterations, histological preparations of the mantle samples from snails taken from the control and experimental groups at 10th, 20th and 30th days of the experiment were prepared. Histopathologic changes were examined with light microscope and photographed.

Results: In the control group, the mantle consists of epidermal layer, columnar muscle fibrils, lipid vacuoles, and pigment cells. In Group there wasn't any histopathological changes in the mantle. In the experimental groups, at the end of the 10th day, increase in pigment cells in the mantle, (Group II), an increase in pigment cells and lipid vacuoles and atrophy in muscle fibrils (Group III) and (Group IV) were determined. At the end of the 20th day, there was an increase in pigment cell and lipid vacuoles in the mantle (Group II), in Group III atrophy in the muscle fibrils, condensation of lipid vacuoles, desquamation in the epithelium were observed. In Group IV, the histopathological changes were more severe than Group III and necrosis was detected. At the end of the 30th day, in Group II desquamation in the epithelium, atrophy in the muscle fibrils, increase in lipid vacuoles were detected; in Group III in addition to the histopathological changes of Group II necrosis was observed. In Group IV connective tissue and muscle fibrils were replaced by pigment cells and lipid vacuoles. *Physa acuta* was exposed to CuSO₄ at sublethal concentrations of 0.05 mg/l, 0.1 mg/l, 0.2 mg/l for 30 days and histopathological changes in mantle tissues were observed to increase with dose and duration.

Acknowledgment: Research was supported by Dicle University Scientific Research Project Coordinator (DÜBAP) with 07-02-19 numbered project. Birgöl OTLUDİL and Sabahat Ayaz contributed to the research.

Keywords: *Physa acuta*, copper sulphate, histopathology, manto, snail.

Histopathological Examination of Cd Toxicity of Ovotestis in *Lymnaea stagnalis* Linnaeus, 1758 (Gastropoda: Pulmonata)

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The purpose of the work: Cadmium is the second toxic heavy metal after mercury among the heavy metals. It was decided to determine the effect of cadmium toxicity on the ovotestis of *Lymnaea stagnalis* Linnaeus, 1758 (Gastropoda: Pulmonata). In this experimental study, It was aimed to determine the histopathologic changes in the ovotestis of *Lymnaea stagnalis* exposed to sublethal cadmium concentrations for different periods.

Materials and Methods: *Lymnaea stagnalis* specimens were acclimated to laboratory conditions for 15 days. After adaptation period, the snails were divided into 5 groups.

Group I. the snail control group not exposed to cadmium concentration

Group II. Snails exposed to 63.4 µg / l concentration of cadmium

Group III. Snails exposed to 31.7 µg / l concentration of cadmium

Group IV. Snails exposed to 15.85 µg / l concentration of cadmium

Group V. Snails exposed to 7.92 µg / l concentration of cadmium

The sublethal Cd doses were applied to all experimental groups except the control group for 30 days. In order to determine the histopathological alterations, histological preparations of ovotestis samples from snails taken from the control and experimental groups at 7th, 14th, 21st and 28th days of the experiment were prepared. Histopathologic changes were examined with light microscope and photographed.

Results: In the control group, ovotestis is covered with single-layered flat epithelium from the outside. From the oocysts in the asinus, those around them constitute egg cells and those in the center form sperm bundles. In Group I, no histopathological changes was observed in the ovotestis. In experiment groups, at 7th day vacuolization in the cytoplasm in Group II, Group III, and Group IV and degenerated ovotestis in Group V were detected. At 14th day, vacuolization around the oocyte in Group II and Group III, changes in cellular level and picnotic cell in Group IV and large-scale cellular changes in Group V were observed. At 21st day, in Group II and Group III, while the degeneration was ongoing, amorphous oocytes separated from the asinus walls were detected. In Group IV excessive deterioration in reproductive cells and necrosis in all of the tissues in Group V were observed. At 28th day, amorphous oocytes separated from acinus walls in Group II and Group III; necrosis in all acinus of the tissue in Group IV; amorphous oocytes separated from the walls of the acinus but distinguished hardly recognized lumen and degenerated spermatozoa in Group V were detected. It was observed that histopathological changes in ovotestis tissues increased with dose and duration of the experiment.

Acknowledgment: Research was supported by Dicle University Scientific Research Project Coordinator (DÜBAP) with 07-02-19 numbered project. Birgül OTLUDİL contributed to the research.

Key words: *Lymnaea stagnalis*, Cd, EDTA, histopathology, snail.

Histopathology of Liver in *Anabas testudineus* After Exposure to Sublethal Concentrations of Chlorpyrifos

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Aim of the study: The present study was undertaken to assess the toxicity of sublethal concentrations (0.125, 0.250 and 0.375mgL⁻¹) of chlorpyrifos (an organophosphate pesticide) in the liver of *Anabas testudineus* for 7, 14 and 21 days.

Material and Methods: At 7th, 14th and 21st days liver tissues were removed and dropped in Bouin's fluid. After fixation for 24-30 hours, the liver samples were dehydrated with increasing concentrations of ethanol, transparented in xylene, embedded in paraffin. Sections of 5 mm were prepared from paraffin blocks by using a rotary microtome. These sections were then stained with hematoxylin-eosine.

Results: The histopathological changes in the liver were observed using a light microscope. On the 7th day, dilatation of sinusoids and granular degeneration were observed at 0.125mgL⁻¹, at 0.250mgL⁻¹ and 0.375mgL⁻¹ concentrations hypertrophy of hepatocytes, congestion, granular degeneration were diagnosed in the liver. On the 14th day, the determination of granular degeneration, hypertrophy of hepatocytes, congestion at 0.125mgL⁻¹ and 0.250 mgL⁻¹ concentrations, vacuolar degeneration, granular degeneration, hypertrophy of hepatocytes at 0.375mgL⁻¹ concentration were recorded. On 21st day and at all concentrations, congestion, pycnotic nucleus, granular degeneration, hypertrophy of hepatocytes were observed. On 21st day, at 0.250mgL⁻¹ and 0.375mgL⁻¹ concentrations, focal necrosis were also observed.

Acknowledgements: This study was financially supported by Jawaharlal Nehru Memorial Fund (SU/1/192/2006-2007/646).

Keywords: histopathology, liver, chlorpyrifos, *Anabas testudineus*

Spectroscopic Study of the Gold Nanoparticles (AuNPs) Distribution in Leaf, Stem, and Root of the Pea Green (*Pisum sativum*) Plant

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Aim of the study: Effects of nanoparticles on biologic systems and for the environment is known according to recent researches. Pea green (*Pisum sativum*) is belong to Fabaceae family which has an economic value in the world. According to this study, pea green is selected to investigate the translocation and transmission of gold nanoparticles (AuNPs) as regards leaf, stem and root parts of the pea green plants. Differential spectra data were obtained from the AuNPs exposed and from the control samples in comparison with standard AuNPs to study the distribution of the AuNPs in different parts of pea green plants.

Material and Methods: Pea green seeds were induced 10 nm AuNPs for 2 days and they were grown in the pots for 3 weeks. Control group of the samples were also grown in another pot. All the plants watered every day only with water in the morning. After 3 weeks, obtained different parts of the pea green plants (leaf, stem, and root) as regards AuNPs induced and control group were homogenized, washed by deionized water and collected for the following centrifuging filtering. The filtered aliquots from the plants grown in AuNPs and from the control plants were analyzed by methods of Near Infrared Spectroscopy (Nicolet 6700 FT-IR spectrometer from Thermo Electron Corporation). As a positive control, a standard aqueous suspension of AuNPs is used.

Results: According to this study, 3 graphics regarding AuNPs exposed leaf, stem and root of pea green plants were made. On the other hand, 3 graphics related leaf, stem and root of control group pea green plants for comparing the AuNPs induced parts were made. Graphics as regards AuNPs exposed parts showed that, every parts of the plant has AuNPs considerably. However, AuNPs exposed leaf graphic has differences if it compared with control leaf graphic and the others. It shows that, AuNPs absorbed and translocated to the leaves and transmitted in big rates while photosynthesis is existing. Stem and root reaction to the AuNPs translocation and transmission are similar.

Keywords: Pea green (*Pisum sativum*), AuNPs, spectroscopy, FT-IR

The Acute Toxic Effect of Glyphosate-Based Herbicide on *Melanopsis praemorsa*Birgöl OTLUDİL¹, Feysel ÇAKMAK¹, A. İsmail ÖZKAN¹, Özlem DEMİRCİ¹¹Department of Biology, Dicle University, Turkey
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Aim of the study: In this research, the aim is to determine 24, 48, 72 and 96-hours acute toxic effect of glyphosate-based herbicide on *Melanopsis praemorsa*.

Material and Methods: *M. praemorsa* is an organ in the "Red List of Threatened Species" of the International Union for Conservation of Nature. *M. praemorsa* samples were exposed to ten concentrations in the range of 0,1-1968.3 mg/l of a commercial formulation of glyphosate for 24, 48, 72 and 96-hours. We analyzed the results by probit analysis.

Results: In this work, the effects of different concentrations of glyphosate-based herbicide on *Melanopsis praemorsa* were tested. The LC50 values of glyphosate were determined for 24, 48, 72 and 96-hours as 21.762, 12.641, 10.583 and 9.338 mg/l respectively.

Acknowledgements: We are thankful to Prof. Dr. Rıdvan Şeşen for their contributions to our study.

Keywords: Acute toxicity, Glyphosate, *Melanopsis praemorsa*

The Comparison of Pesticide Residues on Organic and Conventional Raisin Products in Aegean Region

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The aim of the study: This study has been conducted to evaluate and compare pesticide residues on organic and conventional raisin products in Aegean Region.

Material and Methods: Experiments were carried out in 5 replicates completely randomized design through 9 years. According to soil analysis results, certified fertilizer and green manure and ground pruned branches were applied as plant nutrition material in organic plots. On the other hand, chemical fertilizer were applied in conventional plots. Certified products and traps permitted in related organic regulations were used as plant protection material in organic plots. In conventional plots, standard pesticides were used.

Results: According to research results, some small quantity of residues has been detected in a few case in the organic plots while high level residues have been dedected in the most cases in the conventional plots. The reason of chemical contamination in the organic plots is needed to be investigated and certification process should be carried out more strictly.

Acknowledgments: This study is supported by Ministry of Food Agriculture and Livestock and General Directorate of Agricultural Research and Policies

Keywords: Residue, organic raisin, conventional raisin, Aegean Region

The Effect of Glyphosate on *Bacillus subtilis* growth, α -Amylase Activity and Plasmid

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Aim of the study: The current study focuses on the effect of Glyphosate on *Bacillus subtilis* growth, α -Amylase Activity and Plasmid.

Material and Methods: *B. subtilis* which was used as a source of α -amylase obtained from *B. subtilis* ATCC 6051. Bacteria are grown on nutrient agar at 37°C for 24 h for inoculum preparation and then a loopful of the growth was transferred to Laura Broth (LB) liquid medium. Different concentrations (20, 28, 36 and 44 mg/ml) of the commercial glyphosate were used for bacterial growth, α -amylase activity and rate of plasmid.

Results: In this work, the effects of different concentrations of glyphosate-based herbicide on *Bacillus subtilis* were tested. Bacterial growth, both bacterial and commercial α -amylase activity has decreased against concentration of test compound, respectively. On the other hand, plasmid has shown weakly amplification against test compound, respectively.

Keywords: Glyphosate, *Bacillus subtilis*, alpha amylase, plasmid

The Heavy Metal Concentrations in Water, Sediment, Soil and Muscle Tissues of Fish from Kabaklı Pond

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Aim of the study: the aim of the study is to determine heavy metal concentration of water, sediment, soil and muscle tissue of fish in the contaminated pond (Kabaklı Pond) where massive fish dead were seen.

Material and Methods: Fish, water, sediment and soil samples were collected from Kabaklı pond, Diyarbakır, Turkey. The samples were dried and digested with microwave. After digestion samples were diluted with 15 ml with ultra-pure water. All samples were analyzed triplicate times for V, Cr, Mn, Co, As, Se, Mo, Cd, Sb, Ba, Hg, Tl and Pb by Agilent 7700X inductively coupled plasma mass spectrometry (ICP-MS). Working standard solutions for system calibration and control of analytical accuracy were obtained by dilution of the stock solutions (1 mg l⁻¹ for ICP-MS).

Results: In the water samples the Ba had the highest concentration (50,702 µg l⁻¹). In parallel, Ba concentration in the sediment was also the highest (141.230 µg l⁻¹). In the soil samples Co, As, Se, Mo, Sb, Ba, Tl and V concentrations were under the detection limits, but Cr had the highest concentration (1.000.000 µg l⁻¹). In the muscle tissues of the fish samples while Sb and Tl were below the permissible limits proposed by the Food and Agriculture Organization, World Health Organization and Turkish Legislation, V, Cr, Mn, Co, As, Se, Mo, Cd, Ba, Hg and Pb concentrations were above the limits.

Acknowledgements: We are thankful to Rectorate of Dicle University for their support.

Keywords: Heavy metals, Kabaklı Pond, ICP-MS, Water, Soil, Sediment, Fish.

The Structure of the Bacterial and Archaeal Community in a Labscale Hybrid Bio-Methane Reactor as Revealed by Denaturing Gradient Gel Electrophoresis and 16S rDNA Sequencing Analysis

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Aim of the study: Anthropogenic activities produce huge amounts of CO₂ all over the world. Biogas draws significant attention due to the fact it is sustainable, clean, environmentally friendly and highly efficient and can be produced for wide range of organic waste material. In this study, it was aimed to identify the shifts and dynamics in archeal and bacterial profiles in a hybrid anaerobic bio-methane reactor fed with only H₂ and CO₂ gasses by 16s rDNA-based methods.

Material and Methods: Different H₂/CO₂ rates were tested during the study. No additional organic material was fed into the bioreactor. The dynamics of microbial communities were quantified by real-time PCR analysis. All quantitative analysis were carried out with LightCycler 1.5 and reaction mixture was prepared using LightCycler TaqMan Master kit (Roche Diagnostics, Mannheim, Germany). Also, denaturing gradient gel electrophoresis (DGGE) method was used for determining microbial profile changes under different H₂/CO₂ ratios. DGGE of the PCR products was performed by DCode Universal Mutation System (Bio-Rad, USA) on 8% polyacrylamide gels with different denaturing gradients (35-70% for ARC, MBT, MSL and MMB, 40-60% for BAC samples) of urea-formamide (100% correspondent to 7M urea and 40% [v/v] formamide). The electrophoresis conditions were 135 V in 1xTAE buffer at 60°C for 8 h. Separated DNA bands were excised, re-amplified and analyzed using Sequencher 5.4.5 Sequence Analysis Software (Gene Codes, US). Bacterial V3-V5 variable region specific and archeal group-specific (*Methanobacteriales*, *Methanomicrobiales*, *Methanosarcinales* and total Archaea) primer and probe sets were used.

Results: The group-specific primer and probe sets targeting methanogenic archaea showed that *Methanobacteriales* members were more intense, followed by *Methanosarcinales* members and *Methanomicrobiales* members had lower numbers. The number of archaea is generally approximately 1 log (10 times) more than the number of bacteria. DGGE results indicated that *Methanosaeta concilii*, *Methanoculleus* sp., *Methanosphaerula palustris*, *Methanofollis formosanus*, *Methanolinea* sp. and *Methanobacterium palustre* were the most dominant methanogens depending on different H₂/CO₂ ratios. DGGE profiles suggested both hydrogenotrophic and acetoclastic species were responsible of producing methane. Syntrophic bacteria and acetoclastic methanogens were thought to be survived by organic materials provided by dead cells. To the best of our knowledge, this is the first microbial profile detection study in the hybrid bioreactor system operated with only pure hydrogen and carbon dioxide gas supply.

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Keywords: CO₂, biomethane, hydrogenotrophic methanogen, DGGE, Quantitative PCR

Time-Dependent Toxicity of Silver Nanoparticles to *Daphnia magna*Rahime ORAL¹, Fatma KOÇBAŞ², Gökür ŞİŞMAN AYDIN¹¹ Faculty of Fisheries, Ege University, Turkey² Biology Department, Faculty of Arts and Science, Manisa Celal Bayar University, Turkey
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Aim of the study: Due to its antimicrobial properties, silver is the most produced nanomaterial. Thus, large quantities of silver nanoparticles (AgNPs) could be released and enter freshwater environments. The goal of our study is to examine and better understand the potential ecotoxicological impacts of nano-sized (<100 nm) silver particles on freshwater biota by using the *Daphnia magna* acute toxicity test.

Material and Methods: In this research, *D. magna* were cultured, handled and used in ecotoxicological tests according to the procedures outlined in the U.S. Environmental Protection Agency. Four replicates of five neonates (less than 24 h old) were used for each treatment and control without feeding. The *D. magna* tests were performed using different concentrations of AgNPs (1, 2.5, 5, 10 and 25x10⁻⁷M). After 24 and 48 hours of exposure, the immobilization and mortality of the *D. magna* in each test beaker were observed. An animal was recorded as dead when it was immobile. The LC₁₀, LC₅₀, and LC₉₀ values were calculated using the probit analysis program after 24-h and 48-h.

Results: The results obtained from the exposure studies showed that the toxicity of AgNPs on *D. magna* neonates was dose and time dependent. The 24-h LC₁₀, LC₅₀ and LC₉₀ concentrations of AgNP were calculated as 2.4, 6.1 and 15.7 x10⁻⁷ M, respectively. In addition of these results, the 48-h LC₁₀, LC₅₀ and LC₉₀ concentrations of AgNP were calculated as 1.4, 4.2 and 12.3x10⁻⁷ M, respectively. In conclusion, the release of nano-sized silver particles into the freshwater environment should be carefully considered to protect biodiversity.

Keywords: *Daphnia magna*, Silver, Nanoparticle, Acute toxicity

Toxicity Effect of Furan on the Morphology of Human Erythrocytes

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Aim of the study: Furan is a toxicant and it is classified as carcinogenic to animals and humans. Aim of this study was to examine the potential damage of furan on human erythrocytes with the May-Grünwald-Giemsa method staining method *in vitro* conditions.

Material and Methods: Obtained healthy blood was centrifuged at 10,000 rpm, for 10 min, the supernatant was removed and PBS was added at 4 °C. All treatment was repeated three times. Obtained stock of RBC suspension were used for all experiments. RBC suspension (100 µL) treated with furan for different concentrations at room temperature and only saline solution was given to control group. Histological preparations were done and staining carried out with May-Grünwald-Giemsa method. Images of the RBC were obtained by ×100 of optical microscope (Olympus CX51, Japan).

Results: The morphological structure of erythrocytes changes from normally disk-shaped to a number of shapes with treatment different chemicals. Changing normal cells were identified and classifications of these changes about cell morphology can be recognized. The crenated cell, or echinocyte, and the cup-shaped cell, or stomatocyte are best characterized as abnormal shapes. Various drugs, by depletion of intracellular ATP and changes in pH can be caused abnormal erythrocytes shape. In this study, changes in membrane morphology from human erythrocytes can be observed *in vitro* under different concentrations of furan. Application of high doses of furan induced changes in erythrocytes morphology for 24 h. A very slight changing of erythrocytes cell's morphology was observed at 1 µg/mL for 6 and 12.

Acknowledgements: The authors would like to thank to Kemal KOÇ and Fatma İLÇE for helping us to prepare this study.

Keywords: Furan, erythrocytes, morphology, echinocytes.

Altitude and Habitat Preferences of Zerconid Mites (Acari: Zerconidae) in Afyonkarahisar Province (Turkey)

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Aim of the study: Zerconid mites represent with many endemic species in Turkey. Until now, more than one hundred species were recorded from Turkey. This study was aimed to research about altitude and habitat preferences of zerconid mites in Afyonkarahisar province.

Material and Methods: This study based on materials which collected from various forestland areas in Afyonkarahisar province between February 2014 and August 2016. Litter, soil and moss samples were collected from research areas and transferred to laboratory. During the field studies, habitat types (*Acacia* sp., *Acer* sp., *Astragalus* sp., *Cedrus libani*, *Cistus* sp., *Crataegus monogyna*, *Cupressus* sp., *Cydonia oblonga*, *Elaeagnus angustifolia*, *Euphorbia* sp., *Juglans regia*, *Juniperus* sp., *J. oxycedrus*, *Melia* sp., *Morus alba*, moss, *Paliurus spina-christi*, *Pinus* sp., *P. brutia*, *P. nigra*, *Platanus orientalis*, *Populus* sp., *Prunus* sp., *P. dulcis*, *Pyrus* sp., *P. elaeagrifolia*, *Quercus* sp., *Q. cerris*, *Q. coccifera*, *Q. infectoria*, *Q. ithaburensis*, *Q. pubescens*, *Q. vulcanica*, *Rosa* sp., *Rosa canina*, *Rubus* sp., *Salix* sp., *Salvia* sp., *Urtica* sp., *Verbascum* sp., *Vitex agnus-castus* and *Vitis* sp.) and height zones (between 800-2100 meters) of collected samples were noted.

Results: After identification processes, 24 different zerconid species were found in research area (1 species belong to genus *Prozercon* and 23 species belong to genus *Zercon*). Distribution features of zerconids were revealed according to detected habitat types and altitude zones. When informations are compared which about height zones of detected zerconids, specimens of *Z. mehmeturhani* and *Z. osmaneliensis* spread at only low altitudes (800-900 m). Otherwise, specimens of *Z. arslani*, *Z. tefenniensis* and *Z. yusufi* spread at only high altitudes (over 1400 m). Remaining species range from 800 to 2100 meters. Also, only specimens of *Z. colligans* were detected at all height zones. Additionally, in *Quercus* sp., *Juniperus* sp. moss, *Paliurus spina-christi*, *Pinus* sp. habitats, species richness is highly. However, in *Acer* sp. *Cupressus* sp., *Cydonia oblonga*, *Euphorbia* sp., *Melia* sp., *Platanus orientalis*, *Quercus pubescens*, *Rosa* sp., *Salvia* sp., *Urtica* sp., *Verbascum* sp., *Vitex agnus-castus* and *Vitis* sp. habitats, specimens of only one species were detected. With all these informations, it is predicted that zerconid mites have different habitat and altitude preferences and it is considered that distributions of zerconids closely related with these parameters.

Acknowledgements: This research was financially supported by TÜBİTAK (Scientific and Technological Research Council of Turkey) with 113Z717 project number.

Keywords: Acari, Zerconidae, altitude and habitat preferences, Afyonkarahisar, Turkey.

Influence of Total Phenolics and Tannins on Nitrogen Mineralisation in Soils of Native Oldest Forest from Eastern Mediterranean

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Aim of the study: The aim of this study was to compare the effect of total phenolics and tannins content of litter on nitrogen mineralization in the soil of native oldest pure *Abies bornmuelleriana* (AB) *Fagus orientalis* (FO) and *Pinus nigra*, (PN) communities and mixed *A. bornmuelleriana*-*P. nigra* (AP) and *A. bornmuelleriana* ve *A. bornmuelleriana* - *P. nigra* - *F. orientalis* (APF) forest communities which are in association with them from Eastern Mediterranean.

Material and Methods: Litter and mineral soil (0-5 cm) layers samples were taken by volumetric cores (20x20x20 cm) from three different parts for each sampling sites (100 x 100 cm). Litter taken aboveground each volumetric soil sample was separated by handling and put in to nylon bags. Samples were dried in air in laboratory and homogenized by mill. The concentration of total phenolics and hydrolyzable tannins was measured spectrophotometrically with the Folin-Ciocalteu method in homogenized powders. Nitrogen mineralization in mineral soil layers (0-5 cm) was analyzed continuously over a year by the field incubation method.

Results: A significant difference among communities was found according to secondary metabolites concentrations (total phenolics and tannic acid) of litter layer. *Pinus nigra* (PN) communities showed the highest amounts in both total phenolic compounds and tannic acid. Concentrations of total phenolics in litter correlated positively with soil annual net NH_4^+ -N nitrogen production ($r = 0.695$, $p < 0.05$) and, negatively with soil annual net NO_3^- -N nitrogen production ($r = -0.821$, $p < 0.05$) in the upper soil layer (0-5 cm). While no significantly correlation was shown between tannic acid and soil NH_4^+ -N nitrogen production ($r = 0.168$, $p > 0.05$), significant negative correlation between tannic acid and NO_3^- -N nitrogen production ($r = -0.551$, $p < 0.05$) was found. These results indicate that nitrification rate in soil was inhibited with total phenolics and tannins contents of litter layer in forest ecosystems.

Acknowledgements: This study is a part of the Ph.D. thesis of F.S. Sakar (advisor G.Güteryüz)

Key Words: Nitrification, Oldest Forest Communities, Litter, Total Phenolic and Tannic Acid

Insects on Forest trees and shrubs of TurkeySelma ÜLGENTÜRK¹

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Aim of the study: Aim of the study is this study presented to effects of scale insect (Hemiptera: Coccoidea) on forest system and biodiversity Forest area of Turkey.

Material and Methods: Information's of scale insect were based on author'records and bibliographic sources.

Results: Number of scale insect species increased more than 120 with new records such as *Chionaspis kabyliensis* Balachowsky, *Diaspidiotus jaapi* (Leonardi), *Gomezmenoraspis pinicola* Leonardi, *Torosaspis farsianus* (Balachowsky & Kaussari), *T. turcica* Ülgentürk and Kozár (Diaspididae), *Ceroplastes floridensis*, *Physokermes hellenicus* (Kozár & Gounari) (Coccidae), *Phenacoccus arambourgi* (Balachowsky), *P. yerushalmi* Ben-Dov (Pseudococcidae) on conifers; *Aesterodiaspis hadzibejliae* Borchsenius (Asterolecaniidae), *Eulecanium cerasorum* (Cockerell) (Coccidae), *Puto israiliensis* Ben-Dov (Pseudococcidae) on deciduous and every green trees. Scale insects are one of the important pests on forest trees. They cause discoloration, premature needle fall, reduction of shoot growth, death of branches and even of whole tree. In this study were discussed to potential of distribution and damage of scale insects (Hemiptera: Coccoidea) on forest system in Turkey.

Keywords: Coccoidea, Conifer, deciduous plants, Hemiptera.

Soil Ecosystems and Vegetal Species: Artificial Neural Networks Modeling

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Aim of the study: The function of soil ecosystems is an essential parameter in the conservation or extinction of plant species. Soil quality may be indicated by the degree of organic carbon and nitrogen stratification. This organic matter at the surface also intervenes in erosion, the conservation of water and its infiltration. This quality has a direct effect on the plant species that populate these soils. To analyze such factors, it is very difficult if not impossible to model them by conventional mathematical techniques. In this study, we propose a system based on artificial neural networks.

Material and Methods: Artificial neural networks possess the ability to model complex systems. Their application is well adapted to these problems. A system is constructed with input variables (degrees of stratification of organic matter into carbon and nitrogen, water conservation) and an output variable that expresses the offending species. A learning phase of the network is carried out on half the analyzed variables. The other half is used for network testing.

Results: After the learning phase of the network, it becomes possible to predict the result at the output of the system from the input of the variables at the input. The proposed system will then make it possible to predict the nature of the species that survive under the conditions of the parameters fixed at the input of the system.

Keywords: Vegetal species, soil ecosystems, intelligent systems, ANN.

Study on Promising Strains of Nitrogen-Fixing Actinomycetes Belonging to the Genus *Frankia* Under Laboratory Conditions

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Aim of the study: At present, sea buckthorn is a plastic plant in relation to various unfavorable environmental conditions in the south-east of Kazakhstan. In other words, it can be said that sea-buckthorn has a high ecological valence. The ability to tolerate frosts and elevated air temperatures, reconciliation with edaphic conditions of the growth site, including soil salinity, and a wide range of production areas where sea buckthorn can be successfully applied, give it significant advantages over other shrub species. The sea-buckthorn plantations contribute to the environmental improvement of the distribution areas for this crop and provide many other useful properties to the population and the soil cover, as well as to the wild fauna. The aim of the paper was to study the nitrogen-fixing ability of actinomycetes belonging to the genus *Frankia*.

Material and Methods: Isolates of *Frankia* actinomycetes, obtained from the floodplain of the Bolshaya Almatinka river - *Frankia* spp., and from the foothills of the Ile-Alatau nature reserve - *Frankia* spp., were used as the objects of the study. Nitrogen-fixing (nitrogenase) ability of the *Frankia* actinomycetes was studied with the acetylene reduction assay. To determine the ability to acetylene reduction in pure cultures of *Frankia* spp., biomass grown on rich medium A (QMod) for 21 days at 29°C and washed from the medium with saline was used. To test the ability to nitrogen fixation, the nitrogen-free medium (BS) was used. The amount of formed ethylene was determined with the Agilent GC 7890/5977 MSD gas chromatograph and calculated from the ethylene peak value versus the reference mixture (10 nmol of ethylene in 1 ml of air).

Results: The nitrogen-fixing activity of actinorhizal bacteria is one of the most important criteria for selecting promising commercial strains of microorganisms to develop a biological preparation on their basis. Currently, a great number of strains of actinorhizal sea buckthorn (*Hippóphaë rhamnoides*) bacteria have been isolated, selected, and maintained in artificial conditions in the world, which can be used in developing biopreparations. It was established that in the studies on the nitrogen-fixing activity, all the 11 isolates of actinorhizal bacteria of *Frankia* spp. strains obtained from the sea buckthorn plants (*Hippóphaë rhamnoides*) possessed nitrogenase ability. Of all the examined samples, the highest nitrogenase activity was found in the actinomycete *Frankia* spp. isolate KF3, obtained from the floodplain of the Bolshaya Almatinka river - 12.0 ± 0.10 nmol C₂H₄/protein per hour, and isolate KF7 obtained from the foothills of the Ile-Alatau nature reserve - 11.9 ± 0.12 nmol C₂H₄/protein per hour. A promising actinomycete *Frankia* spp. strain KF3 with the highest nitrogenase activity has been selected.

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Keywords: nitrogen fixing actinobacteria 1, *Frankia* 2, symbiosis 3, sea buckthorn 4, soil fertility 5.

Chromosome Numbers of Genus *Geranium* (Geraniaceae) from TurkeyEsra MARTİN¹, Hawva BOZKURT¹, Ahmet KAHRAMAN², Tuncay DİRMENCİ³¹Biotechnology Department, Faculty of Science, Necmettin Erbakan University, Konya, Turkey²Biology Department, Faculty of Science and Arts, Uşak University, Uşak, Turkey³Biology Education Department, Balıkesir University, Balıkesir, Turkey
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Aim of the study: This study comprises a comprehensive examination concerned with taxa belong to *Geranium* genus naturally spreading on Turkey. The main aim of this study is to complete the lack of karyological studies in terms of cytogenetics.

Material and Methods: All samples were collected from wild populations from Turkey. Collected specimens were deposited in Uşak University. All chromosome observations were carried out on root tips. Root-tip meristems were provided from seed by germinating them on wet filter paper in Petri dishes at room temperature. Firstly root tips pretreated for 16 h in α -monobromonaphthalene at 4°C, fixed in 3:1 absolute alcohol/glacial acetic acid, then the root tips were hydrolyzed with 1 N HCl for 12 min at room temperature and stained with 2% aceto-orcin for 3 h at room temperature. Stained root tips were squashed in a drop of 45% acetic acid and permanent slides were made by mounting in Depex. For karyotype analysis the photographs enlarged 10 ×100 were taken using a microscope with a camera attachment. The karyotypes were measured by Software Image Analyses (Bs200ProP) loaded on a personal computer. Ideograms of these taxa were arranged in decreasing length.

Results: The previous karyological studies are on the determination of somatic chromosome numbers for *Geranium* genus. A detail information related to chromosome morphologies of taxa of *Geranium* genus will be firstly provided via this study. It follows from the literatures that chromosome numbers of the genus vary like $2n=18, 22, 24, 26, 28, 30, 32, 34, 36, 40, 46, 48, 52, 56, 54, 58, 64, 68, 84, 112$. The genus comprises *Geranium moschatum*, *Geranium robertianum*, *Geranium platypetalum*, *Geranium molle* subsp. *molle*, *Geranium molle* subsp. *bruitium*, *Geranium sylvaticum*, *Geranium collinum*, *Geranium columbinum*, *Geranium finitimum*, *Geranium petri-davisii*, *Geranium sanguineum*, *Geranium ibericum* subsp. *ibericum*, *Geranium ibericum* subsp. *jubatum*, *Geranium divaricatum*, *Geranium asphodeloides*, *Geranium palustre*, *Geranium bohemicum*, *Geranium ponticum*, *Geranium rotundifolium*, *Geranium lucidum*, *Geranium purpureum*, *Geranium gracile*, *Geranium dissectum*, *Geranium subcaulescens*, *Geranium pyrenaicum*, *Geranium psilostemon* taxa. *Geranium molle* subsp. *bruitium* and *Geranium asphodeloides* taxa have $2n=26$ chromosome number while this number was detected as $2n=20$ for *Geranium moschatum* and *Geranium lucidum* taxa. The chromosome number of *Geranium platypetalum*, *Geranium molle* subsp. *molle*, *Geranium sylvaticum*, *Geranium collinum*, *Geranium petri-davisii*, *Geranium rotundifolium* taxa were $2n=28$. Somatic chromosome number of *Geranium columbinum* taxon was $2n=18$ while *Geranium dissectum* taxon has $2n=22$. *Geranium sanguineum* taxon was detected to somatic chromosome of $2n=84$.

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Keywords: Chromosome, *Geranium*

Cytogenetical Studies on Section *Dentati* of *Dianthus* (Caryophyllaceae) from TurkeyEsra MARTİN¹, Ergin HAMZAOĞLU², Murat KOÇ³, Esra KARAKAŞ¹, Aslıhan KELKİTOĞLU¹¹Biotechnology Department, Faculty of Science, Necmettin Erbakan University, Turkey²Department of Elementary Education, Faculty of Education, Gazi University, Turkey³School of Animal Production, Bozok University, Turkey

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Aim of the study: The research has made contribution to the taxonomic revision of the genus *Dianthus* in Turkey.

Material and Methods: All samples were collected from wild populations from Turkey. Collected specimens were deposited in Gazi University. Root-tip meristems were provided from seed by germinating them on wet filter paper in Petri dishes at room temperature. Firstly root tips pretreated for 16 h in α -monobromonaphthalene at 4°C, fixed in 3:1 absolute alcohol/glacial acetic acid, then the root tips were hydrolyzed with 1 N HCl for 12 min at room temperature and stained with 2% aceto-orcin for 3 h at room temperature. Stained root tips were squashed in a drop of 45% acetic acid and permanent slides were made by mounting in Depex. The chromosomes were counted by Software Image Analyses (Bs200ProP) loaded on a personal computer.

Results: This study has been carried out to determinate chromosome number of seven taxa naturally grow in Turkey from *Dentati* section of *Dianthus* genus which takes part in Caryophyllaceae family. The main aim of the study is to contribute the karyological analysis of *Dianthus* taxa which has not been studied in terms of cytogenetics. The chromosome analysis was made by Software Image Analyses (Bs200ProP) loaded on a personal computer. This study will make a contribution for the revision of *Dianthus* genus. The number of chromosomes for *Dianthus kastembeluensis*, *D. erinaceus* var. *alpinus*, *D. roseoluteus*, *D. nihatii*, *D. armeria* subsp. *armeria*, *D. goekayi* and *D. preobrashenskii* taxa which are included in *Dentati* section was determined as $2n = 30$ via squash preparation.

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Keywords: Caryophyllaceae, Chromosome, *Dianthus*

Karyotypes of *Origanum* (Lamiaceae) Section *Anatolicon* from TurkeyEsra MARTİN¹, Tuncay DİRMENÇİ², Türker YAZICI²¹Biotechnology Department, Necmettin Erbakan University, Konya, Turkey²Biology Education Department, Balıkesir University, Balıkesir, Turkey

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Aim of the study: Cytological research needs to be used in conjunction with other sources of data to achieve a better understanding of the cytogenetical relationships of *Origanum* L. taxa, leading to their plant classification. In this regard, karyotypes were determined in two taxa of *Origanum* growing naturally in Turkey and karyological attributes of selected taxa were evaluated for the first time.

Material and Methods: All samples were collected from wild populations from Turkey. Collected specimens were deposited in Balıkesir University. All karyological observations were carried out on root tips. Root-tip meristems were provided from seed by germinating them on wet filter paper in Petri dishes at room temperature. Firstly root tips pretreated for 16 h in α -monobromonaphthalene at 4°C, fixed in 3:1 absolute alcohol/glacial acetic acid, then the root tips were hydrolyzed with 1 N HCl for 12 min at room temperature and stained with 2% aceto-orcin for 3 h at room temperature. Stained root tips were squashed in a drop of 45% acetic acid and permanent slides were made by mounting in Depex. For karyotype analysis the photographs enlarged 10 ×100 were taken using a microscope with a camera attachment. The karyotypes were measured by Software Image Analyses (Bs200ProP) loaded on a personal computer. Ideograms of these taxa were arranged in decreasing length.

Results: Karyotypes of the chromosomes in the *Origanum* genus which belongs to *Anatolicon* Benth. section were studied using the Image Analysis System. *Origanum hypericifolium* P.H.Davis and *O. sipyleum* L. were used in this study. *O. hypericifolium* was studied from the sample named as 4357. The chromosome number of the sample naturally grow in province of Denizli was detected as $2n=30$. Average chromosome length of the 4357 plant sample was 0.46 μm while it haploid chromosome length was measured as 13.80 μm . Also, the relative length was changed between 2.46 and 11.88. In addition, four localities of *O. sipyleum* naturally grow in province of Denizli and Aydın were cytogenetical studied. While the 4308 sample has $2n=28$ chromosome number, this value was $2n=30$ for the samples named with 4517, 4352 ve 4534 numbers. When compared all data between each other; average chromosome lengths for the 4308 and 4352 samples were found as 0.74 μm and 0.47 μm , respectively while the same value was measured as 0.44 μm for the 4534 sample. Furthermore, the haploid chromosome lengths were 20.98 μm , 14.19 μm and 13.32 μm for the 4308, 4352 and 4534 samples, respectively. The relative lengths of the 4308 sample changed between 3.76 and 9.53 while these values ranged between 3.73-9.58 and between 2.92-11.41 for the samples named with 4352 and 4534 numbers, respectively. In this study, all karyotype analyses of the samples was carried out by the use of Image Analysis System.

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Keywords: Image Analysis System, Karyotype, *Origanum*

Molecular Phlogeny of *Acantholimon* Boiss. (Plumbaginaceae) Genus from Turkey Related TRN and ITS Regions

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Aim of the study: The impact of molecular phylogenetic studies on plants have raised in the meantime development of technology in the light of high explanations regarding relationships. According to this study, *Acantholimon* genus has selected to find out its molecular phlogeny by using TRN and ITS primers. According to this study, it is aimed to reveal molecular phlogeny of *Acantholimon* genus by using TRN and ITS primers related 62 taxa of *Acantholimon* genus, which of 42 are endemic, collected from Turkey by preparing dendrograms and making analysis.

Material and Methods: 62 taxa of *Acantholimon* genus were gathered from all over the Turkey at their flowering times. Specimens were kept as herbarium materials. Flora of Turkey was used for their taxonomical description. On the other hand, DNA isolation was made by using Qiagen DNeasy Plant Mini Kit. After DNA deriving, bioanalyzer instrument was used to measure their A260/280 rate (purity evaluation) and determine the quality of DNA. However, agarose jel photographs were taken after PCR reactions.

TRNc-d and ITS 4b-5a primers were selected for this investigation from the literature checks.

TRNc: CGA AAT CGG TAG ACG CTA CG, 40 nmol

TRNd: GGG GAT AGA GGG ACT TGA AC, 40 nmol

ITS 4b: TCCTCCGCTTATTGATATGC, 20 nmol

ITS 5a: GGAAGGAGAAGTCGTAACAAGG, 20 nmol

Cycle sequencing and purity studies of PCR materials after cycle sequencing were made. After all these gradations, DNA sequence analyses were made in a detailed way.

Results: Molecular phlogeny of *Acantholimon* genus tried to reveal with the primers as TRN c-d region of the chloroplast DNA and ITS 4b-5a region of the nucleus DNA. As a result of the study, it is determined the relationships between taxa according to genus. 6 dendrograms by using TRN, ITS and both TRN-ITS sequences were made with 'Maximum Possibility Analysis' and 'Parsimony Analysis' to reveal relation degrees according to taxa of genus and comparisons were made. Network analysis was made by using TRN and ITS data to understand geographic distribution of the genus.

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Keywords: *Acantholimon*, TRN, ITS, molecular phlogeny.

Morphological and Cytological Characterization of Some Turkish Okra (*Abelmoschus esculentus* L.) Landraces

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Aim of the study: Okra is widely grown throughout Turkey and there are many local varieties. Contrary to other okra producer countries in Turkey the okra pods are harvested 3-4 days after fruit set when pods are reached 3-5 cm length (immature). Mature pods of these landraces are considered not edible for their fibrous texture. Turkey has a considerable variety of okra because of its close ties to the two distribution centres of okra (India and Africa). Understanding of the genetic structure of okra and okra germplasm diversity will provide valuable information for okra breeding programs. In this study, morphological and cytological characterizations of twenty okra landraces were performed.

Material and Methods: Okra seeds were collected from different locations of Turkey between 2012-2013. The study was carried out according to randomized block design with three replications. Seeds were sown in field in May 2013. Morphological traits were observed up to July 2013. Observed morphological traits are plant height, general growth habit, leaf blade depth of lobbing, leaf blade colour, petiole length, petiole colour, pod diameter, pod length, number of pods per plant, number of carpels per pod, pod colour, time of flowering and time of first commercial harvest. Cytological examinations were realized with karyotype analysis method in August 2015. Observed traits were subjected to analysis of variance firstly and significance scores according to $p < 0.001$ were examined. Significantly different traits were subjected to analysis of principal component (PCA) and hierarchical clustering analysis.

Results: In the present study, it was found that almost all the landraces were in the middle of the branching, but the tendency was stronger in the O1 local variety, whereas the leaf blade depth of lobbing was mostly medium (11 landraces) but some landraces showed shallow (5 landraces) and deep (4 landraces). Petiole lengths were classified as short (2 landraces, 8-12 cm), medium (11 landraces, 12-17 cm) and long (7 landraces, 17-23 cm), whereas petiole colours were found to be green in 18 local varieties and 2 local varieties in red. Local varieties with red petiole also produced red-coloured fruit, while the fruit colours of the other 18 local varieties became green. The carpel numbers of local varieties ranged from 5-8, with the majority (17 local varieties) producing 7 carpels and 5 carpels (6 local varieties). There are no significant differences between the landraces in the number of pods per plant, pod length and diameter, number of carpels per pod, number of days to first flowering and first commercial harvest. Significantly different traits were subjected to analysis of principal component (PCA) and hierarchical clustering analysis. PCA revealed four principal components (Eigen values > 1) and explain 76.367% of total variation between landraces. According to hierarchical clustering analysis landraces were clustered under two main groups (A and B) and two large subgroups (B1 and B2) in group B. According to karyotype analysis landraces have $2n=128$ chromosome.

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Keywords: Okra, *Abelmoschus esculentus* L. (Moench), Morphological Characterization, Cytological Characterization, Karyotype

Relationship Between Grain Productivity of Ear and Stem Dry Matter Weight of Main Shoot in Winter Wheat Varieties

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Aim of the study: The hypothesis that the greater mass of the stem at the anthesis may be accompanied by increased grain productivity is grounded on the fact that higher ability of stem to accumulate photosynthates at this stage and remobilize them during grains filling can contribute significantly to yield formation under the unfavorable conditions inhibiting current photosynthesis (Photosynthesis Features, 2011). This increases the flexibility of the variety and expression of its genetic potential productivity (Ehdaie et al., 2006; Slewinski, 2012). We have compared the stem dry matter of main shoot of modern varieties and lines of winter wheat originated from Institute of Plant Physiology and Genetics NAS of Ukraine with an aim to establish the selection criteria associated to grain productivity.

Material and Methods: Field experiments (Kyiv region, Ukraine) were conducted in 2014 and 2016, which differed significantly on weather conditions. In 2014 the soil was waterlogged during the period from the beginning of earing phase to milk ripeness due to excessive (3 times higher than normal) rainfall in May, and in 2016 there were higher than normal temperatures and negligible rainfall. 14 varieties and 1 line of winter wheat in 2014 and 8 varieties and 2 lines in 2016 were studied. To determine the morphometric parameters were chosen 20 main shoots (5 shoots on each of 4 plots covering 10 m²). Plant material were dried at 105°C for 3 hours and then at 65 °C to constant weight.

Results: The stem dry matter weight of main shoots of studied varieties and lines of wheat varied widely: at the anthesis from 0.56 to 1.18 g in 2014 and from 1.05 to 2.09 g in 2016 and at the phase of full ripeness, respectively, from 0.46 to 1.00 and from 0.80 g to 1.48 g. The highest dry matter weight of the main stem at both stages under different conditions was observed for varieties Darunok Podillia, Astarta, and Dostatok. Grain productivity of main shoot spike varied considerably among the varieties, and in different growing conditions. Maximum values in 2014 were observed in varieties Darunok Podillia, Pereyaslavka, and Dostatok (1.8-2.2 g), in 2016 - the varieties Darunok Podillia, Natalka, Astarta, Rayhorodka, and Yatran (2.1- 2.5 g). It was found a close positive connection the mass of a grain ear of main shoot with weight of stem dry matter both at the anthesis ($r = 0,77 \pm 0,18$ in 2014., $0,93 \pm 0,13$ - in 2016) and full ripeness (respectively, $r = 0,55 \pm 0,23$ and $0,77 \pm 0,23$) as well as with differences between them ($r = 0,72 \pm 0,19$ and $0,87 \pm 0,16$). These correlations strongly suggest that higher productivity of wheat is associated with the ability to store of assimilates, primarily carbohydrates, before anthesis. The high sink ability of stem before anthesis may prevent inhibition of CO₂ assimilation by assimilates excess, through feedback regulation of photosynthesis, and reserved assimilates could be remobilized for grain filling, especially under adverse environmental condition (Reynolds et al., 2005; Alvaro et al., 2008; Kiriziy et al., 2014; Gonzales-Navarro et al., 2016). Thus, the high stem ability to the temporary deposition of assimilates plays a positive role in increasing the rate of photosynthesis and grain development. Thus, it was found that the weight of main shoot stem dry matter at the anthesis and its ability to temporary assimilate deposition during vegetative growth may be used as criteria for evaluation the grain productivity of winter wheat genotypes season.

Keywords: *Triticum aestivum* L., stem deposited ability, high productivity.

Taxonomic Revision of six *Astragalus* Sections That Native to Turkey based on three non-coding *trn* regions of cpDNA

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Aim of the study: *Astragalus*, belonging to the legume family *Fabaceae*, is a large genus with about 3,000 species of herbs and small shrubs in Northern Hemisphere. The aim of this study is to revise *Macrophyllum*, *Hymenostegis*, *Poterion*, *Megalocystis*, *Halicacabus* and *Hymenocoleus* sections of genus *Astragalus* naturally found in Turkey by using three non-coding *trn* regions from chloroplast DNA.

Material and Methods: Twenty-nine different species that belongs to six *Astragalus* sections native to Turkey were studied. Samples were collected from natural habitats of each species in Turkey. All DNA isolations were done by using optimized CTAB method (Doyle&Doyle). Universal primers from *Taberlet et. al.* were carried out for amplifying *trnL3'-5'*, *trnL-F* and *trn Val* regions. For molecular data analysis MEGA software were used and Neighbour Joining method with bootstrap test analysis was used for constructing phylogenetic trees.

Results: Totally regions were aligned as 1238 base pairs in length and 43 of them were variable. 22 of these variables were parsimony informative. Overall genetic diversity among species were 0,0060. According to phylogenetic tree there were 2 different main clades. *Hymenostegis* section composed one of this clade and the others were located in other main clade. *Poterion* section was distinct than other sections and *Hymenocoleus* section stayed in one different branch in the tree. Moreover, species of *Megalocystis* and *Halicacabus* sections were located closed to each other.

Acknowledgements: This study was support by TUBITAK with TBAG-110 T 911 numbered project.

Keywords: *Astragalus*, non-coding *trn* regions, chloroplast DNA, phylogenetic relationship

The Establishment of Fast-Growing Trees into *in vitro* Collection

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Aim of the study: Biomass as renewable energy has a great potential for European countries. For creating of bioenergy plantations in Ukraine poplar and willow trees could be effectively used, as they are able to produce a significant amount of biomass within a short period. The aim of current study was to introduce perspective for energy plantations fast-growing trees in *in vitro* collection. Further these clones can be used to evaluate stress tolerance as well as for gene engineering experiments.

Material and Methods: Introduction of fast-growing poplar clones "Ivanteyivska" (*Populus suaveolens* Ficsh x *P. berolinensis* Dippel.), "Slava Ukrayiny" (hybrid from free pollination of *P. nigra*), "Novoberlinska-7" (*P. pyramidalis* x *P. laurifolia*) and willows "Pryberezha" (unknown origin) and "Olimpiisky vohon" (*Salix alba* x *S. fragilis*) to the *in vitro* collection was carried out at the beginning of the growing season (February-March). Washing with soap solution followed by plant sterilization with sodium hypochlorite solution (pure common detergent "Bilyzna" diluted with distilled water (1:3) for 10 minutes and then with 70% ethanol for 1 minute were applied. After each stage of processing, plant material with sterile distilled water was washed. Petiole and leaf explants were planted on a callus induction medium (MS, modified by growth regulators 1.02 mg/l 2-ip and 1.86 mg/l NAA). The introduction medium (MS, modified by growth regulators 0.4 mg/l BAP and 0.1 mg/l NAA) for planting shoots with active buds was used.

Results demonstrated high survival efficiency of shoot explants on introduction medium (95%), while the method of direct regeneration from leaves and stems on callus induction medium was not sufficiently effective. Washing of the plant material with warm soap water is important step of sterilization process, what allows to pre-clean material from fungi and reduce the time of sterilization by aggressive sterilizing agents. Excluding of the washing stage by soap solution led to a strong affection of material by spores of fungi, while increasing of exposition time by NaClO up to 10 min, and by C₂H₅OH up to 5 min led to a total loss of explants. The effectiveness of the sterilization method used in the study was about 50%.

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Keywords: Fast-growing trees, biomass, *Populus* sp., *Salix* sp., *in vitro* propagation.

Ab-Initio Study of Structural and Vibrational Properties of Latifolin

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Aim of the study: Alzheimer's disease (AD), which is a chronic neurodegenerative disease, usually starts slowly and gets worse over time. The patients with Alzheimer have memory loss and other insufficiently intellectual abilities to interfere with daily life. They give rise to the dementia occurring with the range of 60% - 70%. Amyloid beta (A β) peptides are noticeably involved in Alzheimer's disease, because the main component of the amyloid plaques founded in the brains of Alzheimer patients. Latifolin is a substance which inhibits to A β . Some quantum-chemical properties of latifolin molecule are limited in the literature. Our main aim to calculate some spectroscopic properties of title molecule by using ab-initio method, in this study.

Material and Methods: In this work, the ab-initio calculations based on Density Functional Theory (DFT) with the basis set of 6-31G(d,p) are performed to determine the molecular structural properties of latifolin. Molecular structure is optimized to get the global minima of the molecule by considering C1-symmetry (no symmetry constraint). The vibrational spectra is predicted by using the optimized structure. The ¹H and ¹³C NMR shielding constants are obtained by applying the Gauge-Including Atomic Orbitals (GIAO) method in the ambient of ethanol. VEDA 4 (Vibrational Energy Distribution Analysis) package program has been used to calculate Potential Energy Distribution (PED) for the vibrational frequency. We have used the scaled factor as 0.961 for DFT/B3LYP. Moreover, the observed vibrational wavenumbers of FT-IR are analyzed and assigned to different normal modes of the molecule.

Results: DFT calculations of the latifolin, which can be used for constructing new drug design to remedy Alzheimer's disease, are presented in this work. The NMR spectrum, FT-IR spectrum, PED analysis and complete molecular structural parameters such as bond lengths, bond angles and dihedral angles of the molecules have been investigated by using the DFT/B3LYP/6-31G(d,p) method.

Keywords: *DFT, Coumarin, Latifolin, NMR, FT-IR*

Activity of Caspase-3 in Erythrocytes of Patient with Anemic Conditions

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Aim of the study: Iron-deficiency anemia (IDA) and anemia of chronic disease (ACD) are the most frequent form of anemic conditions. The cause of IDA is iron deficiency in organism while ACD develops as concomitant of different pathologies. It is still considered that under these pathologies «defective» erythrocytes are died by extravascular hemolysis. At the same time decrease of erythrocyte's life span can be related with initiation of eryptosis. The tissues hypoxia is one of anemia consequences that in turn cause an oxidative stress. Previously we established that oxidative stress in erythrocytes *in vitro* was accompanied by activation of caspase-3. The aim of this work was to evaluate caspase-3 activity in erythrocytes of patients with IDA and ACD.

Material and methods: The samples of venous blood from healthy human volunteers (HV) were obtained from RSPC of Transfusiology and Medical Biotechnologies, Ministry of Health. Samples of blood from patients with IDA and ACD were obtained from Minsk Consulting and Diagnostic Centre. Erythrocytes were derived from blood by centrifugation and subsequently were washed in 155 mM NaCl (4°C, 2000g, 5 min). Cells with exposed phosphatidylserine (PS) well known marker of eryptosis was detected using FITC-annexin V. Activity of caspase-3 was evaluated using CaspGlow™ kit containing specific caspase-3 substrate FITC-DEVE-fmk. Fluorescence measurement was carried out by flow cytometric analysis on BD FACS Canto II (Becton Dickinson, USA). Obtained data expressed as arithmetic means ± SEM of at least 6–12 independent experiments and statistical analysis was made by Mann-Whitney U-test and Wilcoxon signed-rank test. Statistical significance of the data was defined as follows $p < 0,05$ and $p < 0,01$.

Results: In both erythrocyte populations HV and patients with anemias was shown presence of cells with exposed PS. At the same time average number of such erythrocytes in blood samples of patients with anemias were $7,1 \pm 1,5\%$ and $5,2 \pm 0,7\%$ for IDA and ACD respectively whereas for HV – $1,9 \pm 0,2\%$. This data indicated about increase of eryptotic cells in blood samples from patients with anemic conditions. However significant differences in fluorescence intensity of FITC-annexin V between PS exposing erythrocytes of HV and patients with anemia were not detected. It was established that in all group under investigation occur presence of cells with activated caspase-3. For example average number of such caspase-positive erythrocytes in blood samples of patients with anemias were $1,3 \pm 0,3\%$ and $0,8 \pm 0,2\%$ for IDA and ACD respectively whereas for HV – $0,3 \pm 0,1\%$. It should be noted that fluorescence intensity of FITC-DEVE-fmk substrate had the same values in caspase-positive cells for both HV and patients with anemia. Obtained results suggested that in erythrocyte's population from patient with anemic conditions (IDA and ACD) tend to increase number of eryptotic cells developed by caspase-dependent pathway.

Keywords: Anemia, erythrocytes, phosphatidylserine, caspase-3.

Albendazole Bioavailability Change in Combination with β -Cyclodextrin

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Aim of the study: Search for new, low-emission and highly bioavailable forms of drugs to become a pressing issue of modern veterinary and human medicine. This will reduce the dose, increase the effectiveness of pharmacotherapy of diseases, and improve the economic viability of the use of veterinary drugs. One way of solving the problem could be the use of a long-known and used under the number E459 in cosmetics compound that belongs to the class of cyclodextrins (CDs).

Material and Methods: Experiment was performed on 50 mice from the lines C57BL / 6 weighing 20-22 grams. Animals were divided into five groups 10 animals each. 1st – control group, received basic food and water ad libitum; 2nd - received with food albendazole (10% albendazole powder) in a dose of 5000 mg / kg of active ingredient; 3rd - received with food albendazole a dose of 12,000 mg / kg of active ingredient; 4th - received with food albendazole cyclodextrin complex (molar ratio 1: 2) at a dose of 5000 mg / kg of active ingredient; 5th - received with food cyclodextrin albendazole complex at a dose of 12,000 mg / kg of active ingredient.

Results: The study showed that the dose of albendazole 12000 mg / kg did not cause mice death (survived 10 of 10 (mortality 0%), and a complex of the drug with the cyclodextrin resulted in the death of 3 mice out of 10 (survived 7 out of 10, mortality 30%). Number of the survived mice after receiving toxic dose of albendazole - 12000 mg / kg is 10/10 (0 %) and its complex with cyclodextrin 10/7 (30%) (Total number of mice / alive (mortality rate)). The increase in toxicity of the specimen shows its greater bioavailability. A specimen of albendazole poorly penetrates the membrane (5%) and considers a moderately toxic drug [1, 2]. After mixing it with cyclodextrin the resulting complex considerably easier penetrates the cell membrane and provides a more pronounced toxic effect.

Keywords: albendazole, β -cyclodextrin, mice, bioavailability

**An *in vitro* Evaluation of Human DNA Topoisomerase I Inhibition by Small Nettle'
(*Urtica urens*) leaves Extracts**

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Aim of the study: DNA topoisomerases are important class of enzyme that regulate the number of topological links between two strands of DNA by catalysing single- or double-strand breaks. These enzymes have important functions in DNA replication and transcription. Therefore, they are molecular targets of anticancer drugs. Recently, It was found that plant metabolites can be utilized as natural medicines for inhibiting the activity of DNA topoisomerases. *Urtica urens* (Small Stinging Nettle) is one of the most commonly used plant as an alternative and complementary therapy in cancer patients. However, there aren't any studies investigating the effects of this plant on DNA Topoisomerase I. In this regard, the present study was aimed to investigate potential effects of hexane, chloroform and ethyl acetate extract of small nettle on activity of this enzyme.

Material and Methods: For this purpose, firstly, extract of dried stinging nettle leaves was prepared by using hexane, chloroform and ethyl acetate. Topoisomerase I activity was measured by *in vitro* relaxation assay. Briefly, 20 µl reaction medium contained 3 U topoisomerase I, 0.3 µg plasmid (pBR322), extracts at the various concentrations, 2 µL 10X Topo I buffer and dH₂O. The mixture was incubated for 30 min at 37°C. The reactions stopped by addition of 5 µl stop buffer (5% sodium dodecyl sulfate, 0.0025% bromophenol blue; 30% w/v glycerol). Each tube was run in a 1% agarose gel in TAE buffer for 1 hour at 90 V. The obtained gel was photographed using the DNR Bio-imaging system imaging system.

Results: It was found that *Urtica urens*'s leave extracts inhibited formation of the relaxed form of DNA in a concentration-dependent manner. All extracts showed an inhibitory effect on Topoisomerase I even at low concentrations (2.5 µg/ml). This inhibition effect was the most profound in the hexane extract. This was the first study that showed inhibitory effect of *Urtica urens* on Topoisomerase I.

Acknowledgements: This work is supported by TUBITAK 111T515.

Keywords: Topoisomerase I, *Urtica urens*, hexane, chloroform, ethyl acetate extract

Assesment of Cytotoxic Effect of Small Nettle' (*Urtica urens*) Seeds on Human Lung Cancer

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Aim of the study: *Urtica urens* L. (Small Stinging Nettle) is one of the most widely used plant in alternative and complementary treatment of cancer patients in Turkey. However, studies in literature showed that there are limited studies investigating the cytotoxic/anticarcinogenic activity of this plant. Therefore, the present study was aimed to investigate the cytotoxic effect of small nettle seed extracts prepared with different solvents in human lung cancer cell line.

Material and Methods: In this respect, firstly, extracts of dried stinging nettle seeds were prepared by using hexane, chloroform, ethylacetate and methanol according to increasing polarity. There are two different hexane extract namely hexane-solid and hexane-oil was prepared. Then, these extracts were applied different concentration to the A459 (human lung cancer cell line) cells (2.5×10^3 cells/well) for 48 hours by dissolved in dimethyl sulfoxide (DMSO). At the end of 48 hours, the survival rate of cells was determined by WST reagent. Control groups was treated with the medium containing 0.1% DMSO without plant extract. We compared cells treated different concentrations of the small nettle extracts with control group and so, the effect of extracts prepared at different concentration and different polarity on cell viability was determined.

Results: The cytotoxic effect of extracts obtained from *Urtica urens*'s seeds by increasing was determined in A549 cells by this study and the results was showed that the LD₅₀ values of the hexane solid, hexane oil, chloroform, ethylacetate and methanol were found 28,45 µg/ml, 100,1 µg/ml, 38,5 µg/ml, 306,02 µg/ml and 78,9 µg/ml, respectively. These results showed clearly that hexane solid, chloroform and methanol extracts have higher cytotoxic/anticarcinogenic activity with respect to hexane oil and ethylacetate extract. All these results put the hypothesis that the small nettle seed's extracts derived from lower polarity contain promising phytochemicals that may be used in cancer treatment.

Acknowledgements: This work is supported by TUBITAK 111T515.

Keywords: *Urtica urens*, cytotoxicity, anti-carcinogenic, different polarity extracts

Assessment of Hemolytic Uremic Syndrome Cases in terms of Community Health in Food Security

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Aim of the study: There are available 7 subtypes of *Escherichia coli* bacteria being recognized by human beings. Each subtype of such bacteria has its own serotypes. *Enterohemorrhagic E. coli* (EHEC) is a crucial member *Escherichia coli* family due to the potential role of its serotype, named as *E. coli* O157:H7, in current epidemic. The etiology of this aforementioned serotype is as holding on intestinal epithelium by producing invasive factors and releasing verotoxin and shiga toxin (responsible from shigella dysenteriae type 1) along. Hemorrhagic colitis (bleeding colitis), thrombotic thrombocytopenic purpura (blood clotting), and hemolytic uremic syndrome (renal failure) are the important syndromes stemming from *E. coli* O157:H7. Hemolytic uremic syndrome (HUS) appears in 85-95 percents of total incidences consist three mentioned prevalent syndromes. In this study, *E. coli* O157:H7 caused poisoning cases have been examined with regard to public health

Material and Methods: Determination and intimation of the EHEC infections have a big significance owing to the risk for the development of HUS and HUS related deaths among 2-7 percent of cases in following 10 days after diagnosis. Thus, molecular studies like DNA finger print, pulse field gel electrophoresis (PFGE), ELISA, and PCR are conducted to detect contributing cause of epidemics for lightening and reporting any connection between them. In general, children, immunosuppressive patients, and elders tend to HUS development. To conducted studies, common mode of transmission of EHEC infections are fresh vegetables, frozen foods, salads, and meat and meat products. The most effective way to avoid from infection is conforming hygienic measures. HUS cases, developing infections, case results, frequency (f) and percentages (%) were determined with SPSS 20.00 program.

Results: In the present study, the HUS incidences taking place between the years of 2005 and 2016 have analyzed in terms of food related mode of transmission, diagnosis of mentioned infection and prevention methods, and the effects of case results on public health.

Keywords: Food safety, *E. coli* O157:H7, hemolytic uremic syndrome

Bioecological Features of *Opuntia vulgaris* and Its Juice in Regulating Sugar Dose in Blood

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Aim of the study: Sort of opuntia – opuntia (Tournef mill.) This is the wide-spread sort of cacti family (Cactaceae). America is the hometown of opuntia vulgaris. The trunk of opuntia has a churn-stuff, disk-shaped and a little longish form. The fruit of opuntia is pear-shaped, juicy and eatable. The pulp of the fruit is sweet and has 13-14 % sugar in it. There are approximately 200 seeds in the fruit. All parts of the opuntia are used in medicine. The plant is droughtresisting. The flowers are light-yellow and soucer or funnel-shaped. From the ancient times this plant had been used both in traditional and national medicine. The fruit and flowers of opuntia are usually used in complex treatment of obesity, hypertension, diabetes mellitus, hepatic diseases, gastric ulcer and gastritis. But the limited implementation of opuntia in treatment of diabetes mellitus is related to absence of scientifically valid information about its impact on the balance mechanism of sugar in blood. Our scientific research can ensure the solution of very important problem in treatment of diabetes milletus.

Material and methods: About 40 patients were tested during observations and fruit juice of opuntia vulgaris was used as phyto-preparation. Preparation method of opuntia juice: Juice of opuntia fruit is prepared, sterilized and filtrated . Juice of opuntia should be taken twice a day half an hour before the meal in a dosage of ½ glass. Opuntia juice is for inner use. Usage of opuntia juice should last for 3-4 weeks.

