BIORARE-2012

INTERNATIONAL SYMPOSIUM ON BIOLOGY OF RARE AND ENDEMIC PLANT SPECIES

23-27 April 2012

Fethiye, Turkey

Middle East Technical University

Group for Peace with Nature

FTSTBRD

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Preface

The Second International Symposium on "Biology of Rare and Endemic Plant Species (for short BIORARE-2012) is organized and planned to be repeated every other years to share and to discuss recent developments and data on biology, conservation and evolution of rare and endemic plant species. The main goal is to bring senior scientists and students of the field in informal, but rigorous discussion platform to stimulate future researches and collaborations on population biology, genetics and genomics, evolution-speciation, and conservation genetics of rare and endemic plants. Especially, it is essential for taxonomists and geneticist to get together and communicate with a common language of evolutionary biology so further insights in speciation and evolution of rare and endemic plant species could be achieved.

Thet BIORARE-2012 symposium and its sattellite workshop (Biodiversity Conservation and Tourism) have attracted diverse group of researchers from 8 countries including Turkey. Total of 35 and 13 oral presentations were presented in the Symposium and Biodiversity Conservation and Tourism Workshop, respectively on April 24-27, 2012. Additionally, total of 75 diverse and interesting poster presentations were available for the symposium participants to view.

On behalf of organizing committee, I would like to thank to all contributers. Hoping that you had a productive meeting and good times in the Sunny Beaches of Fethiye, Turkey.

May 6, 2012

Dr. Zeki Kaya
The Chair of BIORARE 2012

THE PROGRAMS OF BIORARE-2012 SYMPOSIUM AND WORKSHOPS

23 APRIL 2012 – MONDAY	
ROOM A	**Majesty Tuana Park Conference Room**
14:00-20:00	**Registration**
24 APRIL 2012 – TUESDAY	
ROOM A	
07:00-10:00	**Registration (Continued)**
10:00-10:15	**Zeki KAYA, Welcoming Speech**
10:15-11:00	**Opening talks**
11:00-11:20	**Coffee Break**
11:20-12:00	**Zeki KAYA,** Genetics of Turkish Oaks:Importance of Conservation
12:00-13:30	**Lunch / Poster Mounting**
ROOM A	**Session Moderators: Sertaç ÖNDE, Habib AHMAD**
13:40-14:20	**Glenn T. HOWE**, Plant Conservation and Climate Change: Hitting a Moving Target
14:20-14:40	**Fatih TEMEL,** Genetic Diversity of *Picea orientalis* Determined with SSR Markers
14:40-15:00	**H. Tuğba DOĞMUŞ-LEHTIJARVI**, Invasive Alien Plant Pathogens and Their Impact on Forest Ecosystems
15:00-15:20	**Coffee Break**
ROOM A	**Session Moderators: Fatih TEMEL, Hayri DUMAN**
15:20-16:00	**Kani IŞIK**, Species Extinctions: Six Episodes and Six Voyages from a Historical Perspective
16:00-16:20	**Ayten DİZKIRICI,** Phylogenetic Relationships between Three Sections of *Astragalus* Genus (*Incani* DC., *Hypoglottidei* DC., and *Dissitiflori* DC.) and Their Comparisons with Neo-Astragalus Group Based on ITS nrDNA Region

16:20-16:40	**Aysun GÜLSOY,** Molecular Phylogenetic Analysis of Turkish Oak Species Based on Nuclear Internal Transcribed Spacer (ITS) Region
16:40-18:00	**Poster Session**
25 APRIL 2012 – WEDNESDAY	
ROOM A	**Moderators: Kani IŞIK, Reyhan ÇOLAK**
09:00-09:40	**Donald LEOPOLD,** Rare and Unique Plant Communities as Templates for Restoring Degraded Landscapes and Creating Sustainable Green Systems
9:40-10:00	**Asko LEHTIJARVI,** The Impact of Climate Change on The Forest Tree Diseases
10:00-10:20	**Neş'e BİLGİN,** Genetic Diversity Of Almonds (*Prunus dulcis*) of Datça
10:20-10:40	**Yasemin TAYANÇ,** Phylogenetic Relationships of *Abies* Taxons Endemic to Turkey Based on DNA Sequences from nDNA ITS Region
10:40-11:00	**Coffee break**
	Moderators: Musa DOĞAN, Ayla KAYA
11:00-11:40	**Regine CLAßEN-BOCKHOFF,** Pollinator Driven Evolution of Floral Traits in *Salvia* (Lamiaceae)
11:40-12:00	**Ferhat CELEP,** Flower Ecological studies in Sympatric *Salvia* (Lamiaceae) Communities from central Anatolia: Specialisation vs. Generalization
12:00-12:20	**Maria WILL,** Why Africa Matters: Evolution in Old World *Salvia* L. (Lamiaceae)
12:20-13:30	**Lunch**
ROOM A	**Moderators: Donald LEOPOLD, Asko LEHTIJARVI**
13:40-14:00	**Habib AHMAD,** Conservation Issues of Some of Threatened Trees of Hinduraj Mountains of Pakistan
14:00-14:20	**Haidar ALI,** Contribution to the Red List of the Plants of Pakistan: a Case Study of a Narrow Endemic *Astragalus chitralensis* Ali (Fabaceae-Papilionoideae)
14:20-14:40	**Mustafa YILMAZ,** Conservation and Restoration of *Malus trilobata* Populations
14:40-15:00	**Tofiq S. MAMMADOV,** Present Situation Dendroflora of Azerbaijan
15:00-15:20	**Coffee Break**

ROOM A	**Moderators: Burcu ÇENGEL , Zeki KAYA**
15:20-15:40	**Ahmet AKSOY,** Conservation Status and Autecological Characters of *Astragalus argaeus* Boiss.
15:40-16:00	**Emine AKALIN,** Endemic and Rare Species in Northwest of European Turkey "Yıldız Mountains-Kırklareli"
16:00-16:20	**Halil ÇAKAN,** The Role of Archaeological Parks In-Situ Conservation of Rare Wild Crops Relatives and Wild Gathered Plant species: A Case Study from Fertile Crescent (Tilmen Höyük Archaeological Park, Gaziantep-Turkey)
16:20-16:40	**Mirjam METSARE,** Critically Endangered Orchid species *Coeloglossum viride* (L.) Hartm in Estonia
16:40-17:00	**Özge ÖZDEN,** Current Conservation Status and Future Conservation Strategies of *Tulipa cypria* in Northern Cyprus
17:00-17:20	**Meryem ÖZTÜRK**, Evaluation of Threat Categories of The Genus *Cicer* L. (Fabaceae) And Their Conservation Status In Turkey
17:20-17:40	
26 APRIL 2012 –THURSDAY	
09:00-18:00	**Field Trip (Babadağ) organized by Group Peace with Nature and Scientific Guidance with Hayri Duman and Zeki Aytaç**
27 APRIL 2012 – FRIDAY	
ROOM A	**Moderators: Glenn HOWE, Özcan SEÇMEN**
09:00-09:20	**Çiğdem KANSU,** Molecular Phylogeny of *Triticum* And *Aegilops* Genera Based on Partial Sequences of Chloroplast DNA *Matk* Gene
09:20-09:40	**Asiye ULUĞ,** Genetic Diversity of *Populus nigra* Populations Assessed by Microsatellite DNA Markers
09:40-10:00	**Feyza CANDAN**, Achene Micromorphological Investıgations on the Genus Centaurea Section Acrolophus (Asteraceae) from Turkey
10:00-10:20	Coffee break
ROOM A	**Moderators: Regine CLAßEN-BOCKHOFF, Hayri DUMAN**
10:40-11:00	**Aigi ILVES,** Lowered recruiting potential in genetically impoverished populations of *Ligularia sibirica* (L.) in Estonia

11:00-11:20	**Emel SÖZEN,** Transferability of *Centaurea corymbosa, C. stoebe* and *C. diffusa* SSR Markers to *Centaurea nivea*
11:20-11:40	**Yeliz TÜMBİLEN ÖZER**, Genetic Diversity Patterns among *Quercus cerris* Populations Sampled from Southern Turkey
11:40-12:00	**Eyüp BAĞCI/Gülden DOĞAN,** Essential Oil Composition of Wild and Cultivar Forms of *Rosmarinus officinalis* L. (Lamiaceae) from Turkey
12:00:13:30	**Lunch**
ROOM A	**Moderators: Özcan SEÇMEN, Sertaç ÖNDE**
13:40-14:00	**Meryem BOZKURT,** Threat categories of the genus Psephellus Cass. in Turkey and the Genetic Diversity in *Psephellus brevifimbriatus* (Hub.- Mor.) Wagenitz (Compositae)
14:00-14:20	**Evrim ZEYBEK**, Variation in Antioxidative Enzyme Activities under Low Temperature in Black Poplar (*Populus nigra*) Clones
14:20-14:40	**Kubilay YILDIRIM**, Antioxidant Enzyme Activities, Growth and Morphology as a Selection Criterion for the Drought Tolerance of Turkish Black Poplar Clones
14:40-15:00	**Gürkan SEMIZ,** Peripheral Populations of Widespread Species: How genetically Rich Are They?
17:00-17:30	**Closing Remarks and Next BIORARE meeting (BIORARE-2014)**

27 APRIL 2012 – FRIDAY	
ROOM B	**PASTORAL VADİ - ECOLOGICAL LIVING VILLAGE** **(Address:** Yemişli Mah. Kocabük Mevki, Yanıklar Köyü, Fethiye / Muğla)
	WORKSHOP: BIODIVERSITY CONSERVATION AND TOURISM
	Moderators: Hakkı ÇOPUROĞLU, Sadık ERİK
09:00-09:20	**Hasan TORLAK,** Tourism Potential of Endemic Plant Richness of Turkey
09:20-09:40	**Okyay TİRLİ,** Conservation of Biodiversity in Muğla Province
09:40-10:00	**İbrahim ACAR** (General Directorate of Forestry)
10:00-10:20	**İsmail N. ÖZBOZDAĞ**, Ecotourism and Economy
10:20-10:40	**Nurşen Aslan ÇOPUROĞLU,** Health Tourism and Medicinal Plants
10:40-11:00	**Coffee Break**
11:00-11:20	**Galip AKAYDIN,** The Plant Species of Fethiye And The Plants With Type Specimens From Fethiye Area
11:20-11:40	**Bircan DURDU,** As an Element of Intangible Cultural Heritage "SIĞLA"
11:40-12:00	**Ahmet KIZEN,** A Modern Reinterpretation of Traditional Architecture for Sustainable Habitats: "Adobe with Wooden Frame" Buildings With Its New Formation
12:00-13:30	**Lunch**
	Moderators: Nurşen ASLAN ÇOPUROGLU, Galip AKAYDIN
13:40-14:00	**Hakkı ÇOPUROĞLU,** Botanical Tourism
14:00-14:20	**Mehmet ÖZDEMİR,** Project Strategies for the Protection of Biological Diversity of The Yalova Model Forest
14:20-14:40	**Ali KIŞLAK,** İncirköy Echo-Village and Yeşilüzümlü Slow City
14:40-15:00	**Merve ESRİNGÜ,** Green Marketing for Sustainable Tourism
15:00-15:20	**Coffee Break**
15:20-15:40	**Emre KARABACAK,** A Case Study for Bio-Cultural Diversity Conservation: TaTuTa Project
15:40-16:30	Questions and Discussion
17:00-17:30	**Closing Remarks and Next BIORARE meeting (BIORARE-2014) /Go to ROOM A**

TABLE OF CONTENTS

ORAL PRESENTATIONS

(Listed in the order of Presentation in the Scientific Program)

24 APRIL 2012

OP1- GENETICS OF TURKISH OAKS: IMPORTANCE OF CONSERVATION

A.Demet GÜLSOY[1], Ayten DİZKIRICI[1], A.Murat GÜLSOY[1], Çiğdem KANSU[1], Hayri DUMAN [2], Zeki KAYA[*1]

[1]Department of Biological Sciences, Middle East Technical University, 06800 Ankara, Turkey
[2]Department of Biology, Gazi University, Beşevler, Ankara, Turkey

Oaks with 18 species are the most widespread and diverse angiosperm-tree genus in the Turkey and cover the area of 6.5 million ha. Although HEDGE and YALTIRIK (1982) simplified the taxonomy of Turkish oaks by reducing the number of taxa, the taxonomical, biogeographical and phylogenetic status of oaks are not clear yet. Due to widespread natural hybridization among oak species, taxonomic delimitation of species with conventional approaches is complicated. Thus, we studied the phylogenetic relationships of the native oak species in Turkey by using evolutionarily conserved regions of nuclear (nDNA) (ITS) and chloroplast (cpDNA) (*trn*, *mat*K) genomes. Among the studied regions, *ITS* region had the highest variable sites (188) and nucleotide diversity (0.032) in Turkish oaks compared to two ther regions of cpDNA. The variable site and diversiy were 42 and 0.0028 in *trn* and 33 and 0.0021 in *matK*, respectively. Of the three oak sections, Ilex section was the most diverse with respect to varaible sites and nucleotide diversity. The Cerris section had the lowest nucleotide diversity (ranged from 0.00056 in trn to 0.026 in ITS). The existence of variable sites and nucleotide diversity was influenced by the natural hybridization among species of oak sections. *Quercus cerris* in Cerris section, *Quercus petraea* and *Q. pubescens* in Quercus section seem to contribute greatly to the gene pool of Cerris and Quercus sections, respectively. Although oak forests in Turkey play vital role in sustainable agriculture, range management, and forestry in changing climate, they did not attract foresters and conservation biologists as much as they deserve so. Thus, oak forests in Turkey require well planned and structured genetic resource conservation programs. Especially, dynamic *in situ* conservation programs for priority species and areas which will be based on genetic information and genetic refugia should be initiated in Turkey. The further implication of genetic resource conservation in oaks with respect to climate change and oak forestry will be provided in the presentation.

Key words: *Quercus*, Molecular systematics, Natural hybridization, Speciation, Genetic diversity, Genetic resource conservation

***Invited Speaker;** email: *kayaz@metu.edu.tr*

OP2- PLANT CONSERVATION AND CLIMATE CHANGE: HITTING A MOVING TARGET

Glenn T. HOWE

Department of Forest Ecosystems and Society, Oregon State University, Corvallis, OR, USA

Principles for conserving plant biodiversity are well established, but their implementation is challenged by climate change. In particular, in situ conservation will probably become inadequate for many species and populations as the climatic environments to which these populations are adapted shift to new locations or disappear altogether. Given substantial climate change, assisted migration is the most promising approach for maintaining plant populations in the wild, but is hindered by insufficient information on the ecological genetics of most species, climate change uncertainty, and social factors. Assisted migration is controversial, and even when it is deemed desirable, land management organizations are reluctant to act on the basis of incomplete information. However, given the enormous effects that climate change may have, systems for practicing assisted migration with limited information are needed. I will review principles of plant ecological genetics in relation to assisted migration, and then discuss approaches for applying these principles to reforestation and ecological restoration programs. Key questions I will address are: What are the climate change risks faced by forest ecosystems? What role should assisted migration play in helping forests adapt to climate change? How do we infer relationships between adaptive genetic variation and local climate? How can we use this information to infer future climatic habitats and actual distributions of species and populations? Can landscape genomics help us make better assisted migration decisions? Can we design practical assisted migration programs that account for risk and uncertainty? I will discuss these topics using examples from forest trees and other plant species.