Result: As a result of the research the balancing impact of opuntia vulgaris on the level of sugar in blood are defined in the following way: General treatment mechanism, Tissue intracellular impact, Intra-intestinal impact, Balancing of the appearance of insulin in organism. General treatment mechanism of opuntia juice includes prevention of accumulation of extra-fat in organism. Hence, opuntia fibres can adsorb 28% of fat molecules. As a result fat molecule adsorb in such a way is not affected by digestion enzymes. This process is observed as a tumefy of caatus fibres and their expansion in stomach. Therefore sentiment of the patients gets well and appetite diminishes. As a result both body- weight and the level of sugar in blood decreases.

Keywords: Cactus, *Opuntia vulgaris*, diabetes mellitus, insulin

Calorimetric and Spectroscopic Studies of Interactions between Cucurbituril Q7 and *N*-acetylprocainamide Hydrochloride in Aqueous Solutions

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Aim of the study: The aim of the study was to assess the ability of cucurbit[7]uril macromolecules to carry the model drug, *N*-acetylprocainamide in aqueous solutions. To evaluate, the thermodynamic binding parameters such as enthalpy, entropy and binding constant were calculated.

Material and Methods: Cucurbit[7]uril, *N*-acetylprocainamide hydrochloride and Spectra/Por dialysis tubing (MWCO 1 kDa) were purchased from Sigma-Aldrich. Water distilled three times and degassed were used in all experiments as solvent. Measurements of the thermal effects of interactions between the drug and Q7 cucurbituril were carried out using the technique of calorimetric titration (VP-ITC MicroCal, USA) under isothermal conditions (25°C). There was titrated the aqueous solution of *N*-acetylprocainamide hydrochloride (in a cell) injecting batchwise aliquots of aqueous solution of cucurbit[7]uril. The thermal effect describing the direct cucurbituril-drug interactions was determined subtracting from the effect of mixing the aqueous solutions of both compounds the thermal effects of diluting the drug and cucurbituril independently determined. The thermal effects of interactions determine in this way were described by means of the model of sequential active sites (Origin MicroCal). Using the method of equilibrium dialysis (a two-chamber dialyzer from Harvard Apparatus, USA, the chamber total volume: 1 ml), there was also determine the equilibrium distribution of *N*-acetylprocainamide concentration between the aqueous phase and aqueous solution of Q7 cucurbituril. The determined bonding isotherm ($[Apr]/[Q7]$ from 0.2 to 2.4 at constant Q7 concentration) was described by a non-linear regression.

Results: The measurements carried out by static spectroscopic techniques (dialysis) and dynamic method of calorimetric titration show that Q7 cucurbituril spontaneously binds the antiarrhythmic drug, *N*-acetylprocainamide hydrochloride, in aqueous medium at room temperature. *N*-acetylprocainamide molecule can attach two molecules of cucurbituril. The process of binding the first cucurbituril molecule is stronger and exothermal, whereas binding the second Q7 molecule is weaker and endothermal. Both steps are accompanied by an advantageous change in entropy. The equilibrium dialysis results show that drug-cucurbituril supramolecular complex is formed in aqueous solutions with stoichiometry higher than 1:1. The use of Q7 cucurbituril macromolecules as transporters of this and other toxic drugs should reduce their toxicity and improve the quality of patient treatment.

Keywords: Cucurbituril, acetylprocainamide, isothermal titration calorimetry (ITC), equilibrium dialysis

Physicochemical Study on a Host-Guest Interaction between β -Cyclodextrin and Phenylbutazone in Aqueous Solutions

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Aim of the study: The aim of our present study was to determine the formation constant and physicochemical parameters of the complex formed between nonsteroidal anti-inflammatory drug (phenylbutazone) and β -cyclodextrin using isothermal titration calorimetry. The effect of β -cyclodextrin on the water solubility increase of the mentioned drug was also assessed.

Material and Methods: Phenylbutazone (FBZ), β -cyclodextrin (β -CD) (all Sigma-Aldrich) dried under reduced pressure at 333 K. The water used to prepare all solutions was deionized, twice distilled and degassed. To determine the increase of drug (FBZ) solubility in water caused by the presence of natural cyclodextrin, aqueous solutions of β -CD were prepared and the excess of solid FBZ was added to them. The solutions of cyclodextrin with FBZ were filtered and the content of dissolved FBZ was determined by spectrophotometry. The measurements were carried out in a quartz cuvette with an optical path equals to 10 mm. Calorimetric measurements were carried out in an isothermal calorimeter for VP-ITC titrations (MicroCal) at the temperature of 298.15K. The aqueous solution of phenylbutazone was titrated by aqueous solution of β -cyclodextrin from a syringe. There were taken dilution measurements of aqueous β -cyclodextrin in water, aqueous solution of phenylbutazone were also diluted.

Results: Spectroscopic measurements confirm the effect of natural cyclodextrin (β -CD) on the solubility increase of phenylbutazone in water. Phenylbutazone molecules included inside hydrophobic cavities of β -cyclodextrin macromolecule increases the water solubility couple times. The calorimetric titrations ITC of aqueous solutions of phenylbutazone (FBZ) with the β -cyclodextrin (β -CD) solutions discussed indicate a spontaneous formation of stable inclusion complexes of 1 (FBZ):2 (β -CD).

Keywords: Phenylbutazone, β -cyclodextrin, UV spectroscopy, isothermal titration calorimetry (ITC)

Calorimetric Studies of Interactions of Hydrochlorides of two Selected Antiarrhythmic Drugs: Procainamide and N-acetylprocainamide with Urea Molecules in Aqueous Solutions

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Aim of the study: Urea residues are parts of glicorulil units from which macromolecules of potential drug nano-transporters – cucurbiturils are composed. Urea is polar non-electrolyte, which forms hydrogen bonds with many polar compounds, among others: water, amino acids and amides. Analysis of interactions in water solutions between urea and two selected antiarrhythmic drugs: procainamide (Prc) and N-acetylprocainamide (Apr), should enable to differentiate the strength of interactions between these amide drugs and functional groups of more complicated poliamide nanocarriers, like cucurbiturils. That is why the aim of our study was to determine the enthalpic pair interaction coefficients (h_{xy}) describing the direct interactions of Prc and Apr hydrochlorides with urea molecules in aqueous solutions.

Material and Methods: Procainamide hydrochloride, N-acetylprocainamide hydrochloride and urea were purchased from Sigma-Aldrich. Both drugs were dried under reduced pressure at 353 K. Water distilled three times and degassed were used in all experiments as solvent. Measurements of enthalpies of solution of Prc and Apr hydrochlorides in water and aqueous solution of urea were measured at 298.15 K with an isoperibol calorimeter. The obtained standard dissolution enthalpies of the examined hydrochlorides in water and aqueous urea solutions were used to determine enthalpic pair interaction coefficients (derived from the Desnoyers' modification of McMillan-Mayer theory) between Prc and Apr molecules and a molecule of urea.

Results: Values of both calculated enthalpic pair interaction coefficients: urea – acetylprocainamide (h_{U-Apr}) and urea – procainamide (h_{U-Prc}) are exothermic. It shows the strong interactions between urea and both drugs and indicates a predominant exothermic effect of direct interactions between the drug molecule and the polar urea molecule over the endothermic effects of partial dehydrations of the solvation sheaths of these molecules. The exothermic values of both enthalpic pair interaction coefficients (h_{U-Apr} and h_{U-Prc}) enable to indirectly infer that both drugs will be interact well with glicorulil units presented in cucurbituril macromolecules. Enthalpic pair interaction coefficient between urea and N-acetylprocainamide molecules is more exothermic compared with enthalpic pair interaction coefficient between urea and procainamide ($h_{U-Apr} < h_{U-Prc}$). These relation can be attributed to relatively comparable contribution of protonated amine groups in molecules of both investigated monohydrochloride drugs and increase the direct interaction when second (neutral) amine group of procainamide is substituted by acetyl residue. N-acetyl group presented in the N-acetylprocainamide molecule may interact with some additional urea molecules probably because of the possibility to form additional hydrogen bonds, compared with neutral amine group in non-substituted procainamide.

Keywords: Procainamide, acetylprocainamide, isoperibol calorimetry

Evaluation of Taro (*Colocasia esculenta* L.Schott) Plant in Food Innovation; TarhanaSeydi YIKMIŞ¹, Levent GÜLÜM², Harun AKSU³, Mehmet ALPASLAN¹¹School of Health Sciences, Dept.of Nutrition and Dietetics, Namık Kemal University, Turkey,²Mudurnu Süreyya Astarıcı Vocational High School, Poultry Farming Program, Abant İzzet Baysal University, Turkey³Veterinary Faculty, Department of Food Hygiene & Technology, Istanbul University, Turkey
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Aim of the study: The subject of this work is related to the *Colocasia esculenta* L.Schott, which is being grown in the Mediterranean region in Turkey biodiversity and used as a carbohydrate source. Taro is a broad-leaved, single-year-old plant of the family *Ageraceae* (*Araceae*). Many regions are known as "taro", but in different countries there are names like kolacas, old coco, eddoo or dasheen. In Turkey, the Anamur and Bozyazı districts of Mersin are being cultivated and consumed in the coastal areas of Alanya and Gazipaşa districts of Antalya. When compared to other tropical tubers, the root contains higher protein starch as well as higher starch (resistant starch). When assessed for nutrition, it has moderate energy, protein and vitamins, and high levels of potassium and zinc. However, owing to the calcium oxalate crystals contained in the noodles, raw consumption is not suitable and should be consumed by cooking. It is commercially converted into various products. These include: flour, breakfast product, noodle, mash, canned food, starch, frozen food and chips. As a result of R & D studies using Taro plant, it has been used in the construction of tarhana, which has an important place in Turkish food culture. Our aim the study is to produce functional tarhana.

Material and Methods: Tarhana's sensory analysis was done with 15 trained panelists and each tarhana soup was evaluated in terms of color, flavor, texture, taste and general acceptance characteristics. Sensory analysis was performed as a scoring test and data were evaluated using frequency (f), percentage (%) with SPSS 20.0 program. When the general acceptance was examined, 20% of Taro added tarhana (G3T) was found with an average of 4.5 points.

Results: As a result, it will be contributed to the country's economy by increasing the production and consumption amount by utilizing the nutritional value of the consumed lacustrine plant by processing it as a basic food source in many countries where tropical and subtropical climate prevails.

Keywords: Taro, biodiversity, tarhana, innovation

General View to Physical Treatments and Rehabilitations Studies in Animals

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Aim of the study: Although, physiotherapy for humans has existed for centuries physiotherapy and rehabilitation studies for animals are growing. With this development that started towards the end of the 1980s, significant progress has been made since 1990 and various technical methods have been produced. In humans, there are physiotherapy and rehabilitation protocols for a number of diseases before and after the operation, and in recent years there has been an emphasis on this issue because of the lack of being in animals. Significant results have been obtained as a result of physical therapy and rehabilitation applied especially in diseases seen in cats, dogs and horses. This study emphasizes the necessity of physiotherapy and rehabilitation studies in some diseases seen in animals because animals are as important a living group as humans.

Material and Methods: Generally, animals with head trauma, fracture and soft tissue injuries are used in this studies. Methods such as manual therapy, electrotherapy modalities (electric stimulation, ultrasonic for physical therapy, magnetotherapy etc.) and massage etc. are used to treat such animals.

Results: In this work, the necessity of physical therapy and rehabilitation works on animals has been emphasized. These studies will provide important findings and clues for treatment of elderly patients, neural transmission disorders (stroke, nerve compression, etc.), before and after the operation, Patella emergence, Hip dysplasia, TPLO operation and muscle atrophy.

Keywords: Animal physiotherapy, physical therapy, Electrotherapy, manuel therapy,

Helminth Fauna of the Black Rat, *Rattus rattus* (Rodentia: Muridae) in Phaselis/Antalya, TURKEY

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Aim of the study: Black rats are cosmopolitan species, commonly found living near sources of food and water. They are also found in human environments such as houses, warehouses and pantries. Rats can infect human and domestic animals through rodent excrement and by ingesting food contaminated with rodent's fur, feet, urine or fecal dropping. Some of the helminths of rodents can infect humans, which can cause serious diseases, like hepatic capillariosis or alveolar echinococcosis. The aim of this study is to determine the helminths of black rat which are very important for public health and to contribute to the knowledge of helminth species in Antalya.

Material and Methods: The *Rattus rattus* sample was trapped on May 2015 in Phaselis/Antalya. The individual was deep frozen for preservation until further examination could be carried out. For researching the rat sample for helminth species it was dissected from the anterior to the posterior. All of the internal organs were placed in petri dishes with water. The gastrointestinal tract was dissected from the mouth to the rectum. All of the organs were observed under stereomicroscope for helminth infection. The helminth species which were found were cleaned in distilled water. There was no need for fixation of the samples because they weren't living. The cestodes collected were stained in iron-aceto-carmin, dehydrated in a series of alcohols and mounted in Canada balsam. Nematode samples were dehydrated in 70% alcohol and preserved in small bottles with 70% ethyl alcohol with 5% glycerine. Preparation of nematode species for microscopy have been made with glycerine. The number of the helminths and the location they have been found were noted.

Results: *Hymenolepis diminuta* and *Nippostrongylus braziliensis* were determined in the small intestine of the rat. Furthermore *Nippostrongylus braziliensis* samples were found in the fundus section in the stomach and were much more compact and tightly coiled. In the large intestine *Syphacia muris* samples were found. It is known that the species *H. diminuta* can cause important diseases in human particularly in immunodeficient patients. In healthy patients *H. diminuta* can cause gastrointestinal and nutritional disorders. Rarely *S. muris* samples have been detected in humans which can also cause zoonotic diseases. The dominant species was *Nippostrongylus braziliensis* (n=81). According to these results it seems to be very important to make a detailed examination about the helminth fauna of *R. rattus* in Antalya and the vicinity of Antalya.

Acknowledgements: This study was partly supported by the Akdeniz University.

Keywords: *Rattus rattus*, helminths, nematodes, cestodes, Antalya

Hibiscus (*Hibiscus sabdariffa* L.) Cheese Production and Sensory AnalysisSeydi YIKMIŞ¹, Levent GÜLÜM², Harun AKSU³, Mehmet ALPASLAN¹¹School of Health Sciences, Dept. of Nutrition and Dietetics, Namık Kemal University,²Mudurnu Süreyya Astarıcı Vocational High School, Poultry Farming Program, Abant İzzet Baysal University, Turkey³Veterinary Faculty, Department of Food Hygiene & Technology, Istanbul University, Turkey
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Aim of the study: In this study, in order to increase the quality of feta cheese and to provide functional qualities, the Hibiscus "*Hibiscus sabdariffa*" plant, unique to the biodiversity of America and the Caribbean, is used in the production of feta cheese. It has many functional properties in terms of health; decreases cholesterol and blood pressure, strengthens the immune system, antioxidants, inhibits gas formation in the intestines, regulates the digestive system, decaffeinated, high vitamin C content, laxative (due to magnesium and malic acid content). Our aim the study is to produce functional feta cheese.

Material and Methods: The prescription for the production of feta cheese (P), milk (%97), starter culture (% 1) , salt (% 2) is determined. Cow milk to be used in production is stored in a cooling tank at 2 - 4 ° C. It is filtered and pasteurized at 72 ° C for 20 seconds. After pasteurization, the hibiscus extract is added at a certain rate to provide clotting. After boiling the coagulated milk for 15 minutes, 2% salt (NaCl) is added. The starter culture (*Streptococcus thermophilus* and *Lactobacillus delbrueckii* ssp. *Bulgaricus*) is then added to the clot as the clot is cooled to 42-43 ° C and 1% is added and mixed. Then, it is pressed for 1 day. The Hibiscus extract (hot water extraction) used in the production was added at the rates of 3% (H1P), 5% (H2P), 8% (H3P) and 10% (H4P) before the fermentation stage. Sensory analysis was performed as a scoring test. Data were evaluated using frequency (f), percentage (%) with SPSS 20.0 program. In the obtained data, the scores of the cheese (5-Very good, 4-Good, 3-Medium, 2-Bad, 1-Very bad) were given.

Results: Cheese had the lowest score as taste, H4P 3.2 (medium) and highest score H2P 4.7 (very good). When the general acceptance was examined, the cheese with 5% hibiscus (H2P) was determined with a score of 4.5 points. As a result, a milk product such as cheese, which is preferred by every consumer, has been given a new product by obtaining a functional product and the panelists have generally been evaluated as positive.

Keywords: *Hibiscus*, biodiversity, health, functional food

In Terms of Nurses' Point of View Medication Errors as a Global IssueSümeyye ARSLAN¹¹Health Sciences Faculty / Pamukkale University, Turkey
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Aim of the study: Medication errors are one of the most important concepts under the patient safety. Chronic illnesses, self-treatment, introduction of new medications, polypharmacy, reports and regulations about use of medication safely and properly issues put the medication errors to global health concerns. World Health Organization has documents about it. When medications are used to treat the disease and symptoms it brings some risks. These changes to from unimportant effects to fatal. So medication administration process brings the safety as a priority. The main objective of the current study is to examine the medication errors with a point of view nurses'.

Material and Methods: The literature examining used in the current study.

Results: In the presentation of health care, nurses have a great importance. Especially process of medication administration has been carried out in cooperation with physicians, nurses and pharmacists and the nurses have the biggest responsibility area. Nurses have responsibility at each step of medication administration especially preparation, administration and monitoring steps. Nurses have long and intensive work hours. It brings professional burnout, fatigue and stress and all of these can adversely affect the medication administration and patient safety. To prevent and eliminate medication errors; undergraduate and postgraduate nurses must have trained qualifiedly, number of nurses must increase, roles and responsibilities of nurses must clearly have defined, policies and legal regulations must have done, information and record keeping must use, physical regulations must have done at the medication preparation areas.

Acknowledgements: At this point, all countries have developed different methods and systems to prevent and eliminate medication errors.

Keywords: Patient safety, medication errors, nursing, nurses.

Interaction between α -Cyclodextrin and Cinnamic Acid Derivatives in Water

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Aim of the study: The main objective of our study was research complexes α -cyclodextrin (α -CD) with cinnamic acid, caffeic acid and p-coumaric acid in water.

Material and Methods: Cinnamic acid, caffeic acid and p-coumaric acid are present in many plants, are used in cosmetics, pharmaceutical and food industry. Cinnamic acid derivatives are characterized by poor water solubility. In the present study we determined the number of cinnamic acid derivatives molecules included inside α -cyclodextrin, as well as the complex formation constants and physic-chemical parameters of formed acid-cyclodextrin complex, using isothermal titration calorimetry. The effect of α -cyclodextrin on the water solubility of the cinnamic acid derivatives was assessed, used UV-VIS metod. Using the ITC isothermal calorimeter, interactions between α -cyclodextrin and cinnamic acids in water were examined.

Results: The spectroscopic UV-VIS examinations performed confirmed the effect of α - cyclodextrin (α -CD) on the solubility increase of cinnamic acid, caffeic acid and p-coumaric acid in water. The calorimetric titrations ITC of aqueous solutions of cinnamic acids derivatives with the α -cyclodextrin solutions discussed indicated a spontaneous formation of stable inclusion complexes of β -cyclodextrin and cinnamic acid, caffeic acid or p-coumaric acid with a stoichiometry of 1 (β -CD) : 1 (acid).

Keywords: cinnamic acid, p-coumaric acid, caffeic acid, α -cyclodextrin, UV-VIS spectroscopy, isothermal titration calorimetry

Investigation of the Anti-inflammatory Potential of Glucocapparin Isolated from *Capparis ovata*

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Aim of the study: Multiple sclerosis (MS) is an inflammatory autoimmune, demyelinating disease of the central nervous system. *Capparis ovata* is an aromatic plant, characteristic for the Mediterranean diet. It has been shown to be used as an alternative and complementary medicine for the treatment of MS in Turkey. Flower buds and fruits of *Capparis ovata* contain biologically active compounds such as flavonoids (kaempferol, rutin), glucosinolates (glucocapparin, glucoiberin, glucobrassicin) and alkaloids which are known to provide health-improving benefits due to their various biological activities (antioxidant, antitumoral, antidiabetic, anti-inflammatory, antimicrobial, neuroprotective). In the present study, glucocapparin was tested for its anti-inflammatory effects on selected proinflammatory and inflammatory genes believed to be important in MS pathophysiology using SH-SY5Y cells.

Material and Methods: Glucocapparin was isolated from *Capparis ovata* and further studied for anti-neuroinflammatory effects in SH-SY5Y cells. The human neuroblastoma cell line SH-SY5Y was purchased American Tissue Culture Collection. SH-SY5Y cells were grown in monolayer culture in DMEM:F12 medium containing 10% FBS, 0.5% penicillin/streptomycin at 37°C in a humidified atmosphere comprised of 95% air and 5% CO₂. Cell viability was assessed using lactate dehydrogenase (LDH) activity in the media conditioned by the crystal violet cell staining. Total RNA was isolated using 'RNeasy Mini Kit' (Qiagen) by the manufacturer's standard protocol. Quantitative Real Time PCR (qRT-PCR) analysis was performed using SYBR Green qPCR Master Mix (Abm) in an Exicycler 96 Real Time Quantitative Thermal Block PCR System (Bioneer) for each gene. The mRNA levels of genes (CCL5, CXCL9, CXCL10, GFAP, MMP9, NF-κB1, TNFα) were determined by qRT-PCR.

Results: Glucocapparin did not significantly elicit the CCL5, CXCL9, CXCL10, MMP9, TNFα genes expression. Moreover, we have found out that the glucocapparin significantly inhibited the expression of NFκB gene given above in SH-SY5Y cells. These results support that glucocapparin was found to be non-effective for MS treatment.

Acknowledgments: This work is supported by Scientific and Technological Research Council of Turkey (TUBITAK) with Project No: 112S187.

Keywords: *Capparis ovata*, glucocapparin, multiple sclerosis, anti-inflammatory

Investigation of the Anti-Tumorigenesis Potential of 5-Aminosalicylic Acid: Lack of Efficacy in Caco-2 Cells

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Aim of the study: Recent trials and epidemiological researches recommend that nonsteroidal anti-inflammatory drugs are effective in the counteractive action of various malignancies. Inflammatory bowel disease and ulcerative colitis patients are likely to have an expanded hazard for the development of intestinal tumours. 5-Aminosalicylic (5-ASA) is an anti-inflammatory drug regularly utilized as a part of the treatment in these patients and may give reliance against the improvement of colorectal malignancy in these patients. For this purpose, this study was designed to investigate the anti-tumorigenesis activities of 5-ASA on the expression level of some tumorigenesis related genes in Caco-2 cells.

Material and Methods: The human epithelial colorectal adenocarcinoma cells line (Caco-2) was purchased American Tissue Culture Collection. Caco-2 cells were grown in monolayer culture in DMEM medium containing 10% FBS, 1% penicillin/streptomycin at 37°C in a humidified atmosphere comprised of 95% air and 5% CO₂. Cell viability was assessed using WST. Caco-2 cells were treated with varying concentrations of 5-ASA at mM range for 24 h at 37 °C. Total RNA was isolated using RNeasy Mini Kit (Qiagen) by the manufacturer's standard protocol. Quantitative Real Time PCR (qRT-PCR) analysis was performed using KiloGreen qPCR Master Mix in an Exicycler 96 Real Time Quantitative Thermal Block PCR System to determine p53, Rb-1, Cyclin D1, Cyclin D2, CDKN1A, PTEN, Myc and Jun gene mRNA expression level.

Results: Two different concentrations of 5-ASA (20 and 50 mM) were identified to measure the differential responses of Caco-2 cells. p53 and PTEN genes mRNA expression level were decreased 2.19, 2.47 and 2.41, 3.56 times in Caco-2 cells as a result of 20 and 50 mM concentrations of 5-ASA treatments, respectively. Similarly, Rb-1 gene mRNA expression level was decreased 1.03 and 1.22 times, respectively. Myc genes mRNA expression levels were decreased 1.67 and 1.45 in Caco-2 cells with 20, 50 mM doses of 5-ASA, respectively. Cyclin D1 and Cyclin D2 genes mRNA expression levels were lowered 1.26, 2.69 and 4.5, 4.35 in Caco-2 cells as a result of 20 and 50 mM concentrations of 5-ASA treatments, respectively. CDKN1A gene mRNA expression level was decreased 1.08 and 1.43 times in Caco-2 cells with 20 and 50 mM 5-ASA applications, respectively. Jun gene mRNA expression level was decreased 1.11 and 1.17 times in Caco-2 cells with 20 and 50 mM 5-ASA applications, respectively. To summarize, mRNA expression levels of all genes were downregulated. Based on these results, we suggest that 5-ASA does not have any anti-tumorigenesis effect in Caco-2 cells and does not give any protections against the colorectal malignancy in these patients.

Acknowledgments: This work supported by Pamukkale University PAUBAP-2015FBE042

Keywords: 5-aminosalicylic acid (5-ASA), Caco-2, Anti-tumorigenesis,

Physicochemical Study on a Host-Guest Interaction between β -Cyclodextrin and Phenylbutazone in Aqueous Solutions

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Aim of the study: The aim of our present study was to determine the formation constant and physico-chemical parameters of the complex formed between nonsteroidal anti-inflammatory drug (phenylbutazone) and β -cyclodextrin using isothermal titration calorimetry. The effect of β -cyclodextrin on the water solubility increase of the mentioned drug was also assessed.

Material and Methods: Phenylbutazone (FBZ), β -cyclodextrin (β -CD) (all Sigma-Aldrich) dried under reduced pressure at 333 K. The water used to prepare all solutions was deionized, twice distilled and degassed. To determine the increase of drug (FBZ) solubility in water caused by the presence of natural cyclodextrin, aqueous solutions of β -CD were prepared and the excess of solid FBZ was added to them. The solutions of cyclodextrin with FBZ were filtered and the content of dissolved FBZ was determined by spectrophotometry. The measurements were carried out in a quartz cuvette with an optical path equals to 10 mm. Calorimetric measurements were carried out in an isothermal calorimeter for VP-ITC titrations (MicroCal) at the temperature of 298.15 K. The aqueous solution of phenylbutazone was titrated by aqueous solution of β -cyclodextrin from a syringe. There were taken dilution measurements of aqueous β -cyclodextrin in water, aqueous solution of phenylbutazone were also diluted.

Results: Spectroscopic measurements confirm the effect of natural cyclodextrin (β -CD) on the solubility increase of phenylbutazone in water. Phenylbutazone molecules included inside hydrophobic cavities of β -cyclodextrin macromolecule increases the water solubility couple times. The calorimetric titrations ITC of aqueous solutions of phenylbutazone (FBZ) with the β -cyclodextrin (β -CD) solutions discussed indicate a spontaneous formation of stable inclusion complexes of 1 (FBZ):2 (β -CD).

Keywords: phenylbutazone, β -cyclodextrin, UV spectroscopy, isothermal titration calorimetry (ITC)

Protective Effects of Different Cryoprotectants on Post-Thawed Rabbit Epididymal Sperm Chromatin Condensation

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Aim of the study: Cryopreservation is a long-term storage technique with very low temperatures to preserve the sperm of various animal species for extended period of time at a low cost. This technique can contribute to the persistence of endangered species and hence biodiversity. To preserve the sperm of any animal species, various cryoprotectants are used in sperm freezing protocols. The aim of this study was to determine the protective effects of different cryoprotectants on chromatin condensation of the epididymal rabbit sperm after the freeze–thawing process using Toluidine Blue (TB) stain.

Material and Methods: Epididymal sperms were collected from rabbits (n=32) and evaluated at 37 °C. Pooled semen samples were diluted in Tris-based extender containing different cryoprotectants. Samples were divided into 12 groups as follows: Control, C (Control, C-C; L-Glutamin, C-LG; Basal Medium Eagle Amino Acids, C-BME); Paclitaxel, P (P-C; P-LG; P-BME); Resveratrol, R (R-C; R-LG; R-BME); Paclitaxel+Resveratrol, PR (PR-C; PR-LG; PR-BME). Diluted semen samples were aspirated into 0.25-ml (medium-sized). Straws, sealed with polyvinyl alcohol powder, and equilibrated at 5 °C for 2 h. After equilibration, the straws were frozen in liquid nitrogen vapour, 4 cm above the liquid nitrogen, for 15 min and plunged into liquid nitrogen for storage. Frozen straws were then thawed individually at 37 °C for 25 s in a water bath for evaluation. TB stain (stains phosphate residues of fragmented DNA) was used to assess the sperm chromatin structure. Obtained results for each dose were analysed statistically.

Results: No significant difference was observed in the mean percentage of damaged DNA of sperm cells among the groups. Further analyses are required to reveal the protective effects of different cryoprotectants on incomplete DNA structure and DNA packaging in the epididymal sperm of rabbit during cryopreservation. It is well known that storage of the sperm for a long time causes deterioration of the sperm quality, but supplementation of several cryoprotectants may provide the protection against damage of sperm DNA in cryopreservation. In this respect, the question is which cryoprotectants and doses are more effective. This and suchlike studies can enable researchers to plan the future efforts for the conservation and persistence of endangered animal species.

Acknowledgements: The study was supported by Selcuk University Scientific Research Projects (BAP) (Project No: 12102013).

Keywords: Rabbit, epididymal sperm, cryopreservation, cryoprotectant, chromatin, DNA damage

Regulation of the Both Anti-Inflammatory and Inflammatory Cytokines Expression by 5-Aminosalicylic Acid in Caco-2 Cells

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Aim of the study: This study has provided new clues for further studies required to be carried out to clarify the effect of 5-ASA as cytokines interaction to understand which cytokines anti-inflammatory or inflammatory.

Material and Methods: The human epithelial colorectal adenocarcinoma cells line (Caco-2) was purchased American Tissue Culture Collection. Caco-2 cells were grown in monolayer culture in DMEM medium containing 10% PBS, 1% penicillin/streptomycin at 37°C in a humidified atmosphere comprised of 95% air and 5% CO₂. Cell viability was assessed using WST. Caco-2 cells were treated with varying concentrations of 5-ASA at mM range for 24 h at 37 °C. Total RNA was isolated using RNeasy Mini Kit (Qiagen) by the manufacturer's standard protocol. Quantitative Real Time PCR (qRT-PCR) analysis was performed using KiloGreen qPCR Master Mix in an Exicycler 96 Real Time Quantitative Thermal Block PCR System to determine IL-1b, IL-2, IL-6, IL-10 and IL-13 gene mRNA expression level.

Results: Three different concentrations of 5-ASA (10, 20, and 50mM) were identified to measure the differential responses of Caco-2 cells. IL-6 gene mRNA expression level was decreased 1.47, 1.05, 3.02 times in Caco-2 cells as compared to controls as a result of 10, 20 and 50mM 5-ASA treatments, respectively. Similarly, IL-2 gene mRNA expression level was decreased 1.55, 1.48 and 3.65 times in Caco-2 cells with 10, 20 and 50mM 5-ASA applications, respectively. Moreover, IL-1b gene mRNA expression level was lowered 1.06, 1.58 and 2.08 times in Caco-2 cells as a result of 10, 20 and 50mM concentrations of 5-ASA treatments, respectively. On the other hand, IL-13 and IL-10 genes mRNA expression levels were increased 1.55, 1.47 and 12.46 times and 1.12, 1.37 and 9.06 times in Caco-2 cells with 10, 20 and 50mM doses of 5-ASA, respectively. To summarize, mRNA expression levels of IL-6, IL-2, IL-1b were downregulated 3.02-, 3.65- and 2.00-folds, respectively; and of IL-13 and IL-10 were upregulated 12.46- and 9.06-folds with 50mM 5-ASA-treatment, respectively. These results suggest that high doses of 5-ASA inhibit proinflammatory genes while inducing anti-inflammatory genes in Caco-2 cells.

Acknowledgments: This work supported by Pamukkale University PAUBAP-2015FBE042

Keywords: 5-aminosalicylic acid (5-ASA), Caco-2, Cytokines, Anti-inflammatory

The Anti-quorum Sensing Activity of *Salvia fruticosa* MILLER and *Lavandula stoechas* L. subsp. *stoechas* Essential Oils

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Aim of the study: In this study, the anti-quorum sensing (QS) activity of the essential oils (EOs) obtained from *S. fruticosa* and *L. stoechas* subsp. *stoechas* were investigated. *S. fruticosa* and *L. stoechas* subsp. *stoechas* are known as “sage” and “karabas” in Turkey, and the EOs and aerial parts used as tea to treatment for various diseases. This study is important because it is the first time that the anti-quorum sensing effect of these two EOs have been revealed.

Material and Methods: Aerial parts of *S. fruticosa* and *L. stoechas* were collected by local residents in Mugla province of Turkey and EOs obtained by using the hydrodistillation method. Quorum sensing, violacein pigment production, and swarming/swimming migration inhibition activities were determined using *Chromobacterium violaceum* CV 026, CV 12472 and *Pseudomonas aeruginosa* PA01 strains, respectively.

Results: The minimum inhibitory concentrations (MIC) of the *S. fruticosa* oil were determined as 0.78 µl/ml against *C. violaceum* CV 026 and, CV 12472. The MIC values of *L. stoechas* essential oil against *C. violaceum* CV 026 and, CV 12472 were 0.39 µl/ml. After this stage of the study, sub-MIC concentrations of EOs were selected to further anti-QS activity assays. The agar-well diffusion assay using reporter strain CV 026 indicated that the EOs had no anti-QS activity. In qualitative and quantitative analyses have observed that essential oils reduce high levels of violacein pigment production. The MICs of EOs against *P. aeruginosa* PA01 were >50 µl/ml. The EOs inhibited QS dependent swarming/swimming migration in a concentration-dependent manner. For the concentration of 50 µl/ml EOs, the inhibition rates in swarming and swimming of PA01 were 40.0% and 15.0% for *S. fruticosa*, 38.0% and 30.0% for *L. stoechas*, respectively. The results showed that the EOs obtained from *S. fruticosa* and *L. stoechas* significantly inhibited QS-dependent violacein production in CV 12472, and CV026 and swarming migration in a concentration-dependent manner in *P. aeruginosa* PA01.

Keywords: *Salvia fruticosa*, *Lavandula stoechas* subsp. *stoechas*, Anti-QS, Violacein pigment production, Swarming/swimming migration.

The Characteristics of the Psychological Excitement Performance of the Students Before the Exam

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Aim of the study: Nowadays, there are important role of the higher education institutions for the training of professionals and a full-fledged healthy people. There are important features of reading in the Higher education institutions. It depends on the students' chosen specialties, living environment, age, nutrition and bad habits and etc. These factors affect the bodies of students multiparameter. It results a number of psychophysiological functions, especially the changes against reactions which coming from the environment effects of the nervous system. One of the main reasons of the mental strain is the students' test stress and the result leads to deterioration of mental functions. The literature of last year is cited examination process as a factor that can create psychological trauma.

Materials and methods: The Ganja State University bachelor and master students will be involved in the research for carry out studies. So, the psycho-physiological studies are planned over 17-18 year old students that study at first course, 21-22 year-old students studying in the fourth year, the 24-25-year-old masters that study at the last course. The participants should be practical voluntary and healthy. They are important terms. Minimum 30-40 students in each group will be explored. During the studies are carried the psychological-alarminicators, as well as electrophysiological studies. The following tests are used during the psychological- alarmexamination. In order to determine the level of excitement of Taylor test, to determine the level of situational and personal excitement Spilberger-Khan's test, to determine the status of the intellectual Ayzenko test, to determine the level of motivation of gaining successes and the fear of failure A.A. Reantest, to determine feeling yourself, activity and mood San test with the help of the above-mentioned tests, are defined changes with effects of emotional stress of psycho-physiological indicators anxiety, intelligence, understanding and so on.

Results: It is clear from research that, the highest emotional tension is in the students of the lower course. The physical strain in the students studying the physics faculty is higher than the history faculty students. Perhaps the reason of this has been the basis of our research surveys that, historians are ready to understand and give information about their problems better than physicists. Indicators of emotional stress was higher in members of girls group than the members of boys group. This is explained by the fact that, girls confess their complaints clearer than the boys. In addition, we can come this conclusion that, the most of the stress from exam time was in the first and second course students and for the removing this problem should be made psychological assistance.

Keywords: Stress, electrophysiological, comprehension.

The Effect of *Momordica charantia* on the Expression of Macrophage Migration Inhibitory Factor (MIF) in a Rat Model of Ulcerative Colitis

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Aim of the Study: Ulcerative colitis (UC) is a worldwide idiopathic, chronic, inflammatory disease of unknown etiology. The main symptom of UC is usually constant diarrhea mixed with blood, of gradual onset. UC is treated as an autoimmune disease. Treatment is with anti-inflammatory drugs, immunosuppression, and biological therapy targeting specific components of the immune response. In our country, fruits of *Momordica charantia* (MC) have been frequently used in folk medicine for rapid healing of cutaneous lesions, peptic ulcer and colitis. The present study evaluated the effect of the oily extract of MC fruit on macrophage migration inhibitory factor (MIF) in a rat model of colitis, induced by dextran sulfate sodium (DSS).

Material and Methods: Colitis induced by allowing rats a free access to drinking water containing 5% DSS for 7 days. The rats were randomized and divided into four groups: (1) Normal control group [N-C, 10 rats] had free access to a water bottle containing distilled water, free of DSS, for 14 days. (2) A colitis-control group [UC-C, 10 rats] had free access to a water bottle containing DSS, for 7 days and fed with normal drinking water for an additional 7 days. Fourteen days after induction of colitis, olive oil was administered orally by an oral gastric tube once daily to each rat for 14 days. (3) A colitis group [UC, 10 rats] had free access to a water bottle containing DSS, for 7 days and fed with normal drinking water for an additional 7 days. (4) A treatment group [MC, 10 rats] had free access to a water bottle containing DSS, for 7 days and fed with normal drinking water for an additional 7 days. Fourteen days after induction of colitis, oily MC fruit extract (4 g/kg/day) was administered orally by an oral gastric tube once daily to each rat for 14 days. At the end of the experimental period and following 16 h of fasting, rats were sacrificed and the colonic tissues were dissected. Animal body, and colonic weights and MIF expression levels were evaluated.

Results: Treatment with oily MC fruit extract attenuated DSS-induced ulcerative colitis as shown by improvement in body weight loss. In the UC and UC-C groups, the colonic expression levels of MIF increased significantly compared with the N-C group, and were also significantly higher than those in the MC-treated group. However, there was no statistical difference in MIF mRNA between groups UC and UC-C. In conclusion, the expression levels of MIF increased significantly in rats with UC. Oily MC fruit extract reduced colonic mucosal damage by downregulating the expression of MIF, an inflammatory factor that regulates the function of macrophages, in rats with DSS-induced UC. *M. charantia* inhibits DSS-induced colitis in rats may be through its anti-inflammatory property. Therefore, *M. charantia* could be a promising protective agent recommended for UC patients.

Acknowledgements: This work is supported by the Scientific Research Projects Council of Pamukkale University (PAUBAP-2013BSP011).

Keywords: Ulcerative colitis, *Momordica charantia*, macrophage migration inhibitory factor, dextran sulfate sodium, rat model.

Wound Healing Role of Hayıt (*Vitex agnus-castus* L.) Plant in Experimental Diabetes Created On Rats

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Aim of the study: The plants that human beings use every day have a significant medical significance. The plant variety used also increases day by day. We also investigated the effect of Hayıt (*Vitex agnus-castus* L.), a medicinal herb in our study, on the diabetic wounds on rats for whom we have developed experimental diabetes. In our study, both male and female rats were used and 5 groups were formed: control, SHAM, 65 mg / kg, 265 mg / kg and 465 mg / kg. The extracts in dose-adjusted doses were injected into the wound area for 21 days. In 21 days, wound areas were measured and the results were compared.

Material and Methods: For the study, an approval has been obtained from Pamukkale University Animal Experiment Ethics Committee no. 45403 at the 2016/05 meeting. In our study, healthy female and male rats of Wistar-Albino genus and leaves of viticulture plants were used. To cause experimental diabetes, (STZ) (Sigma, St. Louis, Mo., USA) was given at rats. After leaves were dried, milled with the aid of blender (Waring Commercial Blender, USA) and then plants separated in small pieces were extracted with ethanol (Merck) for 6 hours at 55 °C in a water bath (Nucleon Water Bath). The solvent in the solution was evaporated on a Rotary Evaporator (IKA RV10, Germany) at 50 °C. The remaining water in the extract was frozen in a lyophilizer (Labconco Freezone 6) machine. The obtained extract which calculated according to the group weights, was injected into the wound area for 21 days with water.

Results: At the end of 21 days samples were taken according to the rules of tissue tracing method. 5 µ sections were taken from the tissues with the aid of a microtome. The sections were then examined with the Olympus BX-51 light microscope and the Olympus PP72 Digital Camera. When the groups were compared with each other, the best healing rate of 265 mg / kg among female rats. In male rats, this dose was determined to be 465 mg / kg.

Acknowledgements: This study was supported by Pamukkale Scientific Research Unit (BAP Turkey) Project No: 2013FBE049

Keywords: *Vitex agnus-castus* L., plant extract, diabetes, wound healing, histochemicaling, rat

Potential Geographic Distribution of the Monkey Goby (*Neogobius fluviatilis*) as Predicted from Native Range Presence Data by a BIOCLIM Model

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Aim of the study: The gobiid fishes (Actinopterygii: Gobiidae: Benthophilinae) are a large group of about 50 species found in coastal habitats of the Black and Caspian seas. Many species from this region constitute a major part of the introduced aquatic taxa in northern/central Europe and North America. As, for instance, *Neogobius melanostomus* (round goby), multiple other Ponto-Caspian species are also predicted to become successfully established if introduced. Compared to the round goby, *N. fluviatilis*, or the monkey goby, has shown moderate success in colonization and establishment outside of its native range. Robust methods for anticipating the geographic potential of possible invaders on a continental scale would allow decision-makers and managers to make informed decisions and take effective actions towards species before they are established.

Material and Methods: The BIOCLIM approach in ecological niche modelling was applied to estimate the potential distributional area for the monkey goby in Europe and North America using models based on *native range* distribution data (together 138 georeferenced records taken from museum and literature sources, for instance, Movchan et al., 2002). Previous investigators have applied ecological niche modelling to this problem in both terrestrial and aquatic ecosystems (Peterson, 2003, 2008). Environmental data included 19 bioclimatic variables from *WorldClim* (worldclim.org) that are commonly used in ecological analyses. Model evaluation focused on their predictive performance and included the determination of a minimum threshold of quantitative output for the potential presence of the species.

Results: The models (using various combinations of bioclimatic variables to cope with patterns of inter-correlation) performed between 'good' and 'very good', composing an average AUC of 0.756 ± 0.008 . The best predictive performance was reached by a model considering three prime bioclimatic variables: 'Precipitation of Driest Month', 'Mean Temperature of Coldest Quarter' and 'Mean Temperature of Warmest Quarter'. These have been used as proxies for distinguishing the potential distribution of the species beyond its native home range. Point data from places where the species is considered to be invasive fit sufficiently into the potential geographic distribution for the monkey goby in Europe predicted from native range presence data. Particularly suitable conditions for the species are found in the Pannonian Basin and large areas of 'highly suitable' habitat appear across Poland, extending into Germany. In the meantime, the monkey goby is successfully invading European waters via two major migration corridors of Ponto-Caspian species – the Central and the Southern, which is consistent with the BIOCLIM model indicating the predominant expansion of the species into Europe in an 'east to west' direction. A worldwide extrapolation of the model indicated the suitability of the Great Lakes in North America as a habitat for the monkey goby, particularly Lake Michigan, where the conditions are predominantly 'high' and 'very high'; another suitable area turns out to be the Korean Peninsula that houses a full range of bioclimatic suitable habitat for the species.

Keywords: *Neogobius fluviatilis*, BIOCLIM model

Towards the Issues on the Impact of Global Warming on BiodiversityR. KH. JABNIDZE, M. N. TURMANIDZE, N. R. JABNIDZE

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Aim of the study: The global warming contributes to the emergence dangerous consequences for natural ecosystems and cause irreparable damage to biological diversity. One of the strategic objectives, conscious by world community in connection with the problem of ecological crisis is the conservation of biological diversity. Agriculture is the source of approximately 20% of greenhouse gases (CO₂, CH₄, N₂O), emitted times reduces the amount of greenhouse gases. According to environmentalists' opinion, the following measures can help slow down the process of global warming: higher prices for fossil fuels; replacement of fossil fuels ecologically pure; development of energy-saving and mom-waste technologies; introduction of technology absorption and carbon sequestration; tree planting; environmental education; usage the phytomelioration in agriculture.

Material and Methods: The role of forests in the conditions of global warming is considered. The main cause of global warming is considered to be high level of Carbon Dioxide in the atmosphere, which can only be absorbed by green plants through photosynthesis as a result of which oxygen is produced, which, in its turn, is a life source of all living beings on earth. The paper paces special emphasisi on the role of forests in cleaning process of air through filtration. Forests also play an important role in protection of water resources and saves soil from emaciating; in addition, forest protect environment from disasters of various kinds; Floods, mudflows, avalanches, erosion, etc. forests play a vital role in protection of the environment from all the above-mentioned threats.

Results: Maintenance of biodiversity of various ecosystems may serve as the basis for biosphere stability. Human business activities cause the intensity of global changes a lowering of biodiversity of ecosystems that is reflected in the reduction of production volume and quality of foodstuff. Recently, functional foodstuff, namely spices, is extremely popular in the developed countries of the world. For the production of functional foodstuff only ecologically clean, non-gen. Modified raw materials are used. Like seven, region located in the Alphs of France, easy accessible mountain-sides of the Georgian highlands can be used. Establishment of Agro Industrial Complex, which shall produce ecologically clean raw materials for functional foodstuff in Khulo, may promote the development of one more direction of tourism, namely, agro tourism, increase the number of tourists and employment of local population in this region and what in most important – it shall protect mountain eco systems from erosive processes.

Keywords: Global warming, biodiversity, ecosystems, foodstuff.

5-Aminolevulinic Acid Increased Productivity and Photosynthetic Pigment Content in *Hematococcus pluvialis*

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Aim of the study: 5-Aminolevulinic acid (ALA) as a plant growth regulator is used widely in plant cultivation. However, there are only few reports about its application in algae cultivation. The goal of the study was focused on the effects of 5-aminolevulinic acid on unicellular algae *Hematococcus pluvialis* productivity: dry cell weight accumulation during cultivation, cell number and size, protein and photosynthetic pigment content.

Material and methods: *Hematococcus pluvialis* algae cells (Strain IBCE H-17) were grown in Rudic's medium (control) for 12 days supplemented with ALA 0.5; 5; 10; 20 and 30 mg/L ("ALA"-variants) under constant temperature (23 ± 2 °C), light provided by white Philips TD-36/765 fluorescent tubes, illumination 2000 lux with 14-h photoperiod and air blowing.

Results: Cultivation of algae cells in the presence of exogenous ALA (0.5; 5; 10; 20 and 30 mg/L) resulted in increasing dry cell weight compared to the control. For two days of an incubation of algae with ALA (10 mg/L) dry cell weight increased in relation to control by 17%. A dose-dependent increase in the content of *Hematococcus* cells on average by 26% and a decrease in their diameter by 15% were observed in ALA-variants compared to those in the control culture. In 7-day culture, a significant increase of the photosynthetic pigment content (per g of dry matter) was observed under ALA action – levels of chlorophylls *a*, *b* and β -carotene were higher than control values by of 37, 37 and 58% for all ALA concentrations used and in the case of xanthophylls - neoxanthin, violaxanthin and lutein - by 31, 30 and 47% respectively. ALA also contributed to an increase in protein content when calculated per g of dry matter (from 20 to 73%) after 7 days of algae cultivation. With the subsequent cultivation of algae up to 12 days, the effectiveness of ALA action decreased while maintaining the tendency noted above. The results are discussed from the position of using exogenous ALA in activation of the synthesis of endogenous cytokinins that stimulated the growth and development of algal cells, as well as the formation of the pigmentary apparatus of photosynthesis.

Keywords: *Hematococcus pluvialis*, 5-aminolevulinic acid, dry weight, cell number and size, protein, photosynthetic pigments

Antibacterial Effects of Marine Macroalgae the Coast of Ordu Province in TurkeyÖmer Ertürk¹, Beyhan TAŞ¹, Zeynep KOLÖREN¹, Onur KOLÖREN²¹Department of Molecular Biology and Genetics, Faculty of Arts and Sciences, Ordu University, Ordu² Department of Plant Protection, Faculty of Agriculture, Ordu University, Ordu, Turkey
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Aim of the study: Four marine macroalgae (*Cystoseira barbata*, *Corallina officinalis*, *Gelidium spinosum*, *Ulva intestinalis*) collected from the coast of Ordu in Turkey were tested for the antibacterial and antifungal activity of ten bacteria and one fungus by the paper disc agar diffusion methods.

Material and Methods: The antimicrobial activity of alg samples were studied using ten bacteria (*Pseudomonas aeruginosa*-ATCC27853, *Proteus vulgaris*-ATCC7829, *Escherichia coli*-ATCC25922, *Klebsiella pneumoniae*-ATCC13883, *Listeria monocytogenes*-ATCC7677, *Clostridium perfringens*-ATCC313124, *Salmonella enteric*-ATCC14028, *Bacillus subtilis*-B209, *Micrococcus luteus*-B1018, *Staphylococcus aureus*-ATCC6538 and and one fungi *Candida albicans*-ATCC10231. The species of bacteria were grown in Mueller Hinton Agar (Merck) and Mueller Hinton Brot (Merck). *C. Albicans* was grown in Sabouraud Dextrose Broth (Difco) and Sabouraud Dextrose Agar (Oxoid). The concentrations of bacterial suspensions were adjusted to 10^8 cells/ml, while those of fungal suspensions to 10^7 cells/ml. Antibacterial and antifungal activities were measured using methods of diffusion disc plates on agar. Bacterial and fungal cell concentrations were adjusted to 10^8 and 10^7 cells/mL by measuring spectrophotometrically. Inhibition zones were mesaured after incubation at 37°C for 48h. All experiments were done in 3 replicates.

Results: Among the four algal samples tested, the largest inhibitory zones were observed with the extract of *Cystoseira barbata* (22.41 ± 1.74 mm) against *Pseudomonas aeruginosa*. The extract of *Ulva intestinalis* showed the highest anti-fungal activity against *Candida albicans* with 26.03 ± 0.09 mm inhibition zone. *M. luteus* has the lowest inhibitor activity against the tested organisms. In addition, the extracts of *C. officinalis* and *C. barbata* showed strong inhibitor activity against *S. enteritidis* and *B. subtilis*, respectively.

Keywords: Antimicrobial effect, *Cystoseira barbata*, *Corallina officinalis*, *Gelidium spinosum*, *Ulva intestinalis*

Assessment of Water Quality Using Benthic Macroinvertebrates and Physicochemical Parameters of Sarıkız Fountains and Gürdük Stream (Gediz Basin, Türkiye)

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Aim of the study: The basic aim of this study was to determine the biological richness of the stream with particular emphasis on the relationship between the structure of the benthic macroinvertebrate community and the physico-chemical features of their environment and to assess water quality of the Sarıkız Fountains (St.1) and Gürdük Stream (St.2, St.3).

Material and methods: Benthic macroinvertebrate communities from Sarıkız Fountains and Gürdük stream were sampled from five sampling sites, seasonally between 2016 - 2017. All phases of the study including sampling, collecting and identification were performed according to the methods (10870 BS EN ISO 2012) given by Water Framework Directive (WFD). All the collected animals were immediately fixed in Ethanol 70%. The macroinvertebrates were counted under the lowest possible taxon and a stereomicroscope. Samples were sorted and identified to the lowest possible taxon. Shannon-Wiener Diversity and Pielou's Evenness indices were used to characterize species diversity in the community. Non-metric Multidimensional Scaling (NMDS) was used to reveal dissimilarities that found in community and Principal Component Analysis (PCA) was performed as an eigenvector method to reveal the community ordination in Gediz Basin. The National Index based on BWMP (Spanish version) was used very first time to reveal the water quality.

Results: As the result of the study, 71 species from 57 genera belonging to 25 families (Athericidae, Baetidae, Caenidae, Ceratopogonidae, Chironomidae, Corixidae, Culicidae, Dixidae, Dytiscidae, Elmidae, Ephemeridae, Gomphidae, Helophoridae, Heptageniidae, Hydraenidae, Hydrohilidae, Hydropsychiidae, Leptoceridae, Leptophlebiidae, Luctricidae, Limonidae, Scirtidae, Simuliidae, Sphaeriidae, Tubificidae) found in Gürdük Stream and Sarıkız Fountains. The richest species diversity (Shannon-Wiener) was found in Sarıkız Pınarları (St1) and Gürdük Stream (St.2 and St.3) respectively 2.22, 1.72 and 0.27. The national index used to determine water quality has yielded the same results. As the result the water quality of Gürdük Stream was found in Class Good.

Acknowledgements: This research was supported by Ministry of Forestry and Water Management "Implementation of Gediz River Basin Management Plans (NHYP)" project, 2016.

Keywords: Gediz River Basin, Bioindicators, Biological monitoring, benthic fauna.

Monitoring Water Quality Using Benthic Macroinvertebrates and Physicochemical Parameters of Karaçay Stream

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Aim of the study: The main aims of this study were to determine the biological richness of the stream with particular emphasis on the relationship between the structure of the macroinvertebrate community and the physical and chemical features of their environment and to assess the water quality of the Karasu Stream in Kayseri and Yozgat.

Material and Methods: Macroinvertebrate communities along the stream were sampled Spring, Summer and Autumn in 2014 at each of the four stations. In this project will be applied WFD (Water Framework Directive) standards 10870 BS EN ISO 2012, Water quality - selection of manual sampling methods and devices for benthic invertebrates in fresh water BARBOUR et. al. accepted after 1999 and multiple multi-habitat technique AQEM I/STAR protocol contains a selection of selected sampling areas to improve habitat diversity (Cheshmedjiev et al, 2011). In addition, TSE 6469 EN 27828, EN 28265, EN ISO 9391, EN 8689-1, EN 8689-2 selection standards taking into account the common sampling procedures and equipment will be monitored. All the animals collected were immediately fixed in formaldehyde (4%) in the field and then transferred to 70% ethyl alcohol. The macroinvertebrates were sorted, identified to the lowest possible taxon and counted under a stereomicroscope. Multimetric Macroinvertebrate Index Flanders (MMIF) and Shannon-Wiener diversity index calculated.

Results: A total of 2973 specimens were collected covering 31 taxa in four stations. Average Biotic indices of four stations have moderate water quality, average third-class water quality for MMIF score was calculated. Shannon-Wiener diversity index average score for four stations was 1.67. The most dominant taxa for four stations *Baetis buceratus* (37%), *Baetis rhodani* (24%), *Caenis luctuosa* (10%) *Caenis macrura* and (9%) were detected. Baetidae family members of some types of beta-mezosaprobic includes taxa founded in alpha-mezosaprobic and polysaprobic stream zones. Also, most Baetidae family members are accessible in type beta-mezosaprobic and alpha-mezosaprobic environment.

Acknowledgements: This research was supported by Ministry of Forestry and Water Management "Kızılırmak, Small Menderes, Antalya, Marmara and Konya Closed Basins, The Water Frame Directive Water Quality Monitoring Project, 2014

Keywords: Kızılırmak River Basin, bioindicators, biological monitoring, benthic fauna.

Composition and Diversity of the Larval Chironomidae (Diptera) Species on Gediz River Basin: Effects of Significant Environmental Variables and Altitude

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Aim of the study: The main aims of this study were to evaluate the spatial distribution of larval chironomids on Gediz River Basin and to investigate the importance of some main environmental predictors and altitude in distribution of this group.

Material and Methods: Chironomidae specimens along Gediz Basin consist of 15 streams were collected seasonally between 2016–2017. All phases of the study including sampling, collecting and identification were performed according to the methods (10870 BS EN ISO 2012) given by Water Framework Directive (WFD). Chironomidae specimens collected from the field were immediately fixed in Ethanol 70%. Samples were sorted and identified to the lowest possible taxon. Environmental parameters measured are: water temperature (WT), pH, Conductivity, dissolved Oxygen (dO₂), Ammonium-Nitrogen (NH₃-N), Nitrate-Nitrogen (NO₃-N), Total Phosphor (TP), Total Dissolved Solids (TDS), Total Organic Carbon (TOC), Total Nitrogen (TN) and Ortho-Phosphate (PO₄P). Benthos was identified at species-level. Observed dissimilarity and ordination distance was calculated using Non-Metric Multidimensional Scaling (NMDS). Significant environmental variables were selected by forward selection while p values based on 999 permutations. Inflated variation parameters (VIF) over 10 were excluded. Canonical Correspondence Analysis (CCA) was applied to figure out ordination between biological parameters, environmental variables and sampling sites. All statistical analysis were calculated and graphed by R. Altitude was used both as a vector and as a factor variable and evaluated in three different categories such as low, mid and high by using quantiles.

Results: As the result of the study, 105 species from 39 genera belonging to Chironomidae family were sorted from 2390 chironomid specimens. Unconstrained rank was found as 14 in CCA. Expanded scores based on NMDS are non-metric $R^2 = 0.942$ and linear fit $R^2 = 0.915$. Environmental variables except WT, pH, NO₃-N and TDS were found significant ($p < 0.05$). TP and TN were excluded from the ordination analysis because of $VIF > 10$. According to forward selection while p values based on Monte-Carlo permutations; Altitude, dO₂, Conductivity and NH₄-N were found as the most significant environmental variables that affected chironomids and water quality on the basin. Altitude, water temperature and NH₄-N was correlated with CCA Axis-1 while others such as dO₂, pH and Cond was correlated with CCA Axis-2. High section on the CCA ordination diagram was mostly correlated with low water temperatures and high altitudes instead of dO₂. Particularly High and Low sections were separated clearly from each other, Mid section was found on the intersection of both High and Low sections.

Acknowledgements: This research was supported by Ministry of Forestry and Water Management “Implementation of Gediz River Basin Management Plans (NHYP)” project, 2016.

Keywords: Benthos, Macroinvertebrate, Multivariate analysis, Canonical Correspondence Analysis, R

Distribution and Species Diversity of Ephemeroptera on Gediz Basin

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Aim of the study: The main aim of this study, examining systematic and ecological aspects of Ephemeroptera, determining of species diversity and revealing the ordination of sampling sites with Ephemeroptera fauna on Gediz Basin.

Material and Methods: Ephemeroptera specimens along Gediz Basin consist of 6 lakes and 12 streams were collected seasonally between 2016–2017. All phases of the study including sampling, collecting and identification were performed according to the methods (10870 BS EN ISO 2012) given by Water Framework Directive (WFD). Ephemeroptera specimens collected from the field were immediately fixed in Ethanol 70%. Samples were sorted and identified to the lowest possible taxon. Shannon-Weaver Diversity and Pielou's Evenness indices were used to characterize species diversity in the community. Non-metric Multidimensional Scaling (NMDS) was used to reveal dissimilarities that found in community and Principal Component Analysis (PCA) was performed as an eigenvector method to reveal the community ordination in Gediz Basin.

Results: As a result of this study, 23 species from 12 genera belonging to 6 families (Baetidae, Caenidae, Ephemeridae, Heptageniidae, Isonychiidae, Leptophlebiidae) found in Gediz Basin consist of 6 lakes and 12 streams. The correlation based on non-metric fit (NMDS) was found $R^2 = 0,891$. First two axis of PCA explains the greatest variation (65%) of the ordination according to 14 ranks. Shannon Weaver index was calculated maximum 2,7 as the community containing equally-common species of $\exp(H)$.

Acknowledgements: This research was supported by Ministry of Forestry and Water Management "Implementation of Gediz River Basin Management Plans (NHYP)" project, 2016.

Keywords: Benthic macroinvertebrates, Shannon-Weaver, stream, community ordination

Assessment of heavy metals in *Dicentrarchus labrax* (Linnaeus, 1758) and *Sparus aurata* Linnaeus, 1758 marketed in Sinop (Turkey)

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Aim of the study: Mercury (Hg), Cadmium (Cd), lead (Pb), copper (Cu) and zinc (Zn) levels in European sea bass *Dicentrarchus labrax* (Linnaeus, 1758) and gilthead sea bream *Sparus aurata* Linnaeus, 1758 that are commercially sold on the Sinop market were appraised. A total of 40 fish samples of both species were purchased from Sinop markets in 2015. Heavy metal concentrations were measured by Inductively Coupled Plasma Mass Spectrometry (ICP-MS).

Material and Methods: The fish samples were taken randomly then labelled and were preserved using ice box and transported to the main laboratory. For metal analysis, sampled European sea bass and gilthead sea bream individuals were measured and first washed with tap water and then rinsed in distilled water. All samples were stored in deep frozen at -21°C until analysis. Metal analysis in edible tissues of the samples was made by m-AOAC 999.10-ICP/MS technique by validated Environment Industrial Analysis Laboratory Services Trade Company (TÜRKAK Test TS EN ISO IEC 17025 AB-0364-T). The mean heavy metal weekly intake was calculated as following formula: Heavy metals intake level = mean heavy metal content X consumption of fish per person/ body wt. IBM SPSS Statistics version 21 software is used for statistical calculations.

Results: The concentrations of measured heavy metals decrease in the order of Zn > Cu > Pb > Hg > Cd. Metal levels in edible tissues of European sea bass and gilthead sea bream individuals from Sinop markets showed differences. The means of metal concentrations in *D. labrax* were 0.03±0.008 mg/kg wet wt. for Hg; 0.009±0.001 mg/kg wet wt. for Cd; 0.06±0.02 mg/kg wet wt. for Pb; 0.42±0.09 mg/kg wet wt. for Cu and 9.2±3.1 mg/kg wet wt. for Zn. Whereas the means of metal concentrations in *S. aurata* were 0.02±0.006 mg/kg wet wt. for Hg; 0.01±0.009 mg/kg wet wt. for Cd; 0.04±0.011 mg/kg wet wt. for Pb; 0.69±0.11 mg/kg wet wt. for Cu and 8.5±2.3 mg/kg wet wt. for Zn. Current European Commission Regulation and Turkish Food Codex allowed the maximum Hg, Cd and Pb limits in the edible tissues of fish as 0.5, 0.05 and 0.3 mg/kg wet wt., respectively. European Commission Regulation has no legislation for essential metals, but Turkish Legislation states the maximum permitted limits of Cu and Zn as 20 and 50 mg/kg wet wt., respectively. None of the metals in European sea bass and gilthead sea bream were not above the permissible values.

Acknowledgements: This work was carried out at the University of Sinop, Fisheries Faculty, Department of Hydrobiology Laboratory.

Keywords: *Dicentrarchus labrax*, *Sparus aurata*, Sinop fish market, heavy metals

Assessment of Phytoplankton and Ecological Status in Alpine Glacial Lake Sağrak (Northeastern Turkey)

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Aim of the study: Alpine lakes where located on the Giresun Mountains in the north-east of Turkey are characterized by "natural water mass". These lakes with glacial origin are water bodies that have not been varied or changed slightly from the natural state. In this study, trophic structure and phytoplankton communities of Lake Sağrak where was a glacial lake with extreme conditions was investigated.

Material and Methods: Lake Sağrak where is study area is 2660 meter high from sea level. In the period June to September 2014 on which is non-ice covered period, sampling was performed. The samples that are collected by plankton net from surface water were fixed via 4% formaldehyde and the samples that are taken for quantitative analysis were fixed with an alkaline lugol's solution. After the sedimentation process, phytoplankton abundance was determined with Sedgewick-Rafter counting chamber. Temperature, pH, dissolved oxygen, conductivity, TDS and light transmittance from physicochemical parameters were determined *in situ*. Suspended solids, total hardness, ammonium, nitrite, nitrate, sulphate and chloride were analyzed in the laboratory spectrophotometrically.

Results: The phytoplankton communities of the Lake Sağrak are mostly composed of picoplanktonic (<2 µm) and nanoplanktonic (2-50 µm) species. The planktonic algal flora consisted of 106 taxa belonging to the divisions Bacillariophyta (45 taxa), Cyanophyta (18 taxa), Chlorophyta (17 taxa), Charophyta (14 taxa), Ochrophyta (5 taxa), Euglenophyta (4 taxa) and Cryptophyta (3 taxa). In general, diatoms were dominant in terms of species number during the study period. As a result of the quantitative analysis, the dominant algal group is green algae (46%). The highest algal abundance was recorded in September (50%). In particular, *Sphaerocystis schroeteri* from small chlorococcal species was recorded in high numbers. Shannon H' and J' changed between 0.641-0.918 and 0.439-0.622, respectively. According to the cluster analysis, the highest similarity was recorded between June and July. In terms of phytoplankton counting results (2735-34131 cells/L), the trophic structure of the lake is ultra-oligotrophic/oligotrophic. The phytoplankton community of Lake Sağrak is composed of A, F, Y, Z, N and X3 functional groups. These data shows that the lake water has "very good quality" and 1st class. As a result, Lake Sağrak has oligotrophic character according to morphometric structure, presence of indicator species, low diversity indices and low biomass values.