Key words: Assisted migration, Forest ecosystems, Climate change

***Invited Speaker;** email: *glenn.howe@oregonstate.edu*

OP3-GENETIC DIVERSITY OF *Picea orientalis* DETERMINED WITH SSR MARKERS

Fatih TEMEL*[1], Aslı ÖZDİLEK[2],Gaye KANDEMİR[3], Zafer ÖLMEZ[1], Zeki KAYA [2]

[1] Faculty of Forestry, Artvin Coruh University, Artvin, Turkey [2]Department of Biological Sciences, Middle East Technical University, Ankara, Turkey [3]Forest Tree Seeds and Tree Breeding Research Institute, Gazi, Ankara, Turkey

Oriental spruce (*Picea orientalis*) natural distribution is confined to eastern blacksea region of Turkey and coastal Georgia. It is one of the major forest tree species and a key component of many fragile ecosystems in the eastern Black Sea region of Turkey. Although the species is listed as Least Concern by IUCN list of threatened plant species, its presence is being seriously threatened by many factors including bark beetles infestation and anthropogenic pressures. Amount and pattern of genetic variation throughout a species natural distribution range are important in designing efficient conservation strategies. A total of 29 natural *Picea orientalis* populations (17 populations were from stands managed for timber production, 12 populations were conserved stands as seed stands or gene conservation forests) sampled in Turkey and Georgia. Randomly selected 10 individuals were

screened with 15 SSR markers. Population genetic parameters reported and implications for forest management will be discussed at the meeting.

Key words: *Picea orientalis*, Genetic diversity, SSR markers

***Presenting author;** email: *ftemel@artvin.edu.tr*

OP4- INVASIVE ALIEN PLANT PATHOGENS AND THEIR IMPACT ON FOREST ECOSYSTEMS

H. Tuğba DOĞMUŞ-LEHTIJARVI[1], Asko LEHTIJARVI [1], Funda OSKAY[1], A. Gülden ADAY[2]

[1]Süleyman Demirel University, Faculty of Forestry, Isparta, Turkey. [2]Süleyman Demirel University, Yenişarbademli Vocational School, Yenişarbademli/Isparta, Turkey.

Being prepared against the biotic or abiotic threats to the forests is among the necessities of sustainable forest management. The threats induced by the invasive alien species (IAS) to the world forestry have already risen up to alarming levels. Forestry activities, changes in land use, international and national trade, tourism and global climate change are among the factors contributing to the spread and establishment of IAS. While globalization brings about economic, social, technological, political, cultural and ecological integration and cooperation between people and countries, it also comprises an increasing risk for the movement of IAS. The introduction of these species to new areas result in unchangeable effects on the ecosystems and, when occupation of natural communities proceeds, the native species face extinction since they cannot compete with the invasive species. The impacts of the possible damages posed by the IAS, which are able to invade, establish, out-compete native species and disrupt ecosystem services, are ecologic and economic, and threaten both environment and human health. As a consequence, IAS will strongly damage the biodiversity, structure and the functions of the invaded ecosystems. In this paper, the invasive alien plant pathogens that cause destructive effects on forest ecosystems will be explained and the possible threads from IAS to the Turkish forestry will be discussed.

Key words: Invasive alien species, Forests, Plant pathogens, Turkish forestry

***Presenting author;** email: *tugbadogmus@sdu.edu.tr*

OP5- SPECIES EXTINCTIONS: SIX EPISODES AND SIX VOYAGES FROM A HISTORICAL PERSPECTIVE

Kani IŞIK*

Department of Biology, Science Faculty, Akdeniz University, 07058 Antalya, Turkiye

Geneticist G. G. Simpson, in his celebrated book “The Major Features of Evolution”, wrote in 1953: “Extinction is the common lot, survival the exception”. Extinction of most species has occurred due to atmospheric and climate changes, sea level changes, plate tectonics and volcanism, all of which could lead to major environmental changes and habitat loss for the species. Geological records indicate that there have been five mass-extinction episodes in the history of Earth, each occurring with intervals of every 60 to 155 million years. The sixth episode of mass-extinction on our planet, which started about 30.000 years ago with mass hunting of early man, reached to its highest intensity within the past 50 years. In this paper I will briefly view the five extinction episodes in the past geological periods,

putting major emphasis on the sixth one caused by mankind on our time. I will also discuss six great voyages mankind attempted to slow down (or hopefully to delay) probable biological disasters forthcoming in the near future. The crucial and common messages given to us by these voyages are that each species has vital functions in its environment, and each has the right to survive and transmit its generations into the future.

Key words: Extinction, Survival, Human influences, Environmental changes

***Invited Speaker;** email: *kani@akdeniz.edu.tr*

OP6- PHYLOGENETIC RELATIONSHIPS BETWEEN THREE SECTIONS OF *Astragalus* GENUS (*Incani* DC., *Hypoglottidei* DC., AND *Dissitiflori* DC.) AND THEIR COMPARISONS WITH NEO-ASTRAGALUS GROUP BASED ON ITS nrDNA REGION

Ayten DİZKIRICI*[1], Murat EKİCİ[2], Zeki KAYA[1]

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[2]Department of Biology, Faculty of Science and Art, Gazi University, 06500, Ankara, Turkey

Evolutionary relationships among 56 species representing three main sections of genus *Astragalus* that is native to Turkey [(*Incani* DC. (30), *Hypoglottidei* DC. (15), and *Dissitiflori* DC (11)] were inferred based on analysis of nucleotide sequence variations in the internal transcribed spacer (*ITS1* and *ITS2*) and *5.8S* gene regions of nuclear ribosomal DNA. Nucleotide deletions, insertions and base substitutions have been found in both spacers (*ITS1* and *ITS2*). However, it is clear that DNA sequence of *5.8S* gene region were more conserved since there were a few substitutions. The length of the total region was about 600 bp; *ITS1* region was about 236 bp, while that of *ITS2* was 10 bp shorter than the length of *ITS1*. The number of variable site of *Dissitiflori* (22) and *Hypoglottidei* (18) sections were high with respect to that of *Incani* section (9). Most of deletions were observed in DNA sequences of both *Hypoglottidei* and *Dissitiflori* species. The insertion of 'CGCACA' sequence that located between 107th and 114th bases caused separation of species of *Incani* section from the species of two other sections. Nucleotide substitutions and indels in DNA sequence of *ITS* region (*ITS1+5.8S+ITS2*) clearly separated three sections from each other with high bootstrap values in the neighbor-joining (NJ) phylogenetic tree constructed by MEGA 5.0 software. However, when only DNA sequence of *5.8S* region was used, *Dissitiflori* could not be separated from *Hypoglottidei* section because of low genetic variations between these sections. Therefore, *5.8S* region was not enough to understand evolutionary relationships between sections of *Astragalus* genus. DNA sequences of *ITS* region of several Neo-Astragalus samples (North and South America) were selected from NCBI database to understand phylogenetic relationships between Old and New World *Astragalus* samples. Phylogenetic tree (NJ) indicated that New World *Astragalus* species are monophyletic and they were nested within the Old World *Astragalus* samples.

Key words: *Astragalus*, Phylogeny, *ITS*, Neo-Astragalus, *Incani, Hypoglottidei*, *Dissitiflori*

***Presenting author;** email: *e131715@metu.edu.tr*

OP7- MOLECULAR PHYLOGENETIC ANALYSIS OF TURKISH OAK SPECIES BASED ON NUCLEAR INTERNAL TRANSCRIBED SPACER (ITS) REGION

Aysun Demet GÜLSOY[1], A.Murat GÜLSOY[1], Hayri DUMAN[2], Zeki KAYA[1]

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[2]Department of Biology, Gazi University, Beşevler, Ankara

The species from three sections of Quercus (*Cerris, Ilex* and *Quercus)* in Turkey were utilized in this study. According to average genetic distance within and between taxa with the overall ITS data revealed that much variation was found in hybrids although the variations within sections were also considerably high, especially in the section Ilex. Moreover, the genetic divergence between section Quercus and other taxa were also high. Since ITS region is composed of three regions including ITS1, ITS2 and relatively conservative 5.8S region in the middle, the data were analyzed with respect to these regions separately. Most of parsimony informative sites were observed in ITS1 region and as expected more conserved sites were in 5.8S region with the lowest variation. For ITS1 and ITS2 regions, more divergence within taxa was seen in hybrids as expected. Similar to overall ITS region results, the section *Quercus* was distinct from other sections.The phylogenetic analysis of *Quercus* showed that the ITS results suggest a geographical division especially the taxa obtained from Adıyaman and Kahramanmaraş. They also indicate the presence of some groups of taxa highly differentiated from other members such as the *Q.pontica, Q.aucheri, Q. ilex* and *Q.coccifera.* The results from ITS data suggest that the relationships within the genus still remain largely unresolved since there are many members of *Quercus* and *Cerris* sections showed dispersed allocation in the phylogentic tree. The lack of resolution of the genus is suggestive of a rapid initial radiation of *Quercus* subsequent to the dispersal of their common ancestor. Moreover, high rate of hybridization suggested that introgression is another corroborative explanation for the lack of distinction among sections.

Key words: *Quercus*, ITS, Nuclear ribosomal DNA, Genetic variance, Phylogeny

***Presenting author;** email: *agulsoy@metu.edu.tr*

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25 APRIL 2012

OP8- RARE AND UNIQUE PLANT COMMUNITIES AS TEMPLATES FOR RESTORING DEGRARED LANDSCAPES AND CREATING SUSTAINABLE GREEN SYSTEMS

Donald J. LEOPOLD*

Department of Environmental and Forest Biology, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210, USA

Some of the rarest natural communities in New York State and the Great Lakes Region of North America, e.g., inland (i.e., non-tidal) salt marshes, marl fens, and alvar pavement barrens and grasslands are comprised of many state and regionally rare plant species. These “marginal” communities have extremes in soil nutrients and salinity, hydrology, and temperature. Many of these otherwise rare species can be abundant in these communities because they are well adapted to these

environmental extremes. These species have great potential in landscape uses under similarly extreme conditions. For example, species in alvar pavement barrens generally persist in nutrient-poor soil less than 10 cm in depth, therefore are well suited to many green roof installations. Species of inland salt marshes are subjected to prolonged flooding early and extreme drought later in the growing season, as well as continuous salt stress. These species thrive in rainwater retention basins, especially those in urban areas that receive substantial salt-laden snow melt. Current building projects on the SUNY-ESF campus in Syracuse, NY are incorporating these strategies to establish unique natural communities and their rare species. This approach can be regionalized to address difficult landscaping issues elsewhere, and to establish functional assemblages of rare species that also have significant aesthetic and educational values.

Key words: Marginal plant habitats, Sustainable landscapes, Rare natural communities

***Invited Speaker;** email: *djleopold@esf.edu*

OP9- THE IMPACT OF CLIMATE CHANGE ON THE FOREST TREE DISEASES

Asko LEHTIJARVI[*1], H. T. DOĞMUŞ-LEHTIJARVİ[1], A. Gülden ADAY[2], Funda OSKAY[1],

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Since the climate is one of the most important natural factors limiting the survival and the distribution of all living organisms, the changes on it will either directly or indirectly affect both the organisms and the environment they inhabit. The climate change affects the intensity, dissemination, degree and duration of damage caused by a disturbance factor within a forest ecosystem. This impact, when considered within the concept of plant pathogens, can cause nonrecoverable damages especially in forest ecosystems. Nevertheless, since the degree of the effects of climate change on different types of ecosystems cannot be clearly projected, the level of its influence on the plant pathogens in different habitats is also not easy to presume. On the other hand, some estimation based on the relationships between the disease- environment and host triangle can be formed. For example, its known that the increase in winter temperatures, collaterally increase the damage caused by *Phytophthora* spp. Similarly, the increase of spring rains is resulted in an increase on the damage caused by shoot and foliage diseases. In this article, the behavior of some plant pathogens, such as *Armillaria, Phytophthora, Heterobasidion, Gremmeniella, Herpotrichia, Phacidium* or *Diplodia,* within the context of climate change will be discussed either by consulting the relevant literature or through personal experiences.

Key words: Global warming, plant pathogens, forestry, forest tree diseases

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OP10- GENETIC DIVERSITY OF ALMONDS *(Prunus dulcis*) OF DATÇA

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Anatolia's agricultural biodiversity, which has evolved over thousands of years with the contributions of many different cultures, is today being rapidly eroded as a result of climate change, population

growth, agricultural policies, globalization and other factors. This decline not only puts the food resources of future generations at a risk, but also undermines cultural diversity. It is estimated that three quarters of the world's agricultural genetic diversity has been lost over the past century. In every part of Turkey, there are fruit varieties that are adapted to local soil and climate conditions, resistant to local pests and diseases, and require no irrigation, artificial fertilizer or pesticides. However, most of these fruit varieties are today threatened by urbanization, soaring land prices, agricultural policies and marketing problems. Not only are these fruit varieties an important genetic resource essential for food security in the face of climate change, but with their diverse flavors and traditional uses they are a significant part of Turkey's cultural heritage. Since 2007, we are, as Fruit Heritage group (http://www.fruitheritage.org) running a project entitled "FRUIT LANDRACES OF MUĞLA: CULTURAL HERITAGE, DATABASE AND CONSERVATION PROJECT". As a part of this project, 96 local varieties of almonds (*Prunus dulcis*) that has been collected and deposited into our laboratory earlier were studied. Using SSR markers, we gathered molecular data, in the form of DNA fingerprints and identified 82 unique almond varieties. Using this data, phylogenetic relatedness of these varieties were constructed on a dendrogram. Our data can be used for the selection of proper varieties for agricultural hybridization studies for the development of new and better varieties. DNA fingerprints could allow the registration of these unique varieties as Datça's landraces.