Acknowledgements: This study was funded by Ordu University Scientific Research Project under Project No: TF-1439.

Keywords: Alpine lakes, ecological status assessment, high-mountain lakes, reference conditions, Shannon-Weaver index, trophic state

PP-314
Benthic Amphipods from Turkish Aegean coast

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Aim of the study: Turkish coast is extremely interesting from the biogeographical point of, because it is situated on a board line among many sectors with different biogeographical characteristics. In Turkish coast and in the Eastern Mediterranean in general, amphipod communities have received little attention. The information concerning the amphipod fauna of the Aegean Sea is not enough. The main objectives of the present paper are to provide new information and to compare the amphipod fauna with other Mediterranean regions.

Material and Methods: The material was collected from 101 stations, in depths between 4 and 183 m in various types of substrates scattered all over the Aegean Sea excluding Greece coast in 2003. Samplings were made by dredges and beamtrawls. Samplings were carried out on soft substrates. The samples taken in each station were placed in separate jars and fixed with a %5 formaldehyde solution. Specimens have been deposited in the Laboratory of Marine Biology, University of Sinop.

Results: As a result of this study, a total of 7215 amphipod individuals belonging to 169 species and 31 families was determined. The dominant species are *Caprella acanthifera*, *Phtisica marina* and *Dexamine spinosa*. According to Soyer (1970) frequency index the frequent species are *Phtisica marina*, *Dexamine spinosa*, *Harpinia dellavallei* and *Caprella acanthifera*. As with other types of systematic level, the highest species numbers have been identified from a depth of 5-50 m and the depth increases, a significant drop in the number of species observed. In this study, 121 Atlanto- Mediterranean, 40 Endemic and 8 Cosmopolitan species have been identified. Lessepsian species were not encountered.

Keywords: Amphipoda, Ecology, Taxonomy, Aegean Sea, Turkey

Benthic Macroinvertebrates of Bafa Lake in Buyuk Menderes Basin (Mugla, TURKEY)

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Aim of Study: Bafa Lake is important wetland area in Buyuk Menderes Basin. Bafa Lake is a shallow lagoon, located into southeastern part of Turkey and the largest coastal shores lake near Aegean Sea. Bafa Lake is a private wetland area and give many benefit for the livelihood of the people around this region. The aim of this study was to given benthic makroinvertebrates in the evaluation of biological datas in Bafa Lake.

Materials and Methods: This study was carried out at Bafa Lake, which is located boundaries of Aydin and Mugla, in between April 2013 and March 2014. Macro-invertebrates were collected from 5 stations in Bafa Lake monthly to determine taxonomy and distribution of macro benthic invertebrates. Benthic macroinvertebrate were collected by nets, hand and ekman grab. The collected benthic macroinvertebrates were identified by their species or genus levels. Then Frequency, Dominancy (Kocatas, 1994) and Similarity analysis were determined (Birol, 2007). It was given that Bafa Lake has 2nd class water quality (Sasi et al., 2017).

Results and Discussion: In this study, 18 taxons and 26509 individuals which are consist of 6 classis and 12 species that are belonged Crustacea, Gastropoda, Bivalvia, Polychaeta, Arachnida and Insecta at the stations determined to the benthic macroinvertebrates. The most predominant group among the benthic samples in Bivalvia and representative of the group is *Mytilus marioni* (Locard, 1889). Also the analyses of Frequency, dominancy and Similarity of the benthic samples were given. According to the study results.

Acknowledgement: This study sponsored by Mugla Sitki Kocman University through the University grant no 13/42-BAP.

Keywords: Bafa Lake, Buyuk Menderes basin, Benthic, Macroinvertebrate, Crustacea

Biodiversity in the Black Sea Bottom Trawl Fisheries and Processing Possibilities of Discard Species

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Aim of the study: The Black Sea has unique characteristics (less diversity but more abundant school) compare with the other Turkish seas. Therefore, trawling is one of the industrial fishing methods and mainly used in the Black Sea fisheries. The aim of this study is determined biological diversity of the commercial bottom trawl for the Black sea which is one of the most isolated seas in the world.

Material and Methods: Materials were obtained from the commercial fishing operations; namely 14 trawl (cod-end mesh size varies between 40-48 mm) surveys in three stations (Ordu, Samsun, Sinop) located on the coast of the Black Sea between December 2008 and December 2011. Sampling was carried out from fishing vessel by collecting of species separated. Samples were weighed with 0.01 g precision, total lengths were measured to the nearest 0.1 cm, and shellfish and crustaceans were measured (total length, width, thickness and carapace length) with digital callipers with 0.01 mm sensitivity. Finally, the processing possibilities of discard catch were evaluated.

Results: Totally, 1095 kg (33076 units) samples were obtained and then were made sub-sampling. It was determined 20 different species caught by bottom trawl surveys. The most of them comprise of discard species (35%). This is a huge number for the bottom trawl fisheries and also Turkish Black Sea fisheries. The main species are; *Solea lascaris*, *Sprattus sprattus*, *Spicara smaris*, *Crangon crangon*, *Neogobius melanostomus*, *Alosa fallax*. In Turkey, some of them especially *Sprattus sprattus* use for fish flour and oil production. The discard species are shown differences according to country and fishing gears. Therefore, discard species can be evaluated in processing industry for fish feeding and other purposes for country needs considering Common Fishery Policy of Food, Agriculture Organization in European Commission. Some discard species can be used in fish oil production by their fat content. Especially, the livers of sharks and ray species that are caught discard can be used in the pharmaceutical industry because they are a good source of unsaturated fatty acids. Besides, some red crustaceans such as shrimp and crab can be used for carotenoid production which is important carotenoid source for aquaculture industry.

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Keywords: Black Sea, biodiversity, experimental bottom trawl, discards, processing technology.

***Ceratothoa* sp. (Isopoda, Cymothoidae) Infestation on Bathydemersal Fishes from Gulf of Antalya, Turkey**

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Aim of the study: In the present study, we seek to clarify the status of ecto-parasite infestation in bathydemersal fish species from Gulf of Antalya in Turkey.

Material and Methods: *Chlorophthalmus agassizi* and *Argentina sphyraena* specimens were collected using troll operations (date: 27 Sept. 2016, Number of *C. agassizi*: 6 and TL_{Ca}: 13.10±2.13 cm, Number of *A. sphyraena*: 4 and TL_{AS}: 14.34±3.72 cm, Deep range: 265-600 m, Time: 1 hour, location: N36°44,600'-E31°13,350'/N36°45,110'-E31°09,930') and labelled in separate plastic bags. Ecto-parasitological examinations, evaluation and identification were conducted utilizing standard techniques. All parasite samples were rapidly removed and stored in buffered 4% formaldehyde and 90% ethanol solution. In this study the parasitic *Ceratothoa* sp. (Isopoda, Cymothoidae) gravid female and mature male samples were removed from buccal cavity, branchial cavity and also from hyoid arch of the lower part of the oral cavity of Shortnose greeneye, *Chlorophthalmus agassizi* Bonaparte, 1840 and Argentine, *Argentina sphyraena* Linnaeus, 1758.

Results: All parasite specimens were identified as *Ceratothoa* sp. Dana, 1852 belong to Crustacea, Isopoda, Cymothoidae family. According to the keys to the isopod parasites of fishes; some diagnostic specifications/remarks were found in similar such as the cephalon deeply curved towards rostrum at the level of the eyes; pereopods without prominent expansions on the merus. *Ceratothoa* spp. recorded as a fish parasite from different localities such as Atlantic Ocean and Mediterranean Sea. In this case, it is report of the presence of adult *Ceratothoa* sp. on *Chlorophthalmus agassizi* and *Argentina sphyraena* specimens as bathydemersal fishes caught from the Gulf of Antalya, Turkey.

Acknowledgements: All procedures above were approved by the Institutional Animal Ethics Committee of Firat University (FUDAM).

Keywords: Isopoda, bathydemersal fishes, parasite, Antalya, Turkey

A Preliminary Helminthological Study on *Pelophylax ridibundus* Pallas 1771 collected from Kırıkhan (Hatay) District

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Aim of the study: In this study, the helminths of Eurasian marsh frog, *Pelophylax ridibundus* (formerly known as (*Rana ridibunda*)) inhabiting in Kırıkhan (Hatay) district was first time investigated.

Material and Methods: 33 (16 ♂♂; 16 ♀♀) marsh frogs *Pelophylax ridibundus* were collected in 2009 from Kırıkhan (Hatay) were examined for helminths. Frogs were overdosed in ether-filled glass containers. The body cavity was opened. The alimentary canal was excised and separated. The contents of each part and other were each mixed with 0.5% saline solution and poured into petri dishes for examination under a stereomicroscope.

Results: The helminth fauna of *Pelophylax ridibundus* comprised: 1 species of Digenea (*Prosoctopus confusus*), 4 species of nematodes (*Rhabdias bufonis*, *Cosmocerca ornata*, *Oxysomatium brevicaudatum* and *Abbreviata* sp.

Keywords: Digenea, Hatay, Helminths, Kırıkhan, Marsh Frog, Nematoda, *Pelophylax ridibundus*

A Parasitic Copepod Larvae Existence in Catfish (*Silurus glanis* L. 1758) in Denizli Vali Recep Yazıcıoğlu Dam Lake, in Denizli District, Turkey

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Aim of the study: In this study the catfish, *Silurus glanis* samples were collected from Vali Recep Yazıcıoğlu Dam Lake were parasitologically examined.

Material and Methods: The catfish samples were obtained from the local fishermen. Fish samples were parasitologically examined under the stereomicroscope.

Results: We observed a copepod larva of *Lernaea cyprinacea* (fam, Lernaeidae) on *Silurus glanis* gills. *Lernaea cyprinacea* has ectoparasitic features on fishes. *L. cyprinacea* is first time observed in catfish (*Silurus glanis*) in Denizli region.

Keywords: Copepod, Denizli, Ectoparasite, *Lernaea Cyprinacea*, *Silurus Glanis*, Vali Recep Yazıcıoğlu Dam Lake, Turkey.

A Preliminary Study on Feeding Biology and Helminths of Kotschy's Gecko, *Mediodactylus kotschy* (Steindachner, 1870) Collected from Denizli Province, Turkey

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Aim of the study: In this study, 14 Kotschy's Gecko, *Mediodactylus kotschy* (13 ♂♂; 1 ♀♀) samples collected from Denizli between 2010-2011, were examined for both helminths and feeding biology of first time.

Material and Methods: The Kotschy's Gecko, *Mediodactylus kotschy* 14 (13 ♂♂; 1 ♀♀) samples were collected from Denizli between 2010-2011 years. The lizards were anesthetized in ether filled glass containers, samples guts were dissected out using surgical scissors and forceps in the laboratory. The observed prey items were classified and counted.

Results: The majority of *M. kotschy*'s diet consisted of the class Insecta. The members of Diptera (60%), Hymenoptera (20%) and Heteroptera (20%) orders were eaten by *M. kotschy*. Some plant materials were also observed in guts of *Mediodactylus kotschy* samples. Also, one helminth species (*Mesocestoides* sp.) were observed in guts of *Mediodactylus kotschy* samples. Kotschy's Gecko, represent a new host record for *Mesocestoides* sp. from Turkey.

Keywords: *Mediodactylus kotschy*, Denizli, Feeding biology, Helminth, Turkey

A Preliminary Study on Feeding Biology of the European copper skink, *Ablepharus kitaibelii* (Bibron & Bory, 1833), collected from Denizli Province

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Aim of the study: In this study, the feeding biology of *Ablepharus kitaibelii*, collected from Denizli province and examined first time for feeding biology.

Material and Methods: 12 (7♂♂, 5♀♀) *Ablepharus kitaibelii* samples collected from Denizli province between 2009 and 2010 years. The skinks were anesthetized in ether filled glass containers, guts were dissected out by using surgical scissors and forceps. Prey items were classified and counted.

Results: As a result of the research, the majority of the diet consisted of the class Insecta in the identified preys in diet of the *Ablepharus kitaibelii*: Heteroptera (28.57%), Orthoptera (14.28), Diptera (10.71%), Hymenoptera (7.14%), Coleoptera (3.57%) and Arachnida (35.75%) species. Some plant materials were observed in gut of *Ablepharus kitaibelii*. This plant parts are accidentally swallowed in feeding activity.

Keywords: *Ablepharus kitaibeli*, Denizli, Feeding Biology, Turkey

A Preliminary Study on The Helminth Fauna of Euroasian Marsh Frog, *Pelophylax ridibundus* (Pallas, 1771) from Tokat, Artova District

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Aim of the study: In this study, the helminths of marsh frog *Pelophylax ridibundus* (formerly known as *Rana ridibunda*) inhabiting in Tokat, Artova District was first time investigated.

Material and Methods: Forty-five (29♂♂; 16♀♀) Eurasian marsh frogs, *Pelophylax ridibundus* were collected between 18.07.2008 – 05.04.2009 from Artova district in Tokat. Samples were overdosed in ether-filled containers, and the dissected with surgical scissors, the gut was excised and separated. The contents of each part and other were each mixed with 0.5% saline solution and poured into petri dishes for examination under a stereomicroscope.

Results: The helminths of *Pelophylax ridibundus* is comprised: 5 species of Digenea (*Brachycoelium salamandrae*, *Diplodiscus subclavatus*, *Gorgodera cygnoides*, *Gorgoderina vitelliloba*, *Haematoloechus breviansa*), 4 species of Nematodes (*Cosmocerca ornata*, *Cosmocerca sp.*, *Abbreviata*, *Oxysomatium brevicaudatum*), 1 species of Acanthocephalan (*Acanthocephalus ranae*) and observed uncountable Acanthocephalan cysts from frogs.

Keywords: Acanthocephala, *Rana ridibunda*, Marsh frog, Digenea, Nematoda, Tokat

Changes of Soft Bottom Macrozoobenthic Diversity with Depth in the Southeastern Black Sea

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Aim of the study: Biodiversity is crucial to understand effects of global and regional environmental changes. Black Sea ecosystem has experienced dramatical changes due to eutrophication, pollution, over fishing, alien species and climatic changes. However little is known about status of soft bottom macrozoobenthic communities under these changes. In this study, soft bottom macrozoobenthic organisms were investigated at Southeastern Black Sea as a function of depth and the diversity index were calculated.

Material and Methods: Seasonal distribution of soft bottom macrozoobenthic communities inhabiting 4 depth zones (≥ 5 -15m, ≥ 15 -25m, ≥ 25 -35m, ≥ 35 -m) were investigated at twenty stations along the South Eastern Black Sea (Samsun-Hopa). Soft bottom macrozoobenthic communities were investigated upon depth changes between Spring 2013 and Winter. Samples were collected by Van van Grab sampling system (0.1 m²). Samples were sieved 0.5 mm mesh size. Macrozoobenthic organisms in benthic samples were separated into systematic groups and species, by stereo-microscope and light microscope. Obtained data was used to calculate Shannon–Wiener diversity index (H') for the region.

Results: A total of 71 species belonging to the 8 phylum of Animalia *Cnidaria* (6 species), *Nemertea* (1 species), *Nematoda* (1 species), *Annelida* (26 species), *Arthropoda* (9 species), *Mollusca* (24 species) and *Echinodermata* (3 species) were investigated. The highest Shannon–Wiener diversity index (H') was found at < 25m depth zone varied between 1.2 and 1.6 in spring, summer, autumn, except winter (0.5). The lowest Shannon–Wiener diversity index (H') was found ≥ 25 m and ranged between 0.5-1.3 except winter. During study, species diversity tended to decrease as a function of depth, which is probably the result of different adaptation strategies to the environmental conditions, sediment grain size and TOC.

Key words: Soft bottom macrozoobenthic invertebrates, Shannon –Wiener diversity index (H'), Southeastern Black Sea

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Comparison of Biodiversity Indices and Distribution of Some Fish Species in the Southeastern Black Sea Coasts

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Aim of the study: In this study, in the light of data obtained from fishing operations, distribution of fish species was determined by considering season and depth factors, also diversity indices for the fish species were estimated.

Material and Methods: This study was conducted between June 2010 and June 2011 in the coastal area along Rize coasts in the Southeastern Black Sea at the depths varying from 8 m to 54 m. Sixteen trammel net operations were performed and the catch composition was determined. Totally, 3460 fish specimens belonging to 21 fish species were caught during the operations. Similarity analysis of fish species composition and amount obtained by the operations was performed using the PRIMER 5 software package. Fourth root transformation linked with group average fusion was used for clustering the operations. Multidimensional Scaling (MDS) analysis was performed according to the Bray-Curtis similarity matrix (Kruskal and Wish 1978). Depth and season were used as factors in both cluster and MDS analysis in order to categorize the operations in terms of number and species composition. To determine the contribution of each species to the dissimilarity rate (cut-off percentage = 90) observed between groups, Similarity Percentages (SIMPER) analysis was used (Clarke, 1993). The univariate indices of species richness (Margalef's D), Shannon's index of diversity (H) and Pielou's measure of evenness (J), total number of species were calculated for each depth groups. Differences between the groups were determined applying the Mann-Whitney test.

Results: According to cluster and MDS analysis, two season groups (S1: Winter-Spring, S2: Summer-Autumn) were identified. S1 consisted of operations conducted between depths of 22-54 m, while the S2 group consisted of operations between 8-18 m. MDS stress value was 0.06. This value shows that there is a good ordination between the groups. According to SIMPER analysis, the species that contributed most to the distinction of the two groups were *Merlangius merlangus* (26.22%) for S1 group, *Scopeana porcus* (18.06%), *Solea sp.* (11.95%) and *Uranoscopus scaber* (9.25%) for S2 group. For the species of both two groups, significant differences were found in the species richness (D) and species diversity index (H) ($p < 0,05$), with the exception of the evenness (J) indices. According to these findings, from summer to autumn on the coastal areas at 8-18 m depths, species richness and diversity are higher than the 22-54 m depths. It may be said that, generally fish species in the Black Sea mostly migrate towards to the shore for reproduction and feeding activities in the beginning of summer to autumn.

Acknowledgements: This study was supported by the Scientific Research Fund of the Recep Tayyip Erdoğan University (RTEUBAP) with project number 2010.103.03.1. We are grateful to local fishermen for all of their cooperation and help during the data collection.

Keywords: Black Sea, diversity, fish species, distribution, season and depth.

Ecological Study on the Epiphytic Algal Diversity in the Downstream of Turnasuyu Creek (NE, Turkey)

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Aim of the study: Epiphyton in running water are an important component of aquatic ecosystems. Epiphyton community structure, species composition, and succession respond to environmental conditions and thus can be used to classify inland waterways. Benthic algae represent dominating primary producers in lotic reaches. Algal communities have been used as biotic indicators of ecological condition and change. The purpose of this research is to perform the evaluating situation in order to determine the presence of human or natural influences on the Turnasuyu Creek. Also, it is to determine the water quality class of the creek.

Material and Methods: Water and epiphytic algal samples were collected monthly from lower part of the creek between June 2013 and May 2014. Epiphyton samples were collected in the vascular plants species (*Typha* spp). The samples were preserved in formol 4% solution and identified using a light microscope (soft-algae). Clean diatoms were identified under a 1000X magnification light microscope. Some physical and chemical characteristics were measured in situ and in laboratory.

Results: During the present investigation, the periphytic algal community of Turnasuyu Creek were represented by 66 taxa which belonged to 5 divisions namely Bacillariophyta (57 taxa, 86%), Cyanophyta (5 taxa, 8%), Euglenozoa (2 taxa, 3%), Chlorophyta (1 taxa, 2%) and Charophyta (1 taxa, 1%). During the study, diatoms were the dominant group in diversity. The most common epiphytic species encountered across in the area included *Achnanthes minutissima*, *Cocconeis diversa*, *C. pediculus*, *Cymatopleura elliptica*, *Cymbella helvetica*, *C. minuta*, *Gomphonema truncatum*, *Melosira varians*, *Meridion circulare*, *Navicula cincta*, *N. gregaria*, *N. menisculus*, *N. salinarum*, *Nitzschia palea*, *Pseudoanabaena catenata*, *Rhoicosphaenia curvata* and *R. flexa*. According to the results of the analysis of environmental parameters and indicator species, the Turnasuyu Creek has class I and class II water quality. As a result of less anthropogenic pressures the quality of water is fairly good.

Acknowledgements: This study was funded by Ordu University Scientific Research Project under Project No: TF-1229.

Keywords: Bioindicators, biological assessment, epiphyton, inland waterways, phytobenthos, running water, water quality

Effect of Season on Fatty Acid Composition of *Cyprinus carpio* (Linnaeus, 1758) in Çavuşçu Lake

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Aim of the Study: In this study, fatty acid profiles and $\omega 3/\omega 6$ fatty acids ratio of muscle of carp (*Cyprinus carpio*) at Çavuşçu Lake in two seasons (summer and winter) were investigated.

Material and Methods: Total lipids of fish were extracted and the fatty acids in the total lipid were esterified into methyl esters. Fatty acid methyl esters (FAMES) were analyzed on a HP (Hewlett Packard) Agilent 6890N model gas chromatograph (GC), equipped with a flame ionization detector (FID) and fitted with a HP-88 capillary column.

Results: Palmitic (19.04-22.15%), oleic (11.11-11.28%) and arachidonic acid (6.70-8.68%) were identified as major saturated fatty acid (SFA), monounsaturated fatty acid (MUFA) and polyunsaturated fatty acid (PUFA) in two seasons, respectively. $\omega 3/\omega 6$ ratios useful indicator for comparing relative nutritional values of fish oils were 1.02 and 1.15 in summer and winter in carp, respectively. In conclusion, seasonal variations affected fatty acid composition of carp in Çavuşçu Lake in terms of some fatty acids.

Acknowledgements: This study was supported by Necmettin Erbakan University Scientific Research Foundation (BAP) (Project number: 161210008). The authors thank their support of this project.

Keywords: Fatty acid composition, *Cyprinus carpio*, Çavuşçu Lake, Turkey

Environmental Study of Epiphytic Algae on Emergent Macrophytes in the Lower Part of Akçaova Stream (Ordu, Turkey)

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Aim of the study: The epiphytic algae on aquatic macrophyte are good indicators of water quality and environmental changes. This study was carried out in order to evaluate the epiphytic algal species composition on emerged macrophytes in the riparian zone of Akçaova Stream. Also, the ecological status of the water is to determine with the help of indicator species and environmental parameters.

Material and Methods: The area selected for this study is a location of high macrophyte abundance with *Typha* spp. as the dominant emergent macrophyte species all through the year. Water and epiphytic algal samples were collected monthly from lower part of stream between June 2013 and May 2014. Environmental factors were measured *in situ* with portable measuring instruments and spectrophotometrically in the laboratory.

Results: A total of 42 species of epiphytic algal flora of 5 divisions was found in epiphyton in the river: Bacillariophyta (34 taxa), Cyanophyta (4 taxa), Chlorophyta (2 taxa), Charophyta (1 taxa) and Euglenozoa (1 taxa). Diatoms were dominant and abundant (81%) among the algal flora of Akçaova Stream. The most common species were *Achnanthes minutissima*, *Cyclotella kuetzingiana* var. *radiosa*, *Cymbella helvetica*, *C. lanceolata*, *Diatoma vulgare*, *Navicula gregaria*, *Oscillatoria agardhii*, *Pseudoanabaena catenata*, *Rhoicosphaenia curvata*, *Rhoicosphaenia flexa* and *Synedra affinis*. When water analysis data were evaluated, Akçaova Stream had class I. and class III water quality. In particular, nitrogenous and phosphorous compounds are the major contributors to pollution.

Acknowledgements: This study was funded by Ordu University Scientific Research Project under Project No: TF-1229.

Keywords: biological assessment, biological indicators, ecological quality, epiphyton, phytobenthos, running water

Heavy Metals Health Risk Appraisal in Benthic Fish Species of the Black Sea

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Aim of the study: The present study was conducted to investigate the heavy metal levels in the edible tissues of commercially important benthic fish and to evaluate risks to human health associated with seafood consumption. The aim of this study is to supply information on the Hg, Cd, Pb, Cu and Zn levels in the muscle of red mullet *Mullus barbatus barbatus* Linnaeus, 1758 and whiting *Merlangius merlangus* (Linnaeus, 1758) from Sinop Peninsula of the Black Sea in 2015 fishing season. In addition, this study also attempted to compare the measured values with national and international standards for food and human health.

Material and Methods: Red mullet and whiting were sampled during the fishing season in 2015 from Sinop Peninsula of the southern Black Sea and only consumed sizes were used. Fish samples were then labelled, preserved and transported to the Hydrobiology laboratory. All the samples of the edible tissues were dissected and stored at -21°C. Metal analysis in the samples was performed using m-AOAC 999.10- ICP/MS (Inductively Coupled Plasma – Mass Spectrometer) method by validated Laboratory Services. EN 15763 European Standard methods was made. Statistical analyses were performed using SPSS software (ver. 21). Data were analysed by one-way of analysis of variance (ANOVA). Means were compared by Duncan multiple comparison test ($p < 0.05$).

Results: The fish samples were found to contain Hg levels ranging from 0.010 to 0.021 mg/kg wet wt. with the highest level recorded in the *M. b. barbatus*. The highest Cd levels were recorded in the same species and concentrations ranged from 0.007 to 0.011 mg/kg wet wt. Concentrations of between 0.03 and 0.09 mg/kg wet wt. were recorded for Pb with the highest levels found in the *M. merlangus*. Levels of between 0.18 to 0.49 mg/kg wet wt. were detected for Cu with the highest accumulation recorded in the red mullet. Finally Zn levels ranged from 5.61 to 17.88 mg/kg wet wt. with the highest levels found in the whiting. Overall, the findings from this study revealed that Hg, Cd, Pb, Cu and Zn levels in the muscle were lower than the maximum permissible limit as recommended by the Turkish Food Codex and European Regulation.

Acknowledgements: This work was carried out at the University of Sinop, Fisheries Faculty, Department of Hydrobiology.

Keywords: Black Sea, heavy metal, *Mullus barbatus barbatus*, *Merlangius merlangus*

Heavy Metals in the Mediterranean mussel *Mytilus galloprovincialis* Lamarck, 1819 from Sinop coasts of the Turkish Black Sea coast as Bio-monitor

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Aim of the study: The concentration of contaminants including heavy metals in the marine environment and their effects need to be assessed taking into account the impacts and threats to the ecosystem in Article 8(1)(b)(ii) of Directive 2008/56/EC. Contaminants in fish and other seafood for human consumption do not exceed levels established by Community legislation or other relevant standards. Thus the concentrations of Zn, Cu, Pb, Cd and Hg in the soft parts of Mediterranean mussel *Mytilus galloprovincialis* collected from Sinop coast have been measured by ICP/MS (Inductively Coupled Plasma – Mass Spectrometer) for monitoring metal pollution in 2014.

Material and Methods: Common mussels were collected by SCUBA-diving at a depth interval of 1-20 m, where also the mussel settlements were most dense. were transported immediately from the sampling sites to the Fisheries Faculty Laboratory of Sinop University and subsequently they were kept separately in clean seawater in tanks (20x20x25 cm) for 24 h to defecate the contents in alimentary canals. Following elimination of the gut contents, the specimens were sorted with respect to their sizes and were separated into soft part. All samples were stored in plastic bags in a deep freezer at -21°C until their analysis. Metal analysis in macrobenthic organisms was made with m-AOAC 999.10- ICP/MS (Inductively Coupled Plasma – Mass Spectrometer) method by approved Environment Industrial Analysis Laboratory Services Trade Company (TÜRKAK Test TS EN ISO IEC 17025 AB-0364-T).

Results: Zn was found in highest concentrations followed by Cu and Pb. Hg and Cd showed the least concentrations in all individuals. The average concentrations of Hg, Cd, Pb, Cu and Zn in soft tissues of the *M. galloprovincialis* were $0.02 \pm 0.009 \mu\text{g g}^{-1}$, $0.03 \pm 0.01 \mu\text{g g}^{-1}$, $0.08 \pm 0.03 \mu\text{g g}^{-1}$, $1.12 \pm 0.3 \mu\text{g g}^{-1}$ and $11 \pm 3 \mu\text{g g}^{-1}$ wet wt., respectively. It is concluded that the Mediterranean mussels *M. galloprovincialis* are suitable biomonitors to assess changes in metal pollution in this coastal area of the Black Sea. The results obtained in the present study on concentration of heavy metals in the Mediterranean mussel show that the levels of heavy metals were lower than the recommended standards. It is worth noting that consumption of these mussels from the studied area as food may not possible health hazards to humans at the time of the study.

Acknowledgements: This work was carried out at the University of Sinop, Fisheries Faculty, Department of Hydrobiology.

Keywords: Black Sea, heavy metal, *Mytilus galloprovincialis*, bio-monitor

***In vitro* Clonal Micropropagation of Aquatic Plant *Glossostigma elatinoides* (Benth.) Hook.f.**

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Aim of the study: One of the methods of biological water purification is the use of plants, as they are able to accumulate toxic substances and turn them into non-toxic, to accumulate certain metals and organic substances that are difficult to decompose, and they contribute to the settling of suspended substances. Aquarium plants establish the biological equilibrium of the aquatic environment, enrich the water with oxygen, and play an important role in the metabolism necessary for fishes and plants life. The aim of the work is to develop a system of *in vitro* cultivation of the aquatic plant *Glossostigma elatinoides* (Benth.) Hook.f.

Material and Methods: As a primary explant, small *G. elatinoides* plants with a well-developed root system were selected. For *in vitro* introduction, plants underwent the sterilization treatment in a laminar box. Sterilization was carried out according to the following scheme: under sterile conditions, individual plants were placed in to 0.1% solution of mercury (II) chloride for 1, 2, 3 and 4 minutes, as well as into 5% solution of sodium hypochlorite (bleach) for 5, 10, 15 and 20 minutes. Then they were placed on a Murashige and Skoog nutrient medium (MS). To study the effect on the intensity of growth processes of *G. elatinoides*, the plants were placed on the MS medium with the addition of phytohormones and growth regulators: auxins (2,4-D, IAA, NAA), cytokinin kinetin.

Results: When sterilized with sodium hypochlorite, most of the plants died due to contamination. It was observed that the growth after treatment with a 0.1% CS solution commenced after 2 weeks. The optimal time for sterilization with CS is 2 and 3 minutes. Sterile plants were placed on different variations of Murashige and Skoog medium with the addition of phytohormones and growth regulators in different concentrations. After planting, the plants were placed in the light room. The results of experiments on elucidating the effect of phytohormones and growth regulators, as well as their combinations on the growth rate of *Glossostigma* plants are following: the experimental variants with the addition of only auxins (NAA and IAA) in concentrations of 0.1 and 0.5 mg/l did not actually differ from the control. The variants with a combination of auxin and cytokinin components with the addition of combinations of BAP+IAA and Kin+NAA in concentrations of 3 and 0.3 mg/l were significantly higher, showed a better result than other experimental variants.

Keywords: *Glossostigma elatinoides*, aquascaping, *in vitro* culture, clonal micropropagation

In vitro Cultivation of Aquatic Plant *Heteranthera zosterifolia* Mart.

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Aim of the study: The widespread distribution of aquariums has prompted the development of a new direction in aquarium art – aquascaping, a kind of landscape design, only under water. In the aquascaping *Heteranthera zosterifolia* Mart. can be used to design the background of the aquarium. This plant grows slowly enough; the best way to reproduce it is clonal micropropagation. The use of clonal micropropagation allows to shorten the period of plant cultivation, and to obtain a stable genetically homogeneous planting material, free from viruses and other diseases. The aim of this work was to select the optimal conditions for *in vitro* cultivation of *H. zosterifolia* Mart. plants.

Material and Methods: To study the effect of sterilization of plant cuttings, *H. zosterifolia* cuttings were placed on the Murashige and Skoog nutrient medium after sterilization with different exposure by different sterilizing agents: 5% solution of sodium hypochlorite (1 min., 3 min., 5 min.), 0.1% solution of mercury (II) chloride (1 min., 3 min., 5 min.), 10% solution of hydrogen peroxide (1 min., 2 min., 3 min.). Then the plants were planted into sterile culture vessels on a solid nutrient medium. Then, the culture vessels with plants were placed in a light room. The plants were placed on nutrient media of MS with different acidity (pH): 5, 6, 7 and 8. For the experiment, cuttings consisting of a single node with approximately 4-6 leaves and a height of not more than 1 cm were used. Each variant occupied 20 culture vessels per plant in each culture vessel. Evaluation of morphometric parameters was carried out after 2 months of cultivation.

Results: Introduction to *in vitro* culture suggested the study of the effect of various sterilization modes (combination of sterilizing agent and exposure) on the survival rate of sterilized plants. The best mode for sterilization was 3 minutes treatment with 10% solution of hydrogen peroxide. With decrease of the exposure time, the percentage of surviving plants decreased. The effectiveness of clonal micropropagation is influenced by the external conditions of the experiments. There was no significant difference in the influence of different acidity values on the length of the shoot. The medium with the pH value 5 gave much more shoots than the medium with the pH value 6, and the results on media with pH 7 and 8 are not significant different from the pH 5. At the same time, visual assessment indicates the advantage of media with pH 6 and 7.

Keywords: *Heteranthera zosterifolia*, aquatic plant, aquascaping, *in vitro* culture, morphogenetic potential, clonal micropropagation

***In vitro* Cultivation of *Staurogyne repens* Kuntze**

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Aim of the study: The wide distribution of aquariums has stimulated the development of a new trend in aquarium art – thematic aquascaping, a kind of landscape design under water. In aquascaping, *Staurogyne repens* can be used to design the aquarium's middle plan or to transition the foreground to the middle one. The best way to reproduce this slowly growing plant is the clonal micropropagation. This technique allows accelerating the period of cultivation, and also allows obtaining a stable genetically homogeneous healthy plant material. The aim of this work was the morphogenetic *in vitro* characterization of *Staurogyne repens* Kuntze plants.

Material and Methods: *S. repens* plants were used. To study the effect of sterilization of cuttings, they were placed on the Murashige and Skoog nutrient medium after sterilization with different exposure by different sterilizing agents: 5% solution of sodium hypochlorite or 0.1 % solution of mercury (II) chloride (1 min., 3 min., 5 min.). After sterilization, the plants were twice washed in sterile distilled water. Then the lowest leaves and the root system were cut off. The plants were planted in sterile containers on the solid MS nutrient medium. The containers with plants were placed in a light room with regular lighting and temperature. Pre-sterilized in a 5% solution of sodium hypochlorite, the plants were placed on MS nutrient media with different acidity (pH): 5, 6, 7 and 8. To select the optimal nutrient medium for plants *S. repens* plant cuttings were placed on MS nutrient media with different mineral bases: MS, ½ MS, B5, ½ B5. To study the influence of the hormonal composition of the medium on the growth and development of *S. repens* plants, cuttings were placed on nutrient media of different hormonal composition: NAA, IAA, IBA, BAP (0.5...3 mg/l).

Results: Based on the experiment data the best sterilization mode for *S. repens* plant was a 5% solution of sodium hypochlorite with an exposure of 5 minutes. The MS nutrient medium was chosen as the best variant for growing *S. repens* plants. The surviving plants had the appearance closest to *in vivo* plants. Morphometric analysis showed the advantage of nutrient media with a pH 5 or 8, and a visual assessment was in favor of pH 6 and 7. The number of shoots is significantly influenced by the addition of cytokinin BAP in concentrations of 1, 2 and 3 mg/l. The height of shoots is positively affected by the addition of auxins IBA (0.5, 2 and 3 mg/l) and IAA (1 and 2 mg/l) to the nutrient medium. The length of roots is best influenced by the addition of cytokinins in different concentrations or auxins in low concentrations (0.5...1 mg/l) to the nutrient medium.

Keywords: *Staurogyne repens*, aquatic plant, *in vitro* culture, aquascaping

***In vitro* Introduction and Cultivation of Aquatic Plant *Alternanthera reineckii* Briq.**

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Aim of the study: Aquarium plant growing is a hobby that is extremely popular these days. *Alternanthera* is a wonderful decoration of the water landscape. It is a charming and immediately eye-catching plant. The plant looks great in a variety of aquascapes, as a rule, this plant is used as a focusing point. For many years, *A. reineckii* remains an excellent adornment of ornamental aquariums. Optimized techniques of *in vitro* cultivation are applied proactively for reproduction of this aquatic culture. The aim of this work is to select the optimal conditions for cultivation *in vitro* of plants *Alternanthera reineckii* Briq.

Material and Methods: To investigate the effect of sterilization, cuttings of *A. reineckii* plants were placed on the Murashige and Skoog nutrient medium after sterilization with different exposures by different sterilizing agents: 0.1% solution of mercury (II) chloride (1 min., 2 min., 3 min.), 10% solution of hydrogen peroxide (1 min., 2 min., 3 min.), 5 % solution of sodium hypochlorite (1 min., 3 min., 5 min.). After sterilization, the plants were twice washed in sterile distilled water. The resulting plants were planted into sterile culture vessels on a solid nutrient medium. Then the culture vessels with plants were taken to a light room. Plants were placed on MS nutrient media with different acidity (pH): 5, 6, 7 and 8. For the experiment we used cuttings with one node, which had about 3-4 leaves and was not higher than 1 cm. Evaluation was performed 2 months after clonal micropropagation. Organic nutrient media used to induce organogenesis, contained: 0.5 mg/l IAA; 1 mg/l BAP; 0.5 mg/l IAA + 1 mg/l BAP; 0.1 mg/l IAA + 1 mg/l BAP. Explants were leaf and stem segments.

Results: Based on the experiment data, we can conclude that a 10% solution of hydrogen peroxide must be used for sterilization of *A. reineckii* plants, giving a stable high yield of live aseptic plants at different exposures (1, 2 and 3 min.). It is possible to make a preliminary conclusion about the superiority of using nutrient media with pH 5 or 6. The greatest efficiency of regeneration was found on MS nutrient medium with addition of 0,5 mg/l IAA, but it is slightly higher than that on MC + 1mg/l BAP, but other variants of nutrient media are significantly behind in indices. Consequently, it is possible to conclude that the media MS + 0,5 mg/l IAA and MS + 1 mg/l BAP are most effective for clonal micropropagation of *A. reineckii*.

Keywords: *Alternanthera reineckii*, *in vitro* culture, plant sterilization, aquatic plant, aquascaping, clonal micropropagation, medium acidity

***In vitro* Introduction and Morphogenesis Study of Aquatic Plant *Marsilea hirsuta* L.**

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Aim of the study: Aquatic plants not only play a great biological role, but also serve as the main decorative element of a freshwater aquarium. For many active aquarists, the culture of aquatic and marsh plants reveals the possibility of studying biological and ecological relationships. *In vitro* cultivation of aquatic plants gives an opportunity to receive a large number of healthy plants all year round and to study the possibilities of the influence of external factors on the growth and development of plants. The aim of this study is to introduce *Marsilea hirsuta* L. into *in vitro* culture and to assess its morphogenetic potential.

Material and Methods: *M. hirsuta* L. plants had thin creeping stem-rhizomes. Sterilization was carried out with 2 sterilizing agents, 0.1% solution of mercury (II) chloride (corrosive sublimate, CS) and 5% solution of sodium hypochlorite (bleach), and various exposure variants: 1, 2, 3, 5 minutes in CS, 30 seconds in alcohol + 7 minutes in bleach and 20 seconds in alcohol + 5 minutes in bleach. After sterilization, the plants were placed on Murashige and Skoog nutrient medium (MS) with full and half base components concentration or on the Gamborg medium (B5) with full and half base components concentration, or on the Knop medium. To study the influence of the cutting size on the intensity of growth processes, the plants were divided into cuttings with a different number of nodes (1...4) and placed on full and half MS nutrient medium. To study the effect of phytohormones and growth regulators on the intensity of growth processes, explants (leaf blades, petioles, nodes) were placed on full and half MS medium with addition of 2,4-D or different combinations of cytokinin (BAP) and auxins (IAA, NAA, IBA).

Results: The lowest mortality rate and the highest survival rate were observed on the half MS nutrient medium with a sterilization of 3 minutes in CS. The highest contamination was noted on the Knop nutrient medium with a sterilization mode of 30 s in alcohol and 7 minutes in bleach. 60% mortality and 40% contamination were observed in variants on the Knop nutrient medium with a sterilization duration of 3 and 5 minutes in CS. On the B5 nutrient medium, a low survival rate and a contamination of not more than 20% was observed. The planted plants with 4 nodes, developed faster than plants with 1, 2, and 3 nodes. None of the studied variants of phytohormone and growth regulator composition resulted in morphogenesis *in vitro*.

Keywords: *Marsilea hirsuta*, aquascaping, *in vitro* culture, morphogenesis

Investigation of Microbial Dynamics Of Fish Farms Sediment by Real-Time PCR (Western Coast of Turkey)

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Aim of the study: Aquaculture has become one of the major industrial activities worldwide. On the other hand, organic enrichment of sediments influences microbial communities and biogeochemical cycles. . The aim of this study was monitoring the microbial dynamics (bacterial and archeal) of samples taken from two fish farm sediments at different seasons (spring and autumn).

Material and Methods: Six samples were collected from two fish farm sediments (Ildır Bay and Güllük Bay, located on the western coast of Turkey) in spring and autumn periods. DNA extraction was performed using Power Soil DNA isolation kit (Mo-bio, USA). All quantitative PCR amplifications were carried out with LightCycler 1.5 (Roche Diagnostics, Germany) and with TaqMan probe systems. Archeal (787F-1059R/ARC915F-TaqMan) and Bacterial (338F-805R/Bac516F-TaqMan) specific primers and probes set were used for quantification.

Results: Real-time PCR analysis indicated that the members of Archaea domain were more presence at all locations in the autumn ($\approx 10^4$ gene copies/gr) than in the spring ($\approx 10^2$ gene copies/gr). Similar to these results, the Bacterial population also showed an increase in the autumn. When the results compared regionally, Güllük region have the weakest microbial load ($\approx 10^2$ gene copies/gr), both in Archaeal and Bacterial, in the spring, whereas Ildır region have some sampling location that containing $\approx 10^4$ gene copies/gr. These changes were thought to be related to the physicochemical properties, current regime or organic enrichment of the sampling regions.

Acknowledgments: This work was supported by the Republic of Turkey Ministry of Environment and Urbanization.

Keywords; Fish farm; sediment; Quantitative-PCR; bacteria; archaea

Metal Levels in Commercial Pelagic Fishes and Their Contribution to Their Exposure in Turkish People of the Black Sea

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Aim of the study: In the last few decades, urbanization and industrialization has been created environmental pollution due to the intensive nature of human activities in the Black Sea. Heavy metal contaminations in marine organisms especially fish are of great concern because of their persistence, non-biodegradable and toxicity to consumer via food chains. Four commercially important pelagic fish *Sarda sarda*, *Pomatomus saltatrix*, *Trachurus mediterraneus* and *Engraulis encrasicolus* were captured in four of the most important fishing municipalities in the southern Black Sea coasts, to determine the levels of heavy metals in the muscle and to evaluate the possible risk associated with their consumption.

Material and Methods: The fish samples were taken randomly during the fishing season in 2015 from Igneada, Sinop, Samsun, and Trabzon ports of the southern Black Sea and only consumed sizes were used. Fish samples were then labelled, preserved and transported to the main laboratory. All the samples were stored at -210C prior to pre-treatment and analysis. Metal analysis (arsenic, copper, zinc, mercury, iron, cadmium and lead) in the edible tissues of fish samples was performed using m-AOAC 999.10- ICP/MS (Inductively Coupled Plasma – Mass Spectrometer) method by accredited Laboratory Services. EN 15763 European Standard methods was applied.

Results: The levels of Hg, Cd, As and Pb in all fish species were below the limit of detections (0.05, 0.02, 0.05 and 0.05, respectively). Results showed that the concentration varied from 3.61 (*E. encrasicolus*) to 18.30 (*S. sarda*) mg/kg wet wt. for Zn; from 4.12 (*T. mediterraneus*) to 23.14 (*P. saltatrix*) mg/kg wet wt. for Fe; from 0.14 (*T. mediterraneus*) to 0.47 (*S. sarda*) mg/kg wet wt. for Cu. Concentrations in studied coasts gradually decreased from Igneada to Sinop, and then significantly increased at Samsun and Trabzon. Estimated hazardous quotients of the metals were below 1, therefore these metals in fish do not present any danger to human health.

Acknowledgements: This work was carried out at the University of Sinop, Fisheries Faculty, Department of Hydrobiology.

Keywords: Black Sea, heavy metal, Estimated Weekly Intakes, Hazardous Quotients

Monitoring *Caretta caretta* (Linnaeus, 1758) Population At Bostanlık Beach in Phaselis/Antalya in Summer 2016

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Aim of the study: Bostanlık Beach is new nesting areas of sea turtles "*Caretta caretta*" in Turkey. Apart from its natural, cultural and historical features, it is also one of the outstanding areas with its ecological structure, rare flora and fauna and precious agrarian areas. It has also become an important vocational place for visitors. The first observations about *C. caretta* hatchlings was made in 2014 (Yavuz and Tunç 2015) on this shore. In the present study, we examined incubation period, hatching success, and percent emergence in loggerhead turtle nests on Bostanlık Beach in Phaselis/Antalya at Turkey.

Material and Methods: The reproduction of the sea turtle population at Bostanlık Bay Beach in Phaselis Ancient City/Antalya west-southern Turkey was investigated in 2016. The study was conducted from the first week of May to mid-September in 2016. The beach, is divided into two sections (eastern section about 350 m and west approximately 500 m) because of the tor which extends from near the middle section. The beach was patrolled early in the morning for record any loggerhead turtle activity. All the activities from the previous night were accepted and evaluated as the next day's activity. A nest was recorded when a track led to an area of disturbed sand where digging and covering had occurred. All the nests were left in situ. False crawls were recorded in one of two ways: (1) when some digging in the sand, if only slight, occurred but no covering was apparent (i.e., an attempt to dig a body pit and (or) egg chamber by the female) or (2) when a sea turtle made no nesting or digging attempts but simply crawled on the beach and then crawled back to the sea. Species identification was possible using the criteria of track and nest-pit morphology (Groombridge 1990). The beach was patrolled from 0 m to 500 m and early in the morning for record any loggerhead turtle activity. All the activities from the previous night were accepted and evaluated as the next day's activity.

Results: A First hatchings of *C. caretta* matures began in 16May 2016 in shore of Bostanlık Beach. The last matures hatchings were recorded in 06July 2016. In this study it has been identified in the breeding season Bostanlık Beach is a total of 11 Loggerhead Turtle (*Caretta caretta*) nests were found in the western section and hatchling occurred in 5(45.45 %) of these nests. The remaining 6 nests were excavated by predators. On the other hand, in the east section which is using extensively by tourists and local peoples, only a total of 5 nests were found. None of these nests had a hatching, due to predation. The spatial distribution of nests at 5m intervals from the water's edge in the morning to a distance inland were statistically different (Mann–Whitney U test, $U = 276.33$ $P < 0.001$). Loggerhead turtle activities resulted in nests mainly at 10–25 m from the sea. The mean incubation period was 51.64 ($n=5$, $\min=46$, $\max=55$) days for the year 2016. The main predators were martens (*Martes foina*), red foxes (*Vulpes vulpes*) and dogs (*Canis domesticus*).

Acknowledgements: Because of the support for this study, We thank Prof. Dr. Murat Arslan (Phaselis Survey Research Project Team Leader).

Keywords: Phaselis, Bostanlık Bay Beach, *Caretta caretta*, Antalya 2016

New Records for the Nematode Fauna of Turkey (Nematoda: Chromadoridae)Derya ÜRKMEZ¹, Murat SEZGİN²¹Department of Hydrobiology, Faculty of Fisheries, Sinop University, Turkey²Scientific and Technological Research and Application Center, Sinop University, Turkey
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Aim of the study: Free-living marine nematodes were investigated for the first time in the scope of a meiobenthos project. This study is part of a comprehensive research on meiobenthos ecology of Sinop Bay (Southern Black Sea, Turkey) reporting new nematode taxa for the marine fauna of Turkey.

Material and Methods: Sediment samples were collected monthly between August 2009 and July 2010 at eight stations located on four transects (3 m and 10 m depth). Three replicates of samples were obtained at each station using a metal push corer (diam. 4 cm) and they were fixed onboard with 75% ethanol. Material was washed through a set of sieves (1 mm, 500 µm, 63 µm) in the laboratory and stained with rose Bengal solution. Nematodes were counted under a stereomicroscope and their permanent slides were prepared using slow evaporation method. A research microscope (Nikon Eclipse Ni-U) equipped with Nomarski optics was used for the identifications.

Results: With the present study, three chromadorids are reported for the first time from Turkey: *Hypodontolaimus* sp., *Prochromadorella* sp. and *Spilophorella campbelli* Allgén, 1928. The first two genera are also first records for the Turkish nematode fauna. The taxonomical and ecological features of the three species are investigated. DIC (Differential interference contrast) photographs and morphometric measurements are provided and the spatio-temporal distributions of the species are presented.

Acknowledgements: This study is supported by TÜBİTAK (Project no: 108Y340).

Keywords: Free-living marine nematodes, Meiobenthos, Chromadoridae, Black Sea, Turkey.

Northward Expansion of Robust Cusk-Eel, *Benthocometes robustus* (Pisces: Ophiidiidae), from the Aegean Sea

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Aim of the study: The aim of this study represents range expansion of the sporadic fish species, *Benthocometes robustus*, in the Aegean Sea.

Material and Methods: A specimen of *B. robustus* was captured on board F/V TURANLAR on 23 November 2011 by traditional bottom trawl, called as Ottoman nets has a 24 mm stretched mesh size codend, at 158 meters from Kuşadası Bay (38.5° to 38.0° N). Sampled specimen was preserved by 4% formalin solution and deposited in the Museum of Faculty of Fisheries, Muğla Sıtkı Koçman University (MUSUM/PIS/2011/2). Morphometric characters were measured with digital caliper of 0.01 mm precision, and meristic counts were made under the stereomicroscope with x10 magnification. Morphometric and meristic features of one specimen: Head length 24.25% of SL; eye diameter 15.47% and interorbital distance 3.26% of head length; snout short and stubby, its length 11.81% head length; preorbital and postorbital length 2.72% and 4.91% of head length, respectively. Predorsal length 39.02% of SL; preanal length 56.91% SL; body depth 21.20% SL and head length 24.25% SL. Dorsal fin rays 96; anal fin rays 81, pectoral fin rays 28 and pelvic fin rays 8.

Results: Eastern Atlantic; few specimens caught off the Mediterranean. Western Atlantic; throughout the Caribbean (Nielsen, 1986). The species were reported from different depths by several authors. The maximum depth was reported by Mincarone et al. (2008) for Atlantic with 2300 m. In the Mediterranean Sea, there are a few studies where conducted different sampling depth; e.g: 432 m (D'Onghia et al., 2010), 570 m (Mérigot et al., 2007), 678 m (Mastrototaro et al., 2010), 700 m (Mytilineou et al., 2005), 1200 m (D'Onghia et al., 2004). For Aegean Sea, the maximum depth, where collected *B. robustus*, was reported as a 600 m (Bilecenoglu et al., 2002). The results of reported studies showed that robust cusk-eel occurring mainly 400-2300 m. Recent paper has indicates to report a new extending area and the lowest sampling depth of *Benthocometes robustus*.

Acknowledgements: We would like to thanks Erol Kalayci, captain of the F/V TURANLAR, and his crew for their help during the field works.

Keywords: *Benthocometes robustus*, rare fish, Aegean Sea

Occurrence of Juveniles and Egg Capsules of Thornback Skate, *Raja clavata* from North-Eastern Mediterranean Sea

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Aim of the study: Thornback skate, *Raja clavata* is Atlanto-Mediterranean and distributed from Norway and Iceland to South Africa, extending to Madagascar. Thornback skate is a bottom species that is found on sandy or muddy substrate to depths of 300m. This species is particularly vulnerable to fishing pressures due to its size and low rate of population increase. The aim of this study is to report the existence of egg capsules and juveniles of *R. clavata* captured off the Iskenderun Bay, North-eastern Mediterranean.

Material and Methods: *R. clavata* specimens have been captured as discard from commercial trawl fishing at 220-298 m depths, in the international waters of North-eastern Mediterranean (between 36° 11'012 N -35° 32'732 E and 36° 03'131 N -35° 39'770 E) during the season (15 April-15 July) in which fishing is prohibited in the continental shelf on the 5th of June 2015. Fish samples were transported to the eco-physiology laboratory in Faculty of Fisheries, Firat University where they were identified, sexed and photographed. Morphometric measurements of the juveniles were taken to the nearest 1 mm and the weight of each specimen was measured with a digital scale to the nearest 0.01 g. Juveniles of *R. clavata* were preserved at the Museum of Fisheries Faculty, Firat University.

Results: Total lengths and weights of *R. clavata* specimens were 9.5-19.5 cm, 1.96-17.2 g, respectively. Thus, this study provides the first record of egg capsules and juveniles thornback skate from the North-eastern Mediterranean Sea. This species is currently listed under "Near Threatened" on the IUCN Red List of Threatened Species, because there is evidence to indicate the population has declined significantly. The presence of juvenile individuals and adult females of *R. clavata* in May and June, in the same area suggests that there is egg laying and nursery in the North-eastern Mediterranean.

Keywords: *Raja clavata*, thornback skate, egg capsule, juvenile, Iskenderun Bay, North-eastern Mediterranean

Population Change and Density of *Notonecta viridis* (Hemiptera: Notonectidae) and Chironomidae Along Lake Van Coastline

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Aim of the study: This study was out on the coastal band of Van Lake between May-October, 2011 in order to determine the changes in population the due to environmental effects and different human activities.

Material and Methods: In this study the population densities of *Notonecta viridis* and species that belonging to Chironomidae family were determined in 22 different sampling point where located at the coastal band of Van Lake which has 430 km distance between may-october 2011. The sampling points were consist of settlement, river entries and natural places and samplings were made of by sweepnet which has 35 cm diameters and plankton dipper whose net opening was 153 mesh. In the monthly samples numbers of every species were recorded and additionally, pH, temperature, salinity, nitrogen, ammonium, iron, copper, manganase, potassium values of water were measured.

Results: At the end of the study, *Microchironomus deribae*, *Halocladius fucicola*, *Cricotopus* spp. ve *Chironomid* sp species belonging to Chironomidae family were found and among those, *Microchironomus deribae* and *Halocladius fucicola* species are new records for Lake Van. In the study, the population change according to species months was similar to a large extent in the different sampling methods. All populations, while very low density at the beginning of June reached the highest level in August. Changes in the population of the species the water temperature was found to be significantly effective.

Key words: Van Lake, *Notonecta viridis*, Chironomidae, Population change

Seasonal Dynamics of the Nematodes of the Genus *Neochromadora*: Most Abundant Chromadorids in Sinop Bay (Black Sea, Turkey)

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Aim of the study: This study reveals the dynamics and morphological characteristics of the genus *Neochromadora* Micoletzky, 1924 recorded at Sinop coasts. Two species of the genus, *Neochromadora poecilosomoides* (Filipjev, 1918) and *N. sabulicola* (Filipjev, 1918) were registered in the study area throughout the year.

Material and Methods: The sampling sites of the study includes four different transects holding two stations with depths of 3 m and 10 m, and 8 stations in total. Samples were collected monthly between August 2009 and July 2010 by Scuba divers using push corers. Sediment samples were fixed onboard using 75% ethanol. Specimens were counted and analysed under a research microscope (Nikon Ni-U) with a DIC (Differential interference contrast) attachment and morphometric measurements of the two species are provided based on permanent glycerol slides of the specimens. Photos are obtained with a connected PC and a digital software (NIS elements).

Results: Chromadorids were represented by seventeen species in the study area. *Neochromadora poecilosomoides* and *N. sabulicola* were recorded during four seasons of the year and they were the most abundant chromadorids in Sinop Bay reaching to maximum total densities of 112×10^3 and 142×10^3 ind.m⁻², respectively. Mean density of *N. poecilosomoides* varied seasonally at the stations and made a peak in autumn at St. C1. Population of *N. sabulicola* was at maximum densities in winter at stations B1 and C1.

Acknowledgements: This study is supported by TÜBİTAK (Project no: 108Y340).

Keywords: *Neochromadora poecilosomoides*, *Neochromadora sabulicola*, Sinop Bay, Southern Black Sea, interannual dynamics.

Soft Bottom Echinoderms from the Coasts of Black Sea

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Aim of the study: The reduced salinity is the most important environmental factor influencing marine biodiversity in the Black Sea. Due to this reason, most marine animals and plants can't survive in the Black Sea. Three times fewer species in various taxa of benthic animals live in the Black Sea as compared to the neighboring Mediterranean. There are no typical marine seastars, sea urchins in the Black Sea and existing echinoderms only several small ophiuran and holothurian species adapted to local conditions. The present study deals with the soft bottom echinoderm species collected from the coastal zone of the Black Sea in 2016.

Material and Methods: Replicated samples were taken by a Van Veen Grab, sampling an area of 0.1 m² at 20 stations at the depths ranging between 7 and 70 m.

Results: A total of 166 individuals and 8 species were collected. The most dominant species in the region were the ophiuroids *Amphipholis squamata* (Delle Chiaje, 1828) and *Amphiura stepanovi* Djakonov, 1954, respectively. Number of species and number of individuals varied significantly only between depths and stations. Depth and habitat type were the main factors influencing the echinoderm species in the area.

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Keywords: Echinodermata, Ecology, Taxonomy, Black Sea, Turkey

Soft bottom Molluscan Assemblages of the Sea of Marmara, Turkey Basin

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Aim of the study: The Sea of Marmara is a small intercontinental basin connecting the Black Sea and the Mediterranean Sea. The oceanographic features of the basin are influenced by the Black Sea and the Aegean Sea via the Bosphorus Strait and the Dardanelles, respectively. The present study deals with the soft bottom molluscan species collected from the coastal zone of the Sea of Marmara in 2016.

Material and Methods: Replicated samples were taken by a Van Veen Grab, sampling an area of 0.1 m² at 20 stations at the depths ranging between 4 and 199 m.

Results: A total of 2027 individuals and 61 species were collected. The most dominant species in the region were *Turritella communis* and *Bittium scabrum*, respectively. Number of species and number of individuals varied significantly only between depths and stations. Depth and anthropogenic stress were the main factors influencing the molluscan assemblages in the area.

Acknowledgements: This work has been supported by Ministry of Environment and Urbanization/General Directorate of EIA, Permits and Control/Environmental Reference Laboratory and coordinated by TUBITAK Marmara Research Center through “Integrated Marine Pollution Monitoring (2014-2016)” Project.

Keywords: Mollusca, Ecology, Taxonomy, Marmara Sea, Turkey

Species Composition and Seasonal Distribution of Benthic Macroinvertebrates in Zeytinli Dam Lake (Çanakkale/TURKEY)

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Aim of the study: This study was carried out in Zeytinli Dam Lake which is located in Gökçeada (Çanakkale). The study area is important being the unique drinking water source for Gökçeada. The aim of the present study was to determine the qualitative and quantitative distributions of benthic macroinvertebrate fauna in Zeytinli Dam Lake.

Material and Methods: The five stations were chosen on the field and benthic macroinvertebrate samples were collected twice from each station by using an Ekman-Birge grab (15×15 cm²) between June 2010-May 2011, seasonally. In addition, a hand-net (50 x 30 size with 500-µm mesh) was used for sampling in the coast of lake. The collected samples were kept in 70% alcohol, brought to the laboratory and they were sorted and identified to the lowest possible taxonomic level under a stereomicroscope. Samples were examined qualitatively and quantitatively in accordance with Welch's method.

Results: As a result of the examination of the collected organisms, it was determined that benthic macroinvertebrates are composed of Chironomidae (35.3%), Oligochaeta (29.4%), and other small groups (35.3%). A total of 17 taxa were detected, 5 taxa from Oligochaeta [*Psammoryctides albicola* (Michaelsen, 1901), *Limnodrilus hoffmeisteri* Claparède, 1862, *Limnodrilus* sp., *Potamothenix hammoniensis* (Michaelsen, 1901), *Stylaria lacustris* (Linnaeus, 1767)]; 5 taxa from Chironomidae [*Cryptochironomus defectus* (Kieffer, 1913), *Cryptocladopelma laccophila* Kieffer, 1922, *Cryptotendipes holsatus* Lenz, 1959, *Polypedium convictum* (Walker, 1856), *P. aberrans* Chernovskij, 1949]; and 7 taxa from other groups [Isopoda, *Asellus aquaticus* (Linnaeus, 1758), Ephemeroptera (*Baetis* sp., *Caenis* sp., *Leptophlebia* sp., *Siphonurus* sp.), and Trichoptera (*Ecnomus* sp., *Hydropsyche* sp.)]. According to seasonal faunistic data, it was observed that benthic macroinvertebrates in the lake were maximum in winter, minimum in autumn and spring.

Acknowledgements: This research has been supported by Unit of Scientific Research Projects, Istanbul University (Project No: 4446). We are deeply grateful to them for their financial support.

Keywords: Benthic macroinvertebrates, Seasonal distribution, Zeytinli Dam Lake

***Spirulina platensis* Biomass Concentration and Photosynthetic Pigment Content After Partial Substitution of Sodium Bicarbonate with Sodium Hydroxide in Culture Medium**

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Aim of the study: *Spirulina (Arthrospira) platensis* is a blue-green algae with several beneficial properties. In the mass production of spirulina, the Zarrouk medium or similar culture media containing large amounts of sodium bicarbonate (as a carbon source and for maintaining the alkaline pH) are traditionally used, which makes spirulina production economically costly. Previously attempts have been made to completely replace NaHCO_3 with NaOH, however, under these conditions, preliminary or constant aeration of culture medium with CO_2 is required. Here we show the possibility of partial replacement of NaHCO_3 with NaOH under aeration with ambient air which makes additional CO_2 source unnecessary.

Material and Methods: *Spirulina platensis* algae cells (Strain IBCE S-2) were grown in Zarrouk medium (control) and in modified Zarrouk medium with 8.4 g/L NaHCO_3 and 0.1 g/L NaOH for 7 days under constant temperature (23 ± 2 °C) and under light provided by white Philips TD-36/765 fluorescent tubes (4500 lux) with 14-h photoperiod. Culture was aerated with ambient air during photoperiod. Algae biomass concentration was calculated from light absorption by spirulina suspension at 560 nm. Chlorophyll and carotenoid contents were determined using liquid chromatography of acetone extracts. Phycocyanin was extracted by K,Na-phosphate buffer and its content was assessed spectrophotometrically.

Results: We achieved similar biomass concentration of the culture in modified medium compared to control after 7 days of cultivation showing only minor decrease by 3%. Analysis of photosynthetic pigments content showed that there were no significant difference between samples in contents of chlorophyll a and all detected carotenoids such as violaxanthin, lutein, and β -carotene. Total carotenoid content was only 4% higher than in control samples. Chlorophyll a and total carotenoid content calculated per g of dry matter in spirulina cells grown in medium containig NaOH were 16.76 mg/g and 5.24 mg/g compared to 16.59 mg/g and 5.02 mg/g while using standard Zarouk medium. Highly similar results were also obtained for levels of another photosynthetic pigment specific to *Cyanophyta* – phycocyanin: 5% increase in modified medium. The acquired data shows that partial substitution of NaHCO_3 with NaOH in Zarrouk culture medium for cultivation of *Spirulina platensis* algae under aeration with ambient air does not have a significant effect on algae biomass quality and productivity. Such modified medium is economically beneficial compared to both standard Zarrouk medium (lesser cost of the components) and medium with full substitution of NaHCO_3 with NaOH (no need for preliminary saturation or constant aeration with CO_2).

Keywords: *Spirulina platensis*, chlorophyll, carotenoids, phycocyanin, biomass concentration, culture medium

The Determination of Water Quality by Using Biotic Sediment Index in Kovada Channel and Its Linked Lakes (Lake Eğirdir and Lake Kovada) (Isparta/TURKEY)

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Aim of the study: This study was carried out between July 2010 and June 2011 and aimed to determine the biological water quality in Kovada Channel and its connections including lakes Kovada and Eğirdir.

Material and Methods: Lake Eğirdir is an “A class wetland” according to international criteria and in terms of the protection of biological diversity and it is the fourth largest lake in surface area size in Turkey. The lake connects to Lake Kovada via a regulator and channel system, and water of the lake flows to Lake Kovada which is one of the most important Nature Conservation Areas in Turkey. A total of 9 stations were selected; 3 from the southern part of Eğirdir Lake, 3 from Kovada Channel and 3 from the northern part of Lake Kovada (channel connection area) in this study. Benthic samples were collected monthly, twice from each station, using an Ekman-Birge grab (15×15 cm²), washed through a sieve series and identified to genera and species levels under the stereomicroscope in the laboratory. Biotic sediment index (BSI) was used to determine the biological water quality.

Results: As a result of the examination of the collected organisms, a total of 64 taxa were detected: 23 from Oligochaeta, 20 from Chironomidae, 12 from Mollusca, and 9 from the other groups. When the distributions of the organisms according to their stations are taken into consideration, the dominant groups were determined as Mollusca in Lake Eğirdir, Oligochaeta in the channel and Chironomidae in Lake Kovada. When evaluating dominant species detected during the study, together with their ecological situation, it is seen that Kovada Channel was hypereutrophic and Lake Kovada was eutrophic. Although organisms representing the eutrophic structure were dominant in Lake Eğirdir, organisms that can live in water with low contamination and fresh water with high oxygen content were also detected. The water quality was determined at each station based on benthic invertebrates (Biotic Sediment Index). According to BSI, Lake Eğirdir was determined as moderately polluted, Lake Kovada as polluted and the channel as highly polluted water quality class.

Acknowledgements: This research has been supported by Unit of Scientific Research Projects, Süleyman Demirel University (Project No: 2222-D-10). We are deeply grateful to them for their financial support.

Keywords: Lake Eğirdir, Lake Kovada, Biotic Sediment Index, Water Quality

The Place of Chlorophyll a Determination In Water Analysis

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Aim of the study: Photosynthetic pigment chlorophyll a (CHLA) which basically functions in the photosynthesis is contained in green plants. And since the presence of CHLA in surface waters is an indirect indicator of excess amount of algae in the water body namely eutrophication, the concentration of it must be determined.

Material and Methods: There are three methods utilized for this determination; spectrophotometric, fluorometric and HPLC methods with decreasing quantity of detection limit. The presence of CHLA's degradation products, pheophorbides, interfere with the analysis result of CHLA in the application of the spectrophotometric and fluorometric methods while HPLC method is useful for the determination of each degradation products of CHLA.

Results: In spite of all these fixations, spectrophotometric methods is commonly used because of its simplicity, facility and economy and with further studies is improved with 0,40µg/L detection limit. The trophic state of the water body is estimated by the presence and amount of CHLA which in the case of being at high levels, points to the high concentrations of nutrients that is phosphorus and nitrogen. By using the nutrients, extraordinary grow and finally bloom and decomposition of the algae both causes bad odors with the loss of transparency of the water body and capitalizes the dissolved oxygen of the water body and depletes it by giving rise of fish kills. The WHO Guidelines restrict the recreational exposure to CHLA as 10µg/L for low acute health effects while oligotrophic lakes must provide the CHLA levels below 3,5µg/L according to "Turkish Surface Water Quality Guide/30 November 2012".

Keywords: Chlorophyll A, Algae, Eutrophication

The State of the Mayfly Species in the Eastern Black Sea Region

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Aim of the study: The aim of this study is, to contribute and to evaluate the Ephemeroptera species spreading in the Eastern Black Sea region in terms of the mayfly fauna of Turkey.

Material and Methods: In the field studies carried out in 2009, mayfly larvae were sampled from the Eastern Black Sea region (including Artvin, Bayburt, Giresun, Gümüşhane, Ordu, Rize and Trabzon provinces) using sieves and hand net. They were examined and identified to species level. A distribution list of mayfly species of Turkey was prepared and species in the Eastern Black Sea region were evaluated qualitatively and quantitatively.

Results: As a result, 25 species have been determined and seven of these species are new record for the region. First mayfly records (18 species) from Ordu province were given for the first time in this study. Also, ten of the identified species were first records for Artvin, two for Bayburt, three for Giresun, five for Gümüşhane, three for Rize and two for Trabzon. Turkey Ephemeroptera fauna consists of 157 species. The Eastern Black Sea region represents the turkey fauna with 56 species. Accordingly, the Eastern Black Sea region represents 35.7% of Turkey mayfly fauna. Of these, 46% belong to Heptageniidae and 29% belong to the family Baetidae. The remaining 25% is composed of other species belonging to 6 families. The Heptageniidae species are dominant because of the high amount of rainfall and flow in the region. Due to the scarcity of aquatic plants and sandy areas the diversity of habitat is limited.

Keywords: The Eastern Black Sea Region, Ephemeroptera, Fauna, Turkey

Toxicity of Cadmium on *Palaemon adspersus* Larvae Rathke, 1837 from the Black SeaLevent BAT¹, Sabri BİLGİN¹, Ayşah ÖZTEKİN¹¹ Department of Hydrobiology / Fisheries Faculty, University of Sinop, Turkey² Department of Fishing Technology and Processing / Fisheries Faculty, University of Sinop, Turkey

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Aim of the study: Crustaceans are widespread and important components of marine coastal ecosystems and are thus interesting candidates for toxicological studies. The current experiments were carried out using the *Palaemon adspersus* Rathke, 1837 from the Sinop peninsula of the Black Sea. The objective of the present study is to evaluate the suitability of *P. adspersus* as an indicator for 4 and 10 days cadmium toxicity. The study was undertaken at the Hydrobiology Laboratory from Sinop. The experiment was conducted using standard static bioassay procedure. This involved controlled environmental conditions as to define the response of the bioassay organism to Baltic prawn.

Material and Methods: Specimens of the Baltic prawns were collected from Sinop Peninsula in 2103. *P. adspersus* gravid females (20-35 individuals) were collected by beam trawl from Sinop peninsula. They were placed in an aquarium (0.5x1x1 m) supplied by water recirculated through a gravel filter. The prawns were fed trout pellet. Water temperature of the aquaria was kept at 23±2°C by a thermostatically controlled heater. The newly hatched larvae were stocked at a density of 10 larvae into 1-L round-bottom fiberglass tank. Larvae were fed newly hatched *A. salina* nauplii at 10 mL⁻¹ during experiment. CdCl₂·2½H₂O was dissolved in distilled water and stock solution was made. The concentrations of 0.05, 0.1, 0.5, 1, 5, 10 and 20 mg/l were introduced into each of the jars in triplicate treatments and 0.0 mg/l as control. Four and ten days experiments were designed. Animals mortality was monitored and recorded hourly for the first 3-h and for the next 24-h and subsequently every 24-h for the next 4 and 10 days. If there was any dead individual within first 3-h, the experiment was terminated. Dead organisms were removed immediately with a scoop net to avoid contamination due to rotting.

Results: The four day static bioassay was used to determine the median lethal concentration (LC₅₀) and the value was 0.14 mg/l. Mean mortality was 0, 30, 47, 55, 65 and 95% in the concentration of 0.02, 0.05, 0.1, 0.5, 1.0 and 5.0 mg/l respectively. There was no mortality in the control treatment after 10 days of exposure, demonstrating that the holding facilities, water, control sediment and handling techniques were acceptable. There were significant differences (P<0.05) on the effect of concentration. Mortality increased with increase in concentrations of Cd on Zoea - I stage of *P. adspersus* and time of exposure. The toxicity rate of the organism is concentrate-dependent. All organisms except the control group were died at the end of 10 days. Less than 25% of the animals survived at the 5 days of the exposure to concentrations of 0.5 mg/kg Cd or more. Only 20% of the organisms survived at the 7 days of the exposure to concentrations of 0.1 mg/kg Cd in seawater with clean sediment or less. The results showed that Cd was highly toxic to *P. adspersus*.

Acknowledgements: This work was carried out at the University of Sinop, Fisheries Faculty, Department of Hydrobiology Laboratory.

Keywords: *Palaemon adspersus*, Zoea - I stage, Black Sea, cadmium.

Toxicity of Copper on Marine Organisms from the Black Sea

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Aim of the study: The main emphasis of this study is on heavy metal pollution, a subject which is of particular interest because of the essential requirement of organisms for trace quantities of many metals and the fine balance between requirement and excess, disturbance of which results in markedly deleterious effects. The present study investigates the effect on *Crangon crangon* (Linnaeus, 1758) and *Syngnathus acus* Linnaeus, 1758 of copper, which is essential in trace quantities, yet which is markedly toxic even at quite low concentrations.

Material and Methods: *C. crangon* were sampled by beam trawls with 3 m length and 10 mm cod-end mesh size at 10 m with mud or sand substrata. They were separately placed in biological-filtered clean seawater with 3 cm depth of the clean sediment into Plexiglas experimental stock tanks at temperature 21°C. Specimens of *C. crangon* and were fed with *Artemia salina*. *S. acus* were collected using 3 m length and a 20-mm cod-end mesh size, at a depth of 10–20 m. The sizes of the brood-stock were 9 to 13 cm. It has been observed that gravid greater pipefish in stock aquarium were born a day later. Then they were fed with *A. salina* nauplii, which were opened at 30‰ salinity, in the morning and evening for 6 days. Clean sediment was added to the test tanks to create a 3-cm deep layer. In order to evaluate the effect of copper on these organisms, stock solutions of MERC grade chemicals, copper (II) sulphate (CuSO₄·5H₂O) were prepared in sea water and diluted as required. Short and chronic toxicity tests were made for both of species. Mean numbers of the organisms surviving in seawater containing copper concentrations were calculated.

Results: The water quality measurements showed that the average temperature of the water was 20±1 °C, salinity 17.5±1‰, pH 8.1±0.2 and dissolved oxygen 7.1±0.2 mg l⁻¹. These values were not statistically different between the controls and the treatments and replicates. There was no mortality in all the controls for all species, indicating that the holding facilities, water, uncontaminated sediment and handling techniques were acceptable for conducting toxicity tests, as required in the standard EPA/COE protocol where mean survival should be ≥90%. Cu is essential to many organisms but is potentially harmful at some level of exposure. Animals were checked daily for mortality. Survival of all species decreased with increasing copper concentrations in sea water. On the second day, 80% of the shrimp at 20 ppm died. However, at the end of the 13th day, all of the shrimps exposed to 2 ppm Cu or less are alive. All of the pipefish died at the end of the 3rd day at 5 ppm. The results showed that *S. acus* was sensitive to copper than *C. crangon*.

Acknowledgements: This work was carried out at the University of Sinop, Fisheries Faculty, Department of Hydrobiology Laboratory.

Keywords: *Crangon crangon*, *Syngnathus acus*, Black Sea, copper

Zooplankton Studies In The Boka Kotorska Bay (Southern Adriatic) – AppendiculariaVera VUKANIC¹, Murat SEZGİN²¹Department of Biological Sciences, Biology, State University Novi Pazar, Serbia²Marine Biology and Ecology Department Faculty of Fisheries, Sinop University, Turkey
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Aim of the study: The studies have shown that Boka Kotorska Bay is a specific biotope in the southeastern part of Adriatic. That specificity is caused not only by the geographic position but also by special biotic and abiotic environmental factors. Living conditions at Boka Kotorska Bay are very different than those at the open sea. In this paper we present the hydrographic data of Boka Kotorska Bay, together with data on presence, abundance and distribution of the eight species by two genera: *Oikopleura dioica*, *Oikopleura longicauda*, *Oikopleura fusiformis*, *Fritillaria aequatorialis*, *Fritillaria megachille*, *Fritillaria pellucida*, *Fritillaria haplostoma* and *Fritillaria borealis*.

Material and Methods: Our observations were based on the analysis of zooplankton samples collected monthly during 2007 on three shallow stations near the seafood farming areas and 4 stations in the middle of each bay within Boka Kotorska Bay (Kotor, Risan, Tivat and Hercegnovi bays). Zooplankton was collected with Nansen net (100 and 150 microns). In the same time, other factors were measured: T°C, Sal‰, pH, O₂, transparency by Secchi plate, color of the sea with Forel scale I–XXI.

Results: Appendicularia after the copepods they were the most abundant group of plankton at Boka Kotorska Bay. According to our data, Appendicularia fauna was represented at Boka Kotorska Bay by two genera: *Oikopleura* and *Fritillaria*. The genus *Oikopleura* was represented by species *Oikopleura dioica*, *Oikopleura longicauda*, *Oikopleura fusiformis*, while the genus *Fritillaria* was represented by species: *Fritillaria aequatorialis*, *Fritillaria megachille*, *Fritillaria pellucida*, *Fritillaria haplostoma* and *Fritillaria borealis*. *O. fusiformis*, *F. aequatorialis*, *F. megachille*, and *F. borealis* are recorded in the Boka Kotorska Bay for the first time.

Keywords: Adriatic sea, Boka Kotorska Bay, zooplankton, Appendicularia

A Plasmid from *Pectobacterium atrosepticum* is Self-Transmissible and Contributes to Virulence of the Host Bacterium.

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Aim of the study: The genomic diversity of *Pectobacterium atrosepticum*, a specialised potato pathogen, is mostly due to mobile DNA (phages, transposons and plasmids). The role of this DNA, and plasmids in particular, in *P. atrosepticum* lifestyle is poorly studied. In this study we aimed to characterise the largest known *P. atrosepticum* plasmid, pPA21A, present in *P. atrosepticum* strain 21A originally isolated in Belarus.

Material and methods: Bacterial strains used in this work were *P. atrosepticum* 21A and SCRI1043, *E. coli* XL-1 Blue and J62. *Nicotiana tabacum* Havana petit SR1 was used for hypersensitivity tests. Standard microbiological and molecular cloning techniques were used. Gentamicin resistance cassette was taken from pJQ200mp18 plasmid.

Results: The 32 kb plasmid pPA21A contains many genes without obvious relation to plasmid maintenance. The most interesting are the ones coding for the type IV secretion apparatus (could be involved in protein delivery into plant cells and/or in conjugative plasmid transfer) and two genes of putatively eukaryotic origin coding for phospholipase D and sirtuin-like protein. For further manipulations, the pPA21A plasmid was marked with a gentamicin resistance gene. pPA21A::Gm was capable of conjugative transfer with frequencies ranging from 10^{-3} to 10^{-5} , both in intraspecies and inter-genus matings. In accordance with the presence of a *lexA* regulator binding sites in front of the conjugative apparatus genes, the frequency of conjugative transfer increases when the SOS response is induced. pPA21A::Gm was conjugatively transferred into SCRI1043. This plasmid-free strain is normally unable to cause hypersensitive reaction on tobacco plants, but its variant carrying pPA21A::Gm acquired this ability, just as the original host strain of this plasmid. This report of a plasmid contributing to virulence of plant pathogenic *Pectobacterium* provides new insight into diversity of this important group of plant pathogens and their interaction with host plants.

Acknowledgements: This work is supported by the State Research Programme "Biotechnology"

Keywords: virulence, plasmid, hypersensitive reaction, conjugation.

Amoebicidal Activity of Propolis collected from Different Regions within Turkey

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Aim of the study: Propolis has been used in natural treatments for folk and applied medicine since long time ago because of resins, flavonoids, vitamins and minerals. It contains dissimilar compounds depending on geographical conditions and plant species. The present study was aimed to investigate the in vitro amoebicidal activity of Turkish propolis on *Acanthamoeba* trophozoites.

Material and Methods: The tested propolis samples were collected from Van, Erzurum, Gümüşhane, Ordu, Rize and Muğla provinces of Turkey. They were diluted in ethanol (99%) and this reaction mixture was filtered to remove insoluble ingredients and the supernatant was used to prepare final concentrations (32 mg/ml) of propolis solution. *Acanthamoeba* trophozoites were treated with seven concentrations (1, 2, 4, 5, 6, 7, 8 mg/ml) of the propolis. The numbers of the viable *Acanthamoeba* trophozoites were determined during the experimental process with 1, 3, 6, 8, 24, 48 and 72 h at 26°C.

Results: There was amoebicidal effect with concentrations of propolis 7 mg/mL and higher at 72 h incubation. The trophozoites growth stopped in Turkish propolis ethanolic extracts with IC₅₀/48h at 5 mg/ml. Propolis showed stronger inhibitory effects at the concentrations of 7, 6, 5, 4 and 3 mg/mL with 72 h against *Acanthamoeba* trophozoites. The ethanol extracts of propolis reduced cell viability by approximately 2, 2.67, 22.67, 33.33, 58.33% at the concentrations 7, 6, 5, 4 and 3 mg/mL with 72 h, respectively.

Keywords: *Acanthamoeba* sp., amoebicidal activity, Turkish propolis, ethanolic extracts

Application of *Penicillium piceum* Cultural Liquid Permeate for Synthesis of $\text{Fe}_3\text{O}_4/\text{Co}_3\text{O}_4$ Nanocomposite

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Aim of the study: Aim of this study was to evaluate efficiency of the CLP from fungus *Penicillium piceum* for production of $\text{Fe}_3\text{O}_4/\text{Co}_3\text{O}_4$ nanocomposite. Cultural liquid of the fungus was derived on nutrient medium based on glucose and ethanol. CLP was resulted from ultrafiltration of cultural liquid through membrane UPM 10 (Vladipore, Russia).

Material and Methods: Synthesis of $\text{Fe}_3\text{O}_4/\text{Co}_3\text{O}_4$ was carried out either in the presence or absence of CLP (methods 1 and 2, respectively). It was shown that CLP in the composite $\text{Fe}_3\text{O}_4/\text{Co}_3\text{O}_4$ synthesis medium (method 1) prevented the agglomeration of emerging nanoparticles resulting in their rapid oxidation and lost ability to respond to magnetic impact. Method 2: the mixture of 1.70 ml of distilled water, 100 μl of 0.1 n HCl, 75 μl of 0.5 M $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$, 150 μl of 0.5 M $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$ and 100 μl of 0.2 M $\text{Co}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$ was prepared. The obtained solution was cooled and supplemented with 374 μl of 25% ammonia, the sol was vigorously stirred and the specimen was ultrasonicated (Elmasonic S 30 H, Germany) in degassing mode during 1 h at 6-26 °C. The obtained particles were separated from the synthetic medium (5000 rpm, 5 min), washed with distilled water and dispersed in the CLP. "Catalase" activity of the $\text{Fe}_3\text{O}_4/\text{Co}_3\text{O}_4$ nanospecimens was compared in aqueous solution of 50 mM NaHCO_3 containing 50 mM H_2O_2 and composite in the finite 300-fold dilution (83.3 $\mu\text{g}/\text{ml}$).

Results: The particles dissolved in CLP were sedimented in magnetic field approximately 17 times slower than those dispersed in distilled water. Extent of sol polydispersity in deionized water was considerably higher as compared to CLP. Two fractions of particles differing in the rate of dynamic light scattering were detected in distilled water in contrast to only one fraction in CLP. $\text{Fe}_3\text{O}_4/\text{Co}_3\text{O}_4$ composite in CLP showed 1.9 times higher efficiency of H_2O_2 decomposition versus than dispersed in distilled water. It was apparently determined by presence of 0.001% concentration of $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ in CLP. Thus, CLP proved relatively inefficient supplement to composite $\text{Fe}_3\text{O}_4/\text{Co}_3\text{O}_4$ generating medium, yet it might be used for particle dispersion.

Bioprotectives and Their Application in Food ProductsDemet APAYDIN¹ Ahmet Şükrü DEMİRCİ¹,¹Food Engineering Department, Namık Kemal University, Turkey
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Aim of the study: In this review, it is aimed to emphasis bioprotectives, advantages of using on food biopreservation and the importance of biopreservative agents, antimicrobial properties of lactic acid bacteria and using bacteriocins as food biopreservatives.

Results: Biopreservation means the addition of natural microflora and antimicrobial products to foods in order to extend the shelf life of foods and increase their safety. Many scientific evidences underline the great potential of such an approach to combat pathogenic or spoilage microorganisms in various food products such as meat, fish, bakery products, and vegetables. During the last decade, there has been increasing interest in the development of lactic acid bacteria bioprotective cultures as alternative to chemical additives in food. Lactic acid bacteria is a generally recognized as safe (GRAS) microorganism and belongs to the qualified presumption of safety list in Europe. They have the capacity to produce a wide variety of antimicrobial compounds such as organic acid, diacetyl, acetone, hydrogen peroxide, reuterin, antifungal peptides and bacteriocins which can be used as a probiotic or a bio-protective agent. Lactic acid bacteria have capacity to inhibit unwanted bacteria and increase the shelf life of products. In conclusion, biopreservation emerges as one of the most promising current food preservation techniques and lactic acid bacteria may be considered as biopreservative agents as they can protect food from microbial spoilage and pathogenic microorganisms by competitive growth, and synthesis of antagonistic compounds such as organic acids and bacteriocins.

Keywords: Bioprotectives, lactic acid bacteria, bacteriocins, food security, biopreservation.

Anti-biofilm effect of essential oils from some *Juniperus* species in TurkeyBekir Can TURGUT, Gürkan SEMİZ, Nazime MERCAN DOĞANDepartment of Biology, Faculty of Arts and Science, Pamukkale University, Denizli, Turkey
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Aim of the study: The essential oil obtained from medical plants and their evaluation are very important in both scientific and economic aspects. In present study, anti-biofilm activity of *Yersinia enterocolitica* RSKK 1501, *Staphylococcus aureus* ATCC 33862, *Escherichia coli* ATCC 25922, *Enterococcus faecalis* ATCC 19433, *Staphylococcus sciuri* M16 and *Enterococcus faecium* M20 were examined on essential oils obtained from *Juniperus excelsa* Bieb., *Juniperus oxycedrus* L., *Juniperus communis* L. and *Juniperus phoenicea* L. in Turkey.

Material and Methods: SEM analysis was performed of essential oils obtained by hydrodistillation, information has tried to get about biofilm formed by strains. Also, content analysis of essential oils was determined by GC-MS analysis.

Results: Antibacterial activity was observed for almost all plant extracts and all EOs against both bacterial strains with stronger activity against *Y. enterocolitica*. In SEM analysis, cells were observed as aggregate or single. Photographic result, bacteria colony surface were thick smooth surface in control. However, colony surface in single essential oil treatment has shown crack surface layer compared with colony surfaces in control. According to results, essential oil of these plants indicates antibiofilm activity. By examining pharmacological properties of essential oil and components, it may be considered beneficial that use in medical, cosmetic, industrial areas and essential oils and their compounds can be safely used in research to identify new antibacterial and anti-biofilm products against pathogenic bacteria.

Keywords: Antibiofilm, essential oil, *Juniperus*, Turkey

Boron Tolerant Actinobacteria from Boron Mines in Turkeyİlayda Gül Karakuş¹, Semiha Çetinel Aksoy¹, Ataç Uzel¹

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Aim of the study: In the world, 72% of the boron reserves are found in Turkey and there are only a few studies on the microorganisms found here, especially the actinobacteria, the largest known antibiotic producers. Furthermore some antibiotics contain B atoms in their molecular structures. Therefore these studies aimed to isolation and characterization of the actinobacteria and determine their antibiotic production potentials as well as filling the literature space in this area with the characterization of actinobacteria in the boron mines of our country.

Material and Methods: Soil, underground water, waste pool samples were collected from 3 different boron mines (Kütahya/Emet, Eskişehir/Kırka and Balıkesir/Bigadiç) which are depended to directorate general of Eti Mine Enterprises. Actinomycetes Isolation Agar plates were inoculated with samples and incubated at 27°C for 2-5 weeks. Isolates were purified after incubation and their boron tolerances were determined in the same medium containing different concentrations of Boron. Isolates were also screened for their antimicrobial activity using boron containing fermentation medium and potent isolates were also identified based on the 16SrDNA sequences.

Results: A total of 24 actinobacteria isolates were purified from Boron mines. The strain B2-1 showed the best boron tolerance with growing in medium containing 175 mM boron. Isolates were subjected to fermentation in the liquid medium containing different concentrations of boron. Some strains (B2-2, B2-3, B5-2, B5-4 and E7-3) showed activity in the boron free fermentation medium and some strains showed activity in the boron containing (50mM) boron. However, strain E7-3 showed antimicrobial activity in 100mM boron containing fermentation medium. Furthermore, isolates were identified according to the phenotypic and genotypic assays and assigned to the genus *Streptomyces*.

Acknowledgements: This work was supported by Scientific and Technical Research Council of Turkey (TÜBİTAK) by providing scholarship to İlayda Gül Karakuş with the 2210-C programme.

Keywords: Boron, actinobacteria, boron tolerance, antimicrobial activity, antibiotics

Combined Antimicrobial Effect of Potassium Metaborate and Mineral Trioxide Aggregate (MTA) for Dental Applications

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Aim of the study: The most prominent and well-known effect of boron on mammalian metabolism is probably its contribution to bone and teeth development. Boron has been found to display remarkable antimicrobial characteristics against a wide range of bacteria, yeast, and fungi. Mineral Trioxide Aggregate (MTA), that composed mainly of tricalcic silicate, tricalcic alluminate and bismuth oxide, has a biocompatible nature and have excellent potential in endodontic use. This study is aimed to demonstrate the *in vitro* antimicrobial properties of potassium metaborate and MTA against oral pathogenic strains and investigate the synergism of the combination of potassium metaborate and MTA.

Material and Methods: Potassium metaborate and MTA has been provided commercially. The antimicrobial activity of potassium metaborate and MTA were tested by agar well diffusion assay against *Candida albicans* ATCC 10239, *Staphylococcus aureus* ATCC 25923, *Streptococcus mutans* ATCC 25575 and *Streptococcus sanguis* ATCC 10556 which were provided from Culture Collection of Mugla Sitki Kocman University (MUKK).

Results: MTA showed no antimicrobial against tested microorganisms. Potassium metaborate was found to be highly active against *C. albicans* with 33 mm zone of inhibition (ZOI). When combining the MTA and potassium metaborate together, ZOI was measured as 32 mm for *C. albicans*. ZOIs of the MTA and potassium metaborate combination were 20, 19 and 12 for *S. sanguis*, *S. aureus* and *S. mutans*, respectively. Results verified the synergism between MTA and potassium metaborate. It can be concluded that, potassium metaborate has great potential to enhance the antimicrobial properties of MTA for dental applications.

Keywords: Mineral Trioxide Aggregate (MTA), Potassium metaborate, Antimicrobial, Pathogen, Dental

Comparison of Fungi Species Found In Loggerhead Sea Turtle Nests, (*Caretta caretta* L.), at İztuzu Beach (Dalyan-Turkey) During The 2015-2016 Season

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Aim of the study: Isolation of fungus in the nest of sea turtles nesting at İztuzu beach and comparison of microfungi in the nesting season of 2015-2016

Material and Methods: Turtles nest annually between May and August on İztuzu at Dalyan (Muğla) one of the nesting beaches on Turkey. All samples were taken at 2015-2016 nesting seasons. For sampling 50 cm depth and a total of 51 nesting sand was chosen. Sand samples were gathered on two separate field trips. We collected both samples using known laying time or ending of incubation time. Samples were taken from eggs with sterile injectors from undamaged eggs. The samples were inserted into sterile urine containers and brought to the laboratory by cold chain. The samples were refrigerated at +4°C. Then transported to the microbiology laboratory within 24 hours. Sand samples were shaken for 1 minute after dilution. All samples transferred to Sabrouth Dextrose Agar (SDA) by spreading method. The samples for inoculation were left for incubator.

Results: As a result, in total 3 fungi had been isolated from all the accumulated nests. Although 11 species had been cultivated, the majority of these fungal isolates were *Aspergillus* sp. (68%), *Chaetomium* sp. (27%) and *Fusarium* sp. (5%). According to their presence in the nesting sand; *Aspergillus* sp. (68%), *Chaetomium* sp. (27%) and *Fusarium* sp. (5%) in the 2015 season. In the 2016 season, *Aspergillus* sp. (57%), *Fusarium* sp. (29%) and *Chaetomium* sp. (14%) were isolated. Low percental species were not recorded.

Acknowledgements: This study was supported by the project of 2015FBE046 by Pamukkale University coordinator of scientific research.

Keywords: Loggerhead, *Caretta caretta*, Nest, Sand, Microbiology

Determination of Extracellular Hydrolytic Enzyme Production Capacity and 16S rDNA Analysis of *Streptomyces* Bacteria Isolated from Soil Samples Collected in Sulaimani – IRAQ

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Aim of the study: *Streptomyces* bacterial isolates were isolated from soil samples taken from certain points in Suleymaniye province of Iraq. The activities of some extracellular hydrolytic enzymes were determined and phylogenetic analysis of the 16S rDNA gene region was performed.

Material and Methods: Twenty-six different strains of *Streptomyces* bacteria were isolated by dilution plate method and then purified. Amylase, protease, xylanase and lipase enzyme activities were determined. The 16S rDNA gene region was amplified with universal primers 27F and 1492R.

Results: Isolates showed positive results in 3 isolate xylanase activity, 3 isolate lipase activity, 21 isolate amylase activity and 18 isolate protease activity in extracellular hydrolytic enzyme activity studies. These results were obtained by using the Maximum Likelihood algorithm with the Mega 7.0.18 packet program and phylogenetic tree was constructed by the method of phylogenetic distance matrix (Jukes and Cantor 1969). According to the phylogenetic tree, isolates were divided into 2 major groups. All isolates were clustered with a strong homology in the *streptomyces* genus.

Keywords: Molecular characterization, Sulaimani, *Streptomyces*, 16S rDNA.

Determination of Urease Enzyme Activities of Some Ureolytic Bacteria in Calcium Precipitation Medium

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Aim of the study: The aim of present study is to determine urease enzyme activities of some ureolytic bacteria (*Lysinibacillus fusiformis* U1, *Paenibacillus favisporus* U3, *Bacillus megaterium* U4, *Lysinibacillus fusiformis* U5, *Bacillus tequilensis* U8, *Bacillus licheniformis* U9, *Bacillus mycoides* U10, *Sporosarcina pasteurii* ATCC 6453) in calcium precipitation medium.

Material and Methods: For this purpose, ureolytic bacteria were incubated in calcium precipitation media (CPM) containing calcium chloride, sodium bicarbonate, urea and nutrient broth. At the end of the incubation, the cell cultures were sonicated by ultrasonicator and the enzyme mixture was obtained. The urease enzyme activities of bacteria were determined by phenol-hypochlorite method reading of colours at 630 nm in spectrophotometer.

Results: As a result of the study, urease enzyme activity of *L. fusiformis* U1 was found to be 2373.772 nmole/min/mg, *P. favisporus* U3 to 220.929 nmole/min/mg, *B. megaterium* U4 to 631.190 nmole/min/mg, *L. fusiformis* U5 to 244.444 nmole/min/mg, *B. tequilensis* U8 to 302.810 nmole/min/mg, *B. licheniformis* U9 to 290.707 nmole/min/mg, *B. mycoides* U10 to 188.417 nmole/min/mg and *S. pasteurii* ATCC 6453 to 2524.006 nmole/min/mg. Most of these bacteria may be used in soil improvement and restoration of limestone buildings. In order to test this hypothesis, several different experiments have been still continuing.

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Keywords: Ureolytic bacteria, urease enzyme activity, biomineralization, calcium carbonate mineralization

Development of Biopreparations for Biocontrol of Sugar Beet Diseases and Insect Pests

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Aim of the study: The aim of the study is to develop new antifungal, entomopathogenic, and growth-stimulating biological preparations based on microorganisms isolated in Kazakhstan

Material and Methods: 225 isolates of rhizosphere bacteria and actinomycetes (66 isolates of the genus *Streptomyces*, 57 isolates of the genus *Azotobacter*, 50 isolates of the genus *Pseudomonas*, and 52 isolates of the genus *Bacillus*) were isolated in pure culture. The antifungal activity of rhizosphere microorganisms was determined using the agar block technique and the well method against 6 genera of phytopathogenic fungi: *Aspergillus niger*, *Fusarium oxysporum*, *F. solani*, *F. sporotrichiella*, *Alternaria alternate* and *Rhizopus stolonifer*. The nitrogenase activity was determined by the acetylene method using an Agilent Technologies 7697 A gas chromatograph. In laboratory conditions, the test-insects were treated with the culture liquid of 225 isolates of rhizosphere microorganisms. The insecticidal activity was determined using the contact method. The test-insects (beet-leaf aphid *Aphis fabae*) were sprayed once with a bacterial suspension (10^6 CFU/ml), taking into account the death of insects at a later time (after 4, 8, 24 hours). The phyto regulatory activity was determined by soaking the seeds. To carry out the control, the seeds were soaked for the same period in sterile distilled water and in sterile liquid media. After a 24-hour soaking, the seeds were spread on the moistened filter paper in Petri dishes and placed in a thermostat at 25 °C for 10 days

Results: The actinomycete isolates A28, A33, A56, and A57 showed high antibiotic activity. High activity among bacterial cultures was recorded in the *Pseudomonas* (P4; P15) and *Bacillus* (B8; B52) isolates. The culture liquid of 22.7% of the actinomycete isolates had a growth stimulating effect on sugar beet seeds: in bacteria of the genus *Pseudomonas* - 25.3%, *Bacillus* - 27.8%, *Azotobacter* - 20.5%. The culture liquids of actinomycetes possessed the highest toxicity to phytophages. After 4 hours of the experiment, the mortality of aphids amounted to about half of the insects - 45.5%; when spraying with the culture liquid of bacteria of the genus *Bacillus* - 28.5-30.8% of insects died; bacteria of the genus *Pseudomonas* caused the death of 35-40% aphids, and bacteria of the genus *Azotobacter* of 35-40% aphids. The mortality rate after 8 hours varied within 72.5-85.3%. After 24 hours, 95-100% of aphids died. The highest nitrogenase activity was found in the *Azotobacter* isolates Az10, Az48, Az12 (10.1-10.9 nmol C_2H_4 /h per 1 million cells), which are of interest for further studies. The biocompatible cultures of microorganisms will be selected from the promising PGPR strains, and biopreparations for biocontrol of sugar beet diseases and insect pests will be developed.

Acknowledgements: Source of funding for research. Ministry of Education and Science of the Republic of Kazakhstan.

Keywords: sugar beet, rhizosphere microorganisms, biological preparations, nitrogenase, antifungal, growth-stimulating, entomopathogenic activity.

Effect of Initial pH on Calcium Carbonate Mineralisation Induced by *Bacillus amyloliquefaciens* U7.

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Aim of the study: The aim of this research is to determine the role of initial pH of the carbonate producing medium on bacteriologically induced calcium carbonate mineralisation.

Material and Methods: In this study, local ureolytic *Bacillus amyloliquefaciens* U7 strain from the culture collection of Pamukkale University, Faculty of Arts&Sciences, Bacteriology Laboratory isolated from the calcareous soil of Denizli was used in order to determine the effect of initial pH on microbiologically induced calcium carbonate production (MICP). U7 was inoculated in Ferris's carbonate producing medium (CPM) which was comprised of 25 mM CaCl₂, 25 mM NaHCO₃, 333 mM Urea and 3 g/l nutrient broth. The initial pH of the medium was adjusted over the range of pH:6.00-10.00 (Ph: 6.00, 6.50, 7.00, 8.00, 9.00, 10.00). Calcium carbonate amount was calculated by EDTA titrimetric method in 1st, 5th, 7th, 10th and 14th days. The medium with highest calcium carbonate production rate was centrifuged and calcium carbonate minerals were collected and dried. Calcium carbonate profile was analysed by Scanning Electron Microscopy (SEM).

Results: At a result of this research, initial pH of the medium was detected to have crucial effect on MICP and on the amount of produced calcium carbonate. Highest calcium carbonate production rate was observed in pH: 6.50 in 5th day (1.954 g/l). Calcium carbonate production was drastically decreased over pH: 7.00. Incubation period was also found to have effect on MICP. Optimum incubation time for calcium carbonate production was detected as 5 days and diminishing on this rate were observed after 5 days of incubation. Calcium carbonate minerals collected from the optimum MICP medium (pH:6.50, 5th day) was investigated by scanning electron microscopy and calcium carbonate minerals were observed as trigonal calcite and spherical vaterite crystals.

Acknowledgements: This research is financially supported by Pamukkale University Scientific Research Projects Supporting Department (PAUBAP, Project Number: 2017FEBE016).

Keywords: *Bacillus amyloliquefaciens* U7, MICP, pH, CPM.

Endophytic Microorganisms from *Styrax officinalis* and their Antimicrobial Activities

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Aim of the study: Endophyte microorganisms reside in the living tissues of the host plant without causing a harmful effect to the host. Endophytes may contribute to their host plant by producing a wide variety of substances that provide protection against pathogenic microorganisms and herbivores. *Styrax officinalis* is a plant species that found in south and west Anatolia and benzoin resin, a dried exudation from pierced bark currently produced from this plant commercially. Therefore the aims of this study were to isolation and identification of the endophytic microorganisms from *Styrax officinalis* and determine their metabolites.

Material and Methods: Whole plants of *Styrax officinalis* was collected from İzmir Turkey in May 2016. Different plant parts including leaves, stems and roots were subjected to surface sterilization with bleach and ethanol to eliminate the surface microorganisms. Then the outer tissues are removed with a sterilized scalpel and inner tissues are sliced thinly than placed on isolation media. Plates were incubated at 27°C up to 6 weeks. Endophytic microorganisms were isolated as pure cultures. Endophytic isolates were identified using polyphasic taxonomy. Furthermore all isolates were subjected fermentation in 250 ml erlenmeyer flasks in order to assess their antimicrobial activities and other metabolites such as benzoin. Microorganisms were subjected to feed batch fermentation and cell free fermentation broths were used in antimicrobial activity studies after extracted with ethyl acetate. Antimicrobial activities of the extracts were determined by disc diffusion and broth microdilution methods against a panel of test microorganisms. Another 50 ml cell-free fermentation broth were lyophilised and stored at -20°C for metabolite analysis.

Results: A total of 8 bacterial endophytes and 11 fungal endophytes were isolated from the different tissues of the *Styrax officinalis*. All isolates were characterized using polyphasic approach. Different phenotypic and genotypic characteristics such as gram staining, morphology, oxidase, catalase, 16s rDNA, ITS and calmodulin sequence analysis were used for identification purposes. Bacterial isolates were identified at genus level as follows *Pseudomonas*, *Bacillus*, *Curtobacterium*, *Paenibacillus* and *Micrococcus*. *Penicillium* was the most abundant genus among fungi and all endophytic fungal strains were belonged to Ascomycota division. Only butanol extracts showed activity and 4 bacterial and 5 fungal isolates were found active against test microorganisms. The bacterial isolate G1b showed activity against *Enterococcus faecium*, *Escherichia coli*, *Bacillus cereus*, *Candida albicans* and MRSA and MIC values were found as 16, 64, 128, 128 and 512 µg/ml respectively. Another bacterial isolate I5b has been shown to have activity against *C. albicans* and MRSA with a MIC value as 64 and 256 µg/ml respectively. This study presents the first report about the endophytic microorganisms of *Styrax officinalis* and their antimicrobial activities.

Acknowledgements: We gratefully acknowledge to Dr. Işın YAZICI for providing and identifying the plant specimen.

Keywords: *Styrax officinalis*, endophytic microorganisms, antimicrobial activity, benzoin

Genetic Diversity of Motile *Aeromonas* spp. from Meat Samples

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Aim of the study: *Aeromonas* spp. are frequently present in aquatic environments. These bacteria are commonly isolated from food, water and soil. In humans, *Aeromonas* species are responsible for various infections including gastroenteritis, chronic diarrhea, wound infections, respiratory tract infections, peritonitis, urinary tract infections, and septicemia. Enterobacterial repetitive intergenic consensus sequence-PCR (ERIC-PCR) method is useful for epidemiological studies and population genetic analysis of *Aeromonas* spp. In this study, the motile *Aeromonas* strains obtained from seawater fish (*Sparus aurata*), freshwater fish (*Oncorhynchus mykiss*) and ground beef were tested to determine the genetic relatedness by ERIC-PCR.

Material and Methods: A total of 44 motile *Aeromonas* strains including 8 strains of *A. hydrophila*, 27 strains of *A. caviae*, and 9 strains of *A. veronii* biovar *sobria* from fish and ground beef samples were examined for genotyping by ERIC-PCR method. Primer sequences, ERIC-1R and ERIC-2, were used for ERIC-PCR. PCR reactions were performed in a thermocycler with initial denaturation at 95°C for 7 min, followed by 30 cycles of denaturation at 90°C for 30 sec, annealing at 52°C for 1 min and extension at 65°C for 8 min, and a final extension at 65°C for 16 min. A 8 µl aliquot of each amplification reaction was analysed using electrophoresis on a 1.5% agarose gel and run in a 1X Tris-borate-EDTA buffer. The gel was stained with ethidium bromide and visualized with a UV transillumination. The band patterns of ERIC-PCR were analysed using the NTSYS-pc (version 2.10) software package. Each amplified ERIC band was marked as 1 for presence and 0 for absence. The similarity among the motile *Aeromonas* strains was calculated with Dice coefficient. The dendrogram was obtained by means of unweighted pair group method using average (UPGMA) clustering.

Results: In this study, a total of 45 *Aeromonas* strains including 44 motile *Aeromonas* strains isolated from fish and ground beef samples and one *A. hydrophila* ATCC 7966 as a reference strain were subjected to ERIC-PCR fingerprinting. Dendrogram constructed using ERIC-PCR fingerprint patterns showed that the 45 *Aeromonas* could be divided into 34 genotype. ERIC-PCR revealed 4 clusters consisting of 15 strains at the 100% similarity level.

Acknowledgements: This study was supported by Abant İzzet Baysal University, Scientific Research Projects (Project No. BAP-2011.03.01.405) to whom we would like to express our gratitude.

Keywords: *Aeromonas* spp., ERIC-PCR, Molecular typing, fish, ground beef.

Genotyping of *Yersinia enterocolitica* Strains from Various Food Products by Enterobacterial Repetitive Intergenic Consensus (ERIC) - PCR

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Aim of the study: *Yersinia enterocolitica* belongs to *Enterobacteriaceae* family. *Y. enterocolitica* which is an important food-borne enteropathogen can cause gastrointestinal infections in humans, ranging from mild diarrhea to mesenteric adenitis, evoking appendicitis and septicemia. Various molecular methods are available for genetic analysis of *Enterobacteriaceae* isolates. Enterobacterial repetitive intergenic consensus (ERIC)-PCR is a powerful method to reveal genetic differences among the strains. Recently, the number of studies on genetic typing of *Y. enterocolitica* by ERIC-PCR method is scarce. Therefore, the purpose of this study to investigate the genetic relationship between the *Y. enterocolitica* strains isolated from meat and milk products through ERIC-PCR technique.

Material and Methods: A total of 18 *Y. enterocolitica* strains were isolated from 300 samples including chicken meat (n=60), minced meat (n=60), homemade white cheese traditionally made from raw milk (n=60), open (unpackaged) white cheese made from pasteurized milk (n=60), and raw milk (n=60). Identification of *Y. enterocolitica* strains from various foods was performed by both conventional and 16S RNA sequencing method. *Y. enterocolitica* strains were analyzed for typing by ERIC-PCR method. The extracted genomic DNA of the strains was maintained -20°C and used for molecular characterization. The amplified DNA bands of ERIC-PCR were recorded as 1 in case of presence of band, 0 when there is no band. ERIC-PCR genotype analysis was performed using the NTSYS-pc (version 2.10) software package. Similarity between the fingerprints was calculated by Jaccard coefficient. Cluster analysis of similarity matrices was carried out by the unweighted pair group method with arithmetic mean (UPGMA) analysis.

Results: The results of our study indicated the fingerprints of *Y. enterocolitica* strains consisted of 2 to 12 amplification bands. The 18 *Y. enterocolitica* strains from meat and milk products and one *Y. enterocolitica* ATCC 23715 reference strain could be divided into 18 different genotypes with %81 similarity. Among the *Y. enterocolitica* strains, the genetic similarity of only two strain was 100%. Consequently, we did not detect a direct relationship among the ERIC-PCR fingerprint patterns in terms of their sampling source.

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Keywords: *Yersinia enterocolitica*, ERIC-PCR, meat products, milk products.

Investigation The Viral Diseases Using RT-PCR in The Tomato Growing Areas of VAN Lake Basin

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Aim of the study: In the areas of tomato growing in Van Lake Basin so far *Tobacco Mosaic Virus*, *TMV*, *Tomato Spotted Wilt Virus*, *TSWV* and *Tomato Yellow Leaf Curl Virus*, *TYLCV* No study has been found. In this study, it was aimed to determine by RT-PCR method, determination of spreading areas and characterization of positive samples of these three important viral diseases causing infections in tomato grown in Van Lake Basin.

Material and Methods: Van Lake located in Van Lake Basin; Gevaş, Merkez, Adilcevaz, Edremit, Ercis, Muradiye districts, Bitlis province; In the surveys conducted during the June period from tomato growing areas in Ahlat county, leaf samples of 350 tomato plants were collected and used as the main material for studying the detection of TMV, TSWV and TYLCV viruses. Positive controls used in studies; TMV, Department of Plant Protection, Faculty of Agriculture, Yüzüncü Yıl University, Phytopathology Department of Biology, TYLCV, virus Adana Agricultural Research Institute, Phytopathology Department Department of Virology TSWV, virus from Antalya Western Mediterranean Research Institute (BATEM). At the end of the study none of the tested 350 samples were reacted positive for the investigated viruses. The isolates of tomato mosaic virus (TMV) and tomato spotted wilt virus (TSWV) used as positive virus source were characterized as molecularly. For those isolates genome specific primers were designed by using Vector NTI software. The partial genomes of the isolates were amplified by RT-PCR by using Taq DNA polymerase enzyme.

Results: At the end of the study none of the tested 350 samples were reacted positive for the investigated viruses. The isolates of tomato mosaic virus (TMV) and tomato spotted wilt virus (TSWV) used as positive virus source were characterized as molecularly. The amplified products of 480 bp for TMV and 777 bp for TSWV were cloned using the commercial pGEM T-Easy Vector kit. After sequencing, TMV isolate was deposited as KM407602 and TSWV isolate was deposited as KM407603 in the NCBI database. TMV showed 96-98% similarity to the other world isolates while TSWV Antalya isolate showed 95- 98% similarity in the phylogenetic analysis with the help of computer program.

Acknowledgements: Prof. Dr. Dr. H. Murat SİPAHİOĞLU also supported during my studies. Yard Assoc. Dr. Mustafa USTA, Research assistant Dilek ÖZCAN, Nejla ÇELİK at BATEM and Asst. Prof. Akdeniz University Hakan FIDAN. In addition, I would like to thank you for the contributions and support YYU BAP Presidency.

Keywords: TMV, TSWV, molecular cloning, RT-PCR.

Isolation and Urease Activity of *Bacillus amyloliquefaciens* U7

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Aim of the study: Microbially induced calcium carbonate precipitation (MICCP) is a natural biological process in which microbes produce different carbonate polymorph as a result of their metabolic activities. This technology has been widely explored and promising in various applications especially in civil engineering. Although, different groups of microorganisms involved in this process, calcium carbonate precipitation by urea hydrolysis is the simplest and most widely used method. Therefore, identification and characterization of urease positive bacteria have been great attention in these days. In this regard, the aim of this study is to identification of urease positive bacteria that can be used for calcium precipitation.

Material and Methods: Calcium rich soil samples were collected from Denizli, Turkey. Isolation of bacteria was performed and the colonies were transferred onto Urea agar base, urease selective medium, to check the production of urease. Isolates designated as U7 were selected for further studies based on their ability to produce urease qualitatively. 16S rRNA gene was amplified to identify the bacterial isolate. The urease enzyme activities of bacteria were determined by phenol-hypochlorite method reading of colour at 630 nm in spectrophotometer.

Results: The nucleotide Blast results showed the isolates belong to *Bacillus* genus. Test bacterium was 100% identical to *Bacillus amyloliquefaciens* U7 (GenBank: CP006952.1) (Life Sciences Research and Application Center, Gazi University. It was gram positive rods. Urease enzyme activity of this bacterium was found to be 243.7 nmole/min/mg protein. All this results put the hypothesis that this urease positive may be used in various processes such as bio-deposition in soil and sand materials, bio-mineralization in cementitious materials and restoration of limestone buildings. In order to test this hypothesis, several different experiments have been still continuing.

Acknowledgements: This study was supported by the Scientific Research Council of Pamukkale University, Turkey (research grants 2013FBE017 and 2017FE016).

Keywords: Ureolytic bacteria, urease enzyme activity, biomineralization

Isolation of Thermophilic *Anoxybacillus kestanbolensis* SO-18 and its α -Amylase Production by Submerged Fermentation (SmF) and Characterization

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Aim of the study: A novel thermophilic bacteria was isolated from Omer thermal spring mud in Afyokarahisar, Turkey.

Material and Methods: The morphological, biochemical and its 16S rRNA gene sequencing were tested to characterization of isolate. The 16S rRNA gene sequence exhibited maximum identity 97% similarity with *Anoxybacillus kestanbolensis* SO-18 (Accession number: KJ434793).

Results: The impacts of various parameters such as incubation time, fermentation temperature and pH on α -amylase production were evaluated. The highest enzyme production (4218 U/mg) was found at 60 °C, pH 6.0 and 24th hour. In addition to these, different parameters such as temperature and temperature stability, pH and pH stability, detergents and metal ions on enzyme characterization were studied. The optimum temperature and pH on enzyme activity were found to be 80 °C and 6.0, respectively.

Keywords: *Anoxybacillus kestanbolensis*, 16S rRNA, α -amylase production, thermostable

Isolation, Identification and Antimicrobial Activities of Endophytic Microorganisms from *Dianthus erinaceus*

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Aim of the study: Bioactive compounds synthesized by endophytes to defense against plants enemies are thought to be promising source for the discovery of new drugs. Highly specific symbiotic plant-microorganism interactions can produce compounds that could not be found elsewhere. Endemic plants and their endophytic microorganisms present valuable sources for new bioactive compounds. Therefore the aims of this study were to isolation and identification of the endophytic microorganisms from an endemic plant, *Dianthus erinaceus* and evaluate their antimicrobial activities.

Material and Methods: Whole plants of *Dianthus erinaceus* was collected from Bozdağ, İzmir in July 2016. Different plant parts including leaves, stems and roots were subjected to surface sterilization with bleach and ethanol to eliminate the surface microorganisms. Then the outer tissues are removed with a sterilized scalpel and inner tissues are sliced thinly than placed on isolation media. Plates were incubated at 27°C for 6 weeks. Endophytic fungi and bacteria isolates were identified using polyphasic taxonomy. Furthermore all isolates were subjected fermentation in 250 ml erlenmeyer flasks in order to assess their antimicrobial activities. Cell free culture filtrates were extracted three times with an equal volume of ethyl acetate and butanol (1:1, v/v) separately. Extracts were concentrated in rotary evaporator. *Escherichia coli* O157H7, methicillin-resistant *Staphylococcus aureus* ATCC43300, Vancomycin resistant *Enterococcus faecium* DSMZ 13590, *Candida albicans* DSMZ 5817, *Pseudomonas aeruginosa* ATCC 27853 and *Bacillus cereus* ATCC 10876 were used test organisms. Antimicrobial activities of the crude extracts were determined by disc diffusion and broth microdilution methods.

Results: A total of 10 bacterial and 6 fungal endophytes were isolated from the different tissues of the *Dianthus erinaceus*, the endemic plant species of the Bozdağ Mountain in the Aegean Region. Bacterial isolates were characterized morphological, biochemical and molecular biologic features such as gram staining, morphology, oxidase, catalase, 16s rDNA and fungal isolates were identified using phenotypic characteristics and ITS and calmodulin sequence analysis. Bacterial identifications revealed 5 different bacterial genera including *Bacillus*, *Kocuria*, *Stenotrophomonas*, *Pseudomonas* and *Ralstonia*. Identification of fungal strains revealed that 4 of the fungal isolates were belonging to the Eurotiomycetes classis (*Aspergillus* spp. and *Penicillium* spp.) and 2 belong to the Dothideomycetes classis (*Alternaria* spp.). While ethyl acetate extracts of the isolates were not active, butanol extracts showed considerable activity against test microorganisms. A total of 8 bacteria and 4 fungi showed activity against test microorganisms. Fungal strain DEK20f was shown to be more effective against gram-negative bacteria than gram positive. On the other hand bacterial isolate DEG11b showed a strong antifungal activity against *C. albicans*. This is the first report about investigation of the endophytic microorganisms of the endemic plant *Dianthus erinaceus*.

Acknowledgements: We gratefully acknowledge the support for this research by the Ege University Scientific Projects Foundations, Project No; 16-FBE-12.

Keywords: *Dianthus erinaceus*, endophytic microorganisms, antimicrobial activity, endemic plants

Microflora of Oat and Rape Seeds Used for Germination

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Aim of the study: Nowadays seedlings germinated from seeds, grains, beans of cultural and wild-growing plant varieties find wide use in food industry, medicine, formulation of feed rations and fabrication of cosmetics. Germinated grain-legume species are sources of proteins, vitamins, antioxidants, minerals and other bioactive substances characterized by high biological accessibility. However, germination environment promotes favorable conditions for propagation of microorganisms massively colonizing seed surface. As a consequence microbiological analysis of grain safety is the issue of special concern for seedling manufacturers. Aim of this study was to evaluate microbial parameters of oat and rape grain from cultivars selected in Belarus.

Materials and Methods: Microbial insemination of oat and rape seeds was estimated in accordance with National standards 10444.11, 10444.12, 30519, 31708, 32011. The titer of microorganisms from different groups was expressed as the number of colony-forming units in 1 g of substrate (CFU / g). Microbiological findings were compared with criteria set in Technological regulations of the Customs Alliance № 021/2011. The presented results are the mean values of 3 to 5 experiments conducted in triplicate.

Results: Microbiological investigation of oat grain has revealed that total number of mesophilic aerobic and facultative anaerobic species detected in this substrate equaled 0.8×10^3 CFU / g, lying below upper safety limit (5.0×10^4 CFU / g). In contrast, the tested rape seeds proved more heavily inseminated with the above – mentioned aerobic mesophiles and facultative anaerobes – 18.0×10^4 CFU / g). Insemination index in this case exceeded 3.6 times the normal value. The obtained data indicate that oat and rape seeds are not contaminated with coliform bacteria, pathogenic microorganisms, including salmonella, and mould fungi. Comparative examination of results evidences that microbiota of oat grain is represented by bacteria of 5 morphological types, whereas rape seeds are colonized by at least 6 bacterial species. Noteworthy that cultures synthesizing extracellular polysaccharides were detected on Sabouraud and Czapek media containing glucose and sucrose as carbon source, respectively. Summing up, the tested oat grain meets the established microbial safety standards. To raise efficiency of using this substrate on industrial scale it is proposed to carry out species identification of contaminating microflora.

Keywords: Oat, rape, microflora, contamination, seedlings.

Molecular typing of *Staphylococcus aureus* Strains Isolated from Ready-to-Eat Foods by PCR-RFLP

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Aim of the study: Food-borne infections is caused by *Staphylococcus aureus* and a serious problem for public health. Typing of *S. aureus* play an important role in the evaluation of strain origin and epidemiological investigations. Several molecular typing methods can be used for characterization of *S. aureus* strains. Typing of *S. aureus* strains by polymerase chain reaction-restriction fragment length polymorphism (PCR-RFLP) of the *coa* gene is an inexpensive, easy and rapid. The aim of the current study was to carry out *coa* typing for differentiation of the *S. aureus* strains isolated from ready-to-eat foods based on PCR-RFLP patterns.

Material and Methods: *S. aureus* strains isolated from ready-to-eat foods including kavurma, doner, salad, dessert, and cheese were analysed for typing based on PCR-RFLP of the *coa* gene. The 13 *S. aureus* strains were subjected to PCR for determination of the variability of the 3' region of the *coa* gene. Amplification products of the *coa* gene were digested by *Hae*III restriction enzyme according to manufacturer's procedure. Genetic analysis was carried out using the NTSYS-pc (version 2.10) software package. Each band of RFLP was recorded as 1 for presence and 0 for absence. Similarity among the strains was determined using Dice coefficient. A dendrogram was constructed by the unweighted pair-group method with average linkages (UPGMA).

Results: In this research, 13 *S. aureus* strains from ready-to-eat foods were tested for determination of genetic similarity using the *coa* gene based on PCR-RFLP method. The amplification of the *coa* gene of *S. aureus* strains generated 5 different genotypes. Of the *S. aureus* strains, one strain produced three different bands and 12 strains produced single amplicon of the *coa* gene. PCR-RFLP of the *coa* gene demonstrated 8 patterns which were obtained with *Hae*III digests of PCR products. Typing of *S. aureus* based on PCR-RFLP of the *coa* gene can be significant in the evaluation of the genetic diversity among *S. aureus* isolates from food origin.

Keywords: *Staphylococcus aureus*, *coa*, RFLP, restriction enzyme, ready-to-eat food.

Post-mortem Microbial Biodiversity and Forensic Pathology: Intelligent Modeling

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Aim of the study: The necrobioma which characterizes all the bacteria that conceals a corpse. To analyze the necrobioma, would offer the opportunity to answer a question that is essential for criminal investigations: when was death dead? What are the bacteria to first desert a dead organism? Which bodies are the first to be affected by this depletion? What micro-organisms will tend to multiply post-mortem? How to establish a dynamics of bacterial dissemination and a gradient of occupation according to the time of death? To avoid widening the whole intestinal microbiome, we limit ourselves to a single organ (nasal cavity, under the tongue...etc.) and study the dynamics of these post-mortem colonies. Several factors are involved in this dynamic. Mathematical modeling becomes very complex. In this study, we propose a fuzzy intelligent system to predict the exact date of death from the number and species found at time (t).

Material and Methods: This is to list the bacterial colonies in the study organ. Establish bacterial dynamics as a function of time. As several factors intervene in the process, it becomes very difficult if it is not possible to model them mathematically. In this study, we consider these data to be uncertain and imprecise and therefore to be fuzzy variables. These factors constitute the input of the system. The date of death is considered as an output variable. A rule base is established that links the input variables to the output.

Results: Since the input variables are considered fuzzy, this takes into account the uncertainties inherent in their natures. The output variable is also considered fuzzy. The basis of the established rules must take into consideration all the possible combinations linking the inputs to the output. After defuzzification, the time of death is directly read from the introduction of the random values at the input with the maximum accuracy. The proposed system remains extensible to input variables that can have an effect on output.

Keywords: Necrobiome, Microbial dynamics, post mortem, intelligent systems, fuzzy logic.

Production of Thermostable α -Amylase Obtained from a Novel *Bacillus vallismortis*Sadin ÖZDEMİR¹, Sema AGÜLOĞLU FİNCAN², Barış ENEZ³, Adem KARAKAYA⁴¹Food Processing Programme, Technical Science Vocational School, Mersin University, Yenisehir, Mersin, TURKEY²Biology Department, Science Faculty, Dicle University, Diyarbakır/ Turkey³Veterinary Health Department, Technical Sciences Vocational School, Bingöl University, Bingöl, Turkey⁴Biology Department, Science and Art Faculty, Siirt University, Siirt/ Turkey
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Aim of the study: In this study, a bacterium, which was isolated from hot-spring mud sample of Meyremderesi, Sirnak in Turkey, was used.

Material and Methods: The morphological, biochemical and 16s rDNA analysis of the isolated bacteria were experimented. Based on morphological, physiological and 16S ribosomal RNA sequencing, the isolate was closely related to *Bacillus vallismortis*. Influences of various parameters such as incubation time, temperature and pH, carbon and nitrogen sources, various metal ions, agriculture wates, NaCl concentration, different surfactants on α -amylase production were examined.

Results: The optimum incubation time, temperature and pH for production of α -amylase was found 36th, 35 °C and 7.0, respectively. When compared with control, the amylase production increased approximately 10% in presence of Mn(II) and Ca(II). On the other hand, amylase production rised up 8.2%and 12.4% with Triton-X100 and Tween 20, respectively.

Keywords: α -Amylase production, *Bacillus vallismortis*, surfactant, heavy metal

Selection and Characterization of the Yeast Strain Producing Polysaccharides

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Aim of the study: In recent years microbial polysaccharides, including constituents of yeast cell walls turned out to be of growing demand in production of fodder and feed additives. This is determined by their antigenic, immunomodulating, antiviral, hypolipidemic, enterosorbing (detoxifying), antioxidant, cryoprotective and other properties. Earlier we isolated from soil yeast strain (identified as *Cryptococcus flaveszens*) capable to produce intracellular beta-galactosidase and catalyze *in vivo* synthesis of probiotic galactooligosaccharides. In contrast to other yeast-like fungi, including representatives of genus *Cryptococcus*, strain *C. flaveszens* also produced small amount of polysaccharides. This study was aimed at selection and characterization of a new yeast strain with enhanced level of extracellular polysaccharide production.

Materials and Methods: Multistage adaptive selection of yeast *Cryptococcus flaveszens* 1 was carried out on Sabouraud agar medium containing (g/l): peptone – 10.0; agar-agar – 20.0; pH 7.2±0.2. Glucose and lactose were added into the medium as carbon sources and adaptation agents in steadily growing concentrations (5.0→7.0→10.0%). At the first selection stage rapidly growing yeast colonies of viscous consistency were sorted out of each 10th generation grown sequentially on the afore-mentioned media (26–28 °C, 48 h). At the second stage the selected cultures were characterized via polysaccharide generation capacity during submerged fermentation (200 rpm; 26–28 °C, 72 h) in the media of the following composition (g/l): glucose or lactose - 3.0 (carbon content), peptone – 10.0, yeast extract – 5.0, K₂HPO₄ – 3.0, MgSO₄·7 H₂O – 0.5; initial pH – 6.8. Upon fermentation yeast cells were separated by centrifuging (7000–8000 rpm, 20 min), washed twice with distilled water and assayed for enzyme activity by generally established methods. Enzyme amount sufficient to catalyze substrate hydrolysis and to yield 1 μM of the product in 1 min was assumed as one unit of activity. Polysaccharides were isolated from cell – free cultural filtrate by ethyl alcohol fractionation (1:2 v/v) in the cold, washed with ethanol, dried at 50 °C to constant weight and estimated gravimetrically.

Results: Adaptation of yeast strain *C. flaveszens* 1 to elevated concentrations of glucose and lactose conducted on agar media enabled to select 6 fast – growing colonies of viscous consistency, 3 isolates from each selective medium. Their comparative evaluation in submerged culture singled out new strain *C. flaveszens* 1-AG-3 showing 1.5 – times higher level of extracellular polysaccharide production as compared to the parent culture. Strain *C. flaveszens* 1-AG-3 belongs to the group of asporogenic, encapsulated yeast not capable to form pseudomycelium. The cells are oval – shaped, singular or in short chains (2–3 links in each). The culture produces on agar media with glucose round, convex, regular, even-edged, smooth, opaque, bright, viscid colonies of cream – like color acquiring with age pink tint, 3–5 mm in diameter. The yeast will not generate pigments or release exudate. It does not require artificial light. The organism is strict aerobe with growth optimums pH 6.5 and temperature 25–27 °C. Chemoorganotroph. It assimilates lactose, cellulose, sucrose, melibiose, maltose, glucose, fructose, galactose, mannitol, glycerol, utilizes peptone, urea, ammonium and nitrate nitrogen as N sources, liquefies gelatin, fails to peptonize milk. The culture is capable to synthesize beta – galactosidase, lipase, protease. The strain may find use as producer of oligo – and polysaccharides constituting the basis of synbiotic feed supplements.

Keywords: Yeast, *Cryptococcus*, selection, polysaccharides, production

The Antibiofilm and Antimutagenic Activities of *Ballota nigra* L. subsp. *foetida* HayekOzge DURAN¹, Nurdan SARAC¹¹Department of Biology, Faculty of Science, Mugla Sıtkı Kocman University, Mugla , Turkey
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Aim of the study: In this study; the antibiofilm and antimutagenic activities of *B. nigra* ssp. *foetida*, naturally growing in Mugla, were investigated. Some Lamiaceae members have been used as a tea, a spice or for medicinal purposes by the public for centuries. Mugla province has a large medicinal and aromatic flora, most of which are endemic to the area.

Material and Methods: The ethanolic extract of this plant was obtained with soxhlet apparatus. The antibiofilm activity of the extract on *Streptococcus mutans* ATCC 25175, *Streptococcus sanguis* DSMZ 20567 and *Streptococcus gordonii* ATCC 10558 were determined by microplate biofilm method. The antimutagenic activity of the extract was studied with AMES/ *Salmonella* microsomal test system using the histidine dependent strains *Salmonella typhimurium* TA 98 and TA 100.

Results: The extract has an important antibiofilm and antimutagenic activities. The maximum antibiofilm activity was observed on *S. mutans* (90.4%) at 10 mg/ml concentration. The ethanolic extract, which was tested at three different concentrations (10, 1, and 0.1 mg/plate), did not exhibit any mutagenic effect in the mutagenicity assay performed with *S. typhimurium* TA98 and TA100. In the antimutagenicity assay performed with TA98 and TA100 strains, the extract exhibited great antimutagenic effects at 10, 1, and 0.1 mg/plate concentrations. The strongest antimutagenic activity was observed at 10 mg/plate concentration against *S. typhimurium* TA 98. These activities are an important topic in the medical field as well as in the food industry.