Key words: Almond, Biodiversity, SSR markers, Fragment analysis, Fruit heritage

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OP11- PHYLOGENETIC RELATIONSHIPS OF *Abies* TAXONS ENDEMIC TO TURKEY BASED ON DNA SEQUENCES FROM nDNA ITS REGION

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Fir (*Abies*) species are widely distributed forest tree species in Turkey. The species occupies 626.647 ha of forestland which constitutes 0.3 % of total forest areas in the country. There are six native taxons belonging to this genus growing in pure and mixed stands in the country. Four of these taxons (*Abies nordmanniana* subsp. *bornmülleriana*, *Abies nordmanniana* subsp. *equi-trojani, Abies x olcayana, Abies cilicica* subsp. *isaurica*) are endemic and considered as low risk (LR) species. Taxonomic classification of species is under question. Eucaryotic ribosomal RNA multigene families are presented in hundreds or thousands of repeats tandemly arranged at one or several locations. Sequence of the ITS (Internal Transcribed Spacer) region, including ITS1, 5,8S, and ITS2, can diagnose organismal origins and phylogenetic relationships at many taxonomic levels. Individuals from five populations were used to find out phylogenetic relationships between *Abies nordmanniana* subsp. *bornmülleriana*, *Abies nordmanniana* subsp. *equi-trojani* and *Abies x olcayana*. 521 bp nrITS region including ITS2, 5.8S rRNA and partial ITS1 sequences were obtained. Alignment of sequences yielded 95.5% homology. In neighbor joining tree *Abies nordmanniana* subsp. *equi-trojani* populations separated from other populations. *Abies x olcayana* population appeared to close to two *Abies nordmanniana* subsp. *bornmülleriana* populations.

Keywords: *Abies* taxons; Endemic; nDNA ITS region; Phylogeny

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OP12- POLLINATOR DRIVEN EVOLUTION OF FLORAL TRAITS IN *Salvia* (LAMIACEAE)

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Diversity in floral traits and specific functional interactions among pollinators and flowers indicate that pollinators might drive floral evolution. *Salvia*, the largest genus in the Lamiaceae (ca. 900 ssp.), is a convenient model to test this hypothesis. Species are world-wide distributed, pollinated by bees (> 80%) and birds (< 20%) and characterized by the well-known staminal lever mechanism (SLM). The levers are morphologically derived structures mediating pollen transfer. They have to be moved by pollinators and directly influence the plant's sexual reproductive success. Morphological and molecular data indicate that ancestral sages were bee-pollinated. Bird pollination evolved several times in parallel, mainly in the New World. Co-evolution with bees and parallel shifts to bird pollination clearly indicate pollinator driven evolution of floral traits on the level of functional pollinator groups. But is there similar co-evolution on a lower level, i.e. among different sized bee-flowers and sub-groups of bees? And what is the specific role of the SLM in this assumed co-evolution? We summarize main results of our studies in the genus *Salvia* including floral force measurements, field investigations and quantitative pollen transfer experiments. *Salvia* flowers fit best to bumblebees, but they are rarely- closely specialized. Instead, the SLM increases the range of pollinators by lowering down allowing even small bees to transfer pollen. It also promotes co-occurrence of species and divergent use of the same pollinators. Being adapted to bees without suffering from pollinator limitation by too close specialization might be the key to successfully assuring pollen transfer in *Salvia*.

Key words: Bee and bird pollination, Staminal lever mechanism

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OP13- FLOWER EOLOGICAL STUDIES IN SYMPATRIC *Salvia* (LAMIACEAE) COMMUNITIES FROM CENTRAL ANATOLIA: SPECIALISATION VS. GENERALIZATION

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Specific flower constructions have often been correlated with differences in pollination syndromes. This conceptual structure has been evaluated because flowers attract a broader spectrum of visitors than one might expect based on their syndromes. Bilabiate flowers evolved in co-evolution with bees

and thus represent a classical example for specialization to a certain pollinator guild. This is also true for *Salvia*, the largest genus in the Lamiaceae with approximately 680 bee-pollinated species. In our study, we investigated ten co-occurring *Salvia* species (*S. absconditiflora*, *S. aethiopis*, *S. candidissima*, *S. cyanescens*, *S. hypargeia*, *S. russellii*, *S. tchihatcheffii*, *S. verticillata*, *S. virgata*, *S. viridis*), one hybrid (*S. candidissima* x *S. cyanescens*) and their pollinators from three populations in central Anatolia, Turkey. We identified 32 insect pollinators, among them 28 bee species from 15 genera. They either preferred only a single *Salvia* species (18 bee species) or visited up to seven different sages (e.g. *Apis mellifera*). The ten *Salvia* species and the hybrid usually share 3-7 pollinators (8 ssp.) with only two pollinators observed in the hybrid and 12 and 25 pollinator species in *S. russellii* and *S. virgata*, respectively. Though they appeared in different frequencies per species, they clearly indicated that the *Salvia* species investigated had almost no specialization to a certain bee species, bee subgroup or bee size. We conclude that in our model system the bees are much more specialized than the *Salvia* species, which indeed appear to be functional generalists within the limits of their bilabiate flower construction.

Key words: Flower ecology, Specialization, Generalization, *Salvia,* Central Anatolia

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OP14- WHY AFRICA MATTERS: EVOLUTION IN OLD WORLD *Salvia* L. (Lamiaceae)

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The genus *Salvia* is distributed worldwide comprising approx. 900 species. About one third of these species is restricted to the Old World with centers of diversity and endemism in China, Iran, Turkey and Africa. To better understand the intergeneric relationships and character evolution in Old World sages we chose *Salvia* Clade I for molecular investigations. This monophyletic lineage includes sages from Europe, Southwest Asia (Iran and Turkey) and Africa. Here, we focus on the African species which are extraordinary divers concerning i.e. habit, floral morphology and pollinator interactions.
Based on nuclear (*nr*ITS-ETS) and chloroplast data (*rpl*32-*trn*L IGS) of 48 African sages (77.4%) we draw the following conclusions. (1) African sages do not represent a monophyletic lineage. They rather split into several lineages within *Salvia*-clade I reflecting biogeography i.e. Circum-Mediterranean Area, Sub-Saharan Africa or the Canary Islands. Interestingly, some species (*S. aegyptiaca*-group) distributed from Northern Africa to SW Asia are clearly placed in *Salvia*-clade III. (2) The Canary Islands were colonized twice. (3) Hybridization might have influenced the evolution of African *Salvia* species. (4) The highly supported Sub-Saharan Africa subclade largely lacks resolution, but some species groups were identified and additionally supported by morphological data and distribution patterns.

Key words: Africa, Canary Islands, Evolution, *Salvia* Clade I, Madagascar, Phylogeny

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OP15- CONSERVATION ISSUES OF SOME OF THREATENED TREES OF HINDURAJ MOUNTAINS OF PAKISTAN

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Studies were conducted to record conservation issues and thereafter recommend effective recovery measure for *Litsea monopetala*, *Neolitsea cuipala*, *Quercus glauca, Rhododendron arboreum, Ulmus chumlia* and *Ulmus wallichiana;* the locally considered threatened trees of Hindu Raj Mountains-Northern Pakistan. The survey area (c. 20000km^2) included the administrative boundaries of Malakand Agency, Buner, Shangla, Swat and Dir Districts. Information regarding the status, extent of distribution and historical range of the species were gathered from literature, scientific observation and community experts. Conservation status of the species was evaluated in accordance with the IUCN Criteria. Observations on the distribution pattern of the species revealed that *Rhododendron arboreum, Litsea monopetala, Neolitsea cuipala* were available along with the highly drained streambeds of Sub Tropical Chir Forest, whereas Quercus *glauca, Ulmus chumlia* and *U. wallichiana* were recorded in the ravine of moist temperate forests. We were unable to locate even a single tree of *Quercus glauca*, already reported from lower Hindu Raj Mountans in the recent past. We assured it as completely vanished from its natural habitat and can therefore be placed in the Extinct Category. Genetic diversity of *Ulmus chumlia* and *Litsea monopetala* is squeezed to the availability of only a few trees and can thus be considered as Critically Endangered. The information placed *Rhododendron arboreum, Neolitsea cuipala* and *Ulmus wallichiana* in the Endangered Category. Field observation confirmed that commercial exploitation was the evident threat to genetic erosion of *Litsea monopetala* and *Ulmus wallichiana* and the Dutch Elm Disease most probably caused genetic erosion of *Ulmus chumlia* and *Ulmus wallichiana*. Consumption as fuel wood, habitat fragmentation and irrational commercial use of *Rhododendron arboreum* and *Neolitsea cuipala* were obvious threats to the existence of these species. Keeping in view the results based upon the field observation, experience with the associated people and lessons learnt from the secondary information, we identified hotspots and propose recovery plan for these species.

Key words: Conservation issues, Threatened trees, Hinduraj Mountains, Pakistan

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OP16- CONTRIBUTION TO THE RED LIST OF THE PLANTS OF PAKISTAN: A CASE STUDY OF A NARROW ENDEMIC *Astragalus chitralensis* ALI (FABACEAE-PAPILIONOIDEAE)

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Narrow endemic plants are more prone to the process of extinction; this is due to their narrow ecological amplitude and habitat specificity as compared to the sufessively rare or widely distributed endemic taxa. In this paper, the conservation status of *Astragalus chitralensis* Ali (Fabaceae-Papilionoideae) is given according to IUCN Red List Categories and Criteria. It is a narrow endemic plant of district Chitral Pakistan. This taxon was previously reported from one locality i.e.

Birmoghlasht. Whereas, during our three years of field excursions in Chitral we have collected it from 6 more localities. On the basis of the data of population size (174 mature individuals), extent of occurrence (780.49 km^2) and area of occupancy (24 km^2) this taxon is categorized as Critically Endangered. Furthermore, a continuing decline in number of mature individual plants was also observed with fluctuation in the AOO in all the subpopulations. Whereas, the total number of mature individual plants in each subpopulation was less than 50. These results of low population size with continuing decline and extreme fluctuation collectively suggest the category of Critically Endangered (CR). Grazing and habitat destruction are the main causes of depletion of this taxon. Early conservation measures are extremely necessary in order to protect the taxon from extinction.

Key words: *Astragalus chitralensis,* endangered, conservation

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OP17- CONSERVATION AND RESTORATION OF *Malus trilobata* POPULATIONS

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Deer apple (*Malus trilobata* (Poir.) C.K. Schneid.), a rare Eastern Mediterranean species, is an interesting tree species in Turkey. The species is usually a scattered tree in forests and agricultural lands and doesn't form stands. This species grows to 4–14 m in the height. It is found in South Anatolia (largest population), Thrace (Greece), Bulgaria, and Lebanon. In Turkey, it mainly occurs at 350-1450 m altitude where it usually prefers sunny places on rocky, limestone-rich, or chalky soils. Both in its flowers and in leaves, *Malus trilobata* is a very ornamental species. The number of *Malus trilobata* has decreased dramatically as a result of their overuse as firewood despite its sparse distribution since it is publicly perceived as a fruit tree rather than a forest tree. A comprehensive program is needed to conserve its genetic resources and to restore its native populations. In this study, some ecological characteristics of *M. trilobata*, its main fruit and seed characteristics, some existing monumental individuals, and in situ and ex situ conservation of the species are examined.

Key words: Deer apple, *Malus trilobata,* conservation, *ex situ, in situ*.

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OP18- PRESENT SITUATION DENDROFLORA OF AZERBAIJAN

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Recently, we have studied the floristic composition of Azerbaijan. The purpose of this work was a thoroughly analysis of taxonomic composition, nomenclature and distribution of woody and shrub species of Azerbaijan. There are 1116 woody-shrub taxa, 264 species and 91 families in Azerbaijan. Higher taxonomical group includes: 123 Gymnosperm, 993 Angiosperm taxa. Gymnosperms and Angiosperms consist of 11.8% and 88.2% of the total number of taxa, respectively. Investigations revealed that there are 478 tree taxa (48.2%) are 638 (47.2%) shrub taxa, 45 epiphytes (4.5%).

Research results indicated that there are 153 are endemic taxa in Azerbaijan. Of these, 67 are endemic to the Caucasus.

Key words: Dendroflora, Endemic, Relict

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OP19- CONSERVATION STATUS AND AUTECOLOGICAL CHARACTERS OF *Astragalus argaeus* BOISS.

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Astragalus argaeus Boiss. which is endemic to Erciyes Mountain in Kayseri and which is only known from type locality, is under threat of extinction. This species was collected by Balansa for the first time from Erciyes Mountain in 1856 and it was described by Boisser in 1859. Siehe collected this species for the second time in the same area. Although many botanists visited the area after this date, this species was not re-collected. There was a thought that this species was extinct because there has been no data of this species for nearly 100 years. This plant species was re-collected by us in 2006 from the type locality and three different localities in Erciyes Mountain in 2011. In this study, the distribution of this species has been re-established. Conservation status of *Astragalus argaeus* has been renovated according to IUCN criterions as CR B2b (ii) (previously EN). Besides, this species was examined in terms of morphological, palynological, karyological and autecological characteristics. Pollen grains are symetric and izopolar, shape prolate, aperture tricolporate, ornamentain reticulate. The somatic chromosome number is determined as $2n = 16$ in *A. argaeus*. The karyotype formula of this species consists of three median chromosome pairs and five submedian chromosome pairs. The physical and chemical properties of the soil in which the plant grows are, clay-loam, weak acid, non-saline, very few calcareous, high organic matter.

Key words: Conservation, *Astragalus argaeus*, Autecology, Endemic

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OP20- ENDEMIC AND RARE SPECIES IN NORTHWEST OF EUROPEAN TURKEY "YILDIZ MOUNTAINS-KIRKLARELİ"

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Endemic and rare taxa in Yıldız Mountains was carried out during "the Yıldız Mountains Biosphere Project" the abbreviated name for Technical Assistance for Protection and Sustainable Development of Natural Resources and Biodiversity in the Yıldız Mountains, is a one-year Project. Project area is located in the Northwest corner of European part of Turkey and covers about 1300 km^2. Project purpose is to serve the long term and large scale protection of biodiversity of Yıldız Mountains. A total of 1376 plant taxa have been recorded from the project area based on the results of this survey and previous studies. The endemic and rare taxa list have been prepared: I–Endemic to Turkey (taxa occur only in Turkey) 16 taxa; II- Bern specie (taxa listed on Appendix I of the Bern Convention) 11

taxa; III- Rare and threatened (taxa occur only in European Turkey, Balkan and Europe not in Asiatic part of Turkey) 52 taxa.