Acknowledgements: This study was supported by the Scientific Research Project Unit of Mugla Sıtkı Kocman University, through the Grant number 14/042.

Keywords: Lamiaceae, Oral Streptococci, Antibiofilm Activity, AMES

The Anticariogenic and Antibiofilm Activities of *Marrubium vulgare* L.Ahmet ALTIN¹, Nurdan SARAC¹¹Department of Biology, Faculty of Science, Mugla Sıtkı Kocman University, Mugla , Turkey
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Aim of the study: In this study; the anticariogenic and antibiofilm activities of *M. vulgare*, belonging to the *Lamiaceae* family, growing in Mugla, were investigated. *Lamiaceae* species are important for the biological activities among plants, which are used in research of antimicrobial and antibiofilm activities.

Material and Methods: The ethanolic extract of this plant was obtained with soxhlet apparatus. The anticariogenic activities of the extract on *Streptococcus mutans* ATCC 25175, *Streptococcus sanguis* DSMZ 20567 and *Streptococcus gordonii* ATCC 10558 were determined by disc diffusion and microdilution methods. While the antibiofilm activities of the extracts on same bacteria were studied with microplate biofilm method.

Results: The ethanolic extract of *M. vulgare* did not have any significant inhibition effect on the tested cariogenic bacteria. Although the extract slightly inhibits the growth of *S. mutans* and *S. sanguis*. The antibiofilm activity of the extract was studied on the tested bacteria. The maximum antibiofilm activity was observed on *S. mutans* at 2.5 mg/ml concentration (85.60%). The extract has antibiofilm activity on oral streptococci and for this reason; it can be used for protection of oral and dental health. Moreover, they can be used in the medical materials, such as prosthesis or implants, which have several biofilm problems.

Acknowledgements: This study was supported by the Scientific Research Project Unit of Mugla Sıtkı Kocman University, through the Grant number 14/041.

Keywords: *Lamiaceae*, Oral Streptococci, Antibiofilm Activity

The Combination Effect of *Citrus bergamia* Risso et Poiteau Oil and Amoxicillin on *Staphylococcus aureus*

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Aim of the study: In this study, the antibacterial activity of the volatile oil of *Citrus bergamia* fruit peel and amoxicillin combination was investigated on antibiotic resistant *S. aureus* strains. *C. bergamia* are known as bergamot in Turkey and the fruit peels was used as a flavor agent in black tea after dried. This study is important for determination an alternative treatment approaches for the staphylococcal infections.

Material and Methods: The volatile oils of the fruit peels were obtained with hydrodistillation method. Firstly, the antibacterial effect of bergamot oil (pure) on multiple antibiotic resistant strains *Staphylococcus aureus* MU38 (methicillin resistant strain), *S. aureus* MU 40 and *Staphylococcus epidermidis* MU 30, were determined with disc diffusion method. Then the minimum inhibitory concentration (MIC) of the volatile oil and amoxicillin on the test bacteria were determined with tube dilution method. After determining the minimum inhibitory concentrations (MIC) of the volatile oil and amoxicillin, the volatile oil and amoxicillin were combined at the MIC concentrations and the new MIC values of the mixture on test bacteria were determined.

Results: Bergamot oil inhibited all of the three *Staphylococcus* strains and the inhibition zones are between 7-20 mm. The maximum antibacterial effect was determined on *S. epidermidis* MU 30 with 20 mm inhibition zone. The MIC values were determined as 5 mg/ml on all of the three *Staphylococcus* strains. The MIC values of amoxicillin on the tested bacteria were determined. Moreover, the antibacterial effect of the mixture of the bergamot oil and amoxicillin on the same bacteria were evaluated.

Keywords: *Citrus bergamia* (bergamot), *Staphylococcus*, synergistic activity.

The Diversity of Pathogen Receptors in *Solanaceae* Plants and Characterisation of *Pectobacterium*-Specific Receptor-Like Kinases

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Aim of the study: Most plants have hundreds of rapidly evolving pathogen receptors, both transmembrane and cytoplasmic, whose genes constitute highly variable genome fraction. The genomes of *Solanaceae* plants are no exception and contain about 500 genes coding for receptor-like kinases (RLK). Few of these receptors have been characterised experimentally, but the functions of the vast majority of RLK remain unknown. In this work we aimed to review the diversity of RLK in *Solanaceae* and experimentally characterise receptors, specifically involved in recognition of important pathogen *Pectobacterium carotovorum*.

Material and Methods: Belarusian isolate 3-2 of *Pectobacterium carotovorum*, *N. tabacum* cv. Havana petit SR1, *S. lycopersicum* cv. Dohodny, *S. tuberosum* cv. Zhuravinka and wild type *N. benthamiana* and *S. bulbocastanum* plants were used throughout this work. LexA-based yeast two-hybrid system was used for protein interaction studies and TRV-based vectors – for virus-induced silencing.

Results: *Pectobacterium*-specific plant receptors have not been described before. *Erwinia amylovora* is the closest bacterium from the same *Enterobacteriaceae* family for which specific plant receptors are known. Four conserved RLK (DIPM1 to 4) recognize the DspA/E effector protein delivered by *E. amylovora* into *Malus domestica* cells. DIPM1-4 belong to the LRR-III RLK subfamily that has about 40-50 members in *Solanaceae* plants with at most 60% amino acid identity with DIPM1-4. Using yeast two-hybrid system, we find that *P. carotovorum* effector DspE (orthologous to *E. amylovora* DspA/E) directly interacts with two receptor-like kinases, RLK2 and RLK5, from *Nicotiana tabacum* plants. We have also cloned orthologous receptors from *N. benthamiana*, *Solanum lycopersicum*, *S. tuberosum* and *S. bulbocastanum*, and verified interaction with DspE for some of these RLKs. Virus-induced gene silencing of RLK2 and RLK5 in *N. benthamiana* showed that these receptors are involved in recognition of *P. carotovorum* and are required for proper activation of signal chain controlling *PR* gene expression. We also note that *P. carotovorum* is capable of suppressing *RLK2* and *RLK5* genes during infection.

Acknowledgements: This work is supported by the State Research Programme “Biotechnology”

Keywords: *Pectobacterium carotovorum*, *Solanaceae*, receptor-like kinases, gene expression, effectors

The Effects of Urea and Calcium Chloride on Urease Activity in *Lysinibacillus fusiformis* U1 and *Sporosarcina pasteurii* ATCC 6453

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Aim of the study: This study aimed to determine effect of urea and calcium chloride on urease enzyme activity in ureolytic *Lysinibacillus fusiformis* U1 and *Sporosarcina pasteurii* ATCC 6453. Thus, the effect of urease enzyme activity on bacterial soil improvement will be learned.

Material and Methods: For this purpose, three different media (LB, LB-urea, calcium precipitation medium(CPM)) were used in our study to determine the effect of urea and calcium chloride on urease enzyme activity. While LB medium does not contain urea and calcium chloride, LB-urea medium does not contain calcium chloride. Bacteria were incubated at optimum temperatures in these 3 different media. Then, urease enzyme activity was determined by phenol-hypochlorite method.

Results: Urease enzyme activities of bacteria in LB medium are as follows; *Lysinibacillus fusiformis* U1 520.741 nmole/min/mg and *Sporosarcina pasteurii* ATCC 6453 2137.869 nmole/min/mg. The activities in LB-urea medium are *Lysinibacillus fusiformis* U1 1760.911 nmole/min/mg and *Sporosarcina pasteurii* ATCC 6453 3966.600 nmole/min/mg. Finally, urease enzyme activities in CPM are *Lysinibacillus fusiformis* U1 2373.772 nmole/min/mg and *Sporosarcina pasteurii* ATCC 6453 2524.006 nmole/min/mg.

Acknowledgements: This study was supported by the Scientific Research Council of Pamukkale University, Turkey (research grant 2016FEBE053).

Keywords: Ureolytic bacteria, urease enzyme activity, biomineralization, calcium carbonate

A New Lichenized Fungus Species From Turkey: *Pertusaria rubefacta* Erichsen.

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Aim of the study: Studies on the lichenized and lichenicolous fungal biota of several regions in Turkey have been recently increasing. Almost 1300 species of lichenized fungi and 200 species of lichenicolous fungi are now known from the country. Still, there are many areas in Turkey that are insufficiently studied or no lichenological studies have been conducted.

Material and Methods: The specimen reported here are deposited in Erciyes University Herbarium, Kayseri, Turkey (ERC). Examination was made by standard microscopic techniques. Handcut sections were studied in water. Measurements were made in water. And also DNA extraction, PCR amplification, PCR purification, and cycle sequencing were performed. Phylogenetic trees were calculated based on ITS and mtSSU gene region data. For phylogenetic trees, we used this specimen and all *Pertusaria* specimens available in Genbank.

Results and Discussion: This species confirmed by an identification key based on morphological and anatomical characteristic. And also confirmed by phylogenetic trees

Keywords: Lichenized fungus, Akkuyu, Mersin, *Pertusaria rubefacta*

Acknowledgement: This study was financially supported by FYL-2015-6298 coded Erciyes University Project.

**A Study of the Growth and Development of the Root System
of *Corylus maxima* Mill. In Absheron Condition.**

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Objective of the study: To study the growth and development features of the root system of 1-3 year old seedlings of *Corylus maxima* Mill. Obtained by germination of seeds taken from the flora of Azerbaijan (Oguz region) and introduction into dry subtropical conditions of Absheron.

Material and methods: The material of the study was the introduced species of large fruited hazel - *C. maxima* Mill. the genus *Corylus* L. belonging to the family of Rosaceae. Morphology and the growth features of the roots of the studied species was investigated by methods of digging and washing them which recommended by V.A Kolesnikov and I. N. Rakhteenko. Particular attention was paid to the structure of the root system, the number of lateral roots, the diameter of the root neck, the length of the main and lateral roots, the depth of bedding, etc. Digging of the roots of 1-3 year old plants was carried out at the end of the vegetation period (November).

Result: The conducted experiments in the plots of the Central Botanical Garden of the National Academy of Sciences of Azerbaijan showed that in Apsheron condition *C. maxima* 1-3 year old seedlings root system structure parameters was as following: height of 9-33 cm, root neck diameter 0.3 - 1.2 mm, main root penetrates deep into the soil 10-60 cm, the lateral roots 3-38 cm, the number of lateral roots 15 - 50 pieces. The lateral roots begin to form 3-5 days after their appearance. As the root system was formed, intensive growth of the aboveground organs is observed. As seen, along with the stem root, the studied species has a large number of lateral roots, which is necessary for extracting the moisture from both the lower and upper layers of the soil. The main mass of the roots is located at a depth of 2-11 cm, which makes it possible to cultivate them as fruit plants, and during landscaping works, it is easy to replant different-aged plants.

Acknowledgments: I would like to express my thanks to the administration of the Botanical Garden of the National Academy of Sciences of Azerbaijan for financial support in carrying out this work.

Key words: hazel, seedlings, root, growth, development

A Study on the Development of Landscape Restoration and Management Plan in Büyük Melen River

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Aim of the study: The environmental problems which are difficult the return from time to time, are occurred as a result of human interventions on nature. These problems have been based on the construction of dam and highways, the irregular landfills or the radiative pollution sources such as industrial or agricultural activities. It is need for more comprehensive and holistic decision than the local approaches in the solving of these problems. Büyük Melen river basin is included the catchment area between Efteni Lake (Düzce) and Black Sea. Büyük Melen River is also nationally significant due to the supply of water to the Büyük Melen dam which will provide drinking water to Istanbul.

Material and Methods: In this study was carried out the basin scale analysis and also the types of land use based on visual landscape were identified in the main river axes. Some strategies and suggestions were developed for landscape restoration and management related problems. In addition, the form of "Riparian Visual Habitat Assessment Data Sheet" was prepared and the field data in 35 sampling sites obtained by using this forms, than these results were compared with theoretical assessments. Estimated data for the field and theoretical assessments were analyzed by *T*-test at significant level α ; 0,05. Not significant difference ($P > 0.05$) was found among data means.

Results: It was concluded that the evaluation of landscape rehabilitation in the basin scale will give responsibility certain tasks related to the different stakeholders and allow the resolution of problems in coordination.

Acknowledgements: This study is a part of the MSc. thesis of E. Gülerüz (advisor O. Uzun)

Keywords: Basin management, Big Melen, Quality of Visual Habitat, Landscape restoration, Landscape Planning,

An Integrated Catchment Approach to Management of Sediment Pollution in the Coastal Shallow Lakes

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Aim of the study: The purposes of this study were to assess the sediment quality and to determine levels of sediment pollution, and also to discuss significantly headlines for suggested management strategies of the coastal shallow lakes in the Kızılırmak Delta, located in the central Black Sea region of Turkey. Lake management projects, offer a real opportunity to increase understanding of lake ecology through associated research and monitoring work. The catchment managers might aim to reduce nutrient export at source for assessment of the impact of nutrient loading on the receiving waters through a number of measures. However, it is important that the selection of a suitable management model is determined of present increases in nutrient loading on shallow waters and also nutrient transport pathways linking the point and non-point sources in the catchment.

Material and Methods: Declining water quality, drainage, eutrophication and catchment disturbances such as development, loss of natural vegetation and poor agricultural practices have changed the fundamental ecology much of shallow lakes in the Delta. In the study, monitoring of sediment quality parameters was conducted for the coastal shallow lakes. It is known that the sediment can directly influence the nutrient level in standing inland waters such as lakes and ponds by way of internal nutrient loading. Sediments may act as both nutrient and contaminant sources or sinks, potentially affecting the nutrient dynamics of entire shallow water bodies. In some watersheds, particularly those that are heavily fertilized, sediments taken from lakes showed that yield large quantities of phosphates and nitrates to the coastal water body.

Results: A range of potential catchment management options have been evaluated here for the shallow lakes in the Delta of Kızılırmak. Along with development activities, population growth, the lake water quality deteriorated and reached at its peak in the last years. Also, the impacts of land use changes throughout the catchment were observed in terms of higher sedimentation rates. According to sustained works in the wetland, it was found that the sediments from Cernek Lake have P release rates ranging from 2.63 to 4.10 mg P/m²/d whereas Balık Lake exhibits lower P release rates (average 3,10 mg P/m²/d). However both lake sediment types had relatively low P release rates compared with published values for eutrophic systems. Nutrient and organic matter content were high, with higher concentrations in lakes with prevalence of fine particles. Importantly, the nutrient release from the lake sediment was contributing to the water bodies as equal as from the inflowing river and drainage canals. Finally, activities needed in all segments and the participation of all stakeholders is levelly important for sustainable conservation of the shallow lakes in the catchment. The approach is informed by an understanding of the following: Physical, chemical and biological control measures are to be implemented in an integrated way without harming the ecosystem of the lake, eco- friendly farming practices in the catchment areas, modification of land use and discharge consents, and for this reason, a further in-depth research is required to implement the water and sediment pollution control measures.

Keywords: Sediment, Catchment Management, Nutrients, Shallow Lakes, Kızılırmak Delta

Anatomical Characters of Endemic *Astragalus stenosemioides* in TurkeyBayram ATASAGUN¹, Ahmet AKSOY²¹Biology Department/Faculty of Science, Erciyes University, Turkey²Biology Department/Faculty of Science, Akdeniz University, Turkey

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Aim of the study: *Astragalus* L. (Fabaceae), is one of the largest genera of vascular plants in the world, with an estimated number of 3000 species. Many species are narrow endemics. It is also the largest genus in Turkey, where it is represented by nearly 476 taxa including 203 endemic in 64 sections. *Astragalus stenosemioides* D.F. Chamb and V. A. Matthews is very local endemic species growing only Erciyes Mountain in Kayseri and at a low population density. The main aim of this study is to investigate anatomical features which are used for systematics purpose of *A. stenosemioides*.

Material and Methods: The plant samples collected from B5 Kayseri from the Erciyes Mountain. For anatomical investigations, specimens were kept in 70% ethanol. The paraffin method was used for cross-sections. The sections were taken by microtome and stained with safranin and fast green.

Results: In this study, *A. stenosemioides* was examined anatomically. Anatomical studies were carried out on sections of root, stem, leaflets. In root anatomy, as a protective tissue, the periderm which has 7-10 layers was located in the outermost layer. Under the periderm, there were cortex parenchyma in different sizes, including starch granules. The centre of roots in transverse sections was covered with xylem. In the cross section of the leaflet, it was possible to observe a single layer of regular and rectangular epidermal cells on both the upper and lower sides. The leaflet was isobilateral and palisade parenchyma was two layered. A xerophytic stoma was placed on both sides of the leaves (amphistomatic).

Keywords: *A. stenosemioides*, Anatomy, Endemic, Erciyes.

Antimicrobial Activity of Fresh and Ready Fruit Juices

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Aim of study: In this study fresh juices of pomegranate, apple, orange, tangerine, strawberry, pineapple and lemon juice products were used. Also, commercial juices were also tested. There are various additives in commercial fruit juices while freshly squeezed juices have none. The aim was to determine whether these juices have antibacterial effects and compare fresh and commercial juices in terms of antimicrobial activity.

Materials and Methods: The antimicrobial activity of the products was investigated in some *Candida* species isolated from pathogenic samples (*Candida albicans* ATCC 10231, *Candida utilis* ATCC 9950, *Candida glabrata*); Gram-negative bacteria (*Pseudomonas aeruginosa* ATCC 35032, *Escherichia coli* ATCC 35218, *Klebsiella pneumoniae* ATCC 13882, *Enterobacter aerogenes* ATCC 13048, *Serratia marcescens* ATCC 13880, *Salmonella typhimurium* ATCC 14028, *Proteus vulgaris* ATCC 33420; Gram-positive bacteria (*Staphylococcus aureus* ATCC 25923, *Bacillus subtilis* ATCC 6633, *Micrococcus luteus* ATCC 9341). Disk diffusion method was used and the resulting zone diameters were measured. Nutrient Agar and Malt Extract Agar were used for activation of bacteria and yeast, respectively. The cultures were incubated at 30-37°C overnight. The inoculum size of each group of bacteria and yeast were prepared by using a no. 0.5 McFarland tube. It was kept to solidify at room temperature for a while and then holes were made on top with a sterile stick. These holes were filled with 50 µl of the samples. At the end of incubation time, the diameters of the inhibition zones formed on the Mueller-Hinton Agar were evaluated in millimeters.

Results: As a result of the study; antimicrobial activity against fresh lemon and pineapple *Bacillus subtilis* ATCC 6633 was found. No antimicrobial activity for commercial juices was expected due to the processing. Whereas in fresh juices only lemon and pineapple showed antimicrobial effect. This can be related to the freshness of the juices. Fresh juices phenolic compounds and volatile elements which a commercial juice doesn't have.

Acknowledgments: This study was carried out at the Microbiology Laboratory of Biology Department, Faculty of Science and Letters, Adnan Menderes University.

Keywords: Fruit juice, Antimicrobial activity, Disc diffusion Method

Antimicrobial Effect of Essential Oil of *Tanacetum argenteum* (Lam.) Willd. subsp. *canum* (K. Koch) Grierson var. *canum*

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Aim of the study: The aim of present study was determined in vitro the antimicrobial efficacy of essential oil obtained from *Tanacetum argenteum* (Lam.) Willd. subsp. *canum* (K.Koch) Grierson var. *canum*.

Material and Methods: The plant was collected from Amasya (between Direkli village and Yassıçal town). Antimicrobial activity was evaluated by determination of the disc diffusion methods, MIC and MLC. Air-dried aerial parts of plant were subjected to hydro-distillation.

Results: It was shown that the essential oil was active against indicator organisms used in this study. The maximal inhibition zone diameter were as follows: *E. cloacae* ATCC 28355 (14 mm), *P. fluorescens* ATCC 55241 (16 mm), *P. aeruginosa* ATCC 27853 (19 mm), *S. sonnei* RSKK 8177 (18 mm), *E. coli* ATCC 25922 (21 mm), *E. coli* O157:H7 (13 mm), *Y. enterocolitica* RSKK 1501 (11 mm), *C. jejuni* ATCC 33291 (12 mm), *K. pneumoniae* ATCC 27736 (13 mm), *S. enteritidis* RSKK 171 (12 mm), *S. aureus* ATCC 33862 (26 mm) and *S. aureus* ATCC 25923 (29 mm), *M. luteus* NRLL B-4375 (20 mm), *E. faecalis* ATCC 19433 (19 mm), *B. cereus* NRRL B-3711 (30 mm), *B. cereus* RSKK (32 mm), *Candida albicans* ATCC 10231 (19 mm) and *C. tropicalis* (17 mm). The minimum inhibitory concentration (MIC) and minimum lethal concentration (MLC) values for all pathogens were ranged from 62.5-900 µg/ml and 125-1000 µg/ml, respectively. *T. argenteum* subsp. *canum* var. *canum* essential oil was the most active against *B. cereus* NRRL, B 3711 and *B. subtilis* RSKK 867. Also, the essential oil has shown a strong anti-candidal activity against two *Candida* species.

Keywords: *Tanacetum argenteum* subsp. *canum* var. *canum*, essential oil, antimicrobial activity

Antimicrobial Effects of Depilatory Creams

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Aim of study: Depilatory creams are cosmetic products that are applied on unwanted hair to temporarily remove them. Depilatory products are available as cream and spray. It's some kind of depilation. Makes the hair fell off by breaking down the protein structure. The microorganisms used in this study are; positive and negative effect and pathogenic species commonly found in natural environments inhabited by humans. This study was carried out to observe whether or not the hair loss creams affect the microflora and pathogenic microorganisms on the skin.

Materials and Methods: The antimicrobial activity of the products was investigated in some *Candida* species isolated from pathogenic samples (*Candida albicans* ATCC 10231, *Candida utilis* ATCC 9950, *Candida glabrata*); Gram-negative bacteria (*Pseudomonas aeruginosa* ATCC 35032, *Escherichia coli* ATCC 35218, *Klebsiella pneumoniae* ATCC 13882, *Enterobacter aerogenes* ATCC 13048, *Serratia marcescens* ATCC 13880, *Salmonella typhimurium* ATCC 14028, *Proteus vulgaris* ATCC 33420; Gram-positive bacteria (*Staphylococcus aureus* ATCC 25923, *Bacillus subtilis* ATCC 6633, *Micrococcus luteus* ATCC 9341). Disk diffusion method was used and the resulting zone diameters were measured. Nutrient Agar and Malt Extract Agar were used for activation of bacteria and yeast, respectively. The cultures were incubated at 30-37°C in overnight. The inoculum size of each group of bacteria and yeast were prepared by using a no. 0.5 McFarland tube. It was kept to solidify at room temperature for a while and then holes were made on top with a sterile stick. 0.1 g of the cream was dissolved homogeneously in 0.5 ml of distilled water. These holes were filled with 50µl of cream samples. At the end of incubation time, the diameters of the inhibition zones formed on the Mueller-Hinton Agar were evaluated in millimeters.

Results: As a result of the study, no antimicrobial activity was found in the creams used in the study. Creams cause hair loss by breaking down the proteins in the hair follicles, but no effect on microorganisms means that there is no effect on the protein structure in the cell wall. In this kind of unwanted hair cleaning, only the use of creams is insufficient and personal hygiene has to be done as well.

Acknowledgments: This study was carried out at the Microbiology Laboratory of Biology Department, Faculty of Science and Letters, Adnan Menderes University.

Keywords: Depilatory creams, Antimicrobial activity, Disk diffusion method

Antioxidant and Antimicrobial Activity of Yeasts Originated from YoghurtSelin UYSAL, Yavuz BEYATLI, Zehranur YUKSEKDAGDepartment of Biology, Faculty of Science, Gazi University, Ankara, TURKEY
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Aim of the study: Probiotics are live microorganisms that provide health benefits to the host when ingested in adequate amounts. Among probiotic candidates, bacteria are recognized as the most common probiotic microorganisms. However the transfer of antibiotic resistance genes among probiotic bacteria is widely mentioned by scientific researchers. Other microorganisms such as yeasts are increasingly being considered as alternative promising candidates for probiotics. The aim of the present study, 15 yeasts isolated from yoghurts which are commonly consumed in Turkey were to determine their antioxidant and antimicrobial activity.

Material and Methods: The antioxidant activity of the yeast strains based on the scavenging activity of the stable 1,1-diphenyl-2-picrylhydrazyl (DPPH) radical and antimicrobial activity tested using diffusion methods against *Pseudomonas aeruginosa* ATCC 278853 and *Candida albicans* ATCC 90028 at the same time tested against *Lactobacillus acidophilus* ATCC 4356 to examine antagonistic relationship.

Results: Fifteen yeast strains were *Saccharomyces cerevisiae* (2), *Cryptococcus humicola* (4) and *Saccharomyces kefir* (9). All of them exhibited the ability to scavenge DPPH free radical, scavenging 44.85–63.89%. All of the yeast strains were able to inhibit *Pseudomonas aeruginosa* ATCC 278853 and *Lactobacillus acidophilus* ATCC 4356 while none of them were not able to inhibit *Candida albicans* ATCC 90028.

Keywords: Yeast, probiotic, antioxidant activity, antimicrobial activity

Antioxidant, Anticholinesterase and Antimicrobial Activities of *Melissa officinalis* L.

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Aim of the study: *Melissa officinalis* include in Lamiaceae family and distributed south Europe, Balkans, Aegean, N. Africa and Caucassia (Davis et al, 1988). The plant is named Kovanotu, Limon nanesi, Turunçotu, Oğulotu, used for treatment to headaches, influenza, toothaches and antispasmodic effects, kardi tonic, carminative, diaphoretic, antiseptic, antidepressant, antiviral, antibacterial, sedative, stomachic, headaches and nervousness. (Baytop, 1984). The purpose of the current study was to examine the antioxidant, anticholinesterase and antimicrobial activities of *Melissa officinalis* L.

Material and Methods: β -Carotene-linoleic acid test system, DPPH free radical scavenging activity, ABTS cation radical decolourisation and cupric reducing antioxidant capacity (CUPRAC) assays were carried out to determine the antioxidant activity. Also, a spectrophotometric method developed by Ellman et al. was established to indicate the acetyl- and butyl-cholinesterase inhibitory effects. The disc diffusion method was used to determine the antimicrobial activity.

Results: The anticholinesterase and antimicrobial effect *Melissa officinalis* L. showed weak activity, but it showed strong antioxidant activity in all methods. Especially, the methanol extract indicated higher DPPH free and ABTS cation radical scavenging activity than α -tocopherol and BHT, at all the concentration. The methanol and water extracts exhibited higher activity than α -tocopherol which was used as a standard in CUPRAC at all the concentration.

Keywords: *Melissa officinalis* L., antioxidant, anticholinesterase, antimicrobial

Assessment of Folate Derivatives and PABA with HPLC by *L. delbrueckii* ssp. *bulgaricus* ZN541 and ZN951 and *S. thermophilus* Z151 and Z1052 strains

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Aim of the study: Folate, a water-soluble vitamin, participating in one-carbon transfer reactions required in many metabolic pathways, especially purine and pyrimidine biosynthesis and amino acid interconversions, functions as a carbon carrier in the formation of heme, the iron-containing non-protein portion of hemoglobin. Mammalian cells cannot synthesize folate and its deficiency has been implicated in a wide variety of disorders. The objective of this study was to determine amounts of the intracellular/extracellular folate derivatives (tetrahydrofolate-THF, 5-methyl-THF, and 5-formyl-THF) and *p*-aminobenzoate (PABA) production with HPLC in the folate producing ability of *L. delbrueckii* ssp. *bulgaricus* ZN541 and ZN951 and *S. thermophilus* Z151 and Z1052 strains.

Material and Methods: In order to evaluate folate derivatives and PABA productivity, lactobacilli were cultivated in the MRS medium, streptococci were cultivated in the Elliker medium. Intracellular/extracellular folate derivatives and PABA concentrations by high-performance liquid chromatography (HPLC) was detected according to Sybesma et al. (2003).

Results: None of the bacteria were not contain para-aminobenzoic acid. The strains of *L. delbrueckii* ssp. *bulgaricus* tested showed both intracellular and extracellular folate derivatives (THF, 5-methyl-THF, and 5-formyl-THF) production. The highest intracellular and extracellular 5-formyl-THF production of 59.6 µg/L, 44.8 µg/L, respectively were determined for *L. delbrueckii* ssp. *bulgaricus* ZN951. Also, the highest total folate production between four strains was found in *L. delbrueckii* ssp. *bulgaricus* ZN951 strains (110. 5 µg/L).

Acknowledgements: This research has been supported by Gazi University Scientific Research Projects Department project coded with 05/2013-07.

Keywords: *Lactobacillus*, *Streptococcus*, THF, 5-methyl-THF, and 5-formyl-THF

Biosynthesis of Silver Nanoparticles Using Pomegranate Peel Extract and Evaluation of its Antimicrobial, DNA Cleavage Activities

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Aim of the study: Green synthesis methods offer environmentally friendly, rapid, less time-consuming and less labor-intensive synthetic procedures in nanoparticle production compared to chemical, photochemical and physical procedures. In this study, we report the biosynthesis, characterization, antimicrobial and DNA cleavage activities of silver nanoparticles (Ag NPs) using pomegranate peel (*Punica granatum* L.) extract as a reducing and stabilizing agent.

Material and Methods: The peel extract of *pomegranate* was used for the synthesis of silver nanoparticles (Ag NPs) from silver nitrate solution. Ag NPs were characterized by UV-Vis, FT-IR and SEM. Antimicrobial activity of the Ag NPs was performed by well diffusion method against 5 bacteria (*Staphylococcus aureus* ATCC 25923, *Escherichia coli* ATCC 25922, *Bacillus subtilis* ATCC 29213, *Bacillus cereus* NRLL B-3008, *Enterobacter faecalis* ATCC 292112) and 2 fungi strain (*Candida albicans*, *Candida tropicalis*). DNA cleavage on pBR322 DNA was performed by agarose gel electrophoresis.

Results: The Ag NPs were spherical with a size of 40 ± 5 nm. The UV-Vis spectrum exhibited a peak ~ 374 nm. Ag NPs had a moderate inhibitory effect against bacteria and fungi. The maximum inhibition zone of Ag NPs against *B. subtilis*, *B. cereus*, *E. coli*, and *C. albicans* were 14, 13, 12.5 and 13.5 mm respectively. A significant effect of Ag NPs on pBR322 plasmid DNA was not observed. It can be concluded that peel extract has reduction potential as well as being a capping agent to produce well-defined nanoscale silver particles. Our biosynthesized Ag NPs can be used against bacteria and fungi as good therapeutic agent.

Keywords: Biosynthesis, Silver nanoparticle, *pomegranate*, DNA cleavage, antimicrobial activity

Comperative Anatomy of Genus *Rubus* Subsection *Glandulosi*Gülçin IŞIK¹, Ersin YÜCEL¹, Sema LEBLEBİCİ²¹Biology Deparment, Faculty of Sciences, Anadolu University, Eskişehir, Turkey² Horticulture Department, Faculty of Agriculture Sciences and Technology, Bilecik Seyh Edebali University, Bilecik, Turkey
glcnymz@gmail.com**Aim of the study:** The purpose of this study is to describe the anatomical features of the subsection *Glandulosi* taxa.**Material and Methods:** The samples belonging to the taxa of *Rubus tereticaulis*, *R. hirtus*, *R. platyphyllos* and *R. caucasicus*, which constitute the material of the study, were collected by field studies carried out between May-September 2009 and May-September 2010, when the plant was flowering. For anatomical studies, specimens from leaves, stems and roots were taken and stored in 70% ethanol and brought to the laboratory. Before the sections were taken, the stock samples were removed from the alcohols and separated into pieces 1 'cm long. In order to perform dehydration of the root, the following process sequence was followed: Root, stem and leaf fragments were stored in Safranin 0 for 18-24 hours. Plant parts taken from the safranin dye were kept in the 70, 80, 90, 95% alcohol series for 18-24 hours. After 2-3 hours of storage in absolute alcohol, the samples were left in the xylol-2 alcohol, 1 xylol-1 alcohol and 2 xylol-1 alcohol series for 24 hours. Finally, the cut pieces were kept in pure xylol for 4 hours. Root, stem and leaf material removed from the xyloid were taken into liquid paraffin. Root, stem and leaf specimens taken into paraffin were placed in a 60-65°C setting for 5-7 days.**Results:** When the root cross sections of the taxa were examined, the presence of exodermis from the outermost 4-5 rows of rectangular cells is observed. In the stem cross sections of the specimens, the outermost periphery is present. The cortex, which consists of parenchymal cells with 8-10 cell rows underneath the peridermis, has little intercellular space between the cortical cells. At the top and bottom of the lamina, there are single row, regularly arranged and no intercellular spaces, rectangular shaped epiderma cells. Lower epidermal cells were found to be smaller when compared to upper epidermal cells. The root, stem and leaf anatomies of the four taxa in the study were examined in cross sections and there was no anatomical difference between species.**Acknowledgements:** This study was supported by Anadolu University Scientific Research Found (Project No: 1001F04).**Keywords:** Rosaceae, *Rubus*, *Glandulosi*, Anatomy, Turkey.

**Determination Antioxidant Activities of Different Solvent Extracts
From *Verbascum glomeratum* Boiss.**

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Aim of the study: The genus *Verbascum* L. with nearly 360 species, is one of the largest members of Scrophulariaceae family. This study was aimed to determine the in vitro antioxidant activities of various solvent (ethanol and acetone) extracts obtained from *Verbascum glomeratum* Boiss.

Material and Methods: The extracts were screened for their possible antioxidant activities by four complementary tests; DPPH (2,2-diphenyl-1-picrylhydrazyl) free radical-scavenging β -carotene-linoleic acid, ABTS free radical scavenging and ferric reducing antioxidant power (FRAP) assays. In addition, total phenolic contents, flavonoid contents and tannin contents in all the extracts of *V. glomeratum* were determined.

Results: *Verbascum* species contain biologically active compounds, such as flavonoids, phenylethanoid and neolignan glycosides, saponins, and iridoid and monoterpene glycosides. The results indicated that acetone fraction exhibited stronger antioxidant activities than ethanol fraction. The highest DPPH free radical scavenging activity of 90.94% in acetone extracts. The means of total antioxidant activity for acetone extract was 58.5%. The scavenging of the ABTS radical by the acetone extracts (75.27) % was found to be much higher than that of ethanol extracts. The maximum ferric reducing ability at 200 μ g/ml for acetone extract. It also showed the highest FRAP value (4.151 μ M of trolox equivalents) in acetone extract. The total phenolics in the extracts were determined colorimetrically by using the Folin-Ciocalteu reagent. The highest total phenolic content and flavonoid of the acetone extracts was found 44.18 mg/g GAE and 87.14 mgQE/g equivalent. The highest total tannin content was found in acetone extract. With regard to the results of this present study the extract of *V. glomeratum* could be an important source of phenolic compounds with antioxidant capacity.

Keywords: *Verbascum glomeratum*, antioxidant activity, free radical scavenging activity

Determination of ABTS Radical Cation Scavenging and Metal Chelating Activity of Three *Convolvulus* L. Species

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Aim of the study: The effort in determining the effects of medicinal plants which are traditionally used in the treatment of various diseases has led many researchers to study on this issue. The Convolvulaceae family includes a large number of important plants which have many chemical compounds that are used for treating many diseases. Many *Convolvulus* species are known for their medicinal utilization and exhibit interesting biological properties such as purgative, antidepressant, antioxidant, antinociceptive, anticancer, and antidiarrhoeal activities. In the light of above information, the antioxidant activity of the ethanol and methanol extracts of three *Convolvulus* species was evaluated by metal chelating activity of iron (II) ions and ABTS (2,2 azino-bis (3-ethylbenzothiazoline-6-sulfonic acid)) radical cation scavenging activity method.

Material and Methods: In this study, antioxidant activities of the ethanolic and methanolic extracts obtained from aerial parts of three *Convolvulus* species (*C.phrygius*, *C.galaticus* and *C. aucheri*) were determined. Aerial parts of plant materials were air-dried and grounded to fine powder and then extracted with ethanol and methanol. The metal chelating activity on ferrous (Fe^{+2}) ions of the extracts was estimated by the method defined by Aktumsek et al. (2013). The effects of the extracts on ABTS cation radical were estimated according to the method of Re et al. (1999).

Results: ABTS and metal chelating activity on ferrous ions were used to evaluate the antioxidant capabilities of the extracts. Among the three *Convolvulus* extracts evaluated, the highest metal chelating activity (25.63%) was obtained from *C.galaticus* ethanol extract compared to other two *Convolvulus* species. In the ABTS system, radical cation is formed prior to the addition of antioxidant test system, rather than generation of radical taking place continually in the presence of antioxidant. This method is used to screen the activity of both lipophilic and hydrophilic antioxidants. In the present study, the highest ABTS radical scavenging activity was obtained from *C. aucheri* extract in both ethanol (100%) and methanol (100%) solvents at 600 µg/mL. Likewise, synthetic antioxidant BHT showed very strong scavenging ability (100%) in the same test system. All extracts exhibited concentration-dependent scavenging activity.

Keywords: *Convolvulus*, ABTS radical, metal chelating, antioxidant activity

Determination of Population Parameters of the Tub Gurnard, *Chelidonichthys lucerna* (Triglidae) from the Iskenderun Bay, North eastern Mediterranean

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Aim of the study: The tub gurnard *Chelidonichthys lucerna* is a commercially valuable gurnard species, living in shelves and usually in sandy, muddy sand or gravel bottoms at depths ranging from 20 m to 300 m. In this study, growth parameter of *C. lucerna* from the Iskenderun Bay (North eastern Mediterranean) was investigated.

Material and Methods: A total of 374 tub gurnard samples, of which 270 female, 104 male, were caught by trawl surveys that carried out between November 2013 and September 2014 in the Iskenderun Bay (north eastern Mediterranean).

Results: All sampled tub gurnard of total length varied between 8 and 30,9 cm and between 8,1 and 30 cm for females and males, respectively. Weights varied between 8,2 and 295,97 g and between 9,34 and 255,88 g for females and males respectively. The maximum age was found to be 4 for both females and males. The length-weight relationships were estimated for female, male and both sexes as $W=0.0114 \times L^{2,9277}$, $W=0,0285 \times L^{2,6545}$ and $W=0,0151 \times L^{2,8441}$ respectively. The von Bertalanffy growth equations were calculated as $L_t=44,735 [1-e^{-0,228(t + 1,029)}]$, $L_t=37,779 [1-e^{-0,339(t + 0,702)}]$ and $L_t=40,592 [1-e^{-0,285(t + 0,841)}]$ for females, males and both sexes, respectively.

Acknowledgements: Thanks to the Scientific & Technological Research of Turkey (TUBITAK - 212T115) for financial support.

Keywords: Tub gurnard, *Chelidonichthys lucerna*, length-weight relationship, growth features, Iskenderun Bay, North eastern Mediterranean

Determination of the Antioxidant and Phenolic Activities of Lavender (*Lavandula angustifolia* Miller) Plant

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Aim of the study: In this study antioxidant activities and phenolic content of hexane extracts obtained from leaves and seeds of lavender (*Lavandula angustifolia* Mill.). This plant has been used for many of years as medical and industrial Turkey.

Material and Method: Lavender (*Lavandula angustifolia* Mill) leaves were collected and dried in seasonal periods. The dried leaves were shredded by blender and the seeds were crushed in press and weighed 4g on a precision scale and extracted with solvent (n-hexane) for 6 hours in a Soxhlet device. The solvent portion of the extracts was removed on a rotary evaporator and the remaining extract was taken up in dark glass bottles for further use in the study and placed in the refrigerator to be stored at +4 ° C. The release activities of the extracts were determined using the free radical of 1.1 - diphenyl-2-picrylhydrazyl (DPPH). 1 ml of DPPH solution was added to 1 ml of plant extract (at different concentrations) and the absorbance of the samples was measured at 517 nm after incubation at room temperature for 30 minutes in the dark. The total phenol content was determined according to the Folin-Ciocalteu method. By the end of the period, it was read 765 nm in UV Spectrophotometer and the total phenol amounts were calculated as mg in a way to be equivalent to the gallic acid from the calibration curve drawn with gallic acid.

Results: The phenolic substances comprise the most important groups of natural antioxidants. Therefore, the antioxidant strength of a substance depends on the amount of the phenolic substance. As a result of the studies carried out, we can conclude that any extract with more phenolic substance has high antioxidant activity too. The free radical elimination activities of the extracts were determined using 1.1-diphenyl-2 picrylhydrazyl (DPPH) free radicals. The lower the absorbance of the reaction mixture of antioxidant and DPPH, the higher the antioxidant free radical elimination activity. The standard free radical elimination activities of jojoba leaf-seed extracts at 5 different concentrations were determined. As can be seen from the values obtained, an increase was found in the DPPH activity with the increase of extract concentration among the 1mg/ml of lavender seeds extracts. When the total phenolic content of lavender extracts was examined, the highest values were determined as 314.40±1.25 mg GAE/ml for lavender leaf and 99.50±0.75 mg GAE/ml for lavender seed.

Acknowledgement: This study was supported by Pamukkale Scientific Research Unit (BAP, Turkey) Project No: 2014FBE010

Keywords: Antioxidant activity, total phenolic content, *Lavandula angustifolia*,

Determination of the Effects of Different Doses of Phosphorus and Humic Acid Application on Yield and Yield Components in Işık and Seçkin chickpea (*Cicer arietinum* L.) Cultivars

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Aim of the study: The research was carried out in the research fields of Siirt University, Faculty of Agriculture, as a one-year field experiment according to factorial design in randomized complete blocks during 2015-2016 growth season. This section must describe the main objective of the current study

Material and Methods: Işık and Seçkin chickpea cultivars, which are well adapted and intensively cultivated, were evaluated in the study. Three different doses of phosphorus (3 kg da-1, 6 kg da-1, 9 kg da-1) and the optimal recommended doses of nitrogen fertilizer and humic acid for chickpea were applied. No application was done on control plots. In the study, plant height, number of main branches, height of the first pod, number of seeds per plant, weight of the pod per plant, weight of the grain per plant and grain yield were measured. This section must describe material and methods used in the current study

Results: In the results obtained from the research, the highest grain yield was 80 kg da-1 in 9 kg da-1 phosphorus application from the cultivar Seçkin, while the lowest grain yield was obtained on control plots and again from cultivar Seçkin with 48.9 kg da-1. In this study; the highest grain yield was obtained from Seçkin chickpea cultivar with 9 kg da-1 phosphorus application, while increased doses of phosphorus application was found to be effective on plant growth and grain yield. However, in order to validate the findings obtained in this research, it is suggested to make a second year field evaluation. It is believed that higher doses of phosphorus application in future studies may lead to an increased grain yield.

Keywords: Chickpea, phosphorus, humic acids

Development of Nanomaterials for Anti-Aging Applications

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Aim of the study: Aging is a complex process, which occurs by time and affects personal life adversely in many aspects. It appears with physiological, histological and metabolic changes on microscopic level and wrinkle, dryness, loss of elasticity and spotting on macroscopic level. Reversing of skin aging and minimising the effects of it with cosmetic products to decrease or annihilate the changes through this process, compose one of the most important subjects in cosmetic science. In this research we aim at developing nanomaterials containing chrysin which is a plant flavonoid that shows anti-aging impact, and characterization of nanomaterials and using controlled release on aging surface of skin.

Material and Methods: Anti-aging p(HEMA) nanomaterials are synthesized with emulsion polymerization technique. For the characterization of the synthesized p(HEMA) nanoparticles, surface area is calculated, SEM images are taken to view the morphological structure, FTIR spectrum is used to determine the chemical bonds and the size analysis were carried out with Zeta-Size. After characterization, pH, temperature, initial amount and time experiments carried out to optimize the adsorption conditions. After the determination of optimum adsorption conditions, controlled release conditions were determined with 5 range of pH and temperature.

Results: First of all, characterization results were obtained. The morphological structure of anti-aging p(HEMA) nanomaterials and the Zeta-Size analysis are reviewed; spheric 168 nm diametered nanoparticles were seen and the surface area has been calculated as 4149/g. After the characterization Optimum adsorption conditions were determined as 55°C, pH 12, 90 minutes for chrysin. The maximum adsorption capacity per gram of anti-aging p(HEMA) nanomaterials (Q_{max}) is 19,401 mg/g. Results of optimum controlled release were pH 5-6. It is thought that the developed nanomaterial can be used on skin. Considering all of these; when the material's toxic features, maximum bonding capacity and releasing conditions are reviewed, it's seen that the developed p(HEMA) nanomaterials are suitable for the anti-aging usage on skin and a promising nanotechnological material.

Keywords: Anti-aging, controlled release, flavonoids, chrysin, nanomaterials

Predator *Macrolophus pygmaeus* (Rambur) on Different Prey Species Under Laboratory Conditions

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Aim of the study: Whiteflies (Hemiptera: Aleyrodidae) and aphids (Hemiptera: Aphidoidea) are among the most important problems causing yield losses in agricultural production. These pests are not only cause damage by sucking leaf and plant tissue, but they also transfer viruses. Thus, multiple damages can be observed on the plants infested by aphids and whiteflies. In addition, these pests can be harmful during the whole cultivation period, and can give many offsprings. *M. pygmaeus* (Hemiptera: Miridae) is a polyphagous omnivorous predator feeding on whiteflies, aphids, mites and leafminers. The aim of this study is to determine of development of the predator *Macrolophus pygmaeus* (Rambur) on different prey species under laboratory conditions.

Material and Methods: In this study, feeding behavior and longevity of *M. caliginosus* were determined on nymphs of *Aphis gossypii*, *Myzus persicae* (Hemiptera: Aphidoidea), *Trialeurodes vaporariorum* (Hemiptera: Aleyrodidae) and eggs of *Ephestia kuehniella* (Lepidoptera: Pyralidae), which were harmful species in the crop production, and also on eggplants as control. Study was carried out in a climate chamber with 26±1°C temperature, %60±5 humidity and 16:8 (L: D) lighting conditions, in Süleyman Demirel University, Plant Protection Department, Biological Control Research and Application Laboratory.

Results: As a result, 54% of the predator individuals fed on eggplants died before reaching the adult stage, while all the individuals fed on the other hosts reached the adult stage. Four nymph stages and total nymph period of the predator fed on eggplants were the longest when compared with other foods. Total nymph period of the predator fed on the eggplant, *Ephestia kuehniella*, *Aphis gossypii*, *Myzus persicae* and *T. vaporariorum* were calculated as 19.56, 14.96, 18.12, 15.50 and 13.64 days, respectively. It can be concluded that *T. vaporariorum* is the most effective prey for the development of the predator.

Acknowledgements: The authors thank the Research and Technology Department of Süleyman Demirel University in Isparta, Turkey for financial support for this project (Project number: 4638-YL1-16).

Keywords: *Macrolophus pygmaeus*, Eggplant, *Ephestia kuehniella*, *Aphis fabae*, *Myzus persicae*, *Trialeurodes vaporariorum*

Diagnostics of Rumen Acidosis: Evaluation of Rumenocentesis and Oro-Ruminal Probes as Routine Techniques

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Objectives: Rumen acidosis in cows involves the change of rumen fluid pH to acidic side (less than 5.8-6.0). Samples of ruminal fluid are collected for diagnostic, therapeutic and scientific purposes. Their examination is routine diagnostics of clinical and particularly subclinical forestomach disorders in dairy cattle. The aim of this study was to compare rumenocentesis versus oro-ruminal probe for measurement of rumen pH.

Materials and Methods: Ten Holstein dairy cows in the dairy farm (Belarus, Brest region, "Otechestvo" OJSC) were selected for the study. The experiment was conducted in two stages: 1) identification of animals with signs of acidosis of rumen; 2) sampling of the rumen fluid in sick animals for measurement of pH. Cows suffering from rumen acidosis have the following clinical signs: loss of appetite, atony of rumen, muscular tremor, diarrhea, hypersalivation, tachycardia, polypnea. 2.5 to 3 hours following feeding and after clinical examination, ruminal fluid collection was carried out by means of oro-ruminal probe and rumenocentesis. The puncture site was located 12-15 cm caudal to the costochondral junction of the last rib, on a horizontal line level with the top of the patella. Before sampling, the puncture site was disinfected. The puncture was done using a 120 mm long, 1.5 mm gauge needle with mandrin. Another sample was taken immediately; we used the oral probe "Drench-Mate". In total, 10+10 samples of ruminal fluid were collected. The pH level was measured by means of a portable pH meter Piccolo by Hanna (model HI-1290). Pre-filtration and centrifugation of the samples were not carried out.

Results: A small local inflammatory reaction around the puncture was observed in 1 of the sampled cow. No other case of inflammation and abscesses formation was observed. Breach of skin integrity of 9 in every 10 animals disappeared within 3-5 days. After rumenocentesis the average pH of ruminal fluid was 5.83 ± 0.46 . The value of pH after oro-ruminal probe was 5.97 ± 0.29 . The difference made up 0.14 or 2.3 %. In some cows the rumen pH results differed by 0.6. The sampling by oro-ruminal probe had higher ruminal pH. The use of rumenocentesis seems to neutralize the effect of continuously coming saliva on pH of the surface layer. Both methods of sampling didn't change the blood indices greatly (no more than 10 %). But we didn't study the influence of the sampling methods on productivity of dairy cows. In our opinion, routine monitoring of rumen pH by rumenocentesis is the most efficient and accurate way to recognize subclinical forestomach disorders at an early stage.

Acknowledgements: The authors acknowledge funding via the research grant: "Metabolic and structural changes in high yielding cows with acidosis and improvement of therapeutic and preventive measures" (Project No. Б 17-018, 2017.04.18; Belarus)

Keywords: Cattle, acidosis, diagnostics, sampling, rumenocentesis, oro-ruminal probe.

Evaluation of *in vitro* Antioxidant Activity of *Datura stramonium* L. Ethanolic Leaf Extract

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Aim of the study:Antioxidants are substances that when present at low concentrations with respect to oxidizable substrates, inhibit or delay the oxidation process. Therefore, antioxidants have a vital role in the maintenance of human health and prevention of disease caused by free radicals. Due to the benefits of antioxidants, food and pharmaceutical products are normally enriched with synthetic antioxidants such as BHA, BHT and PG. However, application of these synthetic antioxidants might lead to toxic effects such as carcinogen. Hence, stronger restrictions have been mandated for their application and there is a trend to substitute synthetic antioxidants with natural antioxidants. *Datura stramonium* (Solanaceae) is an important medicinal plant from which tropane alkaloids, amino acids, tannin, phytic acids, carbohydrates have been isolated. Its diverse biological activities include anti-asthmatic, antibacterial, antifungal, anti-inflammatory, antispasmodic, antioxidant and anti-ulcer activities. The present study aimed to explore the antioxidant activity of the *D. stramonium* leaf extract from Turkey.

Material and Methods:In this study, antioxidant activity of the *D. stramonium* ethanolic leaf extract was evaluated by 1,1-diphenyl-2-picrylhydrazyl (DPPH), phosphomolybdenum and ferric reducing power assays. In addition, total phenolic and flavonoid contents in the extracts were determined. The total antioxidant capacity of extract was determined by phosphomolybdenum method according to Prieto et al. (1999). The impact of ethanol extract on DPPH radical was determined according to Wu et al. (2006). The ferric ion reducing power assay carried out with slight modifications of the method of Oyaizu (1986). Total phenolic content of the extract was analysed via Folin-Ciocalteu method which gallic acid was used as a standart. Total flavonoid content of the extract was determined by the aluminium calorimetric method and expressed as equivalents of quercetin (mgQEs/g).

Results: When the *D. stramonium* ethanolic leaf extract evaluated, DPPH radical scavenging activity value was found as 52.44% for 1 mg/mL extract. Total antioxidant capacity of the extract were expressed as equivalents of ascorbic acid. Ascorbic acid content of the ethanolic extract of *D. stramonium* was determined as 30.18 mgAAEs/g. The reducing power of the extract increased with concentration. Reducing power of the extract was determined as 1.654 nm at 1 mg/mL concentration. Data obtained from the synthetic antioxidant BHT was also recorded as 2.676 nm at 1 mg/mL concentration. The total phenolic content of the extract was determined as 25.77 mgGAEs/g while total flavonoid content was determined as 13.19 mgQEs/g. Determination of total phenolic compounds showed that the observed antioxidant activity may be due to the presence of any of these constituents.

Keywords: Solanaceae, *Datura stramonium*, antioxidant activity, total phenolic and flavonoid content

Evaluation of Phylogenetic Relationships with IGS Gene Region in the Lichen-Forming Ascomycete *Xanthoria parietina* (L) Th. Fr. Specimen with a Cosmopolitan Distribution

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Aim of the study: This study has been made to examine as phylogenetic relationships of *X. parietina* specimen belong to genus *Xanthoria*, which widely spreaded in our country and the world, and to determine the intraspecific genetic variation by using IGS primers with the help of PCR.

Material and Methods: A total of 20 samples of *Xanthoria parietina* were collected from different parts of Turkey and the world. DNA isolation was performed by using Qiagen DNeasy plant mini kit. PCR analysis was performed by using IGS primers (IGSLL2F and NSR1). Phylogenetic analysis of *Xanthoria parietina* lichen samples was performed by using the Maximum Likelihood method of the Mega 6 (Molecular Evolutionary Genetics Analysis) software program.

Results and Discussion: The results are used to investigate the related regions by sequence analysis and to reveal the intraspecific genetic variation between *X. parietina* specimen. The phylogenetic analysis for IGS sequences are performed with the investigated samples and also with the samples obtained from Genbank. The analyses are conducted by the help the maximum likelihood method in order to reveal the genetic similarities between our studied samples. When we examine the Maximum Likelihood dendrogram, it is observed that species are seperated into two main branches. The species which is considered out group forms one of the branches, while *X. parietina* specimens are grouped together.

Key words: Genetic variation, Lichens, IGS (nrDNA), Maximum Likelihood, Phylogenetic analysis, *Xanthoria parietina*.

Acknowledgements: This study was financially supported by FBY-11-3685 coded Erciyes University project.

Evaluation of Phylogenetic Relationships with mtLSU Gene Region in The Lichen-Forming Ascomycete Some Species *Umbilicaria* Hoffm., Which Spreaded in Turkey

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Aim of the study: This study has been made to examine as phylogenetic relationships of some species belong to genus *Umbilicaria* Hoffm., which widely spreaded in our country. It was aimed to determine the intraspecific genetic variation using mtLSU primer, which has not been studied much in *Umbilicaria* before, using PCR technique.

Material and Methods: A total of 16 samples of *Umbilicaria* were collected from different parts of Turkey. DNA isolation was performed by using Qiagen DNeasy plant mini kit. PCR analysis was performed by using mtLSU primers. The evolutionary history was inferred using the Neighbor Joining method. The analysis involved 19 nucleotide sequences. Evolutionary analyses were conducted in MEGA6 (Molecular Evolutionary Genetics Analysis)

Results and Discussion: The results are used to investigate the related regions by sequence analysis and to reveal the intraspecific genetic variation between *Umbilicaria* specimen. The phylogenetic analysis for mtLSU sequences are performed with the investigated samples. *U. decussata* (Vill.) Zahlbr. and *U. nylanderiana* (Zahlbr.) H. Magn. were obtained from the gene bank, but no sequence gene bank belonging to other species was found. For the working samples, the mtLSU gene region will be first worked. The analyses are conducted by the help the Neighbor Joining method in order to reveal the genetic similarities between our studied samples. When we examine the Neighbor Joining dendrogram, the branches separated in the phylogenetic tree made will be close to each other and distant species will be determined. Although the *Umbilicaria* genus can be morphologically determined, the ITS gene region has provided good results in phylogenetic tree to distinguish species from previous studies.

Keywords: Genetic variation, Lichens, mtLSU, Neighbor Joining, Phylogenetic analysis, *Umbilicaria*, *U. decussata*, *U. nylanderiana*.

Acknowledgements: This study was financially supported by, FDK-2014-5226, coded Erciyes University project.

Gymnosperm Garden of Botanical Garden of Adnan Menderes University

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Aim of the study: Gymnosperms are vascular plants whose seeds are not enclosed in an ovule. The aim of this research is to prepare special section for gymnosperms in ADÜ Botanical Garden to introduce this plant group.

Material and Methods: ADÜ Botanical Garden is located in ADÜ Central Campus area. Plants are planted according to their habitat needs.

Results: Botanical gardens are living collection of plants for scientific, educational, recreational and protection purposes. ADÜ Botanical Garden and Herbarium Research and Application Center was founded in 2010. Substructure and landscaping was completed in 2013 and first planting works started. Gymnosperm section of ADÜ Botanical Garden is about 3 decare area located in north part of botanical garden. Gymnosperms have special importance in plant evolution so gymnosperm sections have special role in botanical gardens. ADÜ Botanical Garden gymnosperm section has various gymnosperm species from different geographical areas around the world as well as native species.

Acknowledgements: This project was supported by Adnan Menderes University Scientific Research Projects Department with project ADU-MARL-15001.

Keywords: Botanical garden, Aydın, gymnosperm, gymnospermae, ADÜ

Heavy Metal Pollution in Surface Marine Sediment of the Bay of Izmit, the Marmara Sea (Turkey)

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Aim of the study: The Marmara Sea is semi-enclosed deep basin and together with Bosphorus and Dardanelles straits are a channel between the Black Sea and Mediterranean Sea. The pollutants are introduced through water way into the Izmit Bay by a surface and deep currents from the Black Sea and Mediterranean Sea. This study was undertaken to investigate the current heavy metal contamination in sediment in the Izmit Bay. The Izmit Bay is influenced by factors such as industry, refinery, port activities, rapid urbanization, coastal traffic, agricultural activities.

Material and Methods: In this study, samples of costal sediments collected from the Izmit Bay aimed to determine the level of heavy metals. The sediment samples were collected from 7 sites. Seasonal sampling was performed between August 2011 - May 2012. The microwave digestion and ICP-OES was used in the analysis. Samples were digested in a microwave digestion system with a HNO₃-HClO₄-HCl acid mixture for heavy metal analyses (Cr, Ni, Cu, Zn, Fe and Cd). The accuracy of the analysis was verified by analyzing the Certified Reference Material (Inorganic marine sediment) (NIST 2702). The results showed good agreement between certified and analytical values.

Results: The costal marine sediment samples from the Izmit Bay, the Marmara Sea, Turkey was examined. Concentrations of the heavy metals in the sediment was as follows; Cr 2,4-40,68; Ni 7,4-26,08; Zn 4,68-154,36; Cu 3,42-44,36; Cd < 0,02-0,82; Fe <0,001 µg g⁻¹ dry weight. The heavy metal concentrations in costal sediment samples was Zn>Cu>Cr>Ni>Cd>Fe.

Keywords: Sediment, heavy metal, Izmit Bay, Marmara Sea

Hydrophobicity and Aggregation Properties of Yeasts Isolated From YoghurtSelin UYSAL, Yavuz BEYATLI, Zehranur YUKSEKDAGDepartment of Biology, Faculty of Science, Gazi University, Ankara, TURKEY
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Aim of the study: Yeasts present great potentials for the development of novel probiotics. Therefore, probiotic yeast has become a field of interest to scientists in recent years. Adhesion ability is regarded as an important property when probiotic microorganisms are selected. Microbial adhesion is determined by non specific and reversible interactions that involve hydrophobicity. Properties associated with the initial stage are hydrophobicity of the cell surface and aggregation. Bacterial aggregation is key factors for colonization of the digestive ecosystem and the ability of probiotic strains to exclude pathogens. In the present study, fifteen yeast strains were evaluated for aggregation and hydrophobicity properties.

Material and Methods: Microbial adhesions to solvents (p-xylene-nonpolar neutral solvent, chloroform-monopolar acidic solvent, and ethyl acetate-monopolar basic solvent) were measured by the method of Zarate et.al. (2002). Aggregation abilities were performed by the method of Rinkinen et.al. (2003) using the aggregation percentage. In coaggregation, test microorganisms were used *Lactobacillus acidophilus* ATCC 4356, *Escherichia coli* ATCC 25922, and *Candida albicans* ATCC 90028.

Results: The degree of hydrophobicity is expressed as the percentage of cells transferred from the aqueous phase to the non polar phase. Microbial adherence to hydrocarbons was observed to be species and strain-specific. The yeast strains showed strong hydrophobicity properties (62.50-99.58%). *Saccharomyces kefir* SKYP13A and *Cryptococcus humicola* SKYP3 had the highest adherence to chloroform, while the lowest was by *S. kefir* SSYS5 to ethyl acetate. *Saccharomyces kefir* SKYP9 had the highest percentage autoaggregation (86.71%) after 4 h. The results showed a wide distribution of the yeast strains over the range of co-aggregation ability from 21.26 to 80.46%, regarding the use of test microorganisms. The highest co-aggregation ability was detected for *S. cerevisiae* SSYS2 and *Escherichia coli* ATCC 25922 (80.46%).

Keywords: Yeast, probiotic, hydrophobicity, aggregation

***In vitro*Antioxidant, Hemostatic Activities and Enzyme Inhibitory Potential for Wound Healing of Lactose**

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Aim of the study: Wound healing is the natural response of the body against any type of injury. There are four main stages of wound healing process namely hemostasis, inflammation, proliferation and reconstitution of the extracellular matrix components and formation of the granulation tissue. Failure or prolongation in one phase or presence of oxygen free radicals may result in delay of healing or non closure of the wound. Metalloproteinase enzymes are responsible for the destruction of the foreign substances and dead tissues as well as the components of the extracellular matrix for the reconstitution process of the remodeling phase. For this reason in the present study investigated the antioxidant activity as well as in vitro hemostatic and metalloproteinase enzymes inhibitory effect of lactose.

Material and Methods: The antioxidant activity was estimated by the 1,1-diphenyl-2-picrylhydrazyl (DPPH), β -carotene and H_2O_2 radical scavenging activities. The hemostatic activity was determined by prothrombin time (PT) and activated partial thromboplastin time (aPTT) clotting assays. The hyaluronidase, collagenase and elastase inhibitory activities were determined using bovine hyaluronidase, *Clostridium histolyticum* collagenase and porcine pancreatic elastase, respectively.

Results: Lactose was found to be an efficient inhibition of β -carotene-linoleic acid bleaching (64%) and H_2O_2 radical scavenging (15%) activities at 100 mg/ml concentration. The results showed that lactose can shortened the aPTT clot time from 33.7 ± 0.8 to 28.4 ± 0.9 at 10 mg/ml concentration. Lactose was found to have collagenase and elastase inhibitory activities with the values of 10.6% and 21.6%, respectively. These findings indicate that lactose can be used for the support of healing of injuries or against skin aging.

Acknowledgements: This study was supported by the Scientific Research Project Unit of *Aksaray University*, through the Grant number 2015-068.

Keywords: Lactose, antioxidant, hemostatic, anti-hyaluronidase, anti-collagenase, anti-elastase

***In vitro* Nitric Oxide Scavenging Activity of Ethanolic Tuber Extracts of Six *Cyclamen* L. Taxa from Turkey**

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Aim of the study: Floristic studies have shown that Turkey houses about 12000 plant taxa on its soils and more than 3000 taxa among them are endemic. Geophytes are the important part of this rich biodiversity and contain many important endemic and endangered species. *Cyclamen* L., belonging to the Primulaceae family, is a tuberous perennial geophyte, and some taxa of this genus have been used for their biological activities in folk medicine. Nitric oxide (NO) is an important chemical mediator generated by endothelial cells, macrophages, neurons, etc. and is involved in the regulation of various physiological processes. Excess concentration of NO is associated with several diseases. Literature review reveals that no NO scavenging activity studies have been reported on those *Cyclamen* plants. Here we presented the evaluation of *in vitro* nitric oxide scavenging activity of ethanol tuber extracts of six *Cyclamen* taxa.

Material and Methods: In the present study, six *Cyclamen* taxa; *C. cilicium* Boiss. & Heldr. (endemic), *C. pseudibericum* Hildebr. (endemic), *C. graecum* subsp. *anatolicum* Letsw., *C. mirabile* Hildebr. (endemic), *C. persicum* Mill. and *C. hederifolium* Aiton were collected from different localities in Turkey. The tubers of plants were air-dried and grounded to fine powder and then extracted with ethanol. Nitric oxide radical generated from sodium nitroprusside was measured. Briefly, the reaction mixture (5.0 mL) containing sodium nitroprusside (5mM) in phosphate-buffered saline (pH 7.3), with or without the plant extract at different concentrations, was incubated at 25 °C for 3 hours. The nitric oxide radical thus generated interacted with oxygen to produce the nitrite ion which was assayed at 30 minute intervals by mixing 1.0 mL of incubation mixture with an equal amount of Griess reagent. The absorbance of the chromophore (purple azo dye) formed during the diazotization of nitrite ions with sulfanilamide and subsequent coupling with naphthyl ethylene diamine dihydrochloride was measured at 546 nm.

Results: The nitric oxide scavenging activity for each *Cyclamen* extract increased with increasing the concentration. The highest activity (82.3±0.55%) was recorded on *C. pseudibericum* extracted with 1000 µg/mL concentration followed by *C. persicum* > *C. mirabile* > *C. cilicium* > *C. graecum* > *C. hederifolium*. However, the activity of ascorbic acid was more pronounced than that of the all extracts of *Cyclamen*. *Cyclamen* extracts decrease the amount of nitrite generated from the decomposition of sodium nitroprusside *in vitro*. This may be due to the antioxidant principle in *Cyclamen* extracts, which competes with oxygen to react with nitric oxide thereby inhibiting the generation of nitrite. The plant products may have the property to counteract the effect of NO formation and in turn may be of considerable interest in preventing the ill effects of excessive NO generation *in vivo*.

Keywords: *Cyclamen*, extract, nitric oxide, radical, sodium nitroprusside

Isolation, Purification and Refolding of the Recombinant Bovine α -Interferon From Inclusion Bodies

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Aim of the study: To carry out isolation, purification and refolding by dilution of the recombinant bovine α -interferon (rb α -IFN).

Material and Methods: The following methods were used in the research: UV/Visible spectrophotometry for the determination of the best washing and solubilizing solutions for inclusion bodies (IB), protein concentration and the effectiveness of refolding systems by turbidimetric assay; electrophoretic method for the target protein visualization and assessing its purity; and anion-exchange liquid chromatography for rb α -IFN purification from impurities and collection the protein of interest at the final stage.

Results: Application of two step IB washing by solutions containing 50 mM Tris, 50 mM NaCl and 3,5 M Urea, its further solubilization in 50 mM Tris-HCl, pH 9, 8 M Urea and 10 mM β -mercaptoethanol and subsequent purification on anion-exchange resin makes it possible to get the target protein with the sufficient purity for its renaturation. On the basis of preliminary performed screening of the main characteristics of the refolding buffer, such as pH and temperature value, red-ox potential, final protein and urea concentration in the solution, as well as antiaggregant chemical additives the system containing 10 mM NaPB, pH 7,4, 0,4 M sucrose, 1 mM EDTA, 0,05% cremaphor, 1 mM L-Cys and 0,1 mM L-cystine was chosen as the best one. Scaling up the renaturation process in this refolding system allows to obtain rb α -IFN in active form, homogeneous condition and 20% yield.

Acknowledgements: This research was funded by the State Program «Innovation biotechnologies» within the framework of the treaty № 289/57-M «Development of technology and production arrangement of the substance and adjuvant ready form for cattle vaccines designing».

Keywords: Recombinant bovine α -interferon, protein refolding, inclusion bodies.

Meat Consumption Preferences and Evaluation of Poultry Meat Consumption in the District of Bolu-Mudurnu

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Aim of the study: This study was carried out in order to evaluate meat consumption preferences and consumption of poultry meat in Bolu County of Mudurnu.

Material and Methods: It was conducted with 393 people living in the district of Bolu-Mudurnu in Turkey. A demographic scale of 18 options and an attitude scale questionnaire of 14 questions were prepared to determine the demographic characteristics of the individuals in the data collection, the knowledge, attitudes and behaviors of meat consumption. The obtained data were evaluated with SPSS 20.0 program. 291 people (74%) were given poultry meat preference in response to which meat type you prefer the most. According to the marital status (single n = 48, married n = 345), it was found that there was a statistically significant difference between the answers of the individuals, "Do you believe that poultry meat you buy is cut off under hygienic conditions and inspected by competent people" ($p < 0.05$). Statistically, there was a statistically significant difference between the responses of males and females in the answer to the phrase "Cutting-off animals are important to cutandplace" ($p < 0.05$). According to the meat consumption habits, it was observed that there was a statistically difference between the answers of the individuals who consumed perday and those who consumed per month on the expression of "Meat and meat products are important for me" ($p < 0.05$).

Results: As a result, poultrymeat is preferred in Bolu Province Mudurnu Province but it is seen that the reare different approaches among consumers regarding cuttingand controlling in hygienic conditions. There are differences in the answers given by consumers in this study, and consumer consciousness did not appear to be enough for consumption of poultry meat. Consumer informative studies on poultry consumption have emerged.

Keywords: Meat, Quail, Bolu, PoultryMeat, Biodiversity

Nest-Site Selection of Marsh Harrier (*Circus aeruginosus*) at Lake Acıgöl, Denizli/Turkey

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Aim of the study: The nest site selection of the Marsh Harrier *Circus aeruginosus* was aimed to investigate at Acıgöl, Denizli/Turkey. We argued that (i) the nest site selection is associated with the diameter and patch size, (ii) road, animal husbandry and fire has effects on nesting and nest site choice.

Material and Methods: The study was carried out at Acıgöl Lake (37° 49 'N, 29°53' E) in 2016. Observations were made weekly during the breeding season of the species from March to August. Firstly, nest sites were identified by observing in the reed areas around the lake. Then, the coordinates of the nests were found by walking on the swampy area. Finally, the Google Earth Pro was used for measurement and area calculations.

Results: There were 12 segregated reed beds in the lake and are observed for nesting activities. A total of 13 nests were found in 8 reed beds during the breeding period in 2016. It was seen that the species preferred large reed beds than smaller one according to site patches and diameter for the nesting activities. Nests were made away from road on average of 415.9±213.5 m (range = 113–980 m) and species used tight and distant reed beds to animal husbandry. Preferred nest sites have old and un-burnt reeds to all nest and is important to species to get successful breeding.

Keywords: Marsh Harrier, *Circus aeruginosus*, nest-site selection, anthropogenic effect, Turkey

NO Inhibitory Activity from the Aerial Parts of *Convolvulus aucheri* in LPS-activated H1975 and HCC78 cellsEge Rıza KARAGÜR¹, Cennet ÖZAY², Hakan AKÇA¹, Ramazan MAMMADOV²¹Department of Medical Biology, Pamukkale University, Turkey²Department of Biology, Pamukkale University, Turkey
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Aim of the study: *Convolvulus* is a genus of approximately 250 species of flowering plants in the Convolvulaceae family, commonly known as bindweeds, some of which occur in Mediterranean regions. According to recent studies, this genus is represented in Turkey by 33 species, 9 of which are endemic. Extracts of several members of this genus have been reported to exhibit antioxidant, antinociceptive, anticancer, and antidiarrhoeal activities. Nitric oxide (NO) is a diffusible free radical, which plays many roles as an effector molecule in diverse biological systems including neuronal messenger, vasodilatation, antimicrobial and antitumor activities. This study is the first to assess the NO inhibitory activity from the aerial parts of *Convolvulus aucheri* Choisy in LPS-activated H1975 and HCC78 cells.

Material and Methods: The plants were collected from Hatay, Turkey (885m) and dried in the shadow for extraction. Dried plants were pulverized and extracted with ethanol in a shaker water bath at 55°C for 6 h. The extraction was repeated twice at the same condition. The effect of different concentrations (40-0,625 µg/ml) of *C. aucheri* extract on cell viability was determined via CellTiter-Glo® luminescent cell viability assay. The NO production was measured as described by Yang et al. (2009). Briefly, 5×10^3 cells/well were seeded in 96-well plates. After 24h, cells were washed with fresh medium and treated with LPS (1µg/ml) for 24h and the plant extracts (40-0,625 µg/ml) were added and incubated for 48h. The quantity of nitrite in the culture medium was measured as an indicator of NO production. Amount of nitrite, a stable metabolite of NO, was measured using Griess reagent.

Results: The effect of the crude ethanolic extract of *C. aucheri* on the growth of human non-small cell lung cancer cell lines (H1975 and HCC78) was investigated by the CellTiter-Glo assay. Cytotoxicity of the extract on the proliferation of H1975 was found to be more potent than the HCC78 cells. The effect of *C. aucheri* extract on LPS-induced NO production was determined using Griess reagent. NO production by LPS-activated cells was found to be significantly inhibited by the plant extract in a dose dependent manner. Among the two cell lines evaluated, the highest nitrite-associated NO inhibitory activity was obtained from the HCC78 cells with 208.75 µM nitrite at 40 µg/ml concentration.

Keywords: *Convolvulus*, extract, nitric oxide assay, LPS, H1975, HCC78

Palmetum of Botanical Garden of Adnan Menderes University

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Aim of the study: Palms are distinct group of plants represented with about 3000 species which have specific morphology and known mostly from tropical and subtropical regions. The aim of this research is to prepare special section for palms in ADÜ Botanical Garden to introduce this plant group.

Material and Methods: ADÜ Botanical Garden is located in ADÜ Central Campus area. As prepared section for palms is in the open air, taxa that have the ability to live in mediterranean climate are chosen. Plants are protected in adaptation periods and extreme cold weather conditions in winter.

Results: Botanical gardens are living collection of plants for scientific, educational, recreational and protection purposes. Palmetum is a special botanical garden or region of botanical garden that have only one family of plants, palms. ADÜ Botanical Garden and Herbarium Research and Application Center was founded in 2010. Substructure and landscaping was completed in 2013 and first planting works started. Palmetum of ADÜ Botanical Garden is approximately 3 decares area located in south part of botanical garden. The palm collection have total of 45 palms, out of 13 genus and 24 different species. These species includes only one native palm *Phoenix theophrasti*.

Acknowledgements: This project was supported by Adnan Menderes University Scientific Research Projects Department with project ADU-FEF-13034.

Keywords: Botanical garden, Aydın, palmetum, ADÜ

Phenolic Content of Different Parts of *Salviaspinosa* by Using LC-MS/MS

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Aim of the study: *Salvia* L. genus is member of lamiaceae family which exists approximately 220 genus and 4000 species on the world (1). Although it shows most natural distribution in Turkey and Mediterranean region on the world, almost it can be grown in all habitat types and heights (2,3). *Salvia* L. genus is represented about 89 species in Turkey and 45 of them are endemic (4). *Salvia* species are generally known for their multiple pharmacological effects including their antibacterial, antiviral, antioxidative, antimalarial, anti-inflammatory, antidiabetic, cardiovascular, antitumor, and anticancer (5). In this study, secondary metabolic profile of ethanol extracts of *Salvia spinosa* was determined using LC-MS/MS.

Material and Methods: A comprehensive LC-MS/MS method validation was developed for the qualitative and quantitative analysis of 37 phytochemicals including 15 Phenolic acids, 17 flavonoids, 3 nonphenolic organic acids, 1 phenolic aldehyde and 1 penzopyrane (2). *S. spinosa* was collected from southeast Turkey (Mardin) in June 2015 and characterized by Mehmet Fırat (YüzüncüYıl University, Faculty of Education, Department of Biology, TR-65080 Van,). Voucher specimens were deposited in the Herbarium of Van YuzuncuYıl University, Faculty of Science. The powdered plants (stems, leaves, flowers, roots and mixed parts) were extracted three times with ethanol (50 mL each) at room temperature for 24 h. Afterwards, the extracts obtained were combined, filtered and evaporated under low pressure. Dry filtrates were reconstituted in ethanol at a concentration of 250 mg L⁻¹ and filtered through the 0.2 µm PTFE filter prior to LC-MS/MS analysis.

Results: Especially, the all extracts of *S. spinosa* were determined to possess very high amounts of rosmarinic and fumaric acids. The ethanol extract prepared from the leaf parts was found to be richer in terms of rosmarinic and fumaric acid.

Keywords: *Salvia spinosa*, LC-MS/MS, Phenolic Content.

**Population Parameters of the Black Sea Brill *Scophthalmus maeoticus*
(Pleuronectiformes, Scophthalmidae) from Duzce, West Black Sea**

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Aim of the study: The Black Sea brill *Scophthalmus maeoticus* is an economically important flatfish species belong to the family of Scophthalmidae, and there is a considerable interest in this species with respect to fisheries and aquaculture. *S. maeoticus* occurs in the Black Sea and Marmara Sea. Until this time, there has not been any study about growth features of the Black Sea brill *S. maeoticus*. In the present study, length-weight relationship and growth parameters of *S. maeoticus* from Duzce (West Black Sea) were studied.

Material and Methods: A total of 201 brill samples, of which 118 female and 83 male, were taken from the Duzce between October 2013 and December 2014 by commercial fisheries.

Results: All sampled Black Sea brill varied between 16.3 and 45.8 cm for females and 16.4 and 44.1 cm for males in length. In weight, females varied between 118 and 1500 g, males varied between 120 and 1350 g. Maximum age was found to be 4 years for both sexes. The length-weight relationship was described as $W=0.0887 \times L^{2.5361}$, $W=0.1254 \times L^{2.4392}$ and $W=0.1028 \times L^{2.4947}$ at females, males and both sexes, respectively. The parameters of von Bertalanffy growth equations for Black Sea brill were determined as $L_{\infty}= 82.67071 [1-e^{[-0.141333(t + 1.59538)}]$; $L_{\infty}= 63.8835 [1-e^{[-0.217783(t + 1.38313)}]$ and $L_{\infty}= 73.94855 [1-e^{[-0.169011(t + 1.51068)}]$ for females, males and both sexes, respectively.

Acknowledgements: Thanks to the Scientific & Technological Research of Turkey (TUBITAK – 112O920) for financial support.

Keywords: Black Sea brill, *Scophthalmus maeoticus*, length-weight relationship, growth parameters, Black Sea, Duzce.

Chemical Composition and Larvicidal Activity of Essential Oils from Some Lamiaceae Species from Turkey

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Aim of the study: The essential oils (EO) obtained from *Rosmarinus officinalis* L., *Sideritis leptoclada* O. Schwarz & P.H. Davis, *Origanum majorana* L., *Melissa officinalis* L. and *Ocimum basilicum* L were tested for larvicidal activity against *Thaumatococcus wilkinsoni* Tams.

Material and Methods: EO were obtained via hydrodistillation and subsequently analysed by gas chromatography-mass spectrometry (GC-MS). Fourth-fifth instars larvae of the *Th. wilkinsoni* were exposed to various concentrations (5, 10, 50, 100, 250, 500 and 1000 ppm) of the extracts. Responses varied according to plant material, concentration, and exposure time. Lethal concentration 50 (LC₅₀) and 90 (LC₉₀) values were determined by using Probit Analysis program

Results: Concentrations causing 50% or 90% larval mortality ranged from 95.04 ppm to 246.14 ppm and 503.73 ppm to 2338.77 ppm, respectively. EO obtained from related species, which were containing majority amounts of 1.8 cineole, p-mentha-3,8-diene, methyl eugenol, linalool and β -pinene, showed the highest effects.

Keywords: Larvicidal activity, essential oil, GC-MS, terpenes, Lamiaceae

Preparation of Novel Lectin Affinity poly(2-Hydroxyethyl Methacrylate-Ethylene Dimethacrylate) Hydrogel Membrane Systems for Investigation of Antibody Recognition

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The aim of the study: Immunoglobulin G (IgG) is the most important antibody species in the immune system and constitutes 75% of the immunoglobulins in human serum. The level of IgG in blood plasma is an indispensable marker for the detection of infection, cancer and other autoimmune diseases. Therapeutic, immunostaining and immunochromatographic applications require high purity IgG. For these reasons, the development of new generation systems is becoming important for the identification and purification of IgG. The aim of the study is recognizing IgG antibody with efficient, high amount, fast, easily, with less toxicity, economically and purifying IgG in high ratios from its natural sources.

Material and Methods: In this study, poly(2-hydroxyethyl methacrylate-ethylene dimethacrylate) [p(HEMA-EDMA)] hydrogel membranes are synthesized with free radical photo-polymerization method. Then p(HEMA-EDMA) hydrogel membranes were activated with silanization agent (IMEO) and then attached to Con A as a lectin affinity ligand. p(HEMA-EDMA) hydrogel membranes are characterized by scanning electron microscopy (SEM) and Fourier transform infrared spectroscopy (FTIR), swelling test and elemental analysis. After the characterization studies, IgG adsorption studies were carried out and calculated quantities of adsorption (Q value). In order to determine IgG adsorption condition on the p(HEMA-EDMA)-IMEO-ConA hydrogel membranes, adsorption time, pH, initial adsorption concentration, temperature, ionic strength experiments were performed. Also, reusability of p(HEMA-EDMA)-IMEO-ConA hydrogel membranes were investigated.

Results: In the characterization studies, hydrogel membranes are spherical structures according to the SEM analysis. Also, elemental analysis of p(HEMA-EDMA)-IMEO hydrogel membranes is found to be 10.85 mol/g hydrogel membranes from the nitrogen stoichiometry. And the amount of the Con A attached to p(HEMA-EDMA)-IMEO hydrogel membranes is found as 3.52 mg/g membrane. Highest swelling value is determined as 224.8%. In the adsorption studies, optimum conditions for IgG adsorption to membranes are; 1.5 mg/ml initial IgG concentration, 30 minutes of adsorption time, pH 4 citrate buffer 37 °C and without any different ion strength. Optimum adsorption capacity is determined as 26.81 mg/g (Q value) and it is also determined that this value is 4 times higher than nonspecific IgG adsorption to p(HEMA-EDMA) hydrogel membranes. IgG adsorption-desorption cycles (5 times) proved that product is reusable without losing its adsorption capacity. Consequently, alternative polymeric membrane system with high biocompatibility, fast and easy to apply for IgG purification, has been produced.

Acknowledgments: In this study, experiments were carried out in Ege University, research laboratory (Biorege) of the Biochemistry Department.

Keywords: Lectin affinity chromatography, hydrogel membrane, silanization, Con A, IgG adsorption

Removal of Boron from Contaminated Groundwater via Polyethyleneimine Assisted Cryogels Composite

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Aim of the study: Many water resources in the world and many waste water effluents from the industry have the boron content well above the regulations. The World Health Organization (WHO) limited the boron concentration to 1 mg/L for irrigation water and less than 2.4 mg/L for drinking water. Although Boron is also an essential element for plants, animals and human beings. Excess concentration of Boron in water resources for irrigation and drinking, may be toxic for plants, animals and humans. The objective of the study, was to determine and remove the boron pollution level in groundwater resources used for irrigation and drinking.

Material and Methods: The samples were collected from a town close to capital of Turkey. Boron removal was studied by polyethyleneimine (PEI) assisted-poly(hydroxyethyl methacrylate-glycidyl methacrylate) [poly(HEMA-GMA)] cryogel composites

Results: Reading of boron level prior to column tests and afterwards were done via CP-QES. The generation of boron loaded columns was carried out by NaCl solution, adsorption-desorption cycles was performed 20-times successfully only with a loss of %3 in adsorption capacity.

Keywords: Boric acid Removal, Groundwater, PEI Cryogel Column, Regeneration

Skeletochronological Age Determination and Body Size of Spadefoot Toad (*Pelobates syriacus*) from Afyonkarahisar, Turkey

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Aim of the study: Determining demographic parameters (age, sexual maturity age, body size, etc.) of amphibians are important to elucidate the population ecology. The skeletochronology is one of the most common and using techniques for determining animals' lifespan. *Pelobates syriacus* is the only species represented the European spadefoot toads in Turkey. Despite of some morphological characters were examined in Turkey, there is no skeletochronological study for clarifying the age structure of inhabiting populations in Turkey. We determine the age structure of *P. syriacus* for the first time in this study.

Material and Methods: We collected the samples with the permission of the local ethics committee (Recep Tayyip Erdoğan University 2016/51). We used a total of twenty-one (21) samples of *P. syriacus* (11♂♂, 8 ♀♀, 2 juvenile). Specimens were collected from Dereçine (38° 50' N, 31° 31' E; 978 m a.s.l.), in the city of Afyonkarahisar. The snout-vent length (SVL) of specimens were measured by using digital calipers with 0.01 mm sensitivity. We evaluated sex of each animal by the presence of a glandular pad on the dorsal surface of the arm. A general skeletochronology procedure were applied to determinate the age. We used the longest toe of forelimb and removed the skin and muscle tissues of each digit, then decalcified the remaining bones in 5% nitric acid for approximately 2 hours. After decalcification, we washed them in tap water. The cross-sections from the middle part of the diaphysis were gained by using freezing microtome (17 µm thick) and stained with Ehrlich haematoxylin. Statistical differences between sexes according to age and body size were tested using with Independent Samples t-test for SVL and Mann-Whitney U test for age structure. SPSS 21 was used for statistical analyses.

Results: The maximum age was found to be 8 years in both males and females. Age varied between 4-8 years in males and 5-8 years in females. Mean age was 5.27±1.10 yrs in males and 5.87±1.13 yrs in females. Sexual maturity age was 2 and 3 years in both males and females. We determined that juveniles were 1 and 2 years old. There wasn't any significant difference between sexes in terms of age (Mann Whitney U test, $p > 0.05$). The maximum SVL was found to be 70.84 mm in males and 69.76 mm in females. SVL ranged from 54.84 to 70.84 mm in males and 57.00 to 69.76 mm in females. The SVL of juveniles was 37.62 and 41.11 mm. Despite of there were no significant differences between males and females in terms of SVL ($p > 0.05$), mean SVL of males was larger than females. Correlation between age and SVL were detected only in males ($r = 0.75$, $p < 0.05$), but not in females ($r = 0.49$, $p > 0.05$) according to Pearson's correlation coefficients.

Keywords: Skeletochronology, *Pelobates syriacus*, Turkey.

Some Lichenes Identified by ITS Markers from AkdağlarMehmet Gökhan HALIÇI¹, Tuba ÜZÜM¹, Mithat GÜLLÜ¹¹Erciyes University, Faculty of Science, Department of Biology, Kayseri, Turkey
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Aim of the study: This study was aimed to investigate some lichenized fungi that spread in Akdağlar with anatomical, morphological and molecular methods.

Material and Methods: *Candelleriella cf. vitellin*, *Rhizocarpon cf. geographicum*, *Bellemeria alpina*, *Aspicilia viridescens* species were studied. Some lichen species belonging to Akdağlar were gathered by field study. After the morphological and anatomical examination of the lichen samples, DNA isolation was performed by using Qiagen DNeasy plant mini kit. Phylogenetic analysis of lichen samples was performed using the Mega 6 (Molecular Evolutionary Genetic Analysis) software program.

Results and Discussion: After morphological and anatomical examinations of lichen samples were made, lichen samples were identified using identification keys. Morphological and anatomical observations were confirmed by molecular methods. Phylogenetic trees were formed by phylogenetic analyzes. The species we have identified are compared to those from the genbank. In this way, evolutionary relationships between species were determined.

Key words: Lichens, ITS, PCR, Phylogenetic analysis, Akdağlar.

Study of the Genus *Marsilea* L. (family Marsileaceae Mirb.)

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Aim of the study: The family Marsileaceae Mirb. consists of different species of decorative, ecological and medicinal importance. There are a lot of publications dedicated to Marsileaceae Mirb. representatives. In these articles, monographs etc. different uses of species are considered. The aim of this work is an analysis of literature sources about the important features of species from this plant family.

Material and Methods: We analyzed the special scientific literature, as reviews as well results of practical experiments.

Results: The three genera –*Marsilea* L., *Pilularia* L. and *Regnellidium* Lindm. - form the family Marsileaceae. *Marsilea* is an usual aquatic fern, widely distributed in the tropics, subtropics and temperate climate. A bright representative of this genus is *Marsilea quadrifolia* L. This is a very attractive species of ferns that can grow successfully both in water and on land. The leaves of the plant are triangular-wedge-shaped, with a rounded apex, and the upper side of the leaf blade is bright green, sometimes brownish-reddish. Rhizomes are long, thin, creeping, rooted in nodes. Thin erect petioles depart from it in two rows and carry the compound leaves on top. *Marsilea* is multiplied by dividing the rhizome. The practical significance of *Marsilea* is great: feed for animals and food for humans (except *M. minuta* L. and *M. drummondii* A. Braun). Growing near the water and participating in the water regime, it performs the water protection function. Its composition includes flavonoids, phenolic acids, wax, steroids, higher fatty acids and higher aliphatic hydrocarbons. And chloroform and ethyl acetate extracts of *M. quadrifolia* L. have antibacterial, cytotoxic and antioxidant effects and may have potential applications in medicine.

Keywords: *Marsilea*, aquatic fern, *Marsilea quadrifolia*, dividing the rhizome, feed for animals, application in medicine

The Antioxidant Activity and Chemical Composition of Essential Oils of *Salvia aramiensis* and *Calamintha nepeta*

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Aim of the study: Since ancient times, species of *Salvia* have been used in folk medicine for the treatment of diabetes and skin diseases such as psoriasis and eczema. Numerous species of the genus *Salvia* (Labiatae) have been used since ancient times in folk medicine and subjected to extensive pharmacognosic research intended to identify biologically active compounds. The genus *Calamintha* (Lamiaceae) is represented by eight species, of which four are endemic in the Flora of Turkey. In this study, the chemical compositions and antioxidant activity of the essential oils of *Salvia aramiensis* and *Calamintha nepeta* were studied.

Material and Methods: Essential oil samples were obtained by a Clevenger apparatus from the whole parts of plants which were crumbled into small pieces and soaked in distilled water for 3 h. Then, these samples were dried over anhydrous Na₂SO₄ and stored at +4°C for a sufficient period of time. In the next step, the essential oil samples were diluted using CH₂Cl₂ (1:3 volume/volume) prior to GC/FID and GC/MS analyses. GC/FID and GC/MS analyses were performed using Thermo Electron Trace GC FID and Thermo Electron DSQ GC/MS detectors respectively.

Results: The main constituents of *S. aramiensis* were identified as Cineole (34.4%), Camphor (11.1%) and Borneol (10%); however, the main components of *C. nepeta* were identified as Piperitone (35.5%), Menthone (20%) and Menthol (8.9%). The essential oils of *S. aramiensis* and *C. nepeta* species exhibited good antioksidant activity.

Keywords: *Salvia aramiensis*, *Calamintha nepeta*, Essential Oil, Antioxxidant

The Antioxidant Activity of Ethanol Extract Fractions of *Salvia cerino pruinosa* var. *cerino pruinosa*

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Aim of the study: In this research, antioxidant activities of ethanol extract fractions obtained from *Salvia cerino pruinosa* var. *cerino pruinosa* were compared.

Material and Methods: ABTS cation radical decolorisation method, cupric reducing antioxidant capacity assays and DPPH free radical scavenging activity were carried out to indicate the antioxidant activity. Here, only *DPPH Free radical scavenging activity method* will be explained: 0.1 mM, 160 µL of DPPH solution in methanol was added to 40 µL of sample solutions in methanol at different concentrations. After 30 min, the absorbance values were read at 517 nm.

Results: From the aerial parts of *Salvia cerino pruinosa* var. *cerino pruinosa* ethanol extract, 88 fractions were gained. And also 77 fractions were gained from the roots ethanol extract of this plant. According to the applied thin layer chromatography results, totally 14 fractions from ethanol extract of aerial parts and 13 fractions from the root extract by combining similar fractions. And also, antioxidant activities were studied. In the DPPH free radical scavenging activity, it was determined that 54-60, 61-64, 65-69, 70-75, 76-79, 80-85, 86-88 numbered fractions from the extract of *S. cerino pruinosa* var. *cerino pruinosa* plant's aerial part, showed higher activity than BHT used as standart. And also 18-24, 25-28, 51-55 fractions gained from root of *S. cerino pruinosa* var. *elazigensis* extract showed higher activity than BHT used as standart. In the ABTS cation radical scavenging activity, it was determined that the 48-53, 54-60, 65-69, 76-79 fragments which were gained from the of the aerial part's ethanol extract and 45-50 numbered fractions were gained from the of the root's ethanol extract, showed higher activity than BHT and α -TOC compounds used as standards. When looked at the result of CUPRAC-Copper(II) reduction capacity, aerial parts ethanol extract's 48-53, 65-69, 76-79 numbered fractions and the plant's root ethanol extract's 45-50, 51-55 numbered fractions have the most active copper(II) reduction capacity was determined. According to the activity results generally the aerial parts activities was higher than the root fractions activities was shown.

Acknowledgements: The research was funded by grant: KBAG 114Z801 from TUBITAK, The Scientific and Technological Research Council of Turkey.

Keywords: *Salvia cerino pruinosa* var. *cerino pruinosa*, Antioxidant Activity

The Assessment of Polyethyleneimine Assisted Composite Cryogels for Arsenic [As(III), As(IV)] Removal as Major Groundwater Pollutant

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Aim of the study: Arsenic, one of the common constituent of earth crust, is a carcinogenic and toxic contaminant of groundwater and surface water resources. Especially, groundwater contamination by arsenic remains as major problems due to adverse health effects around the World. Herein, we have developed polyethyleneimine (PEI) assisted-poly(hydroxyethyl methacrylate-glycidyl methacrylate) [poly(HEMA-GMA)] cryogel composites for removal of arsenic (III and V).

Material and Methods: For this aim, PEI was immobilised onto the cryogels via epoxy groups of GMA, and Fe⁺² ions lately were attached onto composite cryogels by imine functional groups. Swelling behaviours and scanning electron microscopy (SEM) were performed for characterization of composite cryogels.

Results: For the optimization of experimental conditions, the effects of pH and initial arsenic concentrations on adsorption were studied by synthetic solutions of arsenic. Afterwards arsenic removal tests were carried out with natural groundwater samples which obtained from Anatolia region, prior to column test the arsenic levels were recorded via ICP-QES. The regeneration of arsenic loaded columns was carried out by NaCl solution, adsorption-desorption cycles was performed 15-times successfully only with a loss of %5 in adsorption capacity.

Keywords: Arsenic Removal, Groundwater, PEI Cryogel Composite Column, Regeneration

The Cymothoid Isopod "*Nerocila* sp." on fishes in Turkey

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Aim of the study: Crustacean parasites constitute about 25% of marine fish parasites and commonly they are represented by Copepods, Brachyura and Isopod (Eiras et. al., 2000). The majority of parasitic isopods consist of members of Cymothoidae, Gnathiidae and Bopyridae families. Cymothoid isopods have been studied for many years. They are found in various parts of the fish body, skin, gills and fins. These parasites can cause gill, eye and internal organ damages, inflammation of the swim bladder. They provide portals of entry for other pathogens in fish. *Nerocila* is a large genus of the family Cymothoidae and living 150 million years include at least 65 species living attached on the skin or on the fins of cultured and wild fish. Many studies were realized related to fish parasites in Turkey and these studies were reviewed by researchers recently. But new reports are being published every day deal with fish parasites. This study aimed to present the *Nerocila* species and their hosts reported in Turkey.

Material and Methods: Studies performed related with *Nerocila* species in Turkey were reviewed and their host and locations listed.

Results: Four species of *Nerocila* (*N. acuminata*, *N. bivittata*, *N. maculata* *N. orbigny*) have been reported from many wild fish in Turkey. *Nerocila acuminata* reported from *Pegusa nasuta*, *Scorpaena porcus*, *Symphodus* sp., *Trachinus draco* and *Uranoscopus scaber*, *Nerocila bivittata* reported from *Belone belone*, *Dentex macrophthalmus*, *Dicentrarchus labrax*, *Gobius niger*, *Hippocampus guttulatus*, *Labrus merula*, *Neogobius melanostomus*, *Pagellus* sp., *Pagellus erythrinus*, *Parablennius sanguinolentus*, *Pegusa nasuta*, *Platichthys flesus*, *Uranoscopus scaber*, *Scophthalmus maximus*, *Scorpaena porcus*, *Scorpaena scrofa*, *Sparus auratus*, *Symphodus* sp., *Symphodus tinca*, *Syngnathus* sp., and *Sciaena umbra*, *Nerocila orbigny* reported from *Dicentrarchus labrax*, *Liza aurata*, *Serranus cabrilla*, *Solea solea* and *Nerocila* sp. reported from *Diplodus puntazzo*, *Mullus barbatus*, *Pegusa nasuta*, *Sciaena umbra*, *Symphodus* sp.

Keywords: *Nerocila*, Fish, Turkey, *Syngnathus* sp.

The Essential Oil Composition of *Hypericum pruinaum* and *H.lysimachioides* var. *spathulatum*

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Aim of the study: The genus *Hypericum* a member of Hypericaceae family, is represented by 100 taxa, 45 being endemic to Turkey (1). In Turkish folk medicine, the genus *Hypericum* is known as “sarı kantaron, kantaron, binbirdelik otu, mayasıl otu” and most of them, especially *H. perforatum*, have been used for the treatment of burns, wounds, hemorrhoids, diarrhea and ulcers. The essential oil compositions of about 50 different *Hypericum* species have been identified in the previous studies. In this study, the essential oil contents of *H. pruinaum* and *H.lysimachioides* var *spathulatum* was analyzed by GC-MS/FID.

Material and Methods: The dried aerial parts of species were cut into small pieces and subjected to hydro- distillation with water for 4 h, using a Clevenger-type apparatus to produce essential oils which were dried over anhydrous sodium sulphate and stored at +4°C until required. The essential oils were diluted by dichloromethane (1:3, v/v) before the GC run. Identification of the compounds was based on the comparison of their retention times and mass spectra with those obtained from authentic samples and/or the NIST and Wiley spectra as well as the literature data.

Results: The major components of the essential oils were identified as α -pinen, β -elemene, caryophyllene, germacrene D and ϵ -Cadinene for *H. pruinaum* and, α -pinen, β -ocimene linolol, caryophyllene and caryophyllene for *H.lysimachioides* var *spathulatum*.

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Keywords: *Hypericum pruinaum*, *H.lysimachioides* var *spathulatum*, Essential Oil, GC-MS/FID

**Essential oil composition of *Thymus longicaulis* C.Presl subsp. *chaubardii* (Rchb.f.)
Jalas (Lamiaceae) from Sandras Mountain (Denizli-Turkey)**

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Aim of the study: *Thymus* L. is an important genus of Lamiaceae family. The genus contains more than 900 species throughout the world. The purpose of the study was to investigate the essential oil content and composition of *Thymus longicaulis* C.Presl subsp. *chaubardii* (Rchb.f.) Jalas. Most of the species of *Thymus* genus are known as “Kekik” in Turkey. There are many different studies performed on *Thymus* species especially on their antimicrobial, antifungal, antiviral, antioxidant, and antidepressant activities.

Material and Methods: *Thymus longicaulis* C.Presl subsp. *chaubardii* (Rchb.f.) Jalas was collected from Sandras Mountain, Turkey. The essential oils were extracted by hydro distillation for 3 h using a Clevenger type apparatus. Essential oils of inflorescence and leaves were extracted separately. The essential oils were stored in dark glass bottles at 4°C until analysis. The essential oil compositions were performed with GC-MS.

Results: The main constituents of *Thymus longicaulis* subsp. *chaubardii* was determined as thymol (41.9%), carvacrol (12.4%), 4-terpineol (7.1%), α -pinene (4.8%), caryophyllene oxide (4.2%), β -humulene (3.7%), α -humulene (3.0%), trans- β -caryophyllene (2.8%) ve p-cymene (2.8%).

Keywords: *Thymus longicaulis* subsp. *chaubardii*, essential oil, Sandras Mountain, Turkey

Essential oil composition of *Nepeta nuda* L. subsp. *lydiae* P. H. Davis (Lamiaceae) from Altınyayla (Burdur-Turkey)

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Aim of the study: *Nepeta* is an important genus of Lamiaceae family. The genus contains more than 250 species throughout the world. The genus *Nepeta* is represented in Turkey by 33 species and altogether 38 taxa, 17 of these being endemic in Turkey (ca. 45%). The purpose of the study was to investigate the essential oil content and composition of *Nepeta nuda* L. subsp. *lydiae* P. H. Davis from Southwestern Turkey. Most of the species of *Nepeta* genus are known as “babaküncü, morküncü” in Turkey. *Nepeta* species are widely used in folk medicine because of their biological activities.

Material and Methods: *Nepeta nuda* L. subsp. *lydiae* P. H. Davis was collected from Altınyayla-Burdur, Turkey. The essential oils were extracted by hydro distillation for 3 h using a Clevenger type apparatus. Essential oils of inflorescence and leaves were extracted separately. The essential oils were stored in dark glass bottles at 4°C until analysis. The essential oil compositions were performed with GC-MS.

Results: The main constituents of *Nepeta nuda* L. subsp. *lydiae* were determined as 1,8 cineole (30.9%), borneol (18.7%) and caryophyllene oxide (14.4%).

Keywords: *Nepeta nuda* L. subsp. *lydiae*, essential oil, Altınyayla, Burdur, Turkey

The Phenolic Content Analysis of *Allium atrovioleaceum* and *A. rhetoreanum* by LC-MS/MS

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Aim of the study: In Turkey *Allium* genus is represented by 179 species. On the Earth, there are more over 800 species depending on *Allium* genus. Species that featured in *Allium* genus are splits some parts between each other. In Turkey, traditionally consumed *Allium* genus like kormen, rock garlic, savage onion, savage garlic, dog onion and shepherd garlic are also used as food or used in treating aim. In this study, secondary metabolic profile of ethanol extracts of *Allium atrovioleaceum* and *A. rhetoreanum* were determined using LC-MS/MS.

Material and Methods: A comprehensive LC-MS/MS method validation was developed for the qualitative and quantitative analysis of 27 phytochemicals. The powdered plant was extracted three times with ethanol (50 mL each) at room temperature for 24 h. Afterwards, the extract obtained was combined, filtered and evaporated under low pressure. Dry filtrates was reconstituted in ethanol at a concentration of 250 mg L⁻¹ and filtered through the 0.2 µm PTFE filter prior to LC-MS/MS analysis.

Results: In general, it was observed that the studied genres are poor in terms of phenolic contents. Ethanol extracts prepared from over ground parts of *A. atrovioleaceum* genus are determined to be richer, especially with regard to rutin ve hesperidin. And also, it was analysed that *A. rhetoreanum* genus is rich in terms of p-coumaric.

Keywords: *Allium atrovioleaceum*, *Allium rhetoreanum* Phenolic content, LC-MS/MS

Total Phenolic, Flavonoid Contents and Antioxidant Assays in the extract of *Urospermum picroides* (L.) Scop. ex F.W.Schmidt

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Aim of the study: Antioxidants play an important role in providing protection to humans against infection and degenerative diseases. Several synthetic antioxidants have many side effects in human beings. However, natural antioxidants are safe and also bioactive. Among the various natural products, phenolic compounds are natural antioxidants that have the character of quenching oxygen-derived free radicals by donating a hydrogen atom or an electron to the free radical. Therefore, recently, wide investigations have been done for identification of plants with antioxidant activity that may be used for treatment of various diseases in human. In this study, we aimed to investigate the total phenolic and total flavonoid contents, and to evaluate the antioxidant potential of *Urospermum picroides* extract.

Material and Methods: *U. picroides* is annual herb of flowering plant in the family Asteraceae known by the common name prickly golden fleece, it is coated in long hairs and bristles. Flowers of the plant were collected from Muğla-Turkey and then air-dried in shade at room temperature, powdered to a fine grain and then extracted with ethanol at 50°C for 6h in a temperature controlled shaker. The antioxidant potential, phenolic and flavonoid contents of ethanolic extract were investigated using *in vitro* assays. 1,1-diphenyl-2-picrylhydrazyl free radical (DPPH·), ferric reducing antioxidant power (FRAP), and phosphomolybdenum assays were used to evaluate the antioxidant capabilities of the extract. Total phenolic and total flavonoid contents of the extract were estimated using standard chemical assay procedures.

Results: When the *U. picroides* ethanolic leaf extract evaluated, we can conclude that the scavenging effects of extract on DPPH radicals increased dose dependently. Free radical scavenging capacity of the extract was determined as 79.22% at 1 mg/ml concentration value. The reducing power of the extract increased with concentration. Reducing power of *U. picroides* was determined as 1.558 nm at 1 mg/ml concentration. Phosphomolybdenum method is based on the reduction of Mo (IV) to Mo (V) by the antioxidants and the subsequent formation of green phosphate/Mo (V) compounds with a maximum absorption at 695 nm. Total antioxidant capacity of the extract were expressed as equivalents of ascorbic acid. Ascorbic acid content of *U. picroides* was found as 17.19 mgAAEs/g. The total phenolic content of the extract was determined as 35.22 mgGAEs/g while total flavonoid content was determined as 24.67 mgQEs/g.

Keywords: Asteraceae, *Urospermum picroides*, antioxidant activity, total phenolic and flavonoid content

Total Phenolic-Flavonoid and Antioxidant Activities of *Nepeta congestavar. congesta* and *Nepeta celiotropifoliavar. celiotropifolia*

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Aim of the study: The genus *Nepeta* is a member of Lamiaceae family and has a worldwide distribution with over 250 species which widely grow in Europe, Asia, North America, North Africa and in the Mediterranean region. In Turkey, *Nepeta* species are represented by 41 taxa (18 of them are endemic) and mostly distributed in East Anatolia and Taurus Mountains. Some *Nepeta* species have been traditionally used as diuretic, diaphoretic, antitussive, antispasmodic, antiasthmatic, febrifuge, sedative, spice and herbal tea. In this study, the total phenolic-flavonoid and antioxidant activities of ethanol extracts of *Nepeta congestavar. congesta* and *Nepeta celiotropifoliavar. celiotropifolia* were determined.

Material and Methods: The antioxidant activities of ethanol extracts of *Nepeta congestavar. congesta* and *Nepeta celiotropifoliavar. celiotropifolia* were determined using DPPH free radical scavenging activity, ABTS cation radical scavenging activity and CUPRAC-Copper (II) reduction capacity methods. The amounts of total phenolic and flavonoid components in crude extracts were determined by expressing as pyrocatechol and quercetin equivalents, respectively.

Results: It was determined that whole parts of two genus (i.e., stems, leaves, flowers, roots and mixed parts) are poor in terms of total phenolic and flavonoid. And also, it was determined that ethanol extracts prepared from flower part of two genres is richer than the other parts in terms of total phenolics and flavonoids. It was observed that antioxidant properties of two kinds are correlated with the total phenolic contents. It was analysed that the flower parts are higher activity according to three methods utilized to determine antioxidant properties.

Acknowledgements: The research was funded by grant: BYP-2016-20585 from Istanbul University

Keywords: *Nepeta*, Total Phenolic, Antioxidant

Total Phenolic-Flavonoid Contents and Antioxidant Activities of *Hypericum lydium* and *H. hyssopifolium* var. *elongatum*

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Aim of the study: *Hypericum* (Hypericaceae) is one of the 100 largest genera that comprise an estimated 22% of angiosperm diversity) with the presence of 484 species from 36 taxonomic sections. *Hypericum* species are well known healing agents in traditional medicine due to various medicinal properties. All *Hypericum* species have been used in Turkish folk medicine under the names “kantaron, peygamber çiçeği, kılıçotu, kanotu, kuzukıran and binbirdelikotu” as sedatives, antiseptics and antispasmodics. In this research, total phenolic-flavonoid contents and antioxidant activities of extracts obtained from various parts of (roots and aerial parts) *Hypericum lydium* and *H. hyssopifolium* var. *elongatum* were compared.

Material and Methods: The amounts of total phenolic and flavonoid components in crude extracts were determined by expressing as pyrocatechol and quercetin equivalents, respectively. ABTS cation radical decolorisation method, cupric reducing antioxidant capacity assays and DPPH free radical scavenging activity were carried out to indicate the antioxidant activity.

Results: It was observed that ethanol extracts prepared from over ground parts of the two studied genus are each in terms of both total phenolics and total flavonoids. The amount of the total phenolic contents of the two species are approximately the same, the *Hypericum lydium* species was found to be richer in terms of total flavonoids. Antioxidant activities were found to be better in the top layer in parallel with the total phenolic content. In general, it has been found that ethanol extracts of both topical and subsoil portions have a high antioxidant potential.

Acknowledgements: The research was funded by grant: DUBAP FEN-15-012 from Dicle University Scientific Research Projects Coordination Unit.

Keywords: *H. lydium*, *H. hyssopifolium* var. *elongatum*, Antioxidant, Total Phenolic

Traditional Use of Some Medicinal Plants in Menteşe (Muğla) Province

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Aim of the study: Ethnobotany, a science that has developed in recent years, is a science that investigates the relationship between man and plants and explores the purposes and uses of plants by humans. The purpose of our research is to bring to light the plants used by the people in our study areas, the local names of these plants, the information about the uses of plants and the usage patterns of these plants and to ensure that the information about the traditions specific to the region are passed on to written sources.

Material and Methods: The survey was conducted in Menteşe district of Mugla province and data were collected by the help of the questionnaires. The information obtained by the questions asked in the direction of the prepared questionnaires constituted the research material. Besides the questions asked in the questionnaire and the information about the purpose and use of the plants used, data such as the regional name of the plant, age, gender, educational status and occupational information of the person who made the questionnaire are mentioned. Herbarium specimens were prepared by collecting and pressing the plants used. In addition, pictures of the plant samples taken from the surveyed people, markets and transporters were also taken and herbarium specimens were prepared. In the diagnosis of the plants, the textbook "Flora of Turkey and The East Aegean Islands" (Davis., 1965-1988) and the System of Seeded Plants (Seçmen et al., 1998) was used. The locality of the identified plants is determined by referring to the book titled Turkish Plant Names (Baytop, 1994) and the Dictionary of Large Plants (Akalın, 1952) and the System of Seeded Plants (Seçmen et al., 1998) and also they are determined by the help of people who attended the questionnaire. The plants which were determined to be used were collected by taking photographs and dried in a suitable manner to prepare herbarium specimens. Herbarium specimens are stored in the Herbarium (MUH) of the Faculty of Science and Letters of Muğla University.

Results: The result of the fieldwork were 37 families and 60 species and subspecies taxa belonging to them. According to the results, Lamiaceae family is the most used 7 different species. Mint, sage, thyme, bark are the most commonly used species. Their head is attracted to Oregano (*Origanum onites* L.) and is said 14 times. Because thyme is very much and easy to find in this region. And since it has been in use for a long time, the benefits of it are well known. The Rosaceae family is in second place with 5 different species and blackberry (*Rubus ceneszens* DC has become more important by being said twice. Poaceae (Graminae) and Cucurbitaceae, represented by 4 different species, are followed by Liliaceae, Asteraceae, Malvaceae and Lauraceae, Caesalpinaceae, which are represented by 3 different species, and the rest of the families are represented by a single species.

Keywords: Ethnobotanic, traditional use, medicinal plant, aromatic plant, Muğla

A Preliminary Study on Current Distribution of Genus *Iberis* L. (Brassicaceae) in Turkey

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Aim of the study: The family Brassicaceae (Cruciferae=Turpgiller) is represented by 49 tribes, 321 genera and 3650 species worldwide. This family contains a large number of agricultural products (*Brassica* L. *Raphanus* L., *Sinapis* L., *Capsella* Medik., *Lepidium* L., *Thlaspi*, etc.) and also *Arabidopsis thaliana* (L.) Heynh, a model organism used in genetic studies for all flowering plants. *Iberis* L. is a genus of flowering plants belonging to the family Brassicaceae and comprises annuals, evergreen perennials and subshrubs native to the Old World. In this study, a preliminary study on current distribution of genus *Iberis* L. in Turkey is presented.

Material and Methods: Materials used for this study were obtained from literature (Flora of Turkey and the East Aegean Islands and Türkiye Bitkileri Listesi (Damarlı Bitkiler)) and herbarium records (AEF, ANK, EGE, GAZI, HUB, ISTE, ISTF, ISTO and MARE).

Results: The genus *Iberis* L. consists of about fifty species of annuals, perennials and evergreen subshrubs worldwide. It is represented by eight species in Turkey; *Iberis carica* Bornm., *Iberis carnosa* Willd., *Iberis halophila* Vural & H. Duman, *Iberis odorata* L., *Iberis saxatilis* L., *Iberis sempervirens* L., *Iberis simplex* DC. and *Iberis umbellata* L.. Two species, *I. carica* and *I. halophila* are endemic to Turkey. In addition to the current distribution of *Iberis* L. in Turkey, general information about morphological characters of the genus, ecological requirements and phytogeographical properties of the species are discussed.

Keywords: *Iberis* L., Brassicaceae, Turkey

A Preliminary Study on the Woody Flora of Karadere Valley (Duzce-Bolu)

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Aim of the study: The Karadere Valley between Bolu and Duzce. Karadere Valley is 20 km away from the center of Bolu and 53 km away from the center of Duzce. The height of the study area ranges from 250 m to 1750 m. Forest, steppe and rocky is the main vegetation types in the area. Determination of woody taxa according to Raunkiaer way of life of Karadere Valley (Duzce-Bolu).

Material and Methods: In this study, woody plant samples were collected as research materials. When samples were being collected, attention was paid to the presence of organs such as roots, leaves and flowers. Locations were recorded where the plants were collected. Collected plants were numbered and dried using newspapers and presses and then kept in freezer. Dried samples were identified in Duzce University Forestry Faculty Herbarium (DUOF).

Results: In the study area, 93 plant taxa belonging to 32 families were identified. According to the life forms described by Raunkiaer (1934); 25 (27%) taxa are Meso-Phanerophytes, 33 (35%) taxa are Micro-Phanerophytes, 24 (26%) taxa are Nano-Phanerophytes and 11 (12%) taxa are Chamaephytes. The most widely distributed families and species in woody plants are: 21 (22%) taxa of *Rosaceae*, 7 (8%) taxa of *Fagaceae*, and 5 (5%) taxa of *Betulaceae*, *Ericaceae*, *Oleaceae* and *Sapindaceae*. In the study area, 5 (5%) are *Acer* ssp. and *Quercus* ssp. and 3 (3%) are *Tilia* ssp. In the study area is an endemic to *Abies nordmanniana* subsp. *equi-trojani* (Aschers. & Sint. ex Boiss.) Coode & Cullen. (LR). The rare woody taxa are *Ilex aquifolium* L. (VU), *Taxus baccata* L. (VU) and x *Malosorbus florentina* (Zuccagni.) Browicz. Some of the trees in the research area are monumental. *Taxus baccata* L. of 27.5 m length (d1.30 = 1.9 m) and *Fraxinus excelsior* L. of 46 m length (d1.30 = 1.9 m). In situ conservation of rare and monumental woody taxa in the region should be ensured that and environmental factors affecting their habitats and habitats should be monitored.

Acknowledgements: It is a preliminary study of the thesis of "Flora of Karadere Valley (Duzce-Bolu)" supported by Duzce University Institute of Science.

Keywords: Karadere, Duzce, Bolu, Woody plant, Endemic

Adaptation of *Cucumis sativus* L. photosynthetic apparatus to red and blue LED lighting

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Aim of the study: Adaptation of the photosynthetic apparatus to illumination includes three main mechanisms: non-photochemical quenching of chlorophyll fluorescence (NPQ), state transitions and changes in the stoichiometry and protein composition of photosystems (PS). NPQ is the fastest of these responses and it allows to minimize the generation of reactive oxygen species (ROS) during an excess of light energy. Previously we have shown the accumulation of ROS and decreased PS2 activity in leaves of cucumber plants grown under red or blue LEDs. Here we show the changes in NPQ parameters in cucumber leaves upon illumination with red or blue LEDs.

Material and Methods: The plants were grown under the white light provided by Philips TL-D 36W/765 fluorescent lamps until the appearance of the first leaf. Then the plants were illuminated for 10 days with red (630-650 nm, variant "R"), blue (450-465 nm, variant "B") light or with red and blue light simultaneously with the ratio of different LEDs 2:1 (variant "RB"), using XLamp XR-C LEDs (Cree, USA) until the full development of the first leaf. Control plants were illuminated with white light (variant "W"). All the plants were grown at a temperature of $23 \pm 1^\circ\text{C}$ and a humidity of $65 \pm 5\%$ with a 14 h photoperiod (irradiance 5 W/m^2 for all variants). The first leaves of the plants were taken for the analysis. The measure of NPQ (NPQ) and the quantum yields of unregulated (ϕ_{NO}) and regulated (ϕ_{NPQ}) energy dissipation were determined using the chlorophyll fluorescence induction method.

Results: In all of the experimental variants, and especially in the variants "RB" and "B", an increase in the NPQ and ϕ_{NPQ} was recorded in comparison with the control. Contrary, value of ϕ_{NO} was higher compared to control only under red LEDs, while in the variant "RB" it was even slightly lower. In the light of high values of the NPQ , a previously shown decrease in the activity of PS2 can be associated with the stress effect of lighting due to a high portion of light actively absorbed by photosynthetic pigments. The values of ϕ_{NPQ} and ϕ_{NO} allow us to state that the excess light energy is effectively utilized by the adaptive mechanism of the NPQ in the variants "RB" and "B", while under red LEDs this mechanism is not effective enough. Considering the previously reported accumulation of ROS under red LEDs, high values of ϕ_{NO} suggest the generation of ROS (primarily singlet oxygen) in chloroplasts during the operation of the photosynthetic apparatus under such lighting. The accumulation of ROS under blue LEDs can be due to other causes. For example, it is known that activation of the blue light receptor cryptochrome leads to generation of ROS.

Acknowledgements: This work was supported by Grants from the Presidium of the National Academy of Sciences of Belarus (№20130811, №20141594).

Keywords: *Cucumis sativus*, lighting, photosynthetic adaptation, LED, non-photochemical quenching, energy dissipation

**Anatomical Research on the Endemic *Rorippa auerea* (Boiss. et Heldr.) Hub.-Mor.
Distributed in Turkey**

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Aim of the study: In this study, anatomical structure of the endemic *Rorippa auerea* (Boiss. et Heldr.) Hub.-Mor. distributed in Turkey is analyzed by light microscopy (LM).

Material and Methods: Root, stem and leaf cross sections of the species analyzed in the anatomical studies. Furthermore, stomata distribution and types were determined by abaxial and adaxial surfaces of the leaf.

Results: Cortex parenchyma was take up wide space and eksodermis was the outermost in the cross section of the root. The surface of stem and leaf surface was sparsely haired. Leaf mesophyll was bifacial (dorciventral) and stomata anisocytic type. In conclusion, it was observed that anatomical structure of the species represents the general anatomical structure of Brassicaceae.

Keywords: *Rorippa*, Brassicaceae, Anatomy, Endemic.

Arbuscular Mycorrhizal Fungi Species in Isparta (Turkey)

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Aim of the study: Arbuscular mycorrhizal fungi species, belonging to Glomeromycota, are symbiotic microorganisms and form associations with the majority of plant species worldwide. Among their beneficial effects, they improve the growth and nutrition of individual plants, promote plant development and enhance the sustainability of ecosystems. In this research, Arbuscular mycorrhizal fungi species in soils of apple growing areas in Isparta, Turkey were determined.

Materials and Methods: Rhizosphere soil samples were collected from the rhizosphere of apple trees from six Provinces of Isparta, Turkey. About 100 g of the soil samples of each were immediately brought to the laboratory, air-dried and processed for AMF isolation using wet sieving and decanting method. Counting of spores was done under microscope. In addition previous studies on arbuscular mycorrhizal fungi species in Turkey were carefully reviewed and added to the species and hosts list.

Results: The arbuscular mycorrhizal fungal species were morphologically identified on the basis of spore size, spore colour and spore wall up to the genera level as per guidelines by INVAM. As a result of the study, the genera isolated were Gigaspora, and Glomus. *Glomus intraradices* was most commonly isolated species.

Keywords: Arbuscular mycorrhizal fungi, *Glomus* sp., Gigaspora sp., apple, soil

Artemiseta lerchianae Formation of Shirvan Steppe (Azerbaijan)

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Aim of the study. *Artemisia lerchianae* formation has a specific role with its geobotanical richness at Shirvan steppe of Azerbaijan. Formation is presented with about 100 species in 30 families and 7 associations.

Material and methods. One of the winter pastures which are the fodder sources for improving of cattle-breeding in Azerbaijan is Shirvan steppe. *Salsola dendroides* and *Artemisia lerchiana* Web. which are more distributed in the region have a similar abundance. But *Artemisia lerchiana* Web. is more strong edificator that organise dominance at mountain areas that forms *Artemisia lerchiana*- *Salsola dendroides* and then clear *Artemisialerchiana*. Flora content of desert and semidesert wormwoods of Azerbaijan enter into the composition of Turan sub-region of Mediterranean flora region. For Azerbaijan flora 16 species of wormwoods described that from them *Artemisia lerchiana* Web. has a specific role in desert and semidesert vegetation of Azerbaijan. Edificator of formation - *Artemisia lerchiana* Web. is a perennial plant in 30 sm height. Aerial part of plant is covered with gray hairs that's why it is silvery-gray color. Roots is in 0,5-1 sm thickness, woody. Lower leaves are petiolate, in 2,5-3,5 sm length, bipinnately. Leaves in middle part are sessile and pinnately. Inflorescence is paniculate. Flowers are small. It is flowering in September-October, fruiting in October-November. Formation is presented with 7 associations: *Artemisialerchiana*-*Salsoladendroides*, *Artemisialerchiana* - *Salsolanodulosa*, (*Artemisialerchiana* – *Climacopteracraea*, *Artemisialerchiana* – *Petrosimonia brachiata*, *Artemisialerchiana*, *Artemisialerchiana* – *Herbosum*, *Artemisialerchiana* – *Ephemeretosum*.

Results. On floristic content there are about 100 species of *Artemisia lerchiana* that they unit in following families: *Asteraceae*, *Poaceae*, *Chenopodiaceae*, *Fabaceae*, *Brassicaceae*, *Apiaceae*, *Caryophyllaceae*, *Malvaceae*, *Papaveraceae*, *Liliaceae*, *Alliaceae*, *Iridaceae*, *Ranunculaceae*, *Fumariaceae*, *Geraniaceae*, *Plantaginaceae* etc. *Artemisia lerchiana* formation in winter pastures has a great role in cattle-breeding.

Keywords: Association, formation, edificator, desert, semidesert

**Assessing Range Shifts under Effects of Climate Change for a Relict Endemic
Dorystoechas hastata Boiss. & Heldr. ex Benth**

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Aim of the study: Ecological Niche Modelling (ENM) predicts the distribution of species in geographic space and, it contributes to the protection of species, their habitats, and ecosystems, via several software. ENM is also a very useful tool to define effects of climate change. Predicting the response of biodiversity to climate change is of great importance due to alerting decision makers to potential future risks. For the purpose of revealing the shift of the species distributions under climatic change conditions, we use ENM with an example of *Dorystoechas hastata* Boiss. & Heldr. ex Benth.

Material and Methods: *D. hastata* is a relict endemic and monotypic species belonging to Lamiaceae family, which is distributed in Antalya, Turkey. Potential habitats of *D. hastata* were assessed with ENM according to current climatic conditions and soil properties. Additionally, effects of climate change were predicted by using MIROC5 (Model for Interdisciplinary Research on Climate) climate change scenario for the year 2070, which was created based on fifth IPCC report. Current and future potential distributions of the species were predicted with Maximum Entropy (MaxEnt) algorithm by combining known occurrence records of *D. hastata* with digital layers of climatic variables.

Results: According to eventual models, *D. hastata* will lose a big part of its potential habitat and it would be constrained in a small area. Unfortunately, the species currently face to anthropogenic threat, overgrazing and excess collecting by the local people. Therefore, it is possible to lose all of its habitat in the near future. Consequently, *D. hastata* will be under local extinction risk because of climate change in the future.

Keywords: Climate change, Maxent, *Dorystoechas hastata*, ecological niche modeling.

Bio-Agriculture and Its Role in Biodiversity Preservation CaseSuliko BERIDZE

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Aim of the study: The very aim of our study represented these issues. We wanted to see how the traditional agriculture forms and methods were effected on environment in the region for the last years. The last decade's analysis show that the monoculture of the agricultures negatively affected on the fertility of the land and its structure, which was followed by the decrease of the land fertility and flushing of the upper fertility layer of the land.

Material and Methods: the subject and the methods of the topic study represent the analysis of the works connected to the environment of the mountainous region populations of the region. During the last 20-30 years, based on the statistical data and factual materials, which we found in ministry of agriculture of Adjara, in the department of statistics, in the management of environment and forest protection, also in the reports of science-research institutes, farmers, in the materials of entrepreneurs and cooperative unions, concerning which we thank to all of them for cooperation in relation to this issue. If we judge based on the obtained materials, we see that, unsystematic cutting of forest, unsystematic use of the water reservoirs, caused desertification and drainage of water on hundreds of hectare agricultural land plots in the several regions of the country and in the mountainous villages of Adjara caused shortage of drinking water, which was followed by erosion and mudflow activation. In addition to this in the world and in our region too, population growth around the cities was followed by agricultural land plot downturn from the circulation due to the necessary communication and construction purposes.

Results: according to the materials obtained, studded and analyzed, we may conclude: Bio agriculture is one of the pars of the biodiversity and it gathers all the experience, uses the latest scientific practical knowledge and it includes it in its activity so that it makes the nature as its companion. Bio agriculture represents the system for leading the agriculture in the village, which economically uses the dignities gifted by the nature and the human. Biosphere of the earth, as one of the parts of the eco-system needs protection. For this reason, the agriculture policy should be carried out in a new way as everywhere as well in Ajara.

Acknowledgements: I thank too much to the organizers and the participants of the conference for expressing the appropriate attention to the issue presented by me.

Keywords: Biosphere, bio-agriculture, biogenesis, ecosystem, ecology

Biodiversity of Landscape Architecture in Absheron

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Aim of the study: In Institute of Dendrology NAS of Azerbaijan has studied research works at first time the scientific bases of floral compositions and their ornamental use in climate conditions of Absheron, flowering time and their determinations to eco-factors resistance. Also there are studied their biological and ecological features plants. During landscape composition creations has used 2 styles: regular and landscape styles. There are determined that the introduced plants from different countries and from local flora ornamental trees, shrubs and herbaceous plants are well adapted in Absheron climate conditions and they are recommended for use in parks, squares, gardens, in various composition creations.

Materials and Methods: The research objects are different species and genus of ornamental trees, shrubs and herbaceous plants. Morphological features of vegetative organs have been studied by method I.T.Vasilchenko and I.Q.Serebryakov, morphology of roots system by method V.A.Kolesnikov. Institute of Dendrology territory is consisted of 12 hectares; it has a beautiful example in Absheron landscape architecture. There are collected many plants in Institute of Dendrology from round the world. Greenhouse stocks in Institute of Dendrology are a living museum of tropical and subtropical plants. By research works have been carried out in Arboretum territory of Institute of Dendrology NAS of Azerbaijan, in parks, streets, squares of different areas of Baku city, in seaside parks, in front of the Republic Palace has been created landscape compositions including of evergreen trees and shrubs, ornamental herbaceous plants. We have used 2 styles of composition structures: regular in form of geometric shapes or landscape. In compositions of the regular style are created different geometrical shapes, such as "Square", "Rhomb", "Circle", "Star", "Rectangle», but in landscape style - the original form of the compositions, such as "Flowers", "Buta", "Map of Azerbaijan", "Tulip", etc. By making compositions are taken into account the biological and ecological characteristics and decorative qualities of plants.

Results: By research works held in Institute of Dendrology and its scientific bases of floral compositions are determined in conditions of Absheron climate their decorative quality uses, flowering time and their resistance to environmental factors. It was found, that introduced from different countries and from local flora ornamental trees, shrubs and herbaceous plants has been well adapted in Absheron climate. They are also prospectively and there are recommended for use in a various composition's creation of parks and gardens design in Absheron. As results of research-scientific works are defined the most perspective ornamental plants used in contemporary creating the compositions in Absheron greening: about 75 genuses of trees and shrubs plants, about 50 genuses of herbaceous plants. The growth phases of plants used currently in greening are going normal. They are divided plants by resistance to local climate-soil conditions used in greening into 3 perspective groups. Every day the Azerbaijan landscape architecture is developed in different city regions. In squares, streets, parks, gardens are created beautiful compositions. We hope that the landscape architecture will be promoted for further development and it will continue to contribute the beauty to Azerbaijan land.

Keywords: Biodiversity, landscape, architecture, decorative, plant

Biodiversity of *Rosa* L. Genus (*Rosaceae* Juss.) in Flora of Nakhchivan Autonomous Republic (Azerbaijan)

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Aim of the study: The genus *Rosa* L. is a critical taxon that presents great difficulties of a taxonomical character. Difficulties in distinguishing individual species of roses arise from large variability of features within particular taxa, mainly caused by hybridization and polyploidy. The aim of the article is taking of inventory of the *Rosa* L. genus in the flora of Nakhchivan Autonomous Republic. The herbarium material and literary sources of the Nakhchivan Autonomous Republic flora, the last composition practical and scientific value of *Rosa* L. genus and its specific gravity in the flora of Nakhchivan Autonomous Republic, to designate participating of the genus were analysed in the vegetable cover of Nakhchivan Autonomous Republic.