Key words: Endemic species, Rare species, Yıldız Mountains, Northwest of European Turkey

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OP21- THE ROLE OF ARCHAEOLOGICAL PARKS IN-SITU CONSERVATION OF RARE WILD CROPS RELATIVES AND WILD GATHERED PLANT SPECIES: A CASE STUDY FROM FERTILE CRESCENT (TİLMEN HÖYÜK ARCHAEOLOGICAL PARK, GAZİANTEP-TURKEY)

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The overall purpose of this study is to draw attention to the wild crop relatives (WCR) and wild gathered plants (WGP) in the flora of archaeological sites and provide data for incorporating botanical values into designing Archaeological and Nature Park (ANP). For this aim, surface flora of Tilmen archaeological site was investigated in respect of WCRs and WGPs. The field surveys were performed between 2006 and 2007, prior to archaeological excavation. A total of 223 taxa of vascular plants in 156 genera and 52 families were collected from the study site. Nearly, 165 (% 75) species in the total flora of ANP were recorded as useful plants. Most of these plants, nearly % 66 (146 species), are gathered from nature to consume as food, medicine and for ornamental purposes, etc. In addition, nine-teen WCRs were recorded from study site. To increase public awareness and ins-situ conservation of WCRs, WGPs and endemic plants growing in ANP, visual and conceptual information of these plants were published on signboards located along visitor's pathways. The concept of ANP is suggested as a new approach for in-situ conservation of the plant genetic resources, in designing archaeological sites in the Fertile Crescent.

Key words: Archaeological Park, In-situ conservation, Wild crop relatives

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OP22- CRITICALLY ENDANGERED ORCHID SPECIES *Coeloglossum viride* (L.) HARTM IN ESTONIA

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There are multiple reasons that cause extinction of orchid species, most frequent of them being habitat loss, managing issues and climate changes. Dispersal of *Coeloglossum viride* (L.) Hartm has decreased over 90% in past decades in Estonia. This generatively multiplying species is strongly dependent on its seed quality to be able to persist in natural populations. Number of seeds per capsule, percentage of empty seeds, germination *in vitro* and enzymatic activity of seed embryos was taken into account to evaluate seed quality. Four-year data shows that the quality of seeds is variable and has a declining trend. Diminished population size and warmer weather conditions than average, affect seed quality

negatively, which leads to declining trend in remained populations. This species is declining in European region and therefore integrated conservation approaches are discussed.

Key words: Seed quality, Weather conditions, Terrestrial orchid, Rare plants, *In vitro* germination, *Coeloglossum viride*

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OP23- CURRENT CONSERVATION STATUS AND FUTURE CONSERVATION STRATEGIES OF *Tulipa cypria* IN NORTHERN CYPRUS

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Biodiversity loss is one of the main concerns of the international scientific community. *Tulipa cypria* is an endemic bulbous perennial in Cyprus and is distributed around Geçitköy, Koruçam, Tepebaşı and Avtepe villages. *T. cypria* is a protected plant species both under local and international legislation and is categorized as 'Endangered' by IUCN (1997) due to its' declining population on the island. *Tulipa cypria* is listed under EU Habitats Directive (92/43/EEC) as an Annex II plant species. In this paper, the current conservation status of this endemic plant is described, location ecological characteristics explained, current threats are highlighted and future conservation strategies are discussed.

Key words: *Tulipa cypria*, Endemic, Habitats, Conservation, Cyprus

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OP24- EVALUATION OF THREAT CATEGORIES OF THE GENUS *Cicer* L. (FABACEAE) AND THEIR CONSERVATION STATUS IN TURKEY

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This study based on the vegetation field survey between 2007 and 2010, about the revision of the genus *Cicer* L. in Turkey. Genus *Cicer* L. (*Fabaceae*) is represented with 46 taxa all over the world. In this study, threat categories of 15 taxa belonging to the genus *Cicer* L. in Turkey are considered in line with their current populations. Besides previously considered endemic species, the IUCN categories of threat of the taxa that were previously undetermined were also evaluated. The threat categories of the all taxa of the genus were determined and evaluated according to "Türkiye Bitkileri Kırmızı Kitabı" and IUCN Red List Categories and Criteria, adopted by IUCN council. In this study, threat categories are suggested for *C. reticulatum, C. bijugum, C. heterophyllum* var. *heterophyllum, C. heterophyllum var. kasanii, C. floribundum* var. *amanicola, C. incisum* subsp. *serpentinica and C. uluderensis* as CR (Critically Endangered); *C. echinospermum, C. isauricum* and *C. floribundum* var. *floribundum* as EN (Endangered); *C. montbretii* as NT (Near threatened); *C. incisum* subsp. *incisum, C. anatolicum* and for *C. pinnatifidum* as LC (Least concern). In this study, threat categories of 15 taxa belonging to the

genus *Cicer* L. in Turkey were evaluated according to IUCN criteria, their distribution maps and also photos are presented.

Key words: *Cicer*, Leguminosae, Threat Categories, IUCN, Turkey

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27 APRIL 2012

OP25-MOLECULAR PHYLOGENY OF *Triticum* AND *Aegilops* GENERA BASED ON PARTIAL SEQUENCES OF CHLOROPLAST DNA *matK* GENE

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Triticeae (Poaceae) family with 330 species contains important cereal crops and taxonomically complex. Molecular information has recently provided the basis for phylogenetic construction in grasses at the subfamily and lower levels. The main objective of this study is to construct robust phylogeny for *Triticum* and its closely relative genus, *Aegilops*, by using partial DNA sequence data of *matK* region of cp DNA. Partial sequence (about 1120 bp) of the *matK* gene was found to be 1120bp in length in *Triticum* and *Aegilops* species. Analyses of the 1121 bp sequence for the 54 species demonstrated low rate of substitution in the *matK* gene. However, the 21 variable sites in the sequences, of which 17 were phylogenetically informative, were adequate to resolve the phylogenetic relationship between *Triticum* and *Aegilops* as well as within genera. *Ae. biuncialis, Ae. umbellulata, Ae. comosa, Ae.uniaristata, Ae. cylindrica* and *Ae. tauschii* located closer to each other. In contrast, the samples of *T. aestivum spelta* and *T. dicoccum* species were formed a separate cluster with species and subspecies of *Ae. speltoides* because of the common (BB) genome composition. Moreover, diploid *Triticum* species (AA) were phylogenetically separated from both tetra and hexaploid *Triticum* samples (BBAA, BBAADD) although their A genome composition of polyploidy has been derived from diploid *Triticum* species. The reason of this phylogenetic separation is the B genome composition of *T.aestivum spelta* inherited from *A.speltoides*. Additional molecular studies with larger number of species and different chloroplast and genomic regions will be useful to get better insights of complex phylogenetic relationship in Triticeae.

Key words: *Triticum*, *Aegilops, matK*, Phylogeny

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OP26-GENETIC DIVERSITY OF *Populus nigra* POPULATION ASSESSED BY MICROSATELLITE DNA MARKERS

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Twenty five percent of the total wood production in Turkey is obtained from poplar. European black poplar (*Populus nigra L.*) plantations provide 45% of total poplar wood production. Black poplar is a keystone species for riparian ecosystems. Due to human influences, it is one of the most threatened tree species in Europe. The important and major genetic resources of black poplar for future plantations in Turkey are consist of 297 clones which are located in the Behiçbey Nursery in Ankara. To determine genetic diversity in black poplar genetic resources and to provide genetic identity information of clones, we analyzed 297 *P. nigra* clones by using six microsatellite markers developed for European black poplar. All the analysed loci were highly polymorphic. The number of alleles ranged from 6 to 13, with an average of 9.6 alleles per locus. The observed heterozygosity ranged from 0.13 to 0.93, with an average of 0.45 per locus. The genetic diversity in clone bank was estimated as 0.46 (expected heterozygosity) and 0.49 (observed heterozygosity). The microsatellite markers developed will be useful for conservation, and sustainable forest management programs, molecular fingerprinting in poplars and screening the genetic diversity in natural populations and in gene bank collections.

Key words: Keystone species, Genetic identity, Microsatellite markers, Molecular fingerprinting

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OP27- ACHENE MICROMORPHOLOGICAL INVESTIGATIONS ON THE GENUS *Centaurea* SECTION ACROLOPHUS (ASTERACEAE) FROM TURKEY

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The Asteraceae or Compositae (commonly referred to as the aster, daisy or sunflower family), is an exceedingly large and widespread family of vascular plants. The Asteraceae is the richest vascular plant family in the world, with 1600–1700 genera and 24,000–30,000 species. They are easily distinguished by the florets grouped in capitula, and the fruit a cypsela often with a pappus. Asteraceae taxa can assume almost every life-form: herbs, succulents, lianas, epiphytes, trees, or shrubs, and they reach every environment and continent, except Antarctica. The largest Asteraceae genera are *Senecio* (about 1000 species), *Vernonia* (about 1000 species), *Centaurea* (about 700 species), *Cousinia* (about 600 species), *Helichrysum* (about 550 species), and *Artemesia* (about 550 species). Asteraceae family is represented with 133 genera and about 1160 species in Turkey. This investigation is made to determine achene micromorphological properties of genus Centaurea section Acrolophus which consists of endemic 17 taxa (*Centaurea arenaria* Bieb. ex Willd.; *C. inermis* Velen.; *C. kilaea* Boiss., *C. cuneifolia* Sm.; *C. zeybekii* Wagenitz; *C. tuzgoluensis* Aytaç&H. Duman; *C. olympica* C. Koch; *C. ulrichiorum* Wagenitz; *C. polyclada* DC; *C. sipylea* Wagenitz; *C.* w*iedemanniana; C. yozgatensis* Wagenitz; *C. ertugruliana* Uysal; *C. cariensis* Boiss. subsp. *Cariensis; C. cariensis* Boiss. subsp.

maculiceps (O.Schwarz) Wagenitz; *C. cariensis* Boiss. subsp. *niveotomentosa* (Hub.-Mor.) Wagenitz; *C. cariensis* Boiss. subsp. *microlepis* (Boiss.) Wagenitz; *C. cariensis* Boiss. subsp. *longipapposa* Wagenitz; *C. cariensiformis* Hub.-Mor; *C. wernerii* Wagenitz; *C. austro-anatolica* Hub.-Mor.; *C. dichroa* Boiss..&Heldr., *C. consanguinea* DC.; *C. aggregata* Fisch.&Mey. ex DC. subsp. *Aggregata; C. aggregata* Fisch.&Mey. ex DC. subsp. *albida* (C. Koch) Bornm.; *C. anthemifolia* Hub.-Mor., *C. pinetorum* Hub.-Mor.; *C. virgata* Lam.; *C. sivasica* Wagenitz; *C. calolepis* Boiss.; *C. diffusa* Lam.; *C. spinosa* L. var. *spinosa*). Scanning electron microscope was used to determine characteristic properties of fruit coat ornemantation as regards genus Centaurea section Acrolophus in a detailed way.

Keywords: Asteraceae, Compositae**,** Achene micromorphology.

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OP28-LOWERED RECRUITING POTENTIAL IN GENETICALLY IMPOVERISHED POPULATIONS OF *Ligularia sibirica* (L.) IN ESTONIA

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Ligularia sibirica (L.) Cass. (Asteraceae) is a *EU* Habitats *Directive* Annex II plant species that has suffered a lot from human-caused major changes in quality and availability of habitats in Estonia. This species is now among the most threatened plant species in the country and subject to strict legal protection since 1936. The main aim of the study was to find out if the observed decline in population size was reflected in the amount of genetic (AFLP) variation and reproductive output in the remaining populations of *L. sibirica.* Genetic diversity and proportion of polymorphic loci in seven populations of *L. sibirica* were significantly lower in smaller populations compared to larger ones, suggesting that action of genetic drift and/or inbreeding. No correlation was found between genetic and geographical distances. The degree of genetic differentiation among populations and genetic differentiation between pairs of populations were estimated using analysis of molecular variance (AMOVA). The amount of viable seeds per flower stem was compared among populations and between years (2007 and 2008). Viable seed production was positively correlated with genetic diversity estimates in 2008, correlation was absent in 2007. Germination % was positively associated to genetic diversity and population size. Results of this study suggest that genetic erosion is at least partially responsible for the lower reproductive fitness in smaller populations of this species.

Key words: *Ligularia sibirica* (L.), AFLP, AMOVA, Genetically impoverished

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OP29-TRANSFERABILITY OF *Centaurea corymbosa*, *C. stoebe* AND *C. diffusa* SSR MARKERS TO *Centaurea nivea*

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Simple sequence repeat (SSR) markers are a valuable tool for many purposes, such as mapping, fingerprinting, breeding and estimating genetic diversity. However, they are only available in some plant species, especially in some economically important crops because of the high cost and labor intensity involved in their development. Cross-species transferability of simple sequence repeats is common and allows SSRs isolated from one species to be applied to closely related species, increasing

the use of previously isolated SSRs. *Centaurea nivea* is rare endemic species that have a narrow distribution area in Eskişehir region and represented by only five populations. According to Red Data Book of Turkish Plants, this species is categorised as critically endangered. In this study, ten published SSR primers developed for *Centaurea corymbosa, C. stoebe* and *C. diffusa* were used to examine their transferability to *Centaurea nivea*. Template, Mg^{+2} and annealing temperature optimization were undertaken for each SSR primer and three of them, namely 13D10, 13A9 and CM15 were found to amplify bands with expected molecular size. These transferable SSR markers can be exploited for further genetic studies in *C. nivea.*

Key words: SSR markers, *Centaurea*, genetic diversity, fingerprinting.

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OP30-GENETIC DIVERSITY PATTERNS AMONG *Quercus cerris* POPULATIONS SAMPLED FROM SOUTHERN TURKEY

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The Oaks belonging to Fagaceae family are represented with 18 species and 10 subspecies. Among these species, *Quercus cerris,* the Turkey oak within Cerris section, is native to Asia Minor and southern Europe. Inter-specific hybridization commonly occurs among oaks and especially in Quercus subgenus. This makes taxonomical and phylogenetical status of oaks be complicated. Although *Quercus cerris* is native and widespread in Turkey flora, there are limited number of studies and very little known about genetic structure of populations. For this reason, the current study aimed to determine genetic diversity of *Quercus cerris* in Turkey. Five populations were sampled from Konya (Çatak/Bulcuk)-Isparta and Kahramanmaraş-Adıyaman oak forests where there is high oak diversity and hybridization among oaks within Cerris section. Eight SSR primer combinations were used to determine genetic variation in these populations.

Observed and expected heterozygosities were estimated as 0.72 and 069. The average alle per locus changed from 4.55 in Isparta, to 9.88 in Kahramanmaraş which also had 26 private allele, the highest among populations. The pure *Q. cerris* populations in mixture with the other species seemed to maintain low genetic diversity, low private alleles and low population differention due to possible hybridization with other species. Dendrogram based on Nei's (1978) genetic distance revealed that there were three clusters: the first one with Konya populations, the second one with southeastern Turkey populations and the third another with Isparta population. The most genetically distant populations were Bulcuk-Konya and Adıyaman while the most closest ones were two Konya populations. The results of present study will be useful for genetic resource conservation and understanding of phylogenetic relationships among red oak species.