Material and Methods: Floristic studies were conducted in the Nakhchivan Autonomous Republic in the years 2004 -2016. The list of species is based on the observations made by the author, relevant data from publications, and the herbarium of the Institute of Botany of Azerbaijan National Academy of Sciences and Institute Bioresources of Nakhchivan Section of Azerbaijan National Academy of Sciences and Nakhchivan State University. The documentary evidence of containing herbarium materials are found in the Herbarium of the Institute Bioresource of Nakhchivan Section of Azerbaijan National Academy of Sciences. The study determined the localities with great diversity due to their richness in species, hybrids, ecotypes and forms. For each locality the coordinates and the altitudes were determined by using GPS.

Results: Between 2004 and 2016 investigation of gathered herbarium materials species of *Rosa* L. of genus from the areas of Nakhchivan Autonomous Republic with the aim of study their systematic and ecological characteristics. As a result of this research it has been determined that nowadays genus of *Rosa* L. counts 34 species in the flora of Nakhchivan Autonomous Republic. It is established that 30 species grow in the territory (*Rosa afzeliana* Fries, *R. brotherorum* Chrshan., *R. boissieri* Crep., *R. buschiana* Chrshan., *R. canina* L., *R. chomutoviensis* Chrshan. & Laseb., *R. corymbifera* Borkh., *R. floribunda* Stev., *R. foetida* Herm., *R. haemisphaerica* Herm., *R. hraciana* Tamamsch., *R. iberica* Stev. ex Bieb., *R. karjagii* Sosn., *R. kazarjani* Sosn., *R. marschalliana* Sosn., *R. nisami* Sosn., *R. orientalis* Dupont ex Ser. (*R. atropatana* Sosn.), *R. sachokiana* P.Jarosch., *R. sosnovskyana* Tamamsch., *R. subafzeliana* Chrshan., *R. rapinii* Boiss. & Bal. (*R. bungeana* Boiss. & Buhse), *R. pimpinellifolia* L. (*R. spinosissima* L.), *R. pulverulenta* Bieb, *R. azerbaijdzhanica* Novopokr. & Rzazade, *R. teberdensis* Chrshan., *R. tomentosa* Smith, *R. tschatyrdagi* Chrshan., *R. tuschetica* Boiss., *R. villosa* L. (*R. pomifera* Herm.), *R. zangezura* P. Jarosch.) as wild and 4 species (*R. centifolia* L., *R. chinensis* Jacq., *R. damascena* Mill., *R. multiflora* Thunb.) cultivated. 9 species from them are Caucasian, and 2 Azerbaijan endemics. The species of *Rosa foetida* *bicolor* Herm., *R. nisami* Sosn., *R. sosnovskyana* Tamamsch., *R. rapinii* Boiss. et Bal., *R. pimpinellifolia* L., *R. tuschetica* Boiss. have been included in the Red Book of Nakhchivan Autonomous Republic due to rare and endangered generation and protection ways have been shown.

Keywords: *Rosa* L, wild and cultivated species, Red Book of Nakhchivan Autonomous Republic

Biomorphological Analysis of *Juniperus* Species in Azerbaijan.

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Aim of the study: *Juniperus communis* L. is an important element of Northern West forests of Azerbaijan. Their ability to grow under the hard conditions makes them particularly suited for afforestation programmes in this ecological region. But, excessive use of juniper wood and leaves by animals, habitat fragmentation and low regeneration are the main reasons of conservation *Juniperus* populations in this region. Ecological and biomorphological analysis of this shrubs helps to prevent any unuseful changes in their population. The present study was carried out to biomorphological differences of *Juniperus communis* individuals in population.

Material and Methods: Biomorphological analysis conducted in accordance with the system of independent morphological units of L. Gatsuk. Within the virginile period the following groups are distinguished to: seedlings (pl) , juveniles (j) , transitional forms from juveniles to matures – immatures (im) and mature individuals (m) . Fifty species of *Juniperus communis* have been studied and their biomorphological stages were described. In biomorphological stage identifications visual tree assessment methods have been used.

Results: Fifty species of *Juniperus* have been studied in Northern West part of Azerbaijan, their biomorphological stages were identified visually by observations. Most of studied plants were mature individuals and immatures, 54 and 40 % respectively. This tendency shows the dangerous conservation of *Juniperus communis* population and the importance of their protection.

Keywords: *Juniperus*, seedling, juveniles, immatures, matures

***Arabidopsis thaliana* and wheat AP endonucleases contain the NIR function**

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Aim of the study: Apurinic/aprimidinic (AP) endonucleases are important DNA repair enzymes involved in two overlapping pathways: DNA glycosylase-initiated base excision (BER) and AP endonuclease-initiated nucleotide incision repair (NIR). In the BER pathway, AP endonucleases cleave DNA at AP sites and 3'-blocking moieties generated by DNA glycosylases, whereas in NIR, the same AP endonucleases incise DNA 5' to a wide variety of oxidized bases. The flowering plant *Arabidopsis thaliana* contains three genes encoding homologues of major human AP endonuclease 1 (APE1): Arp, Ape1L and Ape2. It has been shown that all three proteins contain AP site cleavage and 3'-repair phosphodiesterase activities. However, it was not known whether the plant AP endonucleases contain the NIR activity. To characterize the DNA repair activities involved in the BER and NIR pathway we have used affinity-purified the *A. thaliana* and wheat proteins from *E. coli* expressing the His-tagged form of atArp and wArp. To examine DNA substrate specificity of plant AP endonucleases, DNA cleavage activities of atARP and wARP towards 30-mer THF•T and α dA•T duplexes (in which THF and α dA residues were in position 11) were measured under reaction conditions optimal for the hAPE1-catalyzed AP endonuclease and nucleotide incision activity, respectively. The *Arabidopsis thaliana* mutant lines SALK_021478 (*arp*-/-), harboring T-DNA insertions in the ARP gene were used to test the sensitivity to MMS, *t*-BuO₂H and H₂O₂ exposure.

Results: Here, we report that ARP proteins from *Arabidopsis* and common wheat (*Triticum aestivum*) contain NIR and 3'→5' exonuclease activities in addition to their AP endonuclease and 3'-repair phosphodiesterase functions. The steady-state kinetic parameters of reactions indicate that *Arabidopsis* ARP cleaves oligonucleotide duplexes containing α -anomeric 2'-deoxyadenosine (α dA) and 5,6-dihydrouridine (DHU) with efficiencies ($k_{cat}/K_M = 134$ and $7.3 \mu M^{-1} \cdot min^{-1}$, respectively) comparable to those of the human counterpart. However, the ARP-catalyzed 3'-repair phosphodiesterase and 3'→5' exonuclease activities ($k_{cat}/K_M = 314$ and $34 \mu M^{-1} \cdot min^{-1}$, respectively) were about 10-fold less efficient as compared to those of hAPE1. Expression of ARP greatly reduces the sensitivity of AP endonuclease-deficient *Escherichia coli* *xth nfo* and *Saccharomyces cerevisiae* $\Delta apn1 \Delta apn2$ strains to both alkylating and oxidizing agents. Furthermore, homozygous *A. thaliana arp*-/- mutant exhibits high sensitivity to methyl methanesulfonate and *tert*-butyl hydroperoxide, but not to H₂O₂, suggesting that ARP is a major AP endonuclease that removes abasic sites and specific types of oxidative DNA base damage. Taken together, these data establish the presence of the NIR pathway in plants and suggest its possible role in the repair of DNA damage generated by oxidative stress.

Keywords: DNA repair; nucleotide incision repair; base excision repair; AP endonuclease.

Changing Some Characteristics of Actinidia in Connection with Orographic Conditions

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Aim of the study: Recently, in the world sub-tropical plant growing a special attention was attracted to Actinidia. Its fruit is a valuable dietary supplement for human nutrition. Especially successful is Mskhvilnakhofa "Chinese Actinidia" and "Arguta", which are less sensitive towards low temperatures, insects and diseases. It can be planted in soils, where chemical composition does not allow cultivating tea, and harsh climatic conditions – citrus culture. Among the Actinidia species "Haivard" is distinguished with its higher storage capacity. According to the abovementioned the goal of our work was to study some of the highlights of the fruits of "Haivard" from the various heights above sea level and weather conditions. We have studied physical characteristics and taste properties of fruits of Actinidia vegetation cultivated at various heights above sea level.

Methodology and materials: The microfield experiment has been set under the kiwi seedlings planted at 100 and 928 m height, on brown soils. The research was repeated fivefold with the method of tree-partition. Each option included five plants, the total plants used in the experiment was 10 according to heights from sea level. The plant nutrition area was 2×5=10 m². Before setting up the experiment a pre-registration of kiwi harvest was made. We have studied the agrochemical indicators of the trial venue, the plant vegetation characteristics according to the development phases. The observation was conducted for two years and fruit quality parameters were determined in the harvest. Agrochemical research mini-device Palintest-500 and high pressure liquid chromatograph were used for the research.

Results: 1. The vegetation period of Chinese Actinidia species - Haivard cultivated above sea level -100 and 928 m in different climatic conditions of Adjara Region starts 20-25 days later than the plant vegetation of the same species cultivated in the Black Sea coastal subtropical line. However, the fruit ripens in late November. 2. 64% of fruits of Chinese Actinidia variety – Haivard cultivated in highland climate conditions belongs to the highest category of the fruits, which are suitable for fresh consumption and fully meets the market requirements, while the remaining 26% are the fruits of other category and they can be used in processed form, which will improve farmers' economic potential. 3. In fruits of Chinese Actinidia variety – Haivard cultivated in highland climate conditions the balanced consistency of organic acids and monosaccharides result in high taste properties in fruits, which provides the possibility of cultivating plantation of Haivard species in the abovementioned weather conditions, which would have both, consumer and industrial purposes.

Key words: Actinidia, physical characteristics, taste properties, vegetation, orographic factors, climatic conditions.

Classification of Different Eastern Hyacinth (*Hyacinthus orientalis* subsp. *orientalis*) Cultivars by Neural Network Method

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Aim of the study: The main objective of the current study classification of the four Hyacinth (*Hyacinthus orientalis* L.) cultivars ("Blue Jacket", "Carnegie", "City of Haarlem", and "Jan Bos") grown in the greenhouse conditions by means of Artificial Neural Networks. This method have been successfully applied to problems in pattern classification, function approximations, optimization, and associative memories. In this work, Multilayer feed-forward networks are trained using back propagation learning algorithm. The categorization and recognition was made on the basis of plant attribute measurements, such as leaf length, flower length, stem thickness and leaf size.

Material and Methods: The data set contains 4 classes of 36 instances each, where each class refers to a cultivar of Hyacinth plant. The data base contains the following attributes: leaf length in cm, flower length in cm, stem thickness in cm, leaf size in cm. Classes are: Blue Jacket, City of Haarlem, Jan Bos, Carnegie. The goal of this work is to use an Artificial Neural Network to classify a variety into its category using the above mentioned four features. This is done by using Multilayer Perceptron (MLP) feedforward network using Backpropagation training algorithm. The data is divided as follows: Training inputs (4×115): 4 rows by 115 columns. The number 4 represents the features which will be presented. Target outputs (4×115): There are three outputs for each feature vector. There are 115 data for training and will be the targets for the input vectors. Test inputs (4×29): Once the network has been trained, it has to be tested on data that it has not seen before. 29 vectors are used for testing the network. Test outputs (4×29): These are the expected classes for the test inputs. The simulated outputs of the network will be compared to these actual classes in order to determine the performance of the trained network. For this work a STATISTICA 13.2 Package Program was used.

Results: The results of simulations illustrate the effectiveness of the neural system in Hyacinth class identification. In this paper, it is proposed to have a method for classification of flowers using Artificial Neural Network (ANN) classifier. The ANN has been trained by 115 samples to classify 4 classes of flowers. The maximum accuracy given by the ANN methods is 92%. By using this pattern and classification, in future upcoming years the unknown data can be predicted more precisely.

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Keywords: ANN, classification, flower, *Hyacnithus orientalis* L., leaf, stem

Distribution Mushrooms in Shahbus Region of Nakhchivan Autonomous Republic (Azerbaijan)

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Aim of the study: This paper provides information on the diversity of macrofungi in Nakhchivan Autonomous Republic of Azerbaijan.

Material and Methods: The research was conducted during the 2005-2016 period. Research was undertaken in 25 localities in Nakhchivan Autonomous Republic. Collection and storage of ascoma and basidioma were done using standard techniques (A.S.Bondartsev & R.A.Singer, 1950). The specimens were identified by referring to the following sources: S.P.Švarcman and N.M.Filimonova (1970), P.E.Sosin (1973), L.N.Vasilyeva (1973), M.V.Gorlenko et al. (1980), M.Moser (1983), G.Serzhanina and I.Zmitrovich (1986), A.E.Kovalenko (1989), L.Hansen and H.Knudsen (1992), E.L.Nezdoymynogo (1996), and M.A.Bondartseva (1998). The names of the taxa, families, and author citations were listed according to P.F.Cannon and P.M.Kirk (2007) and P.M.Kirk et al. (2008).

Results: During 2005-2016 a complex research has been conducted for species composition and systematic structure of mushrooms distributed in Shahbus region of Nakhchivan AR, area of distribution, environmental features of species, regularity of distribution of mycobiota along vertical zones, rare species and issue of their preservation. It is determined that currently species composition of the territory consists of 93 species, related to 57 genus, 25 families, 7 orders and 2 classes. From them 16 families, 45 genera and 84 species were recorded first time for the mycobiota of Nakhchivan AR, 4 genera *Mycenastrum* Desv., *Tephrocybe* Donk, *Leucocortinarius* (J.E.Lange) Singer, *Trichaster* Czern. and 18 species - *Leucoagaricus nymphaeum* (Kalchbr.) Bon., *Lycoperdon nigrescens* Pers., *L. spadiceum* Schaeff., *Calvatia gigantea* (Batsch) Lloyd, *Mycenastrum corium* (Guers.) Desv., *Agrocybe arenicola* (Berk.) Singer, *Psilocybe semilanceata* (Fr.) P.Kumm., *Pleurotus eryngii* (DC.) Quel., *Clitocybe candida* Bres., *Tricholoma sejunctum* (Sowerby) Quel., *Leucocortinarius bulbiger* (Alb. & Schwein.) Singer, *Tephrocybe rancida* (Fr.) Donk, *Psathyrella frustulenta* (Fr.) A.H. Smith., *Naucoriacerodes* (Fr.) P. Kumm., *Hygrophorus nitidus* Berk. et M.A.Curtis., *Marasmius collinus* (Scop.) Singer, *Geastrum minimum* Schwein., *Trichaster melanocephalus* Czern. for mycobiota of Azerbaijan. Results of the detailed analysis laid a ground to specify ecological and biological spectrum of the territory's mycobiota: 44 humus saprotroph species, 22 xylotroph species, 11 litter saprotroph species, 13 mycorrhizal species and 3 coprotroph species. It has been defined that mid-mountainous zone of the territory is represented mostly by 85 mushrooms. Lowland has 25 species and alpine zone 18 species. General species for the comparison zones species were calculated: low-mountainous-mid-mountainous 22 species, mid-mountainous-alpine 14 species. 3 species are met in all highland zones. 42 species of the distributed mushrooms in the territory were edible, 30 toadstool and 6 of them poisonous.

Keywords: Mushrooms, Shahbus region, Nakhchivan Autonomous Republic

Diversity of Fruticose Lichens of Azerbaijan

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Aim of the study: Based on the herbarium material and personal collections of the author, using literary data, the species composition of fruticose lichens has been established which includes 122 species from 7 orders, 10 families and 22 genera. Families *Cladoniaceae*, *Parmeliaceae* и *Ramalinaceae* are marked to have prevailing species diversity. The purpose of our work is establishment of species diversity of fruticose lichens growing in the territory of Azerbaijan.

Material and methods: Herbarium collection gathered by various collectors in various years and original collections has served as the material for this paper. Processing of the material was held according to the methodology commonly accepted in the lichenology (Determiner, 1974)

Results: As a result of generalization of the lichen data on fruticose lichens of Azerbaijan the level of their species diversity was determined. In the local lichen flora this group of lichens is represented by 122 species comprised of 7 orders: *Arthoniales*, *Caliciales*, *Candelariales*, *Lecanorales*, *Leprocaulales*, *Teloschistales*, *Pertusariales*; 10 families: *Cladoniaceae*, *Imadophiliaceae*, *Leprocaulaceae*, *Parmeliaceae*, *Physciaceae*, *Ramalinaceae*, *Roccellaceae*, *Sphaerophoraceae*, *Stereocaulaceae*, *Teloschistaceae* and 22 genera. The bulk volume of the species diversity of fruticose lichens is made up by the representatives of three families: *Parmeliaceae*, *Cladoniaceae* and *Ramalinaceae* amounting in sum 108 species (87 % of the total number of species). In generic spectrum four genera are represented with prevailing species diversity: *Cladonia* (49 species), *Ramalina* (15), *Usnea* (14), *Bryoria* (10). Great diversity of fruticose lichens has been marked basically in the forest community of the researched area. These are representatives of nemoral species from genera: *Anaptychia*, *Evernia*, *Ramalina*, and also boreal species from genera: *Cladonia*, *Usnea*, *Bryoria*. Among fruticose lichens there are both widely spread species such as *Anaptychia ciliaris* (L.) Körb., *Cladonia fimbriata* (L.) Fr., *C. chlorophaea* (Flörke ex Sommerf.) Spreng., *C. pocillum* (Ach.) Krognot, *Evernia prunastri* (L.) Ach., *Ramalina fraxinea* (L.) Ach., *R. pollinaria* (Westr.) Ach. etc. and rare: *Bryoria furcellata* (FR.) Brodo & D. Hawksw., *B. fuscescens* (Gyeln.) Brodo ex D. Hawksw., *Cetrarielladelisei* (Bory ex Schaer.) Kämefelt & A. Thell., *Cetraria islandica* (L.) Ach., *Cladonia borelalis* S. Stenroos, *Tornabea scutellifera* (With.) J.R. Laundon, *Usnea longissima* Ach., *U. reticulata* Vain. etc. As for types of substratum epigeous lichens including 57 species, epiphytic - 54 species and epilithic – 11 species have been distinguished.

Keywords: Azerbaijan, diversity, fruticose, species, lichens

The Rules of Traditional Use of Essential Oils and Extracts of *Melissa officinalis* L. Species

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Abstract: Ether-oils and extracts from surface parts and seeds of *Melissa officinalis* L. species are widely used by Azerbaijanians. Plants spread in forests, small ravines, green valleys and high mountain zones. 0.2% - consist ether-oils and also B1, B2, C vitamins, tanins, various organic acids, flavonoids and cumarins. Leaves have sedative and antispasmodic effects. Used in perfumery for lemon smell of ether-oils in leaves.

Materials and Methods: The research was carried out in 2012-2017. Ether-oils have been obtained by the Ginsberg methods. Data about using plants for phytotherapy have been collected on the base surveys of local communities and by traditional methods.

Results: *Melissa officinalis* L. - local names: medical melissa, lemon-mint, honey-grass, badrinj. All parts of plant are raw material, fruits are especially valuable. Top parts of stems with leaves have been collected in budding periods and in flowering time. Plants must to dry on attic or under sunshade, well-ventilated shady areas, temperatures not over 35°C. Raw materials must to detention in special conditions for obtaining ether-oils. Detention periods is 3 years. From row materials have been received 0.2% ether-oils, the main ingredients of oil – cytral (62%), cytronnellal, geraniol and linol. Shredded leaves of medical plants *Melissa officinalis* are sedative and antispasmodic. Preparates received from them in medical practice have anticoagulant and antiaggregant effects. Melissa brew used successfully against neurosis, fatigue, vegetative-vascular dystonia. And also against intestinal dyskinesia and intestinal colic, cholecystitis, cholangitis, kidney stones, urinary tract diseases, stenocardia and climacteric syndrome. Plant have good effects with external application under anti-bacterial, anti-virus influence on the skin and on furunculosis, herpes, stomatitis and paradantosis. Combined use extracts of plant and tincture have sedative-brewing, antispasmodic, analgesic, hypotensive effects. Melissa regulates the secretion of gastric juice, reduces cramps, flatulence, dyskinesia, removes phenimental deficiency and improves metabolism. Local communities used extracts from their leaves against facial rash. Poultice prepared from them have strong anti-virus effects. Combination of extracts and ether-oils in medicine are meets as "Dormiplant", "Novo-Passit", "Persen", "Nervoflukus", "Gastrovit", "Energotonic", "Altalex" drugs preparates. Plant can be the main components of the sedative drugs. Preparates from melissa have sedative, spasmolytic and antibacterial effects. Prevents shortness of breath, heart pain, tones up and strengthens the nervous system. The therapeutic effect of ether-oil is due to the high content.

Keywords: Traditional treatments, *Melissa officinalis*, phytotherapy, folk medicine

Ecological Structure of Flora of Vascular Plants of the Buiratau State National Nature Park of the Central-Kazakhstan Small Hill

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Aim of the study: To characterize the general ecological structure of the flora of vascular plants of the Buiratau State National Natural Park.

Materials and methods: The reports of the expeditions and the collected herbarium materials stored in the SNNP "Buiratau" were the materials for the analysis of the flora and ecological structure. The main method of studying the floristic composition was route-reconnaissance. Cameral processing was conducted according to the conventional botanical technique. "Flora of Kazakhstan", "Specifier of plants of Central Asia" was used while determining the plants. All names of species are given by S.D. Cherepanov's report "The list of vascular plants of Kazakhstan". Rare and endangered species are identified using the "Red Book of the Kazakh SSR".

Results: The territory of the SNNP "Buiratau" is located within the steppe zone in the transition zone between the sub-zones of moderately arid and dry steppes. Studies of the flora of the whole territory of the Central-Kazakhstan Small Hill showed its considerable species diversity. The ecological analysis of vascular plants carried out on the territory of the SNNP "Buiratau" revealed the following groups: mesophytes - 227 species, which amounted to 45.5% of the total number of flora, gigromesophytes - 11 (2.2%), xeromesophytes - 75 (15, 06%), meso-hygrophytes - 22 species (4.41%), hygrophytes - 32 species (6.42%), xerophytes - 129 species (25.9%) and succulents - 2 species (0.4%). The ratio of ecological groups indicates a significant predominance of mesophytes in the flora of the SNNP "Buiratau", which confirms the attribution of this flora to boreal type flora. In the flora of vascular plants of the SNNP, the most dominant position is perennial herbaceous plants - 307 species, accounting for 61.6% of the total number of species. Annual and biennial plants are represented by 96 species (19.2%). Studies of the ecological structure of the flora of vascular plants in the Buiratau SNN of the Central-Kazakhstan Small Hills showed that the territory of the park is a natural complex with the presence of boreal relics.

Key words: Flora, national park, protection, biodiversity

Edible Flowers in Terms of Plant Biodiversity

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Aim of the study: This work was done to raise awareness of edible flowers.

Material and Methods: For the study a set of both printed and electronic material were examined and the findings were analyzed empirically.

Results: Edible flowers have been used in terms of nutritional value, medical effect, taste, shape and aesthetic appearance for centuries in many countries of the world. It is known that flowers in the Ancient Greeks, Romans, Chinese, Middle Eastern and Indian cultures were used in the kitchen. Some edible flowers can be given as examples. *Abelmoschus aesculentus*, *Agastache foeniculum*, *Alcea rosea*, *Allium schoenoprasum*, *Anethum graveolens*, *Begonia*, *Carthamus tinctorius*, *Centaurea cyanus*, *Anthemis nobilis*, *Cercis canadensis*, *Chrysanthemum*, *Melissa officinalis*, *Tagetes erecta*, *Rosa* spp., *Lavandula*, *Tropaeolum majus*... Consumable flowers in edible flowers can be consumed only as flower petals, flower beds, pots and petals, male and female organs as well as petals. These flowers can be consumed freshly or as dried (vinegar, liqueur, tea, candy) as processed. Some of the plants used for medical and aromatic purposes may be flowers, ornamental plants and flowers of some fruit trees. The pollen contained in the flowers is one of the most important when considering the chemical composition. It is an important protein, amino acid, carbohydrate, carotenoid, flavonoid source. The flowers contain; Fructose, glucose, sucrose, aminoacids, inorganic oils, phenolic materials. The colored petals of flowers are rich in C, A and E vitamins, antioxidants and mineral substances. Weed flowers and many edible flowers used for eating can be safely used, but some of the flowers are poisonous and invincible should not be forgotten. Like laurel, yarrow, aconitum flowers. It is also important that these edible flowers to be used for consumption do not contain pesticides. In addition to these, these flowers need to know and consume allergic reactions of humans.

Keywords: Edible flowers, Biodiversity

Endemic Species Residing to the Genus *Hypericum* L. in Azerbaijan

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Aim of the study: *Hypericum* L. is the genus of flowering plants in the family *Hypericaceae*. The genus comprises almost 400 species of small shrubs and herbs, which widespread in the moderate, subtropical and mountain areas of the tropical countries, especially at the Mediterranean region. Species of *Hypericum* do not grow the habitats that are extremely hot, cold or dry. Taxonomy of this genus, have not been studied for many years in Azerbaijan. Only few species of genus have been studied by R.Rzazade (1955). Our aim is to study the endemic species of the *Hypericum* growing in Azerbaijan.

Material and Methods: Plant materials were collected in 2015-2016 in Qobustan and Quba districts of Azerbaijan. Also the herbarium specimens stored in the Herbarium fond of the Institute of Botany ANAS were used in this study. Classic comparative morphological methods were used for identification of species.

Results: 17 species of *Hypericum* genus was registered in Azerbaijan (Конс. Фл. Кавказа 2012). These are *H.androsaemum* L., *H.apiculatum* N.Robson., *H.apricum* Kar et Kir., *H.davisii* N.Robson., *H.elongatum* Ledeb., *H.formosissimum* Takht., *H.hirsutum* L., *H.linaroides* Bosse., *H.lydium* Boiss., *H.nummularoides* Trautv., *H.perforatum* L., *H.pseudolaeve* N.Robson., *H.scabrum* L., *H.tetrapterum* Fries., *H.theodorii* Woronov., *H.venustum* Fenzl., *H.xylosteifolium* (Spach) N.Robson. Only two of them are endemic species for Azerbaijan - *H.apricum* (syn: *H.karjagini*) and *H.theodorii*. *H.apricum* - perennial herb, stems with rather few scattered amber glandular dots. Leaves are sessile, not glaucous, 1-veined or with up to 3 pairs of lateral branches from lower half, with laminar glands pale and sometimes a few black, marginal glands pale or 1-2 black; lamina smaller, narrow, apex obtuse to rounded. Inflorescence narrowly cylindrical, 1-3-flowered, without flowering branches. Sepals unequal to subequal, free or united, imbricate or elliptic (or rarely ovate-elliptic) to oblong subacute to rounded; veins 3, with regular sessile globose black glands or eglandular. Petals rather pale yellow, sepals obovate-oblongate, shortly black-glandular-ciliate. Stamens filaments not red-tinged. Ovary ovoid, shortly acuminate; styles 3. Capsule ovoid-acuminate to ovoid. Seeds long dark brown. Flowering period from May till July. It grows in dry slopes and limy rocks. Found in Kuba. *H.theodorii* - perennial herb, stems numerous thin branched, absent-mindedly red glandular. Leaves sessile, elliptic, 5-11 mm. Inflorescence corymbose. Sepals equal, free, ovoid with black ciliate-glands on edge, 3 mm. Petals yellow, are longer than sepals, on edge ciliate-glandular. Stamens are numerous. Ovary ovoid with 3 styles. Capsule brown, ovoid to ovoid-lanceolate, 11 mm. Seeds slightly curved, and longitudinally striped, 2 mm. Flowering period from July till August. It grows in clay slopes. Found in Kobustan.

Keywords: *Hypericum*, Azerbaijan, species, herbs, petals, glands, seeds

Ethnobotany: Use of Wild Medicinal Plants by the Local Population in Azerbaijan

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Abstract: Ethnobotany inquiries about the use of plants by indigenous peoples were carried out in Tovuz, Agstafa and Gazakh districts of Azerbaijan. Up to 100 plants are used as medical by local population in Tovuz-Gazakh districts have been conducted in result of studies. The population use the same medicinal plants for different diseases by different ways, depending on residence place have been revealed. Data about use information of some plants have been obtained for the first time.

Materials and Methods: The research was put into practice within Azerbaijan territory of Lesser Caucasus botanical-geographical region above the sea level 291172m in Tovuz, Agstafa and Gazakh districts in 2013-2017. Field studies were conducted by the route method and covered all the belts. Herbarium materials have been collected. Ethnobotanic methods and techniques have been used during interviews. Interviews were conducted among more than 200 people in 56 villages of research area. First, informations about local names of plants, rules for their use, spreading, information about the plant collection and their drying commonly used for simple and widespread diseases have been collected. Special blank forms for questionnaires were prepared. Use of plants in accordance with ancient traditions (brewing, tincture, etc.) in veterinary medicine, beekeeping, children and adults diseases have been learned from local population. Interviews were mainly from the older generation.

Results: As you know, ways to use plants have been formed on the basis of customs and traditions of different peoples, on different millennial cultures experience. Different nations use and acceptance medicinal plants by different ways on the basis of national traditions have been shown experiments. Ancient culture of plants using by turkic-speaking peoples described in a number of works. The list of plants, which generally rerepresented by 34 family, used in the treatment of common diseases have compiled during the research. Species used for medicinal goals are representatives of *Asteraceae*, *Fabaceae*, *Asphodelaceae* family, and for numerous in species composition *Poaceae* family. Species of some families have been represented only by one species but broad scope of treatment. Tincture prepared from *Ephedra aurantica* Takht. et Pahom. species use from stomatitis and parodontosis by population of Asrik, Agbulag, Boyuk gishlag of Tovuz districts. However, population of the Qazakh district are unaware about this plant for the same disease. The most commonly known herbs are the interviews: thyme, mint, polygonum, hawthorn, balm, hips, immortelle, cephalaria, St. John's wort, anise, thistle, caraway, cowparsnip and etc. In some cases, animal products are applied to the addition with medicinal plants. Generally up to 100 plant used as a medicinal plants in Tovuz-Gazakh districts and covers about 30 diseases. During the observations were found plants, the medicinal properties of which are not known in the literature and new data on the medicinal properties of the 5 plants collected in this area were first identified as a result of the studies.

Keywords: Medicinal plants, local populations, ethnobotany

Flora of Kefken Island (Kocaeli/Turkey)

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Aim of the study: Because Kefken Island is a small island that is 210000 m² and its flora was never worked, this study aims to explore the vascular plant biodiversity of the Kefken Island.

Material and Methods: In this study, field work was done to find and collect the vascular plants on the island. After that, collected plants were pressed to dry and prepared for herbarium and identification. At last, collected plants were identified by using Flora of Turkey and the East Aegean Islands by Davis, P.H.

Results: 70 different taxon of plants were identified. Identification process is continuing and more field work will be done in coming weeks.

Acknowledgements: Special thanks to MSc student Maaz KESERCİ from Biology Department of Kocaeli University for his help in field work and identification of plants.

Keywords: Flora, Kefken Island, Kocaeli, Turkey

Garden nasturtium (*Tropaeolum majus* L.) With Regard To Plant Biodiversity

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Aim of the study: This work was done to raise awareness as edible flowers garden nasturtium (*Tropaeolum majus* L.).

Material and Methods: For the study a set of both printed and electronic material were examined and the findings were analyzed empirically.

Results: Latin flower is the most popular among the edible flowers. Leaves and flowers are consumed as raw and have similar water cress. Flowers can be consumed fresh as dried or processed (vinegar, liqueur, tea, candy). Latin flower is an unknown-exotic plant- that is not recognized in our country (in TURKEY) in terms of consumption of flowers and leaves. This plant, which can consume leaves and flowers, is used to decorate the gardens in many countries and spontaneously grows in many regions.

Keywords: Garden nasturtium (*Tropaeolum majus* L.), Exotic plant

**Genetic Diversity and Population Structure of Invasive *Bidens frondosa* L.
(Asteraceae) in Lithuania**

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Aim of the study: *Bidens frondosa* is rapidly spreading invasive species in Europe. For the first time in Lithuania it was observed in 1982 (Gudžinskas, 1997). Now it has spread on most riversides, open, frequently visited places. Numerous its populations are found on both sides of the Curonian Lagoon. *B. frondosa* can spread by rivers, riparian corridors, over long distances. It is also distributed by animals. The aim of this study was to investigate genetic diversity and structure of *B. frondosa* populations, from different riversides.

Material and Methods: *Bidens frondosa* plants were collected on riversides and the Lagoon habitats. Total genomic plant DNA was isolated from young leaves. DNA isolation was carried out using the genomic DNA purification kit (Thermo Fisher Scientific Baltics) following the manufacturer's instructions with some modifications. Genetic analysis of populations was carried out using ISSRs (Inter-Simple Sequence Repeats) markers. Genetic analysis of populations was carried out using ISSRs (Inter-Simple Sequence Repeats) markers. The hierarchical AMOVA (analysis of molecular variance) was performed in GenAlEx 6.5 (Peakall & Smouse 2012) to evaluate partitioning of diversity within (PhiPT) and among species (PhiRT). Shannon's diversity index (I) was calculated using POPGENE version 1.32 (Yeh *et al.* 1997).

Results: Our results revealed high genotypic diversity of *B. frondosa* populations. Comparing the parameters of genetic diversity of the populations with those of soil tests (N and P), we found that DNA polymorphism was higher in the populations that contained the increased amounts of P and N in the soil. Therefore, anthropogenic factors that increase eutrophication (intensive agriculture, urbanization) supposedly create favourable conditions for the spread of invasive species, and thereby positively effect on adaptation of this species to the new conditions.

Acknowledgements: This research was funded by a grant (No. SIT-2/2015) from the Research Council of Lithuania.

Keywords: *B. frondosa*, genetic diversity, ISSR markers.

Genetic Diversity of *Urtica* spp. in Ordu Province of TurkeyOnur KOLÖREN¹, Seçil EKER¹¹Department of Plant Protection, Faculty of Agriculture, Ordu University, Ordu, Turkey
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Aim of the study: *Urtica* Twenty samples of *Urtica* spp. from Ordu-Province of Turkey were identified with using 18S-26S rDNA-ITS nucleotide sequences.

Material and Methods: Twenty freshly plant samples of the *Urtica* species collected from different geographic locations in Ordu province of Turkey. They were kept in fridge until using for DNA extraction. DNA was extracted with CTAB method described by Haymes (1996) and this protocol was used with some modifications as described before by Eker and Koloren (2016). PCR products were appeared under the QUANTUM ST5 (Vilber Lourmat) gel system and sequenced commercially by Macrogen Inc. (Amsterdam, the Netherlands) for forward and reverse with primer set ITS1/ITS4. BioEdit was used for combining the sequenced fragments. BLAST (Basic Local Alignment Search Tool in NCBI) scores for multiple nucleotide alignments between our *Urtica* samples and the other references of *Urtica* from GenBank were applied with ClustalX (Thompson et al. (1997) and set aright with MEGA 6.0 (Tamur et al., 2013). Neighbor-Joining (NJ), Maximum-Parsimony (MP) and Maximum-Likelihood (ML) algorithms were conducted to evaluate the phylogenetic relationships between our samples and references from GenBank.

Results: We determined two *Urtica* species among our samples (Ulubey-U5 and Fatsa-U6). The phylogenetic trees drawn with NJ, MP and ML algorithms showed similar topologies with minor differences. In all of them, our species were placed in the same lineage with *U. dioica* and *U. kioviensis*. Ulubey-U5 appeared as sister to *U. dioica* with 97.7% nucleotide sequence similarity and the pairwise genetic divergence was 0.0242. This relation was supported with 60% and 74% bootstrap values in the NJ and ML trees, respectively. The nucleotide sequence similarity and the pairwise genetic divergence between Fatsa-U6 and *U. kioviensis* were 98.7% and 0.0109. This relation was supported with 88%, 79% and 85% bootstrap values in the NJ, MP and ML trees, respectively.

Acknowledgements: This research was supported by the Ordu University Scientific Research Projects Coordination Unit (ODU BAP, Project Number: AR-1649).

Keywords: ITS (Internal Transcribed Spacer), *Urtica dioica*, *Urtica kioviensis*, Ordu

Genotype differences of *Pisum sativum* L. and *Petrosimonia brachiata* L. in standard conditions and under saline stress

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Aim of the study: Quantitative correlation of constitutional and enzyme proteins are definitely arranged due to the strict consistency of genetic systems of an organism. Meanwhile, the decoding of proteins of synthesized fractions in salinity conditions is a problem of current interest moreover due to their genotype peculiarity. The given paper presents investigation results for the amino acid composition of soluble protein fractions (water, salt and alkali-soluble) of pea and *Petrosimonia* in standard conditions and under the saline stress.

Materials and Methods: Two different genotypes of *Pea sativum* L.– glycophyte, *Petrosimonia brachiata* L. – halophyte were investigated. Seeds of test plants were soaked in distilled water and then germinated at 27°C during 48 hours. Sprouts were transferred into water culture medium containing Knoppe's solution. When the first green leaves appeared, sprouts were divided into two parts. The first part was used as check samples and the second part was added by NaCl with the final calculation of dead concentrations 2 for pea and 4% for *Petrosimonia*. Protein fractions from solutions were precipitated by trichloroacetic acid with final concentration 5 at 70°C. Dried proteins were subjected to the acid hydrolysis and their amino acid composition was determined by AAA-339 analyzer.

Results: The investigation of the amino acid composition has revealed that the saline stress extremely stimulates the synthesis of protein soluble fractions for both genotypes. In this case the main amount of proteingeneous amino acids are concentrated at the glutamine fraction. The sudden decrease of the total content of bound amino acids for all protein fractions of *Petrosimonia*, when the saline stress is absent, is stipulated by a genetically inherited demand of halophyte in the salt excess introducing of which stabilizes immediately this gap. Hydrophobic amino acids of pea growing in standard conditions are concentrated in the albumin fraction and of *Petrosimonia* are concentrated in the globulin fraction. The amount of polar amino acids is increased independently on test versions with exception of water soluble proteins of *Petrosimonia*. The content of salt and alkali-soluble fractions remains unchanged. The process of introduction of sour amino acids into the protein composition is promoted, mainly it refers to glutamic acid for both versions of pea and for *Petrosimonia* in standard conditions. We have revealed that in proteins of both plants growing in standard conditions the methionine content is significantly low. Under the saline stress the methionine content abruptly increases in all protein fractions of both plants. This fact gives an evidence to believe that methionine takes part in the prorein structure stabilization under adverse existence independently on the salt tolerance of plants. Our experiments have established that the saline stress promotes the increase of proteingeneous proline in the composition of the glutamine fraction for the intolerant type and in the composition of the globulin fraction for halophyte. Thus, primary reactions of plants to the stress are identical for both plants but in time rates of catabolyc and hydrolytic reactions change differently, i.e. here of significance are peculiarities and properties occurring during the evolution.

Keywords: Different genotypes, Saline stress, Protein fractions.

Green Synthesis of the $\text{Fe}_3\text{O}_4/\text{Co}_3\text{O}_4$ Composite Using a Tea ExtractYana SHAVSHUKOVA¹, Anna ABAKSHONOK², Alexander ERYOMIN²¹Belarusian State University, Belarus'²Institute of Chemistry of New Materials of NAS of Belarus, Belarus'

Aim of the study: Recently a lot of attention has been paid to methods and approaches of green chemistry that are aimed at the search and use of non-toxic chemicals, environmentally friendly solvents and renewable materials [1]. In the synthesis of metal and semiconductor nanoparticles, a variety of plant extracts are used that reduce metal salts and ensure the stability of nanoparticles. The purpose of our research is the application of a tea extract (TE; Princess Java Best, Excellent green Chinese tea) in the synthesis of a composite containing iron and cobalt oxides.

Material and Methods: Synthesis of $\text{Fe}_3\text{O}_4/\text{Co}_3\text{O}_4$ was carried out both in the presence of TE (method 1) and without it (method 2). Method 1: TE was added to a solution containing 0.004 n HCl, 15 mM $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$, 30 mM $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$ and 8.0 mM $\text{Co}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$. The content of TE varied from 12 to 83% by volume. Also, aqueous solutions of TE with NaOH or $\text{NH}_3 \cdot \text{H}_2\text{O}$ were used. The sol was sonicated (US; Elmasonic S 30 H, Germany) in the degassing mode during 1 hour when the temperature of the medium varied from 4-6 to 26-29 °C. Method 2: Ammonium (2.0 M) coprecipitation of iron and cobalt salts was carried out in a solution containing the same components as above. After US treatment (1 hour), the particles were separated from the reaction medium (5000 rpm, 5 min), the precipitate was washed with distilled water and dispersed in TE. The zeta potential and the hydrodynamic diameter of the particles were determined using Zetasizer Nano ZS (Malvern Instruments, UK). The catalase activity of the samples was studied in an aqueous solution of 50 mM NaHCO_3 containing 50 mM H_2O_2 and a sample of the particles in a final dilution of 300 times.

Results: Thus, TE at different concentrations effectively co-precipitates the salts of iron and cobalt at different pH with the formation of the $\text{Fe}_3\text{O}_4/\text{Co}_3\text{O}_4$ composite. Sodium hydroxide and ammonia affect the pH of the sol and the hydrodynamic properties of the composite agglomerates, but they practically do not participate in the co-precipitation of the salts. Magnetite particles decompose H_2O_2 less efficiently than the $\text{Fe}_3\text{O}_4/\text{Co}_3\text{O}_4$ composite. For the manifestation of the activity of the latter, dispersion of the composite in the medium of TE is favorable.

Host Plants Belong to Brassicaceae Family of *Brevicoryne brassicae* L. (Hemiptera: Aphididae) in Diyarbakır

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Aim of the study: *B. brassicae* is a very important pest of crucifers production. It was determined their host plants belong to Brassicaceae family in agricultural and natural area of Diyarbakır of Turkey in 2014-2015.

Material and Methods: Samples on infected various host plants belong to Brassicaceae family were collected from different locations of Diyarbakır. Plant parts with aphids on them were cut off and placed into separate polyethylene bags. The aphids sample were transferred into Eppendorf tubes containing 70% ethyl alcohol with a fine brush.

Results: In this study was found that 15 plant species belong to Brassicaceae family were hosts of *B. brassicae*. These plants were *Brassica nigra* (L.), *Brassica oleracea* L., *Brassica oleracea* var. *acephala* L., *Brassica oleracea* var. *capitata* L., *Brassica oleracea* var. *botrytis* L., *Brassica oleracea* subvar. *cymosa* L., *Eruca vesicaria* (Mill.), *Sinapis alba* L., *Sinapis arvensis* L., *Raphanus sativus*, *Lepidium sativum* L., *Capsella bursa pastoris* (L.) *Raphanus raphanistrum* (L.), *Raphanus sativus* (L.) and *Brassica napus* L.

Key words: *Brevicoryne brassicae* L., Brassicaceae, Diyarbakır, Turkey

Identification of Asteraceae taxa Which Distributes on Gypsum and Marl Sils of the Eskişehir/Turkey

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Aim of the study: One of the main reasons of the biological diversity is edaphic diversity. High endemism ratio in gypsum and marl soil area where named as edaphic island or geolocial island can be explained by geological isolation. This study aims to determinate Asteraceae taxa that has distribution edaphic islands.

Material and Methods: Between 2012-2015 years, 1900 plant specimes have been collected from study area by 58 field trips that performed at different vegetation stages. All vegetative and generative parts of the specimens collected carefully and at least three specimens were taken. All specimens dried via herbarium rules and their data (Gps, locality data, collect time, altitude, habitatum etc.) recorded to field book. Olympus brand streomicroscope used for identification. Herbarium materials prepared from identified specimens and these specimens stored in Eskişehir Osmangazi University Herbaria (OUFE). Physical and chemical analyses of the soil specimens were done in soil analysis laboratory.

Results: At the end of this study, totally 738 plant taxa (673 species of 354 genera from 72 families) were identified. 98 of these 738 are members of the Asteraceae. 19 of these taxa are endemic. Also relationship between vegetation and gypsum-marl soils in Eskişehir province is determined.

Keywords: Asteraceae, Eskişehir, Gypsum, Marl, Flora

Impacts of Irrigation Water Salinity on Leaf Carbon Isotope Discrimination, Stomatal Conductance and Yields of Sweet Corn (*Zea mays saccharata*)

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Aim of the study: Salinity is one of the most important environmental factors limiting crop production of marginal agricultural soils in many parts of the world. The aim of this study is that the determine effects of irrigation water salinity on leaf carbon isotope discrimination (Δ ; ^{13}C ‰), stomatal conductance and dry mater content of sweet corn (*Zea mays saccharata*).

Material and Methods: Experimental site was located in Isparta (37°45'N and 30°33'E) of Mediterranean Region of Turkey. The pot experiment was conducted under greenhouse conditions (humidity around 65-75%, air temperature 23-30°C) in Suleyman Demirel University's Agricultural Research and Training Center. The plastic pots were filled with 2.5 kg of soil. The experimental soil was taken from Aridisol great soil group. Field capacity and wilting point on the volume basis were 34.50% and 21.20% respectively. According to soil fertility analysis results for basal fertilizer was applied. The experimental design was completely randomized block design. The experiment consists of 5 different irrigation water salinity given below with 3 replications. Salinity treatments were; T₁;0 dS/m, T₂;1.5 dS/m, T₃ ;3 dS/m, T₄ ;5 dS/m and T₅ ;10 dS/m. Salinity treatments were imposed by irrigation water containing NaCl, CaCO₃,MgSO₄ salts Sweet corn (*Zea mays saccharata*) of Merit F₁ variety was used in this study and this genotype was moderately sensitive to the salt stress. Carbon isotopes were analyzed on the leaf samples. Carbon isotope ratio ($^{13}\text{C}/^{12}\text{C}$) of the samples ($^{13}\text{C}/^{12}\text{C}_{\text{sample}}$) and the standard ($^{13}\text{C}/^{12}\text{C}_{\text{standard}}$) was determined by means of a mass spectrophotometer (Turkey Atomic Energy Agency/Ankara). $^{13}\text{C}/^{12}\text{C}$ value was transformed into $\delta^{13}\text{C}$ (‰; per mil).

Results: According to the results of the study the highest yield (33.14 gr pot⁻¹) was found at T₁ treatment, which is 75.2% more than the lowest yield (8.22 gr pot⁻¹) produced at T₅ (10 dS/m) treatment. A negative relationship was found between irrigation water salinity and the yield. The value of the average carbon isotope in T₁ is registered 4.00, which is the lowest whereas in T₅ it was the highest value with 4.65. As a result, carbon isotope ratio has increased in parallel with the increase of the irrigation water salinity. The concentration of salinity significantly increased carbon isotope ratio of leaves at T₅ level by 13.98 from T₁ salinity level. Analysis of variance indicated that there was a highly significant effect of salinity on Δ . A positive correlation was found between irrigation water salinity and the leaf $\Delta^{13}\text{C}$. The concentration of salinity significantly reduced stomatal resistance at T₅ level by 31.80% in comparison to the control. A positive and significant relationship was found between stomatal resistance and leaf carbon isotope ratio.

Acknowledgements:We gratefully acknowledge the technical and financial support by Scientific Research Projects Coordination Unit of Suleyman Demirel University through the research contract number 2864-YL-11.

Keywords: Carbon isotope discrimination, corn, irrigation water salinity

Karyological Study on Endemic *Onobrychis argaea* (Fabaceae) in TurkeyBayram ATASAGUN¹, Ahmet AKSOY², Esra MARTİN³¹Biology Department/Faculty of Science, Erciyes University, Turkey²Biology Department/Faculty of Science, Akdeniz University, Turkey³Biotechnology Department/Faculty of Science, Necmettin Erbakan University, Turkey

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Aim of the study: The genus *Onobrychis* is represented by approximately 342 species throughout the World. In Turkey, *Onobrychis* genus is divided into five sections and is represented by 65 taxa, 33 of them are endemics. *O. argaea* Boiss. & Balansa which is endemic species to Erciyes Mountain in Kayseri. Karyotype analysis and chromosome number of *O. argaea* were analyzed in detail. The main aim of this study is to investigate chromosome numbers, chromosome morphologies and karyology which are used for systematics purpose of *O. argaea*.

Material and Methods: Root meristems from germinating seeds collected in the wild were used. Root tips were pretreated with α -monobromonaphthalene at 4°C for 16 h. Root tips were fixed with Carnoy for 24 h at 4°C. Before staining, the material was hydrolyzed with 1N HCl for 12 minutes at room temperature. The chromosomes were stained with 2% acetic orcein and mounted in 45% acetic acid. Permanent slides were made by using the standard liquid nitrogen method. Photographs were taken through BX51 Olympus microscope. The ideogram was prepared with measurements taken on enlarged micrographs of five well spread metaphase plates. The classification of chromosomes, the length of long and short arm, arm ratio, centromeric index and relative chromosomal length were measured by Software Image Analysis (Bs200ProP).

Results: The chromosome number of *O. argaea* was determined to be $2n = 14$ in the karyomorphological study. The smallest chromosome has a length of 0.93 μm and the largest has a length of 1.8 μm . Total haploid chromosomes length was measured as 9.27 μm . The karyotype formula ($2n=7m$) of this species consists of seven median chromosome pairs. Chromosome arm ratio is ranging from 1.10 to 1.36, Centromeric index from 4.32-8.64, and relative length from 10.04-19.44.

Keywords: *Onobrychis*, Image Analysis, Turkey.

Karyomorphological Study on *Cyanus nigrofimbrius* (K. Koch) Soják and *Cyanus pinardii* (Boiss.) Soják (Asteraceae)

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Aim of the study: The aim of this study is to determine karyomorphological characteristics of *Cy. nigrofimbrius* and *Cy. pinardii*.

Material and Methods: Herbarium materials belonging to *Cy. nigrofimbrius* and *Cy. pinardii* were collected from the field between 2014 and 2016. Mature achenes were selected and periodically germinated for chromosomal analyses. Chromosome counts were made on somatic metaphases in root tips using the squash technique. After germinating, the root tips were pretreated by 8-hydroxyquinoline and fixed by the Carnoy solution. Before staining, root tips were hydrolyzed with 5-N HCl, and stained with 1% aceto-orcin. At least 10 metaphases were examined per taxa; the best metaphase plate was photographed. Moreover, the coefficient of variation of the chromosome length (CV_{CL}), coefficient of variation of the centromeric index (CV_{CI}) and mean centromeric asymmetry (MCA) were calculated. Idiograms and karyograms of these taxa were made by using the KAMERAM analysis system.

Results: Karyotype of two *Cyanus* species (*Cy. nigrofimbrius* and *Cy. pinardii*) naturally growing in Turkey was analyzed in detail. The somatic chromosome number was counted as 2n=20 for *Cy. nigrofimbrius* and 2n=16 for *Cy. pinardii*. In *Cy. nigrofimbrius* the karyotype formula consist of 16m + 4sm pairs ; total haploid chromosome length (THL) is 14.03 µm, coefficient of variation of the chromosome length (CV_{CL}), coefficient of variation of the centromeric index (CV_{CI}) and mean centromeric asymmetry (MCA) are 17.70, 10.75 and 10 respectively, whereas in *Cy. pinardii*; total haploid chromosome length (THL) is 9.12 µm, coefficient of variation of the chromosome length (CV_{CL}), coefficient of variation of the centromeric index (CV_{CI}) and mean centromeric asymmetry (MCA) are 21.89, 11.58 and 17.50 respectively. In this study, karyotype analysis and asymmetry indices of *Cy. nigrofimbrius* and *Cy. pinardii* were determined for the first time.

Acknowledgements: This study was financially supported by Selçuk University (BAP Project Number: 15101001).

Keywords: Karyomorphology, Endemic, *Cyanus*, Compositae, Turkey

Karyotype of *Astragalus argaeus* (Fabaceae) Local Endemic for TurkeyBayram ATASAGUN¹, Ahmet AKSOY², Esra MARTİN³¹Biology Department/Faculty of Science, Erciyes University, Turkey²Biology Department/Faculty of Science, Akdeniz University, Turkey³Biotechnology Department/Faculty of Science, Necmettin Erbakan University, Turkey

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Aim of the study: *Astragalus* L. (Fabaceae), is one of the largest genera of vascular plants in the world, with an estimated number of 3000 species. The section *Argaeus* Bunge is monotypic endemic. It has only one species, namely *Astragalus argaeus* Boiss. in Turkey. *Astragalus argaeus*, which is endemic to Erciyes Mountain in Kayseri. The aim of the current study was to determine the karyological features of endemic taxa *A. argaeus*.

Material and Methods: Karyotype was made on somatic metaphases using Image System Analysis. Root meristems from germinating seeds collected in the wild were used. Root tips were pretreated with α -monobromonaphthalene at 4°C for 16 h. Root tips were fixed with Carnoy for 24 h at 4°C. Before staining, the material was hydrolyzed with 1N HCl for 10 minutes at room temperature. The chromosomes were stained with 2% acetic orcein and mounted in 45% acetic acid. Permanent slides were made by using the standard liquid nitrogen method. Photographs were taken through BX51 Olympus microscope. Chromosomes were classified using the nomenclature of Levan et al. (1964).

Results: The chromosome number of *Astragalus argaeus* was determined to be $2n = 16$ in the karyomorphological study. The smallest chromosome has a length of 1.76 μm and the largest has a length of 3.14 μm . Total haploid chromosomes length was measured as 19.44 μm . The karyotype formula of this species consists of three median chromosome pairs (3,6,7. chromosomes) and five submedian (1, 2, 4, 5, 8. chromosomes) chromosome pairs. Chromosome arm ratio is ranging from 1.24 to 2.93, Centromeric index from 3.01-6.07, and relative length from 9.08-16.18

Keywords: *Astragalus*, Image Analysis, Turkey.

Larvicidal Activity of *Calicotome villosa* (Poiret) Link. Extracts against the Larvae of *Culex pipiens* L.Murat TURAN¹, Hüseyin ÇETİN², Ramazan MAMMADOV¹¹Department of Biology, Faculty of Art & Science, Pamukkale University, Denizli, TURKEY²Department of Biology, Faculty of Science, Akdeniz University, Antalya, TURKEY
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Aim of the study: *Calicotome* is a genus belongs to Fabaceae family, which is represented by 5 species of the world and *Calicotome villosa* (Poiret) Link. is the only representative of this genus from Turkey. This species is a spiny shrub that grows in the Mediterranean region, which grows at altitudes of 0-1200 m. The aim of this research was to evaluate the larvicidal activity of flower and stem ethanol extracts of *C. villosa* against the larvae of *Culex pipiens* L. (Diptera: Culicidae).

Material and Methods: First-second instars larvae of the *Cx. pipiens* were exposed to various concentrations (100, 250, 500 and 1000 ppm) of the extracts. After 24-, 48-, 72- h exposure larval mortalities were recorded. Lethal concentration 50 (LC₅₀) values were determined by using Probit Analysis program.

Results: *C. villosa* flower extract was found more toxic than stem extract to *Cx. pipiens* larvae. The LC₅₀ values at 72 h for flower and stem extracts were 330.07 and 404.32 ppm respectively. This is the first study to report on the larvicidal activity of the extracts of *C. villosa* against *Cx. pipiens*. The isolation of toxic larvicidal ingredients from extracts affecting mosquitoes should be ensured and toxicity on more mosquito species should be investigated.

Keywords: *Calicotome villosa*, *Culex pipiens*, Larvicidal activity

Morphological and Anatomic Characteristics of Endemic *Lathyrus trachycarpus* Boiss.Selçuk ERTEKIN¹, Zeynep TOPRAK^{1,2}¹ Department of Biology, Faculty of Sciences, University of Dicle, Turkey² Department of Botany and Plant Biology, Faculty of Sciences, University of Geneva & Jardin Botanic - Conservatoire, Switzerland
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Aim of the study: Consisting about 187 taxa, *Lathyrus* L. is one of the largests genus of the family Fabaceae. Approximately, 40% of the all known *Lathyrus* species are occurring in Turkey. There are 63 species (73 taxa) of the genus existing in Turkey, of which 22 taxa are endemic to the region. *Lathyrus trachycarpus* Boiss., is an endemic species distributed to Diyarbakir (in the South Eastern Anatolia) province. In this study, we attempted to identify morphologic and anatomic features of the *Lathyrus trachycarpus*.

Material and Methods: Morphological studies were carried on the specimens collected between 1986-2014, and belonging to the Herbarium of the University of Dicle (DUF), beside examination of the specimens from virtual herbaria K, P. Anatomic studies were done on the samples preserved in the 70 % ethanol.

Results: The morphological aspects of the *L. Trachycarpus* were observed as: leaves are narrowly elliptic, bearing parallel nerves, undulata, and leaves rachis ending in a deflexed arista; inflorescence 3-8 flowered, flowers large, 15-20 mm in length, purple to whitish; legume elliptic-oblong to elliptic with glandular hairs. The epidermal characteristics of stem and leaves of the *L. trachycarpus*, as well as the stoma indices, for the first time, reported in this study.

Acknowledgements: We thank to Dicle University Scientific Research Centre for their contributions.

Keywords: *Lathyrus trachycarpus*, morphology, anatomy, Diyarbakir.

PP-472
Muğla Floras's Overview

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Aim of the study: Muğla province has an important place in this rich floristic structure. Floristic studies, especially made in the last 10 years, show this richness. When we look at the records of Davis in Muğla province in the Flora of Turkey, there are a total of 1219 taxa belonging to 102 families and 464 species. The number of endemic taxa is 354. After each new flora study in the region, new records were added to C1 and C2 squares, and the total number of taxa in Mugla province increased.

Material and Methods: The Floristic studies in the Mugla province are as follows: Köyceğiz-Dalyan Special Protected Flora Area (Güner and others., 1996) Investigation of Mountains in terms of Plant Sociology (Vural et al., 1995), the study of the vegetation of the Eastern Menteşe Mountains in terms of synecology (Karakaya, 1997), the western hinge of the Menteşe Mountains in terms of sociology (Güney, 2001), Studies on Geo-Pitts of Muğla Province (Satranç, 2001), Florance Characteristics of Pistachio Pine Forests in Muğla Province (Varol et al., 2002), Flora of Datça Peninsula (Mugla) and the herbs the inhabitants use here (Tuzlacı, 2002), Flora Characteristics of Pistachio Pine Forests in Muğla Province (Varol et al., 2002), Pinus pinea L. in West Anatolia (Mugla) Floristic composition and diversity of forests (Varol, 2003), Phytosociological research on forests, Pinus pinea L. in southwestern Anatolia (Varol, 2004), Mugla Yılanlı Mountain Flora (Varol et al., 2004), Bencik Mountain Flora (Yatağan – Muğla) (Aytepe and Varol, 2007), Muğla City Flora (Kaya et al., 2008), Muğla University Flora (Ceylan, Turkey), Floristic Features of Historical Labranda (Milas-Mugla) and Surroundings (Güler, 2010), Historical Aspat (Strobilos) Castle (Bodrum-Turgutreis) and Surroundings (Çınar, 2010), Masa Mountain and Kızıldağ (Muğla) (Kırdal, 2011), Distribution of Liquidambar orientalis Mill in Mugla Province. the Floridian Properties of the Forests (Akbas, 2012) Kavaklıdere (Mugla) Flora (Ceylan, 2014), The Investigation of Bodrum Peninsula (Muğla) in terms of fitosociologia (Aytepe, 2014). and Kurukümes Mountain (Milas-Muğla) Flora (Öz, 2014).

Results: When we look at the recent floristic studies conducted in Muğla province; Following each new flora study in the region, new records were added to the C1 and C2 squares, and the total number of taxa in Mugla province was further increased. The new registration list is as follows. A total of 1462 taxa and 414 endemic plants (E. B. Yeşilyurt, G. Akaydın, 2012) were identified as plant taxa by adding 243 new taxa belonging to the resultant C1 and C2 crops in the province of Muğla. When studies conducted in the province of Muğla are examined, Fabaceae, Asteraceae, Poaceae, Lamiaceae, Brassicaceae and Caryophyllaceae appear to be the most taxon families. These families are large families expected to be in the Mediterranean Phytogeographical Region. The Mediterranean Phytogeographic Region is an ideal environment for these families in terms of both climate and breeding possibilities.

Keywords: Muğla, Flora, Turkey

Notes on the Genus *Noccaea* Moench (Brassicaceae) in TurkeyAtila OCAK¹, Kurtuluş ÖZGİŞİ¹, Barış ÖZÜDOĞRU^{2,3}¹Department of Biology, Eskişehir Osmangazi University, Turkey²Department of Biology, Hacettepe University, Turkey³Biogeography Research Laboratory, Hacettepe University, Turkey

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Aim of the study: The main aim of the current study is to sort out the taxonomical misevaluations of some *Noccaea* taxa which are distributed in Turkey. Detailed descriptions of these taxa were provided to fill gaps of unknown morphological features of species and some taxonomical remarks were given to make contributions to the Turkish Flora.

Material and Methods: To make revision of Turkish *Noccaea* almost all species were collected during 2014-2016. All collected species were compared with the herbarium vouchers from ANK, ISTE, GAZI, HUB. Digital database of B, E, G, K, HJ herbaria were also investigated. Species descriptions in the relevant literature were emended based on recently collected materials. Inflorescence, fruits and seeds photos of the taxa were taken by Nikon SZ120 microscope. For scanning electron microscopy (SEM), dry seeds were mounted directly on stubs and coated with gold in a sputter coater. SEM examination was carried out using a Jeol 5600 LV-SEM microscope at Eskişehir Osmangazi University.

Results: *Noccaea huber-morathii* (F.K.Mey.) Al-Shehbaz was collected by A. Huber-Morath 64 years ago. It was not collected since then In this study, this taxon was rediscovered and reexamined. Also misevaluated *Noccaea* taxa were collected and reexamined. According to the Flora of Turkey the species, which were collected from Çanakkale, evaluated under *Thlaspi ochroleucum* Boiss. & Heldr. After detailed examination on the both herbarium specimens and collected fresh material this taxon was evaluated as *Noccaea versicolor* (Stoj.&Kitan) F.K. Mey. Also same taxonomic reassessments were applied to the *Thlaspi praecox* Wulfen var. *praecox* and this taxon evaluated as *Noccaea aptera* (Velen.) F.K.Mey. Also distribution of *Noccaea tatiana* (Bordz.) F.K.Mey. and *Noccaea aghrica* (P.H.Davis & Kit Tan) Firat & Özüdoğru were updated based on comprehensive field and herbarium studies

Acknowledgements: This study was supported by Eskişehir Osmangazi University Scientific Research Projects Coordination Unit (Projects no. 2015/681)

Keywords: *Noccaea*, taxonomy, biodiversity, Turkey.

Phytocenological Structure of the Perennial Wheaty-Leguminous Grassy Hole-Meadow Vegetation Distributed at Mil steppe of Azerbaijan

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Aim of the study: In this study, during geobotanical researches which conducted at Mil steppe of Kura-Araks lowland of Azerbaijan, the perennial wheaty-leguminous grassy hole-meadows formation class was studied.

Results. It was determined that leguminous plants were dominants and subdominants at hole-meadow vegetation. Perennial wheaty-leguminous-grassy hole-meadow formation class was presented with two formations: *Cynodonetum-Alhagiosum* and *Cynodonetum-Glycyrrhizosum*. The plant cover of formation class form an intrazonality at hole-meadow vegetation. *Cynodonetum-Alhagiosum* formation was consists of *Cynodoneosum dactylon-Alhagiosum pseudalhagi* association. The edificators of the phytocenosis- *Cynodon dactylon* (L.) Pers. and *Alhagi pseudalhagi* (Bieb.) Fisch. form main cover. This vegetation was formed at the salty gray-meadow soils. At the species content of formation 19 species were noted. Dominate of this formation was *Alhagi pseudalhagi* (Bieb.) Fisch., abundance was in 4 points and subdominate was *Cynodon dactylon* (L.) Pers., abundance was in 2-3 points. Whole project cover was between 60-80%. *Cynodonetum-Glycyrrhizosum* formation consisted of *Cynodonetum dactylon-Glycyrrhizosum galbra* association. Dominate of this association was *Glycyrrhiza glabra* L., abundance was in 3 points and subdominate was *Cynodon dactylon* (L.) Pers., abundance was in 2 points. Whole project cover was between 60-90%. *Glycyrrhiza glabra* L. was perennial plant with high fodder quality; cattles eat this plant sufficiently. Due to the decreasing of some researched phytocenosis reserves it is important the conservation and protection of them, because they have a great importance in development of agriculture and cattle-breeding, as well as in increasing of fodder reserves at winter pastures.