Keywords: *Quercus cerris*, genetic diversity, SSR

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OP31- ESSENTIAL OIL COMPOSITION OF WILD AND CULTIVAR FORMS OF *Rosmarinus officinalis* L. (LAMIACEAE) FROM TURKEY

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In this study**,** essential oil composition of the aerial parts of the wild and cultivar forms of the *Rosmarinus officinalis* L. from of Turkey were analyzed by GC and GC-MS system. The essential oils of the aerial parts of *Rosmarinus officinalis* collected from the natural habitats and cultivated form (Turkey) were obtained by hydrodistillation, in 0.9% (v/w) both oil yields. 43 and 44 components were identified representing 93% and 98.7% of the oils, respectively. The major constituents were 1,8 cineole (26.3%), borneol-L (12.7%), α-terpineol (12%) in willd *R. officinalis*, 1,8 cineole (17.5%), *alpha*-camphor (12.2%) and borneol-L (11.2%) were determined in the cultivar form of *R. officinalis* essential oil. Essential oil variation between two different originated forms of the *R. officinalis* were discussed.

Key words: *Rosmarinus, Lamiaceae,* Essential Oil, Cultivar, Wild form.

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OP32- THREAT CATEGORIES OF THE GENUS *Psephellus* CASS. IN TURKEY AND THE GENETIC DIVERSITY İN *Psephellus brevıfımbrıatus* (HUB.- MOR.) WAGENITZ (COMPOSITAE)

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By this study, we aimed to detect the genetic variation of the *Psephellus brevifimbriatus* (Hub.- Mor.) Wagenitz, a local endemic species for Turkey. In this study, eighteen ISSR primers were selected and performed upon eleven individual of *P. brevifimriatus* species, but of thirteen of them answered for all individuals. The polymorphic locus percent of population, Shannon index and Nei's gene diversity are important to decide the genetic variation in the one population, and they have been counted as 83.33%, 0.4583(I), 0.3088(h), respectively. According to results, the level of genetic diversity is high for the species and Eigen value (48 %) corrects the obtained high polymorphism rate relevant to our population.

Key words: Population genetics, Genetic diversity, ISSR Marker, Turkey

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OP33- VARIATION IN ANTIOXIDATIVE ENZYME ACTIVITIES UNDER LOW TEMPERATURE IN BLACK POPLAR (*Populus nigra*) CLONES

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Turkey has a broad diversity of forest ecosystems and species variation due to its climatic and topographic conditions. Black poplar (*Populus nigra*) is one of the species which has wide distribution

in Turkey and it makes considerable contributions to the national economy. However, it is one of the most threatened tree species in Turkey due to overexploitation and poor management of natural resources. Plants are continually facing different environmental changes requiring rapid transient and/or seasonal responses. Among the limiting conditions, low temperature is a major environmental constraint affecting the distribution, growth, development and productivity of plants. Poplar species are fast-responsive woody plants able to adapt to difficult environmental conditions. The present work attempts to determine whether the major families of antioxidant enzymes such as superoxide dismutase (SOD), glutathione reductase (GR), ascorbate peroxidase (APX) and dehydroascorbate reductase (DHAR) are quantitatively expressed by black poplars as a function of tolerance when exposure to low temperatures. In this context, 40 black poplar clones were selected and cambium tissues were sampled at monthly intervals from Behicbey Nursery, Ankara. Considering the average temperature ranges of winter months of 2011 (0 to 5 °C), it was found that although the activities of APX and DHAR decreased with low temperatures, GR activity rapidly increased. Information generated from this study will be useful for characterization of potential commercial black poplar clones which could be considered in plantations where low temperatures experienced. Moreover, the results from this study will help to understand further how poplar copes with low temperature stress.

Key words: *Populus nigra*, Low temperature, Antioxidative enzymes

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OP34- ANTIOXIDANT ENZYME ACTIVITIES, GROWTH AND MORPHOLOGY AS A SELECTION CRITERION FOR THE DROUGHT TOLERANCE OF TURKISH BLACK POPLAR CLONES

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Many human activities such as displacement of native black poplar stands with agriculture areas, overexploitation of this stands for the wood cause complete disappearance in native black poplar populations. Ongoing climate change is another drawback threatening these native populations. Therefore, in the current study 297 black poplar clone collected from all around Turkey were investigated in terms of their tolerance against drought stress. For this purpose antioxidant enzyme activities, growth and morphology properties of these 297 clones were collected in a field trial. The first results of the enzyme activities indicated that all the black poplar clones show similar changes in different enzyme activities. General trend in enzyme activities was an increase until moderate drought level but then a sharp decrease down to the well watered level under severe drought level. After that period if the clones were re-watered, the enzyme activities reached control level but generally stayed under this level. Major differences between clones were observed under the severe drought level and re-watered period. Correlations between enzyme activities and the growth parameters were highly satisfactory to use these enzyme activities as a selection criterion. The correlation between the parameters was very strong and reached up to %60 during the drought period. If the best 20 clones were selected by using measured enzyme activities annual gain in height and diameter according to worst clones was calculated as 62 cm and 10 cm respectively. Except branch angel, high correlation

between (%25) other morphological characters and growth parameters under drought stress was also indicated in the study.

Key words: Black poplar, Drought, Antioxidant enzyme activities, Growth

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OP35-PERIPHERAL POPULATIONS OF WIDESPREAD SPECIES: HOW GENETICALLY RICH ARE THEY?

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Peripheral populations of widespread species are usually characterized by low levels of genetic diversity and by possessing unique alleles compared with central populations. They usually persist in stressful conditions, and are pre-adapted to future changes in their environments. By using terpenes and isozyme analysis results, we hereby studied genetic variation and genetic divergence of Scots pine, a widespread species in Eurasia and forms its southernmost populations in Turkey. The bulked seed samples were collected both from the peripheral and central populations, distributed over different elevations ranging from 1200 m to 2300 m in Turkey. Geographically peripheral populations exhibited various levels of differences from the relatively central populations, both in terms of their terpene and isozyme profiles. Peripheral populations appear to be potentially important for future evolutionary pathways, and should not be ignored in genetic conservation programs. The loss of these populations will reduce the ability of a species to adapt new variables in changing environments, especially under the prevailing threats posed by global warming.

Key words: Peripheral populations, Scots pine, Conservation value, Turkey

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POSTER PRESENTATIONS

(Alphabetically Listed Based on the Presenter's Last Name)

PP1- MORPHOLOGY OF RARE AND ENDEMIC *Inula* L. TAXA OF TURKEY

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According to current records the genus *Inula* L. is represented by 32 taxa belongs to 27 species (4 subspcies and 1 variates), of which 8 endemics and 1 rare distributed. It is determined that *I. macrocephala* Boiss. & Kotschy ex Boiss. *I. discoidea* Boiss., *I. sarana* Boiss., *I. sechmenii* Hartvig & Strid, *I. inuloides* (Fenzl) Grierson is distributed only in one locality, and *I. helenium* subsp. *orgyalis* (Boiss.) Grierson, *I. helenium* subsp. *vanensis* Grierson, *I. fragilis* Boiss. & Hausskn. ve *I. anatolica* Boiss. are distributed in few localities. In this study, it was given that extended morphology and distribution of endemic and rare *Inula* L. taxa in Turkey Flora in the light of the data obtained from field surveys between 2007 and 2011, herbarium, and literature examinations.

Key words: *Inula*, Endemic, Morphology, Distribution

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PP2- PHYLOGENETIC ANALYSES OF SIX *Astragalus* SECTIONS BASED ON NON-CODING *trn* L'3-L'5 REGION OF CHLOROPLAST GENOME

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Astragalus, belonging to the legume family Fabaceae, subfamily Faboideae, is a large genus with about 3,000 species of herbs and small shrubs in Northern Hemisphere. The genus is native to temperate regions. The aim of this study is to revise Macrophyllium, Hymenostegis, Poterium, Megalocystis, Halicacabus and Hymenocoleus sections of genus *Astragalus* naturally found in Turkey using non-coding *trn* region of the chloroplat DNA. The preliminary results included 24 species of these 6 sections to reveal the phylogenetic relationship among them. Leaf samples were collected from natural populations and *trn*L-*trn*F intergenic spacer of complete sequence was amplified from cpDNA of these leaves. Approximately 500 bp region were exactly amplified and sequenced in both directions. According to constructed phylogenetic tree with bootstrap test of phylogeny analysis, Poterium section was formed a distinct group from other sections while Hymenocoleus and Megalocystis sections were closer to each other than other 3 sections which were separated from Halicacabus section. Furthermore, Macrophllium and Hymenostegis sections were distinctly separated from the Hymenocoleus, Megalocystis and Halicacabus main group in the phylogenetic tree. Further data collection is continued to revise the *Astragalus* sections in Turkey with respect to *trn* L5'-3' region of chloroplast genome.

Key Words: *Astragalus,* non-coding *trn* region, chloroplat DNA, phylogenetic relationships.

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PP3-TEN ENDEMIC TAXA GROWING IN ONLY MUĞLA PROVINCE AND THEIR CONSERVATION CATEGORIES

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Muğla is a quite interesting province with its flora. According to previous studies, over 1187 taxa are growing in Muğla and c. 261 of them are endemic for Turkey (22%). 75 of them are growing only in Muğla province. The scientific names of four taxa were taken from Muğla. In this study, 10 taxa are given with their descriptions, photos and conservation categories. These are: *Alkanna mughlae*, *Centaurea ensiformis*, *Erysimum serpentenicum*, *Fritillaria forbesii, Hypericum aviculariifolium* subsp. *avicullariifolium* var. *albiflorum*, *Sideritis leptoclada*, *Teucrium sandrasicum*, *Teucrium alyssifolium*, *Thymus cariensis* and *Verbascum dalamanicum*. According to the conservation status of these 75 taxa based on IUCN, 49 of them are evaluated in CR and 26 of them are evaluated in EN categories.

Key words: Muğla, Endemic plants, Flora, Turkey.

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PP4- THREATENED PLANT SPECIES OF AYSANTI BELI (AYAŞ/ANKARA)

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The objects of this study are to determine the threatened endemic plant species in the region (Aysantı Beli), to obtain information about their last conditions such as distribution area, current population size, habitat quality, and the main threats to them and put the results into action by giving information as well as applying appropriate conservation methods. The species (*Aethionema dumanii, Astragalus densifolius subsp. ayashensis, Astragalus panduratus, Crepis purpurea* (non-endemic) *and Campanula damboldtiana*) were observed in their own habitat and the aimed information were obtained. Red list categories of the target species were reevaluated by using the data that derived from the study according to IUCN Red List Categories and Criteria (2001).

Keywords: Ayaş (Ankara), Conservation, Threats, Endemic, IUCN

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PP5-THE MORPHOLOGICAL, ANATOMICAL AND PALYNOLOGICAL FEATURES OF *Hypericum helianthemoides* BOISS. AND ENDEMIC *H. thymbrifolium* ROBSON & POULTER (CLUSIACEAE) IN TURKEY

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Hypericum is distributed mainly in the Mediterranean and Anatolia region and includes approximately 465 species worldwide. There are approximately 100 taxa represented in genus *Hypericum* in Turkey.

Fourty-five of these taxa are endemic to Turkey. In this study, morphological, morphometrical, anatomical and palynological features of *Hypericum thymbrifolium* Robson & Poulter and *H. helianthemoides* Boiss. species were investigated. The specimens were collected from B6-B7-B9 squares in Turkey. Morphological features of species belongs to different parts of the plants have been described in detail and compared with the descriptions in Flora of Turkey and within the genus patterns. In anatomical studies, transverse and cross sections of leaf, root and stem have been examined and supported by illustrations. Polen characteristics of the both species were prolate spherodial and reticulate, tricolporate. The results were discussed with the *Hypericum* genus patterns in view of systematics.

Key words: *Hypericum,* Morphology, Anatomy, Polen, Systematics, Endemic

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PP6-THE ESSENTIAL OILS OF THE AERIAL PARTS OF *Hypericum elongatum* C.A. MEY. SUBSP. *elongatum* (CLUCIACEAE) FROM TURKEY

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In Turkey, the genus *Hypericum* L. is represented by 89 species, of which 43 are endemic. *Hypericum elongatum* C.A. Mey. subsp. *elongatum* belongs to the Section *Drosanthe* Robson in Flora of Turkey. In this study, essential oil were obtained by hydrodistillation by using Clevenger aparatus and the oil yield was 0.7 ml /100 gr. The essential oil composition of *Hypericum elongatum* subsp. *elongatum* were determined by using GC and GC-MS system. The essential oils obtained by hydrodistillation from the aerial parts of plants. Sixty-nine compounds were identified in the essential oil of this plant. α–pinene (38.0%), caryophyllene oxide (7.0%), spathulenol (3.6%), β–pinene (3.0%) and α–terpineol (1.8%) were determined as the main compounds of the oil. The results showed that the monoterpenes were the main group of the *H. elongatum* subsp. elongatum. The results were discussed with the genus and section patterns.

Key words: *Hypericum,* Clusiaceae, GC-MS, essential oil, α–pinene

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PP7- ESSENTIAL OIL COMPOSITION OF ENDEMIC *Inula macrocephala* BOISS. & KOTSCHY EX BOISS. FROM TURKEY

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The essential oil components of aerial parts of *Inula macrocephala* Boiss. & Kotschy ex Boiss. was investigated by GC and GC-MS. The species is endemic to Turkey. The yield of oil is 0.13 mL/100 g. Thirty five component were identified representing 90.7% oil. Borneol (26.4%), β-caryophyllene (15.3%), *p*-cymene (10.2%) and bornyl acetate (8.9%) were identified as major components of *Inula*

macrocephala. The chemical distribution of the essential oil compounds in the genus pattern were discussed in means of chemotaxonomy and natural products.

Key words: *Inula*, Essential Oil, Borneol, β-caryophyllene, Endemic

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PP8- ANALYSIS OF THE ESSENTIAL OILS OF *Hypericum lanuginosum* var. *lanuginosum* LAM. FROM TURKEY

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The genus *Hypericum* belongs to the Clusiaceae and encompasses 460 species worldwide of which *ca*. 89 species are found in Turkey. *Hypericum lanuginosum* var. *lanuginosum* belongs to the Section *Adenosepalum* Spach in Flora of Turkey. The essential oil of the wild-growing *H. lanuginosum* var. *lanuginosum* Lam. from Turkey was obtained by hydrodistillation and analyzed by GC and GC-MS. In the oil of this plant forty one components were characterized representing 81.6% of the total oil, with spathulenol (17.3%), caryophyllene oxide (13.1%), α–pinene (11.7%) and undecane (6.2%) as the main constituents. The results will be supplied some contributions on the usability of this natural plant as a crop and in view of renewable resources and also chemotaxonomy.

Key words: Clusiaceae*, Hypericum lanuginosum* var. *lanuginosum,* Spathulenol, Caryophyllene oxide, α–pinene.
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PP9- A PRELIMINARY CHECKLIST ON THE EASTERN ANATOLIAN REGION ENDEMIC PLANTS OF TURKEY

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Turkey has rich endemic plant groups in the natural vegetation. Endemic taxa are largely grown in the Mediterranean and Irano-Turanian regions. The Anatolian flora, especially in the more arid areas, is said to be in an active state of diversification. The aim of this study is to create a list of endemic plants in Eastern Anatolia (located in the Irano – Turanian Phytogeographic region) and to show the last records on the distribution of endemic taxa in this region. For this purpose, 14 provinces (Erzincan, Tunceli, Malatya, Erzurum, Bingöl, Muş, Ağrı, Van, Bitlis, Kars, Ardahan, Iğdır, Hakkari, Elazığ) belongs to the Eastern Anatolian region of Turkey, were scanned and the number, categories, threatened position (according to the IUCN) of the endemic taxa were investigated. The data were obtained from the TUBİVES records, scanning of the regional Floristic studies, Flora of Turkey and novel literature reviews. From the Spermatophytes, 49 families, 216 genera, 769 species, 131 subspecies, 108 varieties has naturally distributed and localizied in the Eastern Anatolian Region individually or some of them widely distributedin Elazığ region. The most endemic taxa were found in Erzincan with 37 families, 117 genera, 308 species and the least were found in Iğdır region with 6

families, 7 genus, and 12 species. The endemism ratio of these provinces was 7% and 4% respectively. Asteraceae (ca.160), Fabaceae (ca.155), Scrophulariaceae (ca.85), Lamiaceae (ca.82) families were consisted the more endemic taxa in the region and also *Astragalus* L.*, Centaurea* L.*, Verbascum* L. genera are the more endemic taxa generally.

Key words: Endemics, Plant, Eastern Anatolian, Turkey.

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PP10- EVALUATION OF AKDAĞ AND CEBIREIS MOUNTAINS (ALANYA-ANTALYA) AS AN IMPORTANT PLANT AREA

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Turkey with more than 3000 endemic plant species considered as one of the richest countries in terms of plant diversity in the temperate climatic zone. This number is distinctly more than the combined number of the endemics of the whole European countries. However, the richness of plant diversity in Turkey seems endanger and being reduced. The conservation studies in Turkey recently came into prominence. In these studies, conserving small areas instead of large areas has taken over and the concept of Important Plant Area (IPA) has gained importance. Turkey is the first country to apply the criteria defined by Planta Europa steering Committee and to complete a national inventory of Important Plant Areas. In this study, Akdağ and Cebireis mountains were evaluated according to IPA criteria. 11 globally threatened, 108 regionally (European) threatened, 15 nationally rare species and 4 threatened habitats were determined. These results also were compared with the nearest IPAs. As a result, the research area, located between "Gevne valley and Gökbel plateau" IPA and "Kargı river" IPA, satisfies IPA criteria. Consequently, it is suggested that Akdağ and Cebireis mountains should be a new IPA or combined with the other two IPAs.

Keywords: Important Plant Area, IPA, Alanya, Turkey

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PP11-MORPHOLOGY AND ANATOMY OF *Scutellaria salviifolia* BENTHAM (LAMIACEAE)

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Lamiaceae family is represented by 200 genera and about 3200 species in the world. This family contains 45 genera and 546 species distributed in Turkey. Many species of this family are aromatic and often used as herbs, folk medicines and fragrences. This property stems from this family s' glandular hairs secreting rich oil and ether. The genus *Scutuleria* comprises of 320 species. *Scutulleria orientalis* L. consists of 16 subspecies of which 6 subspecies are endemic to Turkey. These taxa generally used as hemostatic plants and for its tonic property. We investigated the morphological and anatomical characteristics of *Scutelleria orientalis* L. subsp. *pinnatifida* Edmondtson. The specimens used in this study were collected in their flowering period from north slopes of Ferhat Mountain on 17.05.2011 which is located in Amasya city of Central Analolia. Specimens were kept as herbarium material. Flora of Turkey was used for taxonomical description. Alive and herbarium metarials were

used for determining the specimen's morphological characteristics. Also, plant samples were fixed in 70% alcohol for anatomical studies. Paraffin method was used to obtain suitable cross sections for determining anatomical characters of root, stem and its bilaterally symmetrical flower parts of calyx and corolla. Peridermis and paranchyma cells and vascular bundle properties of root, epidermis and paranchyma cells and vascular bundle properties of stem, cuticular properties and paranchyma-epidermis cells of calyx and corolla were determined. Glandular hair properties were also investigated in this study.

Key words: *Scutellaria salviifolia* Bentham, Morphology, Anatomy

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PP12- MORPHOLOGICAL AND ANATOMICAL INVESTIGATIONS ON ENDEMIC *Haplophyllum armenum* SPACH

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Rutaceae, family of flowering plants belongs to the order Sapindales and are valuable as a source of edible fruit and as ornamentals. Known as the citrus, or rue, family, the Rutaceae includes woody shrubs shrubs and trees (and a few herbaceous perennials) and consists of 160 genera and 1,700 species distributed throughout the world, especially in warm temperate and tropical regions. The largest numbers are found in Africa and Australia, often in semiarid woodlands. Haplophyllum genus is one of the most species-rich, but poorly known genera of Rutaceae. As currently circumscribed, it includes 68 species and reaches maximum species diversity in Turkey, Iran, and Central Asia. The main centre of diversity of *Haplophyllum* is the Irano-Turanian region—in particular, Iran, Turkey, and Central Asia—which harbours 60% of the species diversity. Thirty species of *Haplophyllum* are present in Iran, fourteen of which are endemic to the country. Fewer species occur in the other three floristic regions, most notably in the Mediterranean region, which contains 13% of the species diversity. This investigation is about morphology and anatomy of endemic *Haplophyllum armenum* Spach which is one of the endemic taxa as regards Rutaceae family from Turkey. The specimen used in this study was collected in its flowering period from North slopes of Karaman Mountain, Yuvacık village in 16.05.2011, which is in Amasya city of Central Analolia. Specimen is kept as a herbarium material. Flora of Turkey was used for its taxonomical description. Alive and herbarium metarials were used for determining the specimen's morphological characteristics. Also, plant samples were fixed in 70% alcohol for anatomical studies. Paraffin method was used to obtain suitable cross sections for determining anatomic characters of root, stem, leaf, petiole and corolla. Peridermis and paranchyma cells and vascular bundle properties of root, epidermis and paranchyma cells and vascular bundle properties of stem, epidermis, paranchyma cells and vascular bundle properties of leaf and anatomical characters of petiole and corolla were determined.

Key words: *Haplophyllum armenum* Spach, Morphology, Anatomy

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PP13 -ACHENE MACROMORPHOLOGICAL INVESTIGATIONS ON 21 ENDEMIC TAXA OF *Centaurea* SECTION Acrolophus (ASTERACEAE) FROM TURKEY

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The Asteraceae or Compositae (commonly referred to as the aster, daisy or sunflower family), is an exceedingly large and widespread family of vascular plants. The Asteraceae is the richest vascular plant family in the world, with 1600–1700 genera and 24,000–30,000 species. They are easily distinguished by the florets grouped in capitula, and the fruit a cypsela often with a pappus. Asteraceae taxa can be found in different life-form: herbs, succulents, lianas, epiphytes, trees, or shrubs, and they reach every environment and continent, except Antarctica. The largest Asteraceae genera are *Senecio* (about 1000 species), *Vernonia* (about 1000 species), *Centaurea* (about 700 species), *Cousinia* (about 600 species), *Helichrysum* (about 550 species), and *Artemesia* (about 550 species). Asteraceae family is represented with 133 genera and about 1160 species in Turkey.
This investigation is made to determine achene macromorphological properties of 21 taxa (*Centaurea kilaea* Boiss.; *C.zeybekii* Wagenitz; C. *olympica* C. Koch; *C. polyclada* DC; *C.sipylea* Wagenitz; *C. Wiedemanniana;C. cariensis* Boiss. subsp. *maculiceps* (O. Schwarz) Wagenitz; *C. cariensis* Boiss. subsp. *Cariensis; C. cariensis* Boiss. subsp. *microlepis* (Boiss.) Wagenitz; *C. cariensis* Boiss. subsp. *longipapposa* Wagenitz; *C. austro-anatolica* Hub.-Mor.; *C. dichroa* Boiss.&Heldr.; *C. consanguinea* DC.; *C. anthemifolia* Hub.-Mor.; *C. pinetorum* Hub.-Mor.; *C. sivasica* Wagenitz; *C. cariensiformis* Hub.-Mor.; *C. Ulrichorum; C.werneri* Wagenitz; *C.tuzgölüensis; C. yozgatensis* Wagenitz) of genus *Centaurea* section Acrolophus (Cass.) DC. from Turkey. Light microscope and scanning electron microscope was used to determine characteristic properties of achenes as regards 21 endemic taxa.

Key words: *Centaurea*, Composiate, Asteraceae

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PP14-MORPHOLOGICAL AND LEAF-STEM ANATOMICAL INVESTIGATIONS ON ENDEMIC *Jurinea pontica* HAUSSKN. & FREYN EX HAUSSKN. FROM TURKEY

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The Asteraceae or Compositae (commonly referred to as the aster, daisy, or sunflower family), is an exceedingly large and widespread family of vascular plants. The group has more than 22,750 currently accepted species, spread across 1620 genera and 12 subfamilies. Along with the Orchidaceae, this makes it one of the two largest flowering plant families in the world. However, selecting which of the two families is larger has yet to be been done conclusively, owing to the uncertainty around exactly how many species are in each group. The largest Composite genera are *Senecio* (about 1000 species), *Vernonia* (about 1000 species), *Centaurea* (about 700 species), *Cousinia* (about 600 species),

Helichrysum (about 550 species), and *Artemesia* (about 550 species). Asteraceae family is represented with 133 genera and about 1160 species in Turkey. This Investigation is made to determine morphological and leaf-stem anatomical properties of endemic *Jurinea pontica* Hausskn. & Freyn ex Hausskn. (Asteraceae). *Jurinea pontica* Hausskn. & Freyn ex Hausskn. material was collected in its flowering period from north slopes of Ferhat Mountain on 17.05.2011 which is in Amasya city of Central Analolia. Specimen is kept as a herbarium material. Flora of Turkey was used for its taxonomical description. Alive and herbarium metarials were used for determining the specimen's morphological characteristics. Also, plant samples were fixed in 70% alcohol for anatomical studies. Paraffin method was used to obtain suitable cross sections for determining anatomical characters of stem and leaf. Epidermis-paranchyma cells and vascular bundle properties of stem, epidermis, paranchyma cells and vascular bundle properties of leaf were investigated in a detailed way.

Key words: *Jurinea pontica* Hausskn. & Freyn ex Hausskn., Morphology, Leaf-stem anatomy

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PP15-MORPHOLOGICAL AND CALYX-COROLLA ANATOMICAL INVESTIGATIONS ON ENDEMIC *Linaria corifolia* Desf. FROM TURKEY

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Scrophulariaceae, is a family of vascular plants. The plants are annual or perennial herbs with flowers with bilateral (zygomorphic) or rarely radial (actinomorphic) symmetry. Members of the Scrophulariaceae have a cosmopolitan distribution, with the majority found in temperate areas, including tropical mountains. The family name is based on the name of the included genus *Scrophularia* L.. In the past it was treated as including about 275 genera and over 5,000 species, but its circumscription has been radically altered since numerous molecular phylogenies have shown the traditional broad circumscription to be grossly polyphyletic. This family is represented with 30 genera and about 470 species in Turkey. This Investigation is made to determine morphological and calyx-corolla anatomical properties of endemic *Linaria corifolia* Desf. *Linaria corifolia* Desf. material was collected in its flowering period from north slopes of Kırklar Mountain of Amasya province of Turkey on 17.05.2011. The secimen is kept as a herbarium material. Living and herbarium metarials were used for determining the specimen's morphological characteristics. Also, plant samples were fixed in 70% alcohol for anatomical studies. Paraffin method was used to obtain suitable cross sections for determining anatomical characters of calyx and corolla. Cuticular properties and paranchyma-epidermal cells of calyx and corolla were determined.

Key words: *Linaria corifolia* Desf., Morphology, Calyx-corolla anatomy

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PP16-CYTOTAXONOMICAL STUDY IN SOME TAXA OF THE GENUS *Glycyrrhiza* L. (FABACEAE)

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The genus *Glycyrrhiza* L. is represented by about 20 species in the world and 8 taxa in Turkey. In this research, the somatic chromosome numbers of three taxa of the genus *Glycyrrhiza* growing naturally in Turkey were studied. These taxa are *Glycyrrhiza echinata* L., *G. flavescens* Boiss. ssp. *flavescens* and *G. flavescens* Boiss. ssp. *antalyensis* Sümbül, Ö. Tufan, O.D. Düşen & R.S. Göktürk. *Glycyrrhiza flavescens* ssp. *flavescens* is distributed in Mersin, Adana, Hatay, Gaziantep, and Osmaniye. *Glycyrrhiza flavescens* ssp. *antalyensis* is a local endemic taxon in Turkey. All taxa contained somatic chromosome numbers of 2n = 16. The chromosome numbers were defined by using squash preparation method and Bs200Pro Image Analysis Software. In addition, photographs of the taxa and distribution maps were presented.

Keywords: Chromosome number, *Glycyrrhiza*, Leguminosae

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PP17-RAPD ANALYSIS OF SOME SPECIES OF *Lathyrus* L. (FABACEAE) GENUS Cicercula SECTION IN TURKEY

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Individuals of *Lathyrus* L. genus are economically important plants which are mostly used as forage and also as green manure crop, foliage plant and occasionally for human nutrition. There is dissensus among researchers regarding taxonomic studies of the genus. This study investigates the evolutionary relations among some species of *Lathyrus* L. genus *Cicercula* section in Turkey by using DNA variations to contribute to the solution of taxonomic problems of the genus. The study employed RAPD technique for DNA variation analysis. POPGENE v1.31 and MEGA v3.0 softwares were used for statistical assessment of the obtained data and philogenetic dendrograms were produced. As a result of the study, *L. sativus* and *L. cicera* were identified to be genetically very similar species, in agreement with former research findings. On the other hand, other species of the *Cicercula* section were found to display phylogenetic relations which are incompatible with previous literature.

Key words: *Lathyrus*, *Cicercula*, Fabaceae, Turkey, RAPD

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PP18- INVESTIGATION OF DORMANCY BREAKING METHODS IN ENDEMIC *Saponaria halophila* HEDGE & HUB. - MOR. SEEDS

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Saponaria halophila Hedge & Hub.-Mor. is an *endemic plant species* which shows a narrow distribution area. This study was conducted to determine the most appropriate method for breaking dormancy of seeds of *Saponaria halophila*. After sulphuric acid treatment, the seeds were exposed to six different doses of five hormones (benzyladenine (BA), indole-3-acetic acid (IAA), kinetin (KIN), gibberellic acid (GA_3), naphthalene acetic acid (NAA)) at various temperature regimes (10-15, 15-20, 20-25, 25-30 and 30-35 °C) for 12 hours light /dark regime. The effects of different hormones on the germination ratio and rate of the seeds at various temperature ranges were determined. In addition, the effects of various doses of different hormones on the germination ratio at certain temperatures were compared. The highest germination ratios for hormones; GA_3, NAA, IAA, KIN, BA were 83.3 % at a concentration of 50 ppm at 20-25 °C, 75 % at a concentration of 400 ppm at 20-25 °C, 65 % at a concentration of 50 ppm at 15-25 °C, 55 % at a concentration of 25 ppm at 15-20 °C, and 40 % at a concentration of 50 ppm at 20-25 °C, respectively.

Key words: Benzyladenine, Germination, Dormancy, Gibberellic Acid, IAA, Kinetin, Naphthalene-Acetic Acid, *Saponaria*.

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PP19- ANATOMICAL AND PALYNOLOGICAL INVESTIGATIONS ON THREE ENDEMIC *Scutellaria* (LABIATAE) SPECIES OF CYPRUS

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In this study, anatomical and palynological characteristics of three *Scutellaria* taxa endemic to Cyprus (*Scutellaria sipthorpii* Benth. Hal. *S. cypria* var. *cypria* Rechinger and *S. cypria* var. *elatior* Meikle.) were comparatively investigated. When the anatomical structure of the root is examined, sclerenchyma islands were observed on the cortex of *S. sipthorpii* and *S. cypria* var. *elatior*; however, in the other two taxa, such structures were not observed. Petiole is broadly sulcate with adaxially flat. Margins are obtuse. The anatomical structure of petiole of *S. sipthorpii* was different from the others' in shape and its corners were inward-looking. In the other two taxa, corners were outward-looking. In addition, there were two rows of xylem along the edges of the vascular bundle positioned in the center in *S. sipthorpii* whereas there was one row of xylem and a arc-shaped vascular bundle in the others. The investigation of the anatomical structure of the stem revealed that the cuticle in *S. sipthorpii* was thicker than the cuticle in the other two taxa but that there were no significant differences in other parameters. In the investigation of the anatomical structure of the leaf, it was found that the mesophyll, spongy and palisade parenchyma was thicker in *S. cypria* var. *cypria* than in the other two taxa. In all the three taxa, the pollen type was tricolpate, pollen shape was prolate-

spheroid. Pollen ornamentation was retipilate-microreticulate in *S. cypria* var. *elatior*, and reticulate-microreticulate in *S. sipthorpii* and *S. cypria* var. *cypria*. Maximum exine and intine thicknesses were calculated in *S. cypria* var. *cypria*. The thinnest exine was found in *S. Sipthorpii,* and the thinnest intine was found in *S. cypria* var. *elatior*.

Key words: *Scutellaria*, Anatomy, Palinology, Cyprus

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PP20- PHYLOGENETIC RELATIONS OF THREE *Astragalus* SECTIONS BASED ON ANALYSIS OF THE PLASTID *MATK* GENE AND SCREENING POSITION OF NEO-*Astragalus* WITHIN OLD WORLD ASTRAGALUS GROUP

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This study represents a chloroplast DNA *matK* gene-based phylogenetic analysis of a valuable sampling of the Old World Astragalus group and comparison of them with Neo-Astragalus. At the beginning part of the study, DNA sequences of hundred sixty-eight accessions representing 56 species of *Astragalus* genus that is native to Turkey were analyzed to see evolutionary relations between three main sections of the genus (*Incani* DC., *Hypoglottidei* DC., and *Dissitiflori* DC.). After that, *matK* gene sequences of Neo-Astragalus species obtained from NCBI database were analyzed together with our samples to figure out relations between New and Old world *Astragalus* species.
MatK gene has about 1500 bp length with its flanking regions of few hundred base pairs of DNA on each side, but in the current study, partial part (about 1200 bp) of the gene, which was near to 5' end was used. Both nucleotide substitutions and indels were recognized in the sequenced region with high compatibility within section, which caused separation of each studied section with its species from the other two sections. Three nucleotide substitutions (200C-200T, 335C-335T, 1086C-1086G) caused separation of *Incani* form *Hypoglottidei* and *Dissitiflori*, and two substitutions (215T-215C, 1005C-1005T) caused separation of *Dissitiflori* from the other two sections. In the phylogenetic tree constructed by using neighbor-joining method (NJ) in MEGA 5.0 software, all species of one section separated from the others and clustered together. This result indicated that *Incani*, *Hypoglottidei* and *Dissitiflori* sections were monophyletic. Additionally, phylogenetic comparison between Old and New World species was also done by using DNA sequences of *matK* cpDNA region. The DNA sequences of Neo-Astragalus group were obtained from NCBI database and analyzed with that of our samples. Phylogenetic tree (NJ) demonstrated the monophyly of aneuploid species of New World, which form a well supported clade within Old World *Astragalus* species.

Key words: *Astragalus*, Phylogeny, *matK*, Neo-astragalus, *Incani, Hypoglottidei*, *Dissitiflori*

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PP221 NEW CHROMOSOME NUMBERS IN GENUS *Serratula* L. (ASTERACEAE) FROM TURKEY

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Serratula L. genus belongs to Asteraceae family and has 17 taxa in Turkey. In this study, somatic chromosome numbers were determined in three species of *Serratula* L. which grows up naturally from Turkey. These taxa are *Serratula radiata* (Waldst. & Kit.) Bieb., *S. oligocephala* DC. and *S. laziocephala* Bornm. according to their floristic order. Diploid chromosome numbers were made using Bs200Pro Image Analysis System. All species contained somatic chromosome numbers of 2n=30. The basic chromosome number of the genus was x=15. The research has made contribution to the taxonomic revision of the genus *Serratula* in Turkey.

Key words: Asteraceae, Chromosome number, *Serratula*, Turkey

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PP22-NUCLEOTIDE SEQUENCE OF THE SPLIT tRNA-LEU AND tRNA-PHE GENE OF THE CULTIVAR AND WILD FORMS OF ROSEMARY (*Rosmarinus officinalis* L.) FROM TURKEY

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Rosmarinus officinalis L. is widely found in the lands of Aegean and Mediterranean regions of Turkey. *R. officinalis* is a perennial herb with ever-green needle like leaves that belongs to the Lamiaceae family. It is used as a food flavouring agent and known medicinally for its powerful antimutagenic properties, antibacterial and as a chemopreventive agent. The plant is also known for its powerful antioxidant activity. Chloroplasts are plant organelles with their own genome, containing genes coding for transcription, translation machinery and components of the photosynthetic complex. In this study, we aimed to detect the molecular differences between two forms of this economical plant. Leaf samples were collected from natural populations and cultivation area and used to determine according to the data obtained from non-coding tRNA-Leu (trnL) gene of partial sequence, trnL-trnF intergenic spacer of complete sequence and tRNA-Phe (trnF) gene of partial sequence of cpDNA. Approximately 300bp region were amplified and sequenced in both directions. MEGA software was used to analyze the data. Analyses result was shown that no significant molecular differences were observed between these two forms of rosemary in view of the studied genome region.

Key words: *Rosmarinus*, trn-L, trn-F, cpDNA

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PP23-KARYOTYPES OF *Emınium* (BLUME) SCHOTT (ARACEAE) FROM TURKEY

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The taxa of the genus *Eminium* (Blume) Schott (Araceae) used in this study were collected from Turkey. In this research, the somatic chromosome number, karyotypes of four Turkish taxa of *Eminium*, namely *E. spiculatum* (Blume) Schott var. *spiculatum*, *E. intortum* (Banks & Sol.) O.Kuntze, *E. rauwolffii* (Blume) Schott var. *rauwolffii*, *E. rauwolffii* (Blume) Schott var. *kotschyi* (Schott) H.Riedl was investigated. In this study we used squash method for chromosome preparation, the taxa of the genera *Eminium* was evaluated from karyological point of view. In this study all the *Eminium* taxa determined were somatic with chromosome numbers counted as 2n=28. The research has made contribution to the taxonomic revision of the genus *Eminium* in Turkey.

Key words: Araceae, *Eminium*, Karyotype, Turkey

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PP24- PHYTOINFORMATIC MODELLING OF ENDEMIC PLANTS IN TURKEY

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About 11.000 plant species are grown in Turkey. Approximately 3700 of this plant species are endemic to Turkey. Turkey is one of the most important countries of the world in terms of richness of endemic plants. Turkey with this feature has more endemic plant species from whole Europe. An automation program was modelled for Turkey's endemic plants as phytoinformatic systems. In this study, endemic plant automation program which prepared for endemic plants of Turkey were designed. The web-based program is suitable relative-inquiring of taxa by SQL Server data base. This software includes many important details such as systematic, geographic, habitat characteristics, the endangered category, faced with the threat factors, the economic importance, plants that are prohibited imports and exports, customs status, usage status, folkloric values, the current population status, photographs and map distributions of endemic plants. This phytoinformatic automation program is high-capacity, and is enabled to input new data and add of new features continuously. This software is done relative-inquiring each other among all of these features of taxon/taxa. Phytoinformatic systems are very important for Biodiversity monitoring. This study was done for identification current status of endemic plants, and for improving the protection policies.

Key words: Endemic plants, Phytoinformatic, Automation program, Modelling**,** Relative-inquiring

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PP25-CONSTITUENTS OF THE ESSENTIAL OIL of *Helichrysum graveolens* (BIEB.) SWEET FROM TURKEY

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Helichrysum species always used by people in terms of chemicals they contain and today in many places still is consumed as tea, too. It is represented with the 27 taxa and more of them are endemics to Turkey. In this study the essential oils of *Helichrysum graveolens* (Bieb.) Sweet species from Turkey were investigated and 72 components were identified by GC, GC–MS. Essential oils were hydrodistilled by using Clevenger Apparatus from the the aerial parts of plants collected from the natural habitats, from Bursa, Turkey. The essential oil yield was very low and 0.1 (v/w). Seventy two constituents were comprised the 82.97% of the total essential oil extracted from the *Helichrysum graveolens*. The predominant compounds of *Helichrysum graveolens* were determined as α-cubebene (10.5%), β - caryophyllene(9.4%), azulene-octahydro(7.5%), caryophyllene oxide (8.2%). The results were discussed in view of chemotaxonomy and natural products.

Key words: *Helichrysum graveolens*, Asteraceae, GC-MS, essential oil, alpha – cubebene

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PP26-MORPHOLOGICAL, ANATOMICAL AND PALYNOLOGICAL FEATURES OF THE *Helichrysum chionophilum* AND *Helichrysum graveolens* (ASTERACEAE)

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The purpose of the present study is to determine some morphological, anatomical and palynological features of *Helichrysum chionophilum* and *H. graveolens* (Asteraceae) species. *H. chionophilum* is endemic to Turkey and locally spread in South and Central Anatolia. *H. graveolens* is a widespread species in Turkey and also in the world. Anatomical studies were carried out on the stem and root characters with the Light microscope and illustrated. Pollen features of both species were observed with the Light and Scanning Electron Microscopy (SEM). Both species were found different in phyllaries colour, cauline leaves colour, piece of flowers in capitulum, length of involucre features from each others. The plants have woody root anatomy and the stem is herbaceous. The pith and the cortex of *H. graveolens* in cross-sections of root and stem of *H. graveolens* are wider than *H. chionophilum*. The pollen type of both taxa were determined as trycolporate, pollen shape was oblate-spheroidal and reticular pollen ornemantation was observed. Consequently, there are some morphological, morphometrical and anatomical differences in both species, however, no significant differences were determined in view of pollen characters. The findings obtained from the study were discussed within the genus patterns.

Key words: *Helichrysum*, Asteraceae, Morphology, Anatomy, Pollen

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PP27- COMPOSITION OF THE ESSENTIAL OIL OF ENDEMIC *Helichrysum noeanum* Boiss. GROWING WILD IN TURKEY

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Helicrysum genus is represented with 27 taxa, 15 of which are endemic in Flora of Turkey. It is currently known in medicinal plant group and some are used in folk medicine. The species is endemic to Turkey. The essential oil of aerial parts of *Helichrysum noeanum* Boiss. was obtained by hydrodistillation using Clevenger apparatus. The essential oil yield was determined as 0.1 ml/100 g sample. The chemical composition of the essential oil obtained from *Helichrysum noeanum* were analyzed by GC. and GC – MS system. Among the fourty two constituents, representing 96.9% of the total components in the essential oil of *H. noeanum*. γ-gurjunene (11.1%), spathulenol (9.9%), Alloaromadendrene (7.5%), trans-β-caryophyllene (7.1%) are the major compounds. The results is discussed with the genus patterns of *Helichrysum* in means of chemotaxonomy.

Key words: *Helichrysum noeanum*, Essential oil, Endemic, Gamma gurjunene

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PP28-MORPHOLOGICAL, ANATOMICAL AND PALYNOLOGICAL STUDIES ON *Helichrysum plicatum* DC. Subspecies (subsp. *plicatum* and subsp. *polyphyllum*) (ASTERACEAE)

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Helichrysum plicatum is represented with the 4 subspecies, subsp. *plicatum*, subsp *polyphyllum*, subsp. *pseudoplicatum*, subsp. *isauricum*. They are diagnosed according to the phyllaries colour, hair shapes of leaves and stem, to cluster, stem branching, piece of flowers, woody stem, pilose, lenght of stem leaves. In this study, two *Helichrysum plicatum* subspecies (subsp. *plicatum* and subsp. *polyphyllum*) were investigated for the taxonomical evaluation. For this purpose, the specimens belonging to both subspecies were collected from different locations in Turkey. They were investigated morphological, morphometrical, anatomical and palynological features to determine the similarity and differences between two taxa. Some morphological characters like the root type, basal leaves length, leaf shapes, leaf apices, flowers shapes and statement, piece of flowers were used to the description of the taxa and anatomical studies were carried out on the stem and root characters with the Light microscope and illustrated. Both subspecies were found different in some characters like length of internodes, cauline leaves leaf apices, phyllaries apices from each others. The plants have woody root anatomy and the stem is herbaceous. Pollen features of both species were observed with the Light and Scanning Electron Microscopy (SEM). The pollen type of both taxa were determined as trycolporate. While subspecies *plicatum* pollen shape was spheroidal, subs. *polyphyllum* pollen shape was oblata-spheroidal and reticular pollen ornemantation was observed. Consequently, there are some morphological, morphometrical and palynological differences in both subspecies, however, no significant differences were determined in view of anatomical features. The findings obtained from the study were discussed with each other and the genus patterns.

Key words: *Helichrysum*, Asteraceae, Morphology, Anatomy, Pollen

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PP29-MERSIN'S ENDEMICS AND THE ENDEMIC RECORDS OF MERAR (MERSIN RESEARCH HERBARIA)

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In Alpine-Himalayan unit, the central and eastern Bolkars of Taurus Mountains are rich as endemics, while some of them, local endemic *Lamium garganicum* subsp. *pulchrum* live in and around Aslanköy. The others, such as *Alkanna aucherana*, *Stachys rupestris*, *Arisarum vulgare* and also *Alkanna kotschyana*, which has penetrated Mersin and Adana, grow among ruins near the seaside Mersin, Kızkalesi. The endemic trees *Amgdalus zielinskii, Quercus petrea* subsp. *pinnatiloba* and *Pyrus syriaca* were recorded from Mersin high plateaus. *Astragalus, Verbascum, Centaurea, Galium, Alyssum* and *Stachys* are principle endemic genera in Mersin. Additionally, *Flueggia anatolica* (relict-endemic), *Calamintha betulifolia* (DD) and *Scilla silicica* (VU) was recorded from Çamlıyayla, only 65 (EN), 23 (LR), 6 (CR) and 2 (VU) endemic species were collected from Fındıkpınarı. Also, 64 sp (LR (nt), 27 sp (LR (cd), 148 sp (LR (lc), 46 sp (VU), 22 sp (EN), 11 (DD) and one sp. (CR) were from Gülnar, Bozyazı, Mut, Erdemli, Çamlıyayla and Tarsus.

Key words: Mersin, The endemics of MERAR

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PP30-ANTIMICROBIAL ACTIVITIES OF FOUR ENDEMIC *Lamıaceae aqueous* EXTRACTS

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It is known that aromatic plants like Lamiaceae can provide results of economic importance for food and pharmacological industry. *Stachys rupestris* Montbret Et Aucher, *Salvia heldreichiana* Boiss. Ex Bentham, *Salvia hypargeia* Fisch. Et. Mey., *Ballota saxatilis* subsp. *Brachyodonta* Boiss. P. H. Davis & Doroszenko. are endemic species which live in Mersin (square C4,C5) and their antimicrobial activities never been researched before. In this study, the aqueous extracts of the aerial parts of these Lamiaceae plants were investigated for their in vitro antimicrobial activity against pathogen some bacteria and yeast species. The antimicrobial activities of the extracts against *Escherichia coli* (ATCC 25293), *Enterococcus feacalis* (ATCC 29212), *Bacillus subtilis* (ATCC 6633), *Salmonella thyphimurium*, *Staphylococcus aureus* (ATCC 25925), *Staphylococcus epidermidis* (ATCC 12228), *Klebsiella pneumoniae* (10031), *Candida albicans (clinic strain)*, *Candida parapsilosis* (ATCC 22019) were evaluated using the macrodilution method, minimal inhibition concentrations of extracts (MIC) were determined.

Key words: Lamiaceae, endemics, Antimicrobial activity, Aqueous extracts

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PP31- DETERMINATION OF INTRA-SPECIES GENETIC VARIATION OF *Phlomis kurdica* RECH. FIL., *Phlomis oppositiflora* BOISS. & HAUSSKN. AND INVESTIGATION FOR THE HYBRIDTY OF *P.* X *Melitenense* HUB.-MOR. (LAMIACEAE) IN TERMS OF MOLECULAR MARKERS

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P. oppositiflora and *P. kurdica* are the two species that hybridize naturally in genus *Phlomis*. The aims of this study are to determine intra-species genetic variation by employing molecular markers (RAPD and ISSR) in *P. oppositiflora* and *P. kurdica* and to investigate the hypothesis that *P. x melitenense* is natural hybrid of these species. These three taxa were also compared for morphological characters and pollen fertility. As a result of assessment of morphological analysis, *P.* x *melitenense* has shown hybrid vigorous in three out of 28 quantitative characters. Polen fertility was found 93.44 % in *P. oppositiflora*, 90.12 % in *P. kurdica* and 68.42% in *P.* x *melitenense.* As the result of the evaluation of molecular data, it was seen that *P.* x *melitenense* is between its ancestral species. The three taxa also clustered by using UPGMA tree. Consequently, the data obtained from this study has supported the hypothesis that *P. oppositiflora* and *P. kurdica* generate natural hybrids.

Key words: *Phlomis oppositiflora*, *P. kurdica*, *P. x melitenense*, Genetic variation, RAPD, ISSR, Natural hybridization

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PP32- MOLECULAR PHYLOGENETIC ANALYSIS OF TURKISH OAK SPECIES BASED ON MATURASE K (*mat*K) REGION OF CHLOROPLAST GENOME

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Chloroplast *matK* gene sequences from 23 taxa and hybrids belonging to three sections of Oak in Turkey were analyzed using parsimony (MP) approaches. For that purpose, three sections of *Quercus* including *cerris*, *ilex* and *quercus* were considered. Since *mat*K evolve three times faster than other plastid markers, it provided good resolution within genus. Parsimony analyses of *matK* showed that the highest variation within oak sections was observed in *ilex*. Furthermore, according to pairwise analysis of sections, section *ilex* is the most distinct from other sections. In fact, the hybrids urprisingly showed less variation regarding *mat*K region than those sections of oaks. Although there were some geographical divergences among phylogenetic groups, most of the differences were due to *Q. petreae, Q. ilex, Q. coccifera* and *Q aucheri.* These differences were probably due to their different evolutionary rate since the oak taxa aside from these four were not diverged clearly and seen as evolving at the same rate. Another explanation for this situation is the fact that high hiybridization rate

provided gene flow; hence, the taxa that made hybridization much (as in *Q.cerris*, *Q. pubescence* and *Q.infectoria*) may not get enough isolotion to be diverged completely.

Key words: *Quercus*, *mat*K, cpDNA, Genetic variance, Phylogeny

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PP33- MOLECULAR PHYLOGENY OF *Juniperus* SPECIES IN TURKEY BASED ON NON-CODING *trn* REGION OF cpDNA

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The study was aimed to determine molecular phylogenetic differences of *Juniperus* species in Turkey at species and section levels. For this purpose, three non-coding *trn* regions of cpDNA called *trn*L (Leu), *trn*L-F intergenic spacer and *trn*V (Val) region were used. Both *trn*L and *trn*L-F intergenic spacer region showed high nucleotide divergences. At species level, most of the variation were found within *J. excelsa* while *J. foetidissima* and *J. communis* had the highest divergence and showed distinct groupings from other studied taxa. Although *J. oxycedrus* also diverged, the reliability of this result should be tested further due to low bootstrap value. Surprisingly *J. excelsa* and *J. drupacea* seemed to be very closely related to each other although *J.drupacea* is considered highly differentiated and classified as a different clade morphologically. This unexpected similarity may be due to high rate of gene exchange or presence of an ancestral chloplast genome. At the section level, the species firstly were grouped into three sections depending on their cone and needle structure as Oxycedrus, Sabina and Drupecea sections. The results indicated that three sections were clearly distinct from each other and *J.drupecea* was close to the Sabina section which include *J.excelsa*. According to these results, it could be concluded that plastid DNA was reliable for phylogenetic analysis of *Juniperus* species such that each species showed correlation with their own morphological classification.

Key words: *Juniperus*, *trn*, cpDNA, Phylogeny, Genetic variance

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PP34-CONTRIBUTIONS TO THE BOTANICAL FEATURES OF *Lilium akkusianum* R.GäMPERLE (LILIACEAE) ENDEMIC TO TURKEY

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In this study, *Lilium akkusianum* R.Gämperle was examined in terms of morphological, anatomical and palynological features. Plant specimens were collected from the type locality in 2010. Tepals are white and 67–80 x 13–14 mm, perianth segments are slightly recurved. Leaf margins and flower buds are covered with long hairs but leaf veins are glabrous. General stem structure is similar to herbaceous

monocotyledons. Leaves are unifacial, hypostomatic with anomocytic stomata. The pollen shape is monosulcate and oblate with reticulate exine ornamentation.

Key words: *Lilium akkusianum*, Liliaceae, Pollen, Stem, Leaves

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PP35- THE PHYLOGENETIC POSITION OF *Primula davisii* (PRIMULACEAE) ENDEMIC TO TURKEY

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P. davisii W.W. Sm. is listed as vulnerable species in Red Data Book of Turkish Plants according to IUCN treats criteria. It is one of the two species of Primula endemic to Turkey, where it is only known from the type locality in Hakkari (SW Turkey). It is traditionally considered to be a member of *Primula subgenus Sphondylia* (Duby) Rubr., but it is the only member of the subgenus distributed in Turkey. Plant materials of *P. davisii* used in this study were collected from the type locality during the field study in Turkey. The matK gene from this species, as well as 16 other species from the family, was sequenced for the purpose of determining the phylogenetic placement of *P. davisii* in Primula. *P. davisii* was resolved as a member of the same clade as all other sampled members of P. subgenus Sphondylia. However, its closest Turkish relatives appear to be from genus *Dionysia*, rather than *Primula*. That is, *Primula* is paraphyletic with respect to *Dionysia* with P. subgenus *Sphondylia* sister to that genus. Our results support the view that *P. davisii* should be treated as a member of P. subgenus *Sphondylia* based on morphological and palynological data.

Key words: cpDNA, matK Gene, Phylogenetic Position, *Primula, Dionysia*

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PP36- COMPOSITION OF THE ESSENTIAL OIL OF *Centaurea derderiifolia* WAGENITZ. (ASTERACEAE) GROWING WILD IN TURKEY.

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The genus *Centaurea* L. is a polymorphous genus belonging to the Cardueae Cass. tribe of the Asteraceae family, and comprises 400–700 species of annual, biennial and perennial grassy plants, rarely dwarf shrubs predominantly distributed in Europe and Asia. The essential oils obtained by hydrodistillation of the aerial parts of *Centaurea derderiifolia* (Asteraceae) from Turkey were analyzed by GC and GC/MS system. Fourty three components, representing (90.5%) of the oils, were characterized by a higher content of sesquiterpenes. The main components were germacrene D (22.4%), spathulenol (9.2%), caryophyllene oxide (7.3%), allo-aromadendrene (8.2%) and

bicyclogermacrene (6.8%). The results were discussed with the genus pattern in terms of chemotaxonomy and natural products.

Key words: *Centaurea derderiifolia,* Asteraceae, Germacrene D, Essential oil

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PP37- COMPOSITION OF THE ESSENTIAL OIL OF *Centaurea balsamita* LAM. (ASTERACEAE) FROM TURKEY

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Centaurea genus has about 500 species herbaceous thistle-like flowering plants from Asteraceae family with wide distribution mostly in Europe and Mediterranean. Common names for different species are star-thistle, cornflower, and knapweed. *Centaurea* species represented with approximately 179 species in Turkey. This genus is known with its Turkish names such as "peygamber çiçeği", "zerdali dikeni", "çoban kaldiran". Particularly the aerial parts with flowers or only flowers of some *Centaurea* species are used in Turkish folk medicine to alleviate a wide range of symptoms. The essential oil composition of the *Centaurea balsamita* collected from natural habitats in Elazıg-Turkey was determined by hydrodistillation. The essential oils were analyzed by GC and GC/MS system. A total of 34 compounds have been identified constituting 90.6% of the essential oils of *Centaurea balsamita.* Main constituents of the oil were found as butanoic acid (16.3%), spathulenol (15.5%), α-terpinolene (10.2%) and caryophyllene oxide (4.6%). The results were discussed with the genus pattern.

Key words: *Centaurea balsamita,* Asteraceae, Butanoic acid, Essential oil

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PP38-COMPOSITION OF THE ESSENTIAL OIL OF *Centaurea behen* L. (ASTERACEAE) FROM TURKEY

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Turkey is one of the main centres of diversity for the genus *Centaurea* L. It is also the third largest genus, in terms of species numbers in Turkey, where 187 taxa in 34 sections occur mainly in the Mediterranean and Irano-Turanian regions. The essential oil obtained by hydrodistillation of the aerial parts of *Centaurea behen* (Asteraceae) from Turkey was analyzed by GC and GC/MS system. Fourty eight components, representing (87.5%) of the oils, were characterized by a higher content of sesquiterpenes. The main components were caryophyllene oxide (15.9%), spathulenol (11.4%),

germacrene D (6.6%) and allo-aromadendrene (6.1%). The results were discussed with the genus pattern in terms of chemotaxonomy and renewable resources.

Key words: *Centaurea behen,* Asteraceae, Germacrene D, Essential oil

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PP39- CHARACTERIZATION OF YELLOW RUST RESISTANT AND SUSCEPTIBLE DURUM WHEAT LINES AT MOLECULAR LEVEL BY USING ATR-FTIR SPECTROSCOPY

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Durum wheat (*Triticum turgidum* ssp. *durum* or *Triticum durum* Desf.), is one of the most important wheat species after the common bread wheat (*Triticum aestivum* L.). Among the yield-limiting factors of durum wheat, the fungal disease Stripe rust, caused by the fungus *P. striiformis* f. sp. *tritici*, lead to significant yield losses. To increase the resistance of wheat to yellow rust diseases, research for new resistance sources are made for development of resistant wheat lines. Fourier Transform Infrared (FTIR) Spectroscopy is a widely used method for analyzing molecular structure in biological systems via measuring absorption of vibrations of molecules. The aim of the current study is to discriminate between resistant and susceptible durum wheat lines by infrared spectroscopy via searching for molecular differences in ATR-FTIR spectra. According to the spectra obtained for Amide A band (3291 cm^{-1}) there is a significant shift in the frequency to a lower value in resistant durum wheat lines suggesting an increase in hydrogen bonding. The results also showed that the CH_2 asymmetric stretching band frequency was significantly lower for resistant durum wheat lines. This implies a more ordered membrane structure for resistant group because it was composed of less gauche conformers, but more trans-conformers in the fatty acyl chains of membrane phospholipids. FTIR spectroscopy is a robust and rapid technique in differentiation of resistant and susceptible lines, which is important in breeding studies. Although, there observed minor differences in seed samples, it could be promising that macromolecular differences might be observed after pathogen infection in different developmental stages of the host.

Key words: Durum wheat, Yellow rust, ATR-FTIR, Spectroscopy

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PP40- TEN ENDEMIC GEOPHYTE TAXA FROM TURKEY AND THEIR CONSERVATION CATEGORIES

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According to latest studies, 1020 geophyte taxa