Keywords: formation, vegetation, dominant, subdominant, association, hole- meadow

Polymorphism of Microsatellite Loci in the Genus *Fragaria*Volha MEZHNINA¹, Oksana URBANOVICH

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Aim of the study: In present time molecular methods of organism identification are found the waste application for scientific research as well as for salvation the practical problems. In particularly, the development of molecular identification methods promotes to preserve unique genetic recourses of plants. Morphological identification methods, which uses in present time, not always have sufficient resolving power for differentiation of genetic similar material. Molecular DNA-markers are lack this flow and have a high accuracy and reproducibility of results. In this case, the aim of our research is the study of genetic variability of *Fragaria* representatives and development their DNA-identification method.

Material and Methods: The objects of the research were strawberry varieties, cultivated in Belarus (material provided by RUE 'Institute for Fruit Growing') and wild representatives of *Fragaria* genus (material provided by Institute of experimental botany of NAS of Belarus). In the research were used SSR-markers, specific for the genomes of *F.vesca*, *F.nubicola* and *F.x ananassa*.

Results: For valuation of the genetic variability of *Fragaria* genus representatives 8 SSR-markers were used. For each marker, the length of alleles and the number of polymorphic fragments for each sample were determined. The least polymorphic were the loci FG7ab and FG2cd. The number of alleles were found in them was 7 and 8, respectively. The loci of FG2ab and UFFa3-D11 revealed 10 and 12 alleles. Loci FG7cd and EMFn170 found the same number of alleles - 13. In all, among 76 samples were observed 99 polymorphic alleles, 32 of them were rare alleles (were found among 2% of samples and less). The main sources of rare alleles were wild-growing representatives of the genus *Fragaria*. The average number of alleles per locus was 12.4. Discrimination power (PD) for 8 SSR-loci was 0.84. This PD amount indicates high enough resolving power of the markers set. Genetic distances among samples vary from 0.08 to 0.88. *F. vesca*, *F.viridis*, *F. moschata* and *F. virginiana* were on the largest genetic distance and formed separated cluster. This result confirmed their genetic remoteness from strawberry varieties. Industrial cultivated strawberry varieties characterised lower genetic diversity. SSR-analysis observed close connection strawberry varieties from Belarus, Russia, Germany, Poland and other countries. This conclusion is consistent with the other authors results obtained in the study of European selection varieties. The set of SSR-markers, proposed in this research, is enough informative and allows to identify strawberry varieties Belarusian and foreign breeding programs as well as wild and decorative *Fragaria* representatives.

Acknowledgements: The authors express their deep acknowledgment to the Institute for Fruit Growing and Institute of experimental botany of NAS of Belarus for provided material.

Keywords: *Fragaria*, strawberry, SSR-markers, genetic variability, DNA-identification.

Seed Germination Studies in Native Species for Conservation of BiodiversityYonca SURGUN ACAR¹, İbrahim YOKAŞ², Betül BÜRÜN³¹Department of Molecular Biology and Genetics/Science Faculty, Bartın University, Bartın²Ortaca Vocational School, Muğla Sıtkı Koçman University, Muğla³Department of Biology/Science Faculty, Muğla Sıtkı Koçman University, Muğla

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Aim of the study: *In situ* and *ex situ* conservation strategies have been revealed in order to avoid the loss of biodiversity that is a global problem in recent years. *Ex situ* conservation strategies including propagation of native species are very important for the conservation and management of biodiversity.

Material and Methods: Within these studies, germination of seeds of particularly rare, endemic and/or threatened plant species are also being investigated. Exhibiting detailed information about the germination requirements and capacities of seeds of native species will make an important contribution for the conservation of biodiversity.

Results: It has been stated that it is necessary to study on the production and cultivation of endangered species in "National Biodiversity Strategy and Action Plan" in Turkey which is very rich in terms of plant genetic diversity. In this review, the studies that have been investigated on the seed germination of native plants in Turkey were evaluated after indicating the importance of seed germination capacities of the native plants in the conservation and management of biodiversity.

Keywords: Biodiversity, conservation, native species, seed germination, Turkey

Seed Morphology and Testa Sculptures of Three *Allium* speciesSerap KIRMIZI¹, Gürcan GÜLERYÜZ², Hülya ARSLAN²¹Uludağ University, Gemlik Asım Kocabıyık Graduate Vocational School,
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Aim of the study: Our objective was to give detailed descriptions on seed morphology of *Allium guttatum* Steven subsp. *guttatum*, *Allium flavum* L. var *minus* Boiss. and *Allium olympicum* Boiss. by scanning electron microscopy (SEM), to assess the systematic significance of observed characters.

Material and Methods: Seeds of three *Allium* species were collected from the alpine site of Uludağ mount in September 2013. Some seed morphological characters such as shape, weight, size and surface specialities were determined. Seeds were taken from capsule and dried in air after collection for a week. For scanning electron microscope, seed material was sputter coated with gold-palladium for 2 min in a BAL-TEC SCD 005. All observations made using scanning electron microscope and micrographs were taken at 20 kV.

Results: *A. olympicum* has the smallest seeds. *A. flavum* has the biggest and heaviest seeds. *A. guttatum* has the most productive flowers, carrying 86.50 ± 03.40 flowers in each spike. The seed shapes were also similar among four species with small differences.

Acknowledgements: This study was supported by Uludağ University Research Fund (Project no: KUAP/GAKMYO 2012-35)

Key words: *Allium*, seed morphology, testa, SEM

***Taxus baccata* Callus Culture: Initiation and Growth Optimization**

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Aim of the study: The taxanepaclitaxel (Taxol®) is an effective antineoplastic agent originally isolated from the bark of *Taxus brevifolia*, a slow growing yew. Paclitaxel is a successful anticancer drug that has been approved for the treatment of numerous tumor types. Limited native resources of paclitaxel from *Taxus* trees initiated the research to produce this compound by biotechnology. However, *Taxus* cell cultures are still limited for large-scale commercial use, because of low and unstable production and high cost. Culture media must be optimized for each *Taxus* species, and in general, there is no one method that guarantees success for *Taxus* cultures. The source of explant, culture medium composition and the growth regulators used appear to affect callus initiation and maintenance. In this regard, obtaining highly productive lines is still urgent. The aim of this work was to define the optimum procedure of explants sterilization and initiation of callus culture of *Taxus baccata* and to determine the effect of hormones on growth of obtained callus culture.

Material and Methods: All explants were taken from one *Taxus baccata* tree located in Belpitomnik in Belarus. Young stems, 2 cm size, were used as explants after sterilization and were cultured using Gamborg's B5 medium supplemented with 2 mg/l 2, 4-dichlorophenoxyacetic acid (2,4-D), 0,1 mg/l kinetin, 20 g/L sucrose and 2,5 g/l phytigel at dark condition, 24°C, and pH 5.7. After callus induction (in 14 days), subcultures were performed using the same media that was used for initialization of callus. Surface treatment (sterilization) of explants was carried out sequentially immersing in solutions: 1% Microcid-D, 96% ethanol (30 c), 0,001% KMnO₄ (15 min), and "Domestos" (30 min). As the incubation of explants in Microcid-D was long, it was carried out at continuous stirring on an orbital shaker. Variants of the modes of sterilization differed on incubation time in Microcid-D solution and on concentration of "Domestos". For a study of influence of hormonal composition of nutrient medium on the growth of culture of a yew eight variants of the media differing on the content of hormones: 2,4-D and kinetin were tested.

Results: Sterilization of stem explants of *Taxus baccata* with use of «Microcid-D» solution (24 h), 70% ethanol (30 c), 2% KMnO₄ (15 min), and 50 % «Domestos» solution (30 min) it is possible to consider optimum. Use of this variant of sterilization allows to initiate callus tissue on average for 85% of explants. Among the tested variants of media for the maximum growth of biomass and further cultivation of callus culture of the yew the media containing 2 mg/l of 2,4-D and 0,2 mg/l of a kinetin was chosen. In these conditions the callus culture of the yew had the best growth parameters: growth index - 2,8 g on 1 g of wet weight, specific growth rate – 0,1 g of wet weight on 1 g of initial wet weight of callus a day and time of doubling of biomass – 6,9 days.

Keywords: *Taxus baccata*, sterilization, callus culture, growth.

The Effect of Different Hydrated Ions on the Water Absorption and Swelling Processes in Seeds

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Aim of the study: Dry seeds are in forced immobility due to the 5-15% of water in them. Dry seeds swell by absorbing water rapidly under favorable conditions. Swelling of seeds is a complicated process that begins with hydration. Hydration is the combination process of water with different ions, molecules and colloidal micelles (1;3;5) (Gasimov N., 2008; Gusev N., 1974, Kuznetsov V., Dmitriyeva G., 2006). 80% of cell dry weight is composed of high-molecular compounds - proteins, polysaccharides and nucleic acids that do not dissolve in water. If we take into account that mineral nutrients, required for life and normal development of plants in all soils, are in form of polyions (or multi-ions) and each of these ions has different attitude towards water, then the investigation of the effect of the positive and negative hydrated ions on the swelling and germination processes of seeds can be considered important.

Material and method: Monocotyledonous wheat and dicotyledonous pea seeds were used as subject of study. Wheat is a seed whose reserve substance is starch. Proteins are dominant in the composition of peas. In order to determine the effect of different hydration ions on the germination and swelling processes of seeds (after defining the seeds' dry, absolutely dry weights), the seeds were soaked in distilled water (control) and 0.1 and 0.2 M concentration salt solutions (experiment options) and their wet weights were defined with the gravity method within 20- 24 hours. Each of the three weights was carried out on electronic scales. The determination of wet weight was conducted every 30 minutes during the first 3 hours, and later every 3 hours. For this, after carefully selection of the seeds, they were lined up on glass plates covered with filter paper over special bathtubs. The bathtubs were filled with distilled water in control and with relevant concentration of salt solutions in experiment options. Filter paper had to be included into distilled water in control from both sides of the glass plate, and into salt solutions in experiment options. In this way, the paper remaining wet all the time serves water supply for seeds placed on it. An average square edging was calculated from the obtained results. Failure was not more than 5%.

Results: The effect of the salts with two positive ions (Na_2SO_4 , MgSO_4 , NaOH), two negative (KCl , KNO_3 , NH_4NO_3), one positive and the other negative hydrated (NaCl , NaNO_3 , CaCl_2) ions on the absorption of water and swelling processes in seeds was studied. Due to the effect of different hydrated ions, the absorption of water and swelling processes in seeds follow the same way as in control and are characterized by a three-phase curve, regardless of the composition of salts, type of hydrated ions and biological features of seeds. The only difference between the options was quantitative. The effect of ions on the swelling process was related to their effect on the activity of water molecules and their water storage capabilities. For the small size and high electrical load density of the positive hydrated ions, they retain water molecules more tightly and reduce their flow and activity, which delay the swelling and sprouting processes. On the contrary, because of the big diameter and low electrical load density of the negative hydrated ions, the swelling process happens more rapidly compared to control due to the increase of water flow. The results obtained from the salts with different hydrated ions were a bit different. The indicators of pea seeds in each case were higher compared to wheat seeds.

Keywords: different hydrated ions, hydration, swelling, germination

The Flora Biodiversity on the Northeastern Part (Azerbaijan) of the Greater Caucasus Mountains

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Aim of study: As a result of the observations made in the northeastern part (Azerbaijan) of The Greater Caucasus, the flora biodiversity, phytological groups, taxonomic structure in geographical regions have been researched.

Material and Methods: The northeastern part of The Greater Caucasus is occupied by forests with an area of 113368 hectares, 20.5% of Azerbaijani lands. These forests are divided over Guba, Gusar, Davachi, Altiaghaj, Khachmaz geographical areas. The area covered with forest is 18576 hectares or 16.4% in Khachmaz, is 20821 hectares or 18.4% in Gusar, 51636 hectares or 45% in Guba, 22334 hectares or 19.7% in Davachi. The taxonomical content of dendroflora of northern west regions is studied to base on new classificational system.

Results: The flora of these areas depends on the sea level and is divided into the order and the mountainous parts. The layout covers an area between 0-580 m above sea level and the area covered by forest is located in Yalama forests in Khachmaz district. The mountain forests are located in the mountainous regions of Gusar, Guba, Davachi districts for generations. Foothills eccentric type is *Quercus Iberica* Stev. *Carpinus caucasica* A. Grossh. is also widespread. These types are involved with *Acer campestre* L., *A. laetum* C.A. Mey, *Fraxinus excelsior* L.. It forms Undergrowth plants – *Crataegus pentagyna* Waldst et kit., *J. orientalis* pall. *Mespilus germanica* L., *Ligustrum vulgare* L., *Cornus mas* L., *Corylus avellana* L., *Prunus divaricata* Ledeb. The eccentric type of mountainous forests of the middle zone is *Fagus orientalis* Lipsky. Spreading area of pistachio is started from 550-600 meters height in Guba, Davachi zone, started from 900 meters height in Altiaghaj. In the pistachio forests are coincided *Carpinus caucasica* A. Grossh., a small amount of *Acer campestre* L., occasionally *A. laetum* C.A. Mey, particularly *Ulmus elliptica* C. Koch. *Quercus macranthera* Fisch et Mey., *Betula pendula* Roth., *B. roddeana* Trautv., *B. Litwinowi* A. Doluch. trees grow in the high mountain forests in the northeastern part of The Great Caucasus. There are also rare coincided undergrowth plants – *Sorbus caucasigena* Kom., *Juniperus oblonga* M.B., *J. sabina* L..

Keywords: The Greater Caucasus, forest, *Quercus* L., *Fagus* L., *Carpinus* L., *Betula* L..

The Fruit Anatomy of Two Endemic *Bunium* Species (*Bunium allioides* and *B. pinnatifolium*) in Turkey

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Aim of the study: Anatomical features of fruit are very valuable to distinguish between related species and genera in the family Apiaceae. In this study, *Bunium pinnatifolium* and *B. allioides* (Apiaceae) which are endemic and naturally grown in Turkey were comprehensively investigated in terms of fruit anatomy.

Material and Methods: Mature fruits of *Bunium pinnatifolium* and *B. allioides* were collected from natural habitat in Turkey. These materials were kept in 70% ethanol for using anatomical studies. Each mericarp was rehydrated and placed FAA for a minimum of 24 hour. Mericarps were embedded into paraffin blocks following traditional paraffin section method. Transverse sections cut about 5-10 µm thickness using microtome, and stained safranin solution. Micrographs were taken using an Olympus BX53 microscope.

Results: The fruits of *Bunium pinnatifolium* and *B. allioides* have two homomorphic mericarps that are not significantly compressed dorsally or laterally. Each mericarp has five filiform ribs. The mericarps of *Bunium pinnatifolium* and *B. allioides* is semi-circular in transverse section. Exocarp and endocarp consist of one layer convex and small cells. Mesocarp is thin and comprise several layer parenchymatous cells. Vascular bundles in the mesocarp are located below each rib and surrounded by parenchyma cells. *B. pinnatifolium* has 4 dorsal vittae (one in each furrow) and 2 commissural vittae. *B. allioides* has (8)10-16 dorsal vittae and 4 commissural vittae.

Acknowledgements: We wish to thank Selçuk University (Project no: BAP-15101015) for financial support.

Keywords: Fruit anatomy, *Bunium*, endemic, Umbelliferae, Turkey

The Impact Of Drought in Wheat Genotypes Morphophysiological Indicators in Different Soil-Climatic Conditions

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Aim of the study: In this regard, cultivated in unfavorable soil-climatic conditions resistant to various stresses, including drought and salinity, genotypes using in creating of new, highly productive and resistant to stress factors varieties and samples is the most pressing issues of plant breeding.

Material and Methods: Investigation were conducted at Absheron, Gobustan and Jalilabad Regional Experimental Stations of RI of Crop Husbandry, on wheat genotypes. At the same time in connection with the different maturity, variety samples were identified in early, mid and late mature groups. The effects of drought at various development stages on surface area, dynamics of above ground dry bio-mass increase and carbon dioxide gas exchange at ontogenesis etc. changes in physiological indicators of the genotypes were determined. Then obtained results were statistically analyzed (correlation, regression etc.).

Results: Surface area of assimilating parts of two durum wheat (Garagylchyg-2, Alinja-84) and two bread wheat (Nurlu 99 and Gobustan) genotypes were comparatively studied at irrigation and drought options. By obtained results the maximum index of assimilation surface area of leaves was observed at heading-flowering stage, assimilation surface area of leaves at variety Garagylchyg-2 was constituted 66,8; 51,8 m²/ha. The difference between the options was constituted 22,4 %. On the other hand, the maximum indexes at the leaves of bread wheat genotype Gobustan variety was observed at the first decade of May, coincides with heading-flowering stage and accordingly constitute 64.2; 61.2 m²/ha. The difference between the options was 4.6%. It can be noted that the maximum indexes of assimilation surface area of the stem was reached 66.8; 56.7 m²/ha in the second decade of May. As for the difference between the options was 15.1%, as opposed to the leaves. Bread wheat genotype Gobustan had similarity. Thus, the maximum assimilation surface area of the stem was constituted 69.7; 61.2 m²/ha on the first and second decade of May, with 12% of the difference between the options. Here, as in previous versions, the difference decreased at Gobustan. At the end in relation to the growth dynamics of the spike area can be noted that at Garagylchyg 2 at maturity stage (end of May or beginning of June) it was constituted 31.2; 20.9 m²/ha, and difference between the options was increase of 33%. This is related to the fact that towards the end of vegetation deepening of drought leads to sharp difference between the variants. At variety Gobustan, this index constituted 28.6; 23.4 m²/ha. Unlike the difference between the options at Garagylchyg-2 was reduced by 18%. Similar study was conducted at Jalilabad RES. Correlation analysis of the spike with other indicators was conducted. As can be seen the spike elements correlate with each others. If relationship between the indicators lower than 0,3 it show existence of poor correlation. On the other hand, if relationship is between 0,5-0,7 it show existence of close relationship and finally if exceeds 0.9 relationship is high and almost appeared functional relationship. According to the average quantities indexes can be noted that the smallest index is observed at width of the spike, the highest at the number of grains per spike. This is also due to the fact that the smallest index at all the samples was at spike width, thus calculation based on the average value of this index.

Keywords: Wheat varieties, photosynthesis intensity, stress factors, physiological indexes, drought resistance, maturity stage

The Study of Genetic Diversity and Population Structure of *Nuphar lutea* in Lithuania

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Aim of the study: Genetic diversity of *Nuphar lutea* populations is still very little investigated, there are no studies on the impact of environmental conditions on the population structure. We investigated genetic diversity of *Nuphar lutea* L. populations in natural and urban sections of rivers. Yellow water-lily is a widespread aquatic macrophyte that grows well in clean and polluted rivers, stagnant or slow-flowing water, quiet river bays, where water flow is slow. It propagates vegetatively – by rhizomes or their fragments, sexually – by seeds, flowers are pollinated by insects. Fruits with seeds can travel for a long distance and this property is important for spreading the seeds by water. The seeds are also carried by birds and fish. *N. lutea* is considered an indifferent plant that adapts to various environmental conditions.

Material and Methods: *N. lutea* plant leaves were collected during flowering. Total genomic plant DNA was isolated from young leaves. DNA isolation was carried out using the genomic DNA purification kit (Thermo Fisher Scientific Baltics) following the manufacturer's instructions with some modifications. Genetic analysis of populations was carried out using ISSRs (Inter-Simple Sequence Repeats) markers. The hierarchical AMOVA (analysis of molecular variance) was performed in GenAlEx 6.5 (Peakall & Smouse 2012) to evaluate partitioning of diversity within (PhiPT) and among species (PhiRT). Shannon's diversity index (H) was calculated using POPGENE version 1.32 (Yeh *et al.* 1997).

Results: The results of the study showed that greater genetic diversity of *N. lutea* populations was in the urban river sections. Intra-population genetic variation was higher than that of interpopulation. It was found that distribution of genetic diversity of populations from urban and natural habitats was different. Genetic differentiation of natural habitat populations was higher than of urban ones. The Mantel test also confirmed the effects of anthropogenic impact on the population structure, because in the populations of natural habitats, the correlation between genetic and geographic distances was reliable.

Acknowledgements: This research was funded by a grant (No. SIT-2/2015) from the Research Council of Lithuania.

Keywords: *B. frondosa*, genetic diversity, ISSR markers.

The Total Content of Phenolic Compounds in the Leaves of Regenerated Plants of Cabbage (*Brassica oleracea* L.)

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The aim of the study: is to study the accumulation of compounds of phenolic nature (amount of soluble phenolic compounds (SRFS), flavans and flavanols) in the leaves of cabbage, depending on the ploidy level of cells.

Material and Methods: The objects of study were the leaves, isolated with intact diploid plants of cabbage, and plants-regenerants obtained in vitro culture of reproductive organs (ovaries and anthers), characterized by a different set of chromosomes. In our study we used a new universal method for preparation of chromosomes of plants "SteamDrop". Determining the amount of soluble phenolic compounds was performed according to the method of M. N. Zaprometov. The content of flavanol was determined with 1% solution of vanillin in 70% sulfuric acid at 500 nm. The content of flavonols was determined by reaction with 1% aqueous solution of $AlCl_3$ followed by spectrometry at 415 nm.

Results: In this experiment it was studied the accumulation of compounds of phenolic nature (amount of soluble phenolic compounds (SRFS), flavans and flavanols) in the leaves of cabbage, depending on the ploidy level of cells. It was established experimentally that investigated the regenerants, which is mixoploidy culture, have different ability to synthesize phenolic compounds. So, SRFS in the leaves of haploid plants of cabbage in 1,3-1,4 times higher compared to diploid forms. While for plants containing 3n and 5n ploidy levels, this trend was not observed, but on the contrary, this indicator was 1.4-1.5 times lower compared to the diploid (2n) forms. When determining the content of flavans and flavanols in leaves of the obtained regenerated plants was observed the same trend depending on the ploidy level of cells. In the present work has determined the amount of soluble phenolic compounds (SFC) in the 1st and 3rd of the normal leaves. Studies have shown that the regenerated plants of the cabbage with the ploidy of 3n and 5n these changes were significant. In the 3rd normal leave SFC the plants 5n increased by 80%, and in plants 3n - 35% compared to the 1st normal leave. For diploid and haploid plants of significant changes in the content SFC in the leaves was not observed. Determination of chlorophylls a and b showed that haploid forms of cabbage the level of these pigments was higher than that of other forms of plants differing in ploidy. Their accumulation as in the 1st and 3rd normal leaves was not essential. The data indicate that haploid forms of plants-regenerants of cabbage, obtained from the reproductive organs in vitro, the accumulation of phenolic compounds is at a higher level that indicates a change in phenolic metabolism in plants.

Key words: Cabbage, ploidy level, phenolic compounds, regenerated plants, in vitro

The Vascular Plant Diversity and EUNIS Habitat Classifications of Kırşehir Province (Turkey)

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Aim of the study: The main objective of the study is to determine vascular plant diversity of Kırşehir region and classify habitats based on European Nature Information System (EUNIS).

Material and Methods: The vascular plant diversity of Kırşehir Province thoroughly and extensively surveyed between 2016 and 2017. Field data was combined all relevant literature and a complete floristic list obtained. Additionally population size and distribution area of endemic taxa were directly observed in field, thus their IUCN threat categories were re-evaluated taking into account of all potential threats especially on rare endemics. Habitat types were determined by field observation according to the EUNIS classifications and the databases of CORINE Land Cover.

Results: 1255 vascular plant taxa were determined in Kırşehir Province based on both field observation and literature. 1255 vascular plant taxa belonging to 89 families and 438 genera are determined in the province of Kırşehir, of which 186 are endemic. Furthermore, 50 taxa were recorded first time for vascular flora of Kırşehir. IUCN categories of endemic taxa are listed as follows: 6 CR, 4 EN, 11 VU, 31 NT, 143 LC and the rest of (11 taxa) is NE. As a result, 12 different main EUNIS (Level-2) habitat types were determined. The dominant habitat types are *Intensive unmixed crops* and *Irano-Anatolian Steppes* thorough Kırşehir Province. Illegal occupations and open mining projects are the main threat factors against to the natural steppes and mountains in Kırşehir Province.

Acknowledgements: This study was supported by The Ministry of Forest & Water Affairs (Turkish Republic), General Directorate of Nature Conservation and National Parks.

Keywords: Biodiversity, CORINE, EUNIS, Flora, Kırşehir

The Vascular Plant Diversity and EUNIS Habitat Classifications of Kırıkkale Province (Turkey)

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Aim of the study: The main goal of the study is to determine vascular plant flora of Kırıkkale region and classify habitats based on European Nature Information System (EUNIS).

Material and Methods: Floristic surveys were carried out 2016 and 2017 in Kırıkkale Province. Field data was combined all relevant literature including local floras, ethnobotanical studies etc. and a complete floristic list obtained. Additionally population size and distribution area of endemic taxa were directly observed in field, thus their IUCN threat categories were re-evaluated taking into account of all potential threats especially on rare endemics. Habitat types were determined by field observation according to the EUNIS classifications and the databases of CORINE Land Cover.

Results: 1416 vascular plant taxa were determined in Kırıkkale Province based on both field observation and literature. 1416 vascular plant taxa belonging to 97 families and 488 genera are determined in the province of Kırıkkale, of which 169 are endemic to Turkey. IUCN categories of endemic taxa are listed as follows: 4 EN, 10 VU, 16 NT, 131 LC, 2 DD and the rest of (6 taxa) is NE. 82 taxa were recorded first time for vascular flora of Kırıkkale. As a result, 13 different main EUNIS (Level-2) habitat types were determined. The dominant habitat types are *Intensive unmixed crops* and *Irano-Anatolian Steppes* thorough Kırıkkale Province. Direct threats against to the natural steppes and mountains are illegal occupations and open mining projects.

Acknowledgements: This study was supported by The Ministry of Forest & Water Affairs (Turkish Republic), General Directorate of Nature Conservation and National Parks.

Keywords: Biodiversity, EUNIS, CORINE, Flora, Kırıkkale

Tugay Forests of the Northern Coast of the Caspian Sea

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Aim of the study. Tugay forests on the northern coast of the Caspian Sea have spread around the villages of the cross shores of the Velvele river. For this reason, it is possible to call it riverside forests. The dominant type of plant cover is white and black bush (*Populus alba*, *P. nigra*), subdominants are bearded alder (*Alnus barbata*) and *Salix triandra* (*Salix alba*). Abundance of white and black poplar 3-4 point, Abundance of bearded alder 2-3 point and abundance of *Salix triandra* and willow is 2 point.

Material and methods. Willow, alder, poplar formation was recorded in the brigade forest on both sides of the Valvala river. Willow, alder, poplar formation (*Salixeta-Alnusetum-Populosum*): This formation divided in willow - bearded alder - white poplar grove (*Salixeta triandra-Alnusetum barbata-Populosum alba*) and little elm - black poplar grove (*Ulmum minor-Populosum nigra*) associations. For the phytosociological structure in the first structure *Populus alba*, *P. nigra*, *A. barbata*, *Salix alba*, *Ulmus minor* and other trees are recorded that, average height of those species is 1700- 2300 sm and density corresponds to 0.6- 0.9. In this stage *Elaeagnus caspica*, *Tamarix hohenackeri* and *Punica granatum* are recorded. A project cover equal to 10-40%. In the second half of forest *Salix excelsa*, *Berberis vulgaris* and trees - shrubs is recorded in very sparse in the abundance of 1 point. A project cover equal to 10-20%. Average height of those species is 350- 1500 sm and density corresponds to 0.2- 0.5. In this area *Artemisia szovitsiana* is also seen. average height reaches to 70 sm. The abundance is 1-2 points. In addition, lowland flora of *Artemisia szovitsiana* spread in willow - poplar grove area is considered endemic plants of Caucasus. From this perennial herbaceous species of this phyto-celestial weed, there is a very rare occurrence of *Elytrigia eleongatiformis* on the floor of the weed; In the second stage *Trisetaria flavescentis* bushes is recorded in abundance of 1-2 point (average height reaches to 40-70 sm). *Euphorbia humifusa* in the third stage is recorded with 1-2 point (average height reaches to 10-30 sm). On the riverside and in very damp water sources *Populus alba*, *Ulmus minor* bearded alder forest alternating each other.

Result. As a result of this activity on the territory of Caspian lowland, the spontaneous cutting of trees and shrubs in the sea and the tugay forests as a result of human activity, as well as the deforestation of the forest and the degradation of the first forest cover, has been observed and dissolved. It should be added that, it is used mainly for the cultivation of agricultural plants in the coast and near the riverside where the forests in this region are broken.

Keywords: Formation, dominant, phytocenosis, association, natural habitat, biocenosis

Vegetation Diversity of Mountainous Part of Lankaran (Azerbaijan)Elshad GURBANOV, Sanubar ASLANOVA¹ Dendrology Institute of ANAS, Azerbaijan Republic² Azerbaijan State Pedagogical University, Azerbaijan Republic
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Aim of the study: As mountainous part of Lankaran has rich flora, vegetation diversity which is an integral part of biocenosis in ecosystem of region differs from other botanical – geographical regions of Azerbaijan Republic. It forms subalp meadow, forest, subforest meadow, mountain xerophytes, mountain steppe, petrofit and wetland phytosenotypes explored in biodiversity of administrative regions like Yardimli, Lerik and Astara located in the area. Wild flora and natural phytocenosis in ecosystem of mountain, especially, relict forests were subjected to freezing of third and fourth periods. From this standpoint, these forests spread widely in the past and currently, cover enough area in mountainous part, notwithstanding it was not subjected to antropogenic influence.

Material and Methods: Above mentioned vegetation diversity spread at 1500-2500 meter height from the sea level in subalp meadow, mountain–forest, meadow–steppe zones in *moderate, hot semi-desert* and dry field type climate condition passing summer dry; grassy mountain meadow, brown mountain forest, brown mountain and swampy meadow lands.

Results: Vegetation of summer pasture areas in explored areas were digressed at the result of zoogene factors and negative economic activity of peoples. In this regard, productivity of subpasture phytocenosis changed with respect to climate condition and nutritiousness of main fodder crops was decreased.

Keywords: phytocenosis, flora, ecomorph, relict.

The Importance of Traceability Regarding Sustainable Fishery Management

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Aim of the study: In parallel to advance of technology, especially after 1980s, fishery have developed rapidly. Sea and inland water sources have started to be exploited, and ecological structures of water resources have been ruined. Therefore, it is started to found regional collaborations. Moreover, with common interests, it is tried to develop more efficient and more comprehensive methods for fishery. There is a unique importance of fishery within all these fishery methods, because, with traceability, it is possible not only to improve the product quality, but also to make plans.

Material and Methods: Main materials of this research are literature researchs on the subject. Various articles, reports and statistics were used. Information on latest developments was researched and data from reports of the Ministry of GTH were used. Publications and reports of DPT, GTHB, TÜİK, BSGM were used for the collection of data. Data was also gathered through interviews and mails with institutions in Turkey.

Results: The importance of management of biological capacities of fishery fields with principles of sustainable fishery can be understood better, considered that fishery provides nearly %15 of the animal protein. Traceability is a very important tool regarding sustainable fishery and fishery management. Managing the stocks by creating a quota in order fish to be there for hunting in the future is aimed with sustainability in fishery. Traceability begins in boats, docks and landing places. The rules about legality of freshness, length, species of fisheries, and period and place of hunting requires these products to comply the standards and consumer to be informed. With a well-regulated traceability, one can have reliable data, and benefit from these data. By this way, production amounts, dispersion of products and species can be traced. Lack of traceability leads to sale and illicit trade of products without hygiene, standards or products from banned hunting areas. However, it is in responsibility of not only sellers, but also foundations and consumers.

Key words: Sustainability, fishery management, traceability

Traceability of Fisheries in EU and TurkeySerpil YILMAZ¹, İbrahim YILMAZ²¹Basic science/Fisheries Faculty, University of Akdeniz, Turkey² Department of Agricultural Economics/ Agricultural Faculty, University of Akdeniz, Turkey
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Aim of the study: Fishery sector is one of the sectors that Turkey should adapt to European Union. For this purpose, one of the steps that should be taken is to improve the traceability of the products, especially that are being exported. However, there are still serious deficiencies in Turkey regarding traceability. In fishery sector, there is a lot of competition; thus, in order Turkey to be one of the most producer countries in aquaculture as it was in previous years, traceability must be adapted by the manufacturer. In this study regarding alignment with EU, applications of traceability are studied, and deficiencies are put forth, and solutions are tried to be suggested.

Material and Method: The main material of the study is formed of regulations and various source researches. With this regard, it is benefited from articles, reports and statistics about the subject; moreover, the latest progresses about traceability especially in Europe are tried to be obtained from reports of Republic of Turkey Secretariat General for European Union Affairs. Other than these, the necessary data are tried to be obtained via interviews and correspondences with various stakeholders in fishery sector. For this purpose, it is benefited from the reports of foundations such as DPT, GTHB, TÜİK, BSGM of Turkey. Face-to-face interviews have been done with some fishery businesses in Turkey. In this interviews, it is negotiated about opinions and expectations of fishery manufacturers in Turkey about traceability.

Results: Nowadays, there are a lot of awareness about traceability of food products. Thus, rules are set within EU Food Safety Legislation (General Food Law) for all food businesses (food and fodder) in order to protect the consumer well. These rules are implemented on production, procession and distribution of food and fodder. Within these rules, it is given importance to traceability (one step before and after rule) and to transparency (informing the public). In the subject legislation, the basis and methods for free circulation of animals and animal products are determined for in and out commerce. Controls such as certificates, identifying animals and records of activities are compulsory with this legislation. Moreover, the traceability and control of animals and animal products in society and being exported, management and entry to a central database of movements of them are compulsory. According to common fishery policy of EU, for hunting, the ones who are responsible for selling of fisheries from boats to only registered buyers or only in registered auction places, being registered of the first buyer, selling, storing and distribution of products for which minimum sizes are determined must prove the geographical origin of the products. Apart from this, within common market arrangements, the ones who sell these products must take the necessary precautions to inform the consumer, and must ensure that the products conform the marketing standards about the freshness and length of fisheries. Similar rules are applied to aquaculture. For aquaculture, it is required to register the informations about vaccination, where the fish is bought, which fodder is bought from where and how much it is bought, where it is sold. It is also required to obey the rules of fish welfare.

Keywords: Traceability, EU, Turkey, hunting, aquaculture

Determination of Boron Extraction Methods for Plant Available Boron Content in Canola Grown Soils, Tekirdağ and Çanakkale Provinces

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Aim of the study: This research was carried out in order to determine the most suitable method for chemical extraction of available for plant boron content in Tekirdağ and Çanakkale provinces soils.

Material and Methods: The methods used for predicting plant available boron content of the soils exposed a high degree of correlation with the biological indexes. Sixteen chemical extraction methods were ranked as: DTPA- NH_4OAc > 2 mM DTPA > 1 N NH_4OAc (pH: 7) > 1 N NH_4OAc (pH: 4.8) > 0.01 M Tartaric acid > Hot 0.01 M CaCl_2 > 0.05 M Mannitol (pH: 7.5) > 0.05 M Ammonium Oxalate > Hot water > 0.05 M KH_2PO_4 > Total Boron > 0.02 M HNO_3 + 30 % H_2O_2 > 0.05 M Mannitol/ 0.01 M CaCl_2 > Cold 0.01 M CaCl_2 > 0.01 M Mannitol/ 0.01 M CaCl_2 > 5 % Glycerol/ 0.01 M CaCl_2 . The one of the first six chemical extraction method in this arrange could be proposed as the best method to determine the plant available boron content of the soils.

Results: According to the results, dry matter yield, boron content and total boron uptake of canola were increased with the increasing amount of boron applied to the soil. The methods above are usable due to their highest correlations and biological indice values in the identification of the amount of available boron for research plants. The correct identification of the amount of boron for plants, especially for canola, is of high importance; for the boron application more or less than the plant's need might cause significant nutrition problems. With the appropriate amount of boron application, substantial improvements can be observed in canola plant's yield and quality.

Acknowledgements: The authors thank Çanakkale Onsekiz Mart University, Scientific Research Project Funding for their financial support (Project number: 2010/85)

Key words: Canola, available boron, chemical extraction methods.

Erosion Process on Vegetation Cover in Ganje (Azerbaijan) Districts

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Aim of the study: Data about vegetation cover on irrigated areas of Ganja region districts affected by erosion and have been shown in the paper. Rate of the index of erosion sensitivity has been established and has been found high value of erosion index in Shamkir reservoir as results of water increasing and in the same time also in Ganja district as results of regular irrigation: the angle of inclination α - maximum of 60° , for each area has 45° as also all enouther parametrs have maximum level.

Materials and methods: Researching of Ganjateritories of Azerbaijan affected to erozion and degradation have been spent in 2016. Index of erosion and index of topographic relative humidity were determined for this territory. The value of the low-risk method 0-33, the average risk-34-67, 68-100 is considered high risk according by methodics. The maximum volue of Relative topographical humidity index – 60. The general impression that the decline in the rates of assessment models, according to figures from the result of which is as follows: Additive RTHI: both summ - max60; Inclination angle α : max.60; Altitude and solid oundation: the max. 60.

Results: For mapping of land territory determination of plant communities is one of the most important specification. At first in determination of RTHI - Relative topographical humidity index are important parametrs of decreases in plant communities and formation not typical for these territory plants. Therefore, the process of combining the areas of classification biophysical parameters and the accuracy of the study, in advance of potential plants terms is to inform. So after study 7 volatility in population SEI consist 44,4. This indicates the destruction of 40% of plant communities of the flora of the area. Influence of antropogen, technogene and another ecological factors in modern conditions on phytosenosis heve been changes in biotopes (regeneration and digression) and as results took place sucseccion. As a result, in modern vegetation formed *Artemisia fragrans*+*Salsola nodolusa*. Earlier this hole in the steppe and grassland dominated by meat plants but now are found in the spots or interzonal way. Determined that the productivity of the aboveground part of domination phytosenosis of wormwood semi-desert is changing between 39,9 c/h -69,3 c/h depends from soil musture. It was revealed that the total weight of the semi-desert phytocenosis reduced in every year depends from ecological factors. So, for protection of nature genofound must create reserves and also sowing the seeds of valuable forage crops for prevention of degradation and sucseccion and spent surface soil improvement.

Keywords: Erosion rate, degradation, vegetation, sucseccion

First Records of Nymphs of *Prozercon carpathofimbriatus* (Acari: Zerconidae) in Turkey

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Aim of the study: To determine fauna of zerconid mites (family Zerconidae) which spread in Thrace region, and contribute to acarofauna of Turkey, mites belonging to genus *Prozercon* living in litter, soil and moss samples collected from different habitats were examined. Definition of *Prozercon carpathofimbriatus* was given according to samples collected from Edirne, Kırklareli and Tekirdağ provinces. The specimens belonging to nymph stages of this species were found for the first time in this study.

Material and Methods: Soil, litter and moss samples were taken from different localities in forestland of Thrace region (European part of Turkey). Samples were placed in plastic bags, labelled and transferred to the acarology laboratory. Samples were then placed in combined Berlese funnels, and mites were extracted for 5-7 days according to the humidity of the samples. At the end of this process, the contents of the bottles were transferred to Petri dishes and mites were separated under a stereo-microscope by using forceps. They were placed in 60% lactic acid for clearing and mounted on permanent microscope slides using a glycerine medium. The examination and drawing of mites were carried out using an Olympus BX50 microscope with DP25 camera. The specimens examined are stored in 70% ethanol and deposited in the Acarology Laboratory of Pamukkale University (Turkey). Morphological terminology, idiosomal chaetotaxy and poidotaxy used in the description follows that of Mašan & Fend'a (2004).

Results: Original definition of *P. carpathofimbriatus* was made in 2004 by Slovak acarologists Mašan & Fend'a, according to specimens collected from Poland, Czech Republic and Slovakia. Female and male specimens of *P. carpathofimbriatus* were recorded by Duran et al. (2014) from İstanbul province before. However, no members of nymph stages of this species have been found in Turkey. As a result of sampling from Edirne, Kırklareli and Tekirdağ provinces in Thrace region, specimens of deutonymph (57) and protonymph (19) stages were found for the first time in Turkey as well as female (535 ♀♀) and male (239 ♂♂) specimens. Definitions of *P. carpathofimbriatus* specimens were reviewed, measurements of various body parts were taken, and distributions of both Turkey and the world were discussed in light of literatures. Also, a key to the species of genus *Prozercon* known from Turkey is arranged.

Acknowledgements: This study was financially supported by the Pamukkale University Scientific Research Projects Unit (PAUBAP), project no: 2012FBE067. We would like thanks to Esat Kızılkaya (M.Sc.) and Musa Azmaz (Teaching Assistant), for their valuable contributions to the field studies.

Keywords: Acari, Mesostigmata, zerconid mite, nymph, Thrace region, Turkey.

Mite Species on Litters in Ankara VineyardsEmre İNAK¹, Sultan ÇOBANOĞLUDepartment of Plant Protection, Ankara University, Ankara
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Aim of the study: Soil mites are very important in terms of both bioindicator features of them and their roles in decomposing process of organic materials. Because of their different intolerance to different pollutants and their different decomposing capacities, identification of these mite species are very important. Furthermore, there a lot of predator mite species which live in soil. The aim of the study was to determine the soil mite species on litters in Ankara vineyards.

Material and Methods: Sampling was done in northern Ankara (Güdül and Kalecik regions), because that regions has the vineyards which has economic importance for Ankara. The mites were extracted by Berlese Funnel for 48 hours. Samples were kept in 70% alcohol. For further process, lactophenol was used for clarification and Hoyer's medium was used for preperation.

Results: Eight different mite families were identified from plant litters of vineyards. *Neoseiulusmarginatus* (Acari: Phytoseiidae), *Tydeuskochi* (Acari: Tydeidae), *Proctolaelaps pygmaeus* (Acari: Melicharidae), *Hypoaspisbrevilipis* (Acari: Laelapidae), *Arctoseiuscetratus*(Acari: Ascidae) , *Ascabicornis*(Acari: Ascidae), *Tyrophagussimilis* (Acari: Acaridae) , *Tyrophagusperniciosus* (Acari: Acaridae) were obtained from plant litter of vineyards. Additionally, Oribatidae and Cunaxidae family specimen were recorded. Oribatidae was the most common mite group among other mite family members.

Acknowledgements: This study was supported by Ankara University (Project number: 16L0447001)

Keywords: Ankara, Vineyards, Soil mites, Plant litter, Mites, Acari

Research of Soil Pollution with Oil and Solution Ways of Their Restoration

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Aim of the study: In connection with increase in world population the need for soil territory increases every year and it entails elimination of the valuable areas from agricultural territories. Irrational use of natural resources makes results in reduction of the fertile grounds and to disruption of ecological balances. Research in oil fields soil is result in pollution of the big ground areas to make development and prospecting works, drilling of chinks. The deserted and polluted ground territories become ownerless where there is no vegetation, decrease in the number of microorganisms, fauna representatives are completely perished. As result of ground pollution by crude oil, the background radiating of sites increases, representatives of natural flora also perishes. Absheron soil ground fund is 584,7 thousand ha or 6,8 % of all area of the Azerbaijan republic. The territory of Absheron is rather the complex of difficult geological structures. It is characterized by a wide circulation and the big capacities (up to 10-15 km) of complex mezo-kaynazoye adjournments. Positive structures are submitted by Brachianticlinial and rare, dome-shaped fold containing of oil and gas fields which sites of deposits are distributed in allocated of non-uniformly structures. The basic forms of them concentrated in the central and southern part of peninsula. For Absheron has moderately warm climate in dry summer year's characteristic to semi desert climate. Thanking to aridity of Absheron climate as such forms of relief, as arid denudation of saline - deflationary and coniferous-tree species are widely advanced. Naturally vegetative cover of Absheron is ephemeral, described the short period of vegetation. Depending on genetics of geographical features of Absheron soil factors is in the basic of gray-brown and brown ground distribution. Morphological features of gray-brown and brown soil is small humiliation (up to 1,3 %) and with high carbonate contents. This ground possesses adverse physical and chemical properties and it is differing by low fertility. Long time in ground territories of Absheron, namely in Sabunchi, Surakhani, Zig, Binagadi, Garadag and in other areas, at oil recovery occurred pollution of soil by oil, as a result of its where the uncontrolled pollution.

Materials and Methods: The soil analysis is made for carrying out of research, with the purpose of revealing the maintenance contents of oil components, the quantity and a degree of pollution of the ground areas is determined, used an induction by photometer 7100 (palintest, Germany), with the purpose of revealing anions and kations in polluted soil. Measuring instruments of gradients of water (Aquapro a tester), acidity of water with a measuring instrument (User, With Enide, Psh-200) are used, a determinant of quality of air (indoor Air Gualitometer), a hydrotester (Psh-80), definition of a radiating background of soil is made with the radiometric detector (FILCHS - МР/ч), are used also spectrophotometer, microscopy and classical methods of revealing of presence of microorganisms (crop, etc.) and also analytical methods.

Results: As a result of pollution of coastal zones of Caspian sea, more than 136255 areas of the grounds are subject in ownerless of 2300 ha of the grounds are included into the column of poorly and medium polluted, 2600 ha in strongly polluted grounds. For irrigation are used poorly and moderately polluted sites of the grounds. Greening works, prevention a specific smell of air, is special in summertime. Regular having watered, maintenance of plants with organic and mineral fertilizers provides ability to long living of tree-shrub plants.

Keywords: Polluted ground, pollutant, display of plants and microorganisms, a radiating background

The Effects of Gytija on Soil Properties in Nickel Contaminated Soils

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Aim of the study: In this study, the effects of gytija on some soil properties in nickel contaminated two different soils (Inceptisol and Entisol) were investigated.

Material and Methods: This study was conducted with the application of three levels of gytija (0, 5 and 10%) in two different soils (Inceptisol and Entisol) contaminated with three levels of Ni (0, 40 and 80 mg/kg) in a factorial experimental design with three replications.

Results: Some soil properties showed differences in different nickel and gytija applications. Soil nickel content significantly ($P<0.01$), increased in nickel contaminated soils. Soil organic matter and phosphorus contents in gytija applied soils were found in higher level compared to those in without gytija soils.

Keywords: Gytija, nickel, soil properties, inceptisol, entisol

To the Oribatid Mite Diversity of Polessky Nature reserve, Ukraine

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Aim of the study: Polessky Nature Reserve (PNR) is located at the border of Ukraine and Belarus in Ovruch and Olevsk districts of Zhytomyr region. Oribatid mites (Acari, Oribatida) are among the less studied taxa of soil fauna of the reserve, though they may indicate the changes in soil processes linked with bog restoration and forest succession. 12 species of oribatid mites are known for this area: *Banksinoma lanceolata*, *Liochthonius propinquus*, *Minunthozetes pseudofusiger*, *Oppiella nova*, *Peloptulus phaenotus*, *Scheloribates labyrinthicus*, *Scheloribates laevigatus*, *Sellnickochthonius furcatus*, *Sellnickochthonius zelawaiensis*, *Suctobelbella* spp., *Tectocephus velatus* and *Trichoribates novus*. The expected species diversity is higher hence the need for further research.

Materials and methods: In June, 2016, samples of soil, litter, moss and other detritus were taken at five experimental plots in PNR. The volume of samples was approximately 200 cm³. Coordinates of the plots are: mixed forest, N 51032.056', E 028004.326' (plot 1); bog with sparse pines and birches, N 51032.025', E 028005.052' (plot 2); broadleaf forest near Bolotnytsa river, N 51032.299', E 028006.151' (plot 3); wet meadow near Bolotnytsa river, N 51032.022', E 028006.201' (plot 4); mixed forest with heather, N 51031.868', E 028006.055' (plot 5). Oribatid mites were extracted in Berlese funnels and mounted in slides in Hoyer's liquid; 3431 adult oribatid mites were identified to species or genus level.

Results: 51 species of 41 genera of 33 families of oribatid mites are added to the oribatid species list: *Achipteria coleoptrata* (2,3,4), *Acrogalumna longipluma* (5), *Acrotritia ardua affinis* (1,2,3,4,5), *Adoristes ovatus poppei* (4), *Autogneta longillamellata* (2,3,4,5), *Brachyochthonius impressus* (2), *Carabodes minusculus* (1,2,3,5), *Carabodes ornatus* (2), *Chamobates cuspidatus* (1,2,3,4,5), *Ceratoppia bipilis* (4), *Ceratoppia quadridentata* (2), *Ceratozetella minima* (1,3,4,5), *Cepheus cepheiformis* (2,3,4), *Cultroribula bicultrata* (3,4,5), *Damaeus subverticillipes* (4), *Epilohmannia cylindrica cylindrica* (3), *Eupelops acromios* (3), *Eupelops occultus*, *Eupelops torulosus* (4), *Euphthiracarus cribrarius* (1), *Gustavia microcephala* (4), *Gymnodamaeus bicostatus* (3), *Hermanniella dolosa* (3,4), *Hypochthoniella muntissima* (3), *Hypochthonius rufulus rufulus* (3), *Lagenobates lagenula* (4), *Liacarus coracinus* (5), *Liochthonius brevis* (1,3,4,5), *Liochthonius horridus* (3), *Liochthonius forsslundi* (2), *Malaconothrus egregius* (1,4), *Mesotritia nuda* (1), *Metabelba papillipes* (2,3,4,5), *Microtritia minima* (3,5), *Nanhermannia dorsalis* (1,2,3,4), *Nanhermannia nana* (1,2,4), *Nothrus biciliatus* (3), *Nothrus silvestris* (1,2,3,4,5), *Oribatella sexdentata* (4), *Oribatula* sp. (1,3), *Peloptulus phaenotus* (4), *Phthiracarus compressus* (1,2,4,5), *Punctoribates minimus* (1), *Quadroppia quadricarinata* (1,2,4,5), *Sellnickochthonius immaculatus* (2,4,5), *Sellnickochthonius suecicus* (4), *Semipunctoribates zachvatkini* (1,4,5), *Steganacarus carinatus* (2,3,5), *Steganacarus spinosus* (2,3,4), *Trhypochthonius conspectus* (1), *Xenillus tegeocranus* (3,4,5). These are intermediate results of the research on soil fauna in the Polessky Nature Reserve.

Keywords: Oribatid mites, Polessky Nature Reserve, fauna, Ukraine

Seasonal Changes of the Total Antioxidant Content in Plants of Ecologically "Pure" and "Dirty" Zones of Moscow.

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Aim of the study: In such mega city as Moscow, there are ecologically "pure" zones (parks, forest belts) and "dirty" (vicinities of roads, industrial zones). Formation and accumulation of biologically active combinations, including antioxidants (AO), in plants of these zones is the dynamic process substantially depending on numerous factors of environment. As an example, a plantain (*Plantago major* L.) and a dandelion (*Taraxacum officinale* L.) - typical representatives of herbs have been chosen. They grow everywhere: in "pure" and "dirty" zones since early spring and till late autumn. The aim of the present study – research of seasonal changes of the total antioxidant content in leaves of a plantain and a dandelion growing in these zones.

Material and Methods: Objects of research were water extracts of leaves of a plantain (*Plantago major* L.) and a dandelion (*Taraxacum officinale* L.) collected and dried during 2015 year. Leaves of these plants were collected in an ecologically "pure" place – on the brink of a glade in the Kuzminsky forest park of Moscow and in a "dirty" place - at a roadside of highway of MKAD in the vicinity of the Kuzminsky forest park. In the present work an amperometric method of definition of the total antioxidant content was used.

Results: It is revealed that AO accumulation in leaves of these plants is the dynamic process depending on many factors the main things from which are "stressful", "age" factors and the light exposure factor. Dependence of antioxidant accumulation processes on these factors explains the importance of functions which carry out these substances in plants. For plantain and dandelion leaves seasonal fluctuations of the antioxidant content have made 2-4 times, and they are stronger for a dirty zone. The minimum of the antioxidant content in plantain leaves is observed in the summer when there is its flowering and intensive AO accumulation in seeds, instead of in leaves. Such dependence for a dandelion is not present, since its flowering and seed formation occur earlier, and antioxidants in leaves are collected gradually during the season. The antioxidant content in "a dirty" dandelion is 1,5 -2,0 times more than in "pure" throughout all season.

Acknowledgements: The present work has been carried out due to the budgetary financing. The author expresses gratitude to Misin V. M. for support in preparation of herbs.

Keywords: Antioxidant, plantain, dandelion, amperometric method

Urban Green Infrastructure System: A comprehensive Approach to Support Biodiversity in Urban Areas

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Aim of the study: The aim of this study is to suggest a comprehensive and applicable system for ensuring the sustainability of biodiversity, especially in urban areas, against rapid population growth, global climate change and habitats deterioration. Suggested system (Green infrastructure system) being defined as an interconnected open-green spaces network is especially the ecological planning agenda of developed countries since the 2000's. This system provides ecological, socio-economic and socio-cultural contributions to applied regions. Moreover, the system will particularly contribute to developing countries such as Turkey, in the context of the protection and sustainability of biodiversity in the development process.

Material and Methods: The main material of the study is public open-green spaces and socio-cultural assets in Köyceğiz Town, which is one of the most important tourism and agricultural destinations in Turkey. It was schemed within the framework of green infrastructure system using remote sensing and geographic information system technologies. In the creation of this system, primarily current open-green spaces and socio-cultural assets were detected with the help of master plans, recent satellite data, cultural assets maps and field surveys. Afterwards, ecological focuses, ecological corridors, socio-cultural focus and socio-cultural corridors were defined as the components of the green infrastructure system. Open-green spaces, urban parks, recreation areas, children's playgrounds and urban forests were identified as an ecological focus considering the supporting elements of urban ecosystem. Squares, gathering areas, historical and cultural structures were defined as a cultural focus. These components were interconnected based on graph theory with using linear elements such as urban main streets and boulevards via geographical information system techniques, and then, green infrastructure system was created. During the stage mentioned above, the physical structure, socio-economic and socio-cultural dynamics of the city were taken into consideration.

Results: As a result, public open- green spaces of the Köyceğiz Town were revised with green infrastructure approach. The created system was transformed the city into a model settlement in terms of sustainable urbanization. The green area per capita was increased; links were created between ecological and cultural sites supporting socio-cultural structure of the city. The interconnected ecological and cultural structure supports the urban ecosystem dynamics, the urban open and green area integrity is ensured and the urban habitat is supported. Via by ecological corridors, the biological diversity around the city is moved to the urban areas and the urban floristic richness is increased. The created system contributes to the city's microclimatic comfort and the urban water cycle. Urban ecological corridors create appropriate habitats for fauna with urban parks and recreational areas. The system ensures that natural, historical and cultural references of the city are related to each other. Therefore, socialization increases in the city. Created ecological and cultural routes make more public life more convenient. Besides, the urban fauna habitat and movement areas were extended. This study will guide to future ecological planning studies of the city. Additionally, it is predicted that this work will be a applicable model within the ecological sustainability of the city.

Keywords: Ecological network, biodiversity, urban flora and fauna, geographical information systems

Folk Medicine: Phytotherapeutic Properties of the *Portulaca oleracea* L.

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Aim of the study: The data containing in monographs, transactions, dissertations, articles of various authors and archival materials concerning to botanical researches have been used in the research.

Material and Methods: The basic method of study of the material was the inquiry-survey method on the D.M.Cotton's method [1996]. At drawing up of questions program on data acquisition of folk medicine has been used. The ethnobotanical research methods as: the Wild ethnography; the Observation; the Survey; the Questionnaire design; the Interview; the Balances method; the Comparative method; the Component analysis et.al. were implemented [Guber, 2001; Martin, 2001]. Several methods of folk medicine providing the conservation of the data that are being acquired on the base of etnobiological information attract our traditional culture remained among people through research of use at immune system diseases on scientific bases for the future generation have been indicated below.

Results: *Portula caoleracea* L. is an annual plant, characterized by fleshy, opposite, oblong, thick leaves and branching, sometimes rising prostrate and erect stems. Yellow flowers of small size are collected into bundles. Fruit - spherical or egg-shaped, there are dark brown ripen seeds. Blossoms from June to September. Purslane lives on fallow lands, wastelands, in the river valleys. Places its growth - Azerbaijan, the North Caucasus. Purslane cultivated by gardeners as a vegetable. The tradition of using purslane as a medicinal plant come back to the days of Hippocrates and Pliny. These great healers advised to use it to the elderly and debilitated patients and those who are recovering after being seriously wounded. Arabic poetry of the Middle Ages praised purslane, calling him "the blessed herb" for unique as drugs. The bites of snakes and insects, sleep disorders and vitamin deficiencies, intestinal disorders and diseases of the liver - a wide range of applications of purslane as a means of healing made it a very important crop. Not left to attention of purslane and in Russia - in the diet of the inhabitants of monasteries because it was used as a means to reduce the potency, and promote wound healing, reduces inflammation. Moreover, it appeared that purslane has culinary qualities. Sweet-tart taste of purslane is still complements the bouquet of some of French and Azerbaijanian cuisine. Purslane is used in salads and hot dishes, because it is prepared pickles and marinades, no way inferior to capers delicacy.

Keyword: *Portulacaoleracea*, folk medicine, phytotherapy, Azerbaijan

A Preliminary Study on the Helminths of Edible Frog, *Pelophylax esculentus* (Linnaeus, 1758) From Dniester River Province in Ukraine

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Aim of the study: In this study, the edible frog, *Pelophylax esculentus* (formerly known as *Rana esculenta*) from Dniester River Province In Ukraine, were examined for helminths.

Material and Methods: Seven (4♂♂;3♀♀) edible frogs, were collected in 2005 from Dniester River Province In Ukraine. Within 48 hr, frogs were overdosed in ether-filled glass containers. The body cavity was opened by a longitudinal ventral incision. The alimentary canal was excised and separated. The contents of each part and other were each mixed with 0.5% saline solution and poured into petri dishes for examination under a stereomicroscope.

Results: The helminths of *P. esculentus* comprised 3 species of Digenea (*Diplodiscus subclavatus*, *Pleurogenoides medians*, *Prosotocus confusus*), and 1 species of Acanthocephalan (*Acanthocephalus ranae*) from frogs.

Keywords: Dniester River, Edible frog, *Pelophylax esculentus*, Ukraine

A Research on Some Protozoan Parasites in Eğirdir Lake, Isparta from Turkey

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Aim of the study: In this study, water samples were collected from of Eğirdir Lake (Isparta) for examining some protozoan samples.

Material and Methods: Fifteen water samples were collected from 5 stations of Eğirdir Lake (Isparta) between July 2016 - January 2017. The Modified Acid Fast (MAF) method was used for the detection of *Cryptosporidium parvum* oocysts in the samples. Giemsa staining was performed to detect trophozoites of *Giardia intestinalis*. Standard methods such as iodine-lugol staining have been used for the detection of *Giardia intestinalis* cysts and *Entamoeba histolytica* cysts.

Results: *Cryptosporidium parvum*, *Giardia intestinalis* and *Entamoeba histolytica* were detected in the examined water samples from Eğirdir Lake.

Keywords: *Cryptosporidium parvum*, *Entamoeba histolytica*, *Giardia intestinalis*, Eğirdir Lake, Isparta, Turkey

**A Study on Feeding Biology of Field Lizard, *Ophisops elegans* Ménétries, 1832
Distributing in Antalya Province**

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Aim of the study: In this study, the feeding biology of field lizard (*Ophisops elegans*) inhabiting Antalya was investigated first time.

Material and Methods: Fifty (26♂♂, 24♀♀) lizards samples were collected from 5 different areas in Antalya province and examined for feeding biology, between October 2009 and April 2010 years. The lizards were anesthetized in ether filled glass containers, guts were dissected out using surgical scissors and forceps. Prey items were classified and counted.

Results: In total of from 407 prey items were count. The majority of the diet consisted of the class Insecta in the identified preys in diet of the *Ophisops elegans*: Hymenoptera (24%) and Diptera (23%) while being represented in proportion, Coleoptera (15%), Heteroptera (%9), Orthoptera (%4) and Dermaptera (1%). The arachnids were also observed that 15% in the prey items. Some plant materials (e.g. Asteraceae, Poaceae) were also observed in gut of *Ophisops elegans*. This plant parts are accidentally swallowed in feeding activity.

Keywords: Antalya, Feeding Biology, Field Lizard, *Ophisops elegans*, Turkey

A study on the Rumen Ciliates of Domestic Sheeps (*Ovis ammon aries*) in Denizli, Turkey

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Aim of the study: In this study, the rumen ciliates of domestic sheeps (*Ovis ammon aries*) examined in first time from Denizli.

Material and Methods: Fifteen rumen samples were obtained from the slaughterhouse in Denizli city center, between October 2016 - March 2017. The rumen samples were treated with MFS and later they were stained with lugol solution and ciliates were observed under the light microscope.

Results: Five ciliate taxon were observed (*Blepharocorys curvigula*, *Diplodinium* sp., *Entodinium* sp., *Epidinium ecaudatum* and *Ophryoscolex purkynjei*) for the first time in Denizli.

Keywords: *Blepharocorys curvigula*, Ciliata, Denizli, *Diplodinium* sp., *Entodinium* sp., *Epidinium ecaudatum*, *Ophryoscolex purkynjei*, Turkey

Occurrence of *Hysterothylacium aduncum* (Rudolphi, 1802) in some Teleost Fish Taxa from the Coast of Sakarya Karasu District in Black Sea

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Aim of the study: In this study, four fish taxa (*Alosa fallax nilotica prattus sprattus*, *Mullus barbatus* and *Merlangius merlangus*) were investigated helminthologically, collected from district of Sakarya Karasu coast in Black sea.

Material and Methods: A total of 355 fishes samples (*Alosa fallax nilotica prattus sprattus*, *Mullus barbatus* and *Merlangius merlangus*) were collected between February 2016 and February 2017 in district of Sakarya Karasu coast from Black sea were examined for helminths. The Examined fishes were provided from suitable habitats and fishermen. Fish samples were kept in frozen stage to brought Denizli Faculty of Science Biology Department. Fishes were dissected and helminth samples were identified, and displayed both light microscope and Scanning Electron microscope (SEM).

Results: We observed the 810 *Hysterothylacium aduncum* (Rudolphi, 1802) parasite individuals (Nematoda) in all fish taxa. The prevalence of this helminth species in *Alosa fallax nilotica* (%62,96), *Sprattus sprattus* (%46,15), *Mullus barbatus* (%2,6), *Merlangius merlangus* (%59,57) consecutively.

Keywords: *Alosa fallax nilotica*, Helminth, Karasu, *Mullus barbatus*, *Merlangius merlangus*, *Sprattus sprattus* Sakarya, Turkey

Morphological Characterization of Genetic Variability among Dwarf Green Bean (*Phaseolus vulgaris* L.) Landraces from West Mediterranean Region of Turkey

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Aim of the study: Landrace genotypes represent a great importance as being a gene resource for developing new species. This paper describes findings in the characterization of 16 landrace genotypes in a collection of landrace dwarf beans (*Phaseolus vulgaris* L.) in West Mediterranean region of Turkey. Throughout this study, abolishing the complexity of landrace genotypes, reintegrating landrace genotypes, which are valuable gene resources, into breeding programs and preventing landrace genotypes from extinction was aimed.

Material and Methods: Collected bean collections were grown in Aksu campus of Batı Akdeniz Agricultural Research Institute, located at a latitude of 36°56' N and a longitude of 30°53' E, and an altitude of 28 m in Antalya, Turkey, in April-August in 2015-2016 for two years. The study was conducted according to a completely randomized design with three replicates. Morphological observations were held on 15 randomly chosen plants. Morphological and phenological criteria determined according to UPOV. Statistical analyses of obtained data were held in accordance with Variance Analysis (ANOVA), Duncan Multiple Comparison Test, Principle Component Analysis (PCA) and Cluster Analysis methods. SAS-9.1 and Minitab 17.0 computer programs were used in analysis.

Results: Morphological and phenological criteria determined according to UPOV observing 32 characters. While the first three eigen values based on correlation matrix explained 54% of cumulative variance, the first five eigen values explained 75% of the diversity among the genotypes. The cumulative variation values revealed that genetic variation among dwarf green beans was not high. According to Principle Component Analysis, It was determined that the pigment formation, grain color and number of secondary color on grain characteristics were the most effective characters in terms of revealing genetic diversity. To understand better the diversity of the genotypes, the data obtained were analyzed by cluster analysis. Cluster analysis based on morphological characters grouped genotypes into 2 main branches. The most suitable genotypes were identified for use in future breeding programs.

Keywords: Green bean, Landrace, Morphological Characterization, *Phaseolus vulgaris*, Genetic diversity.



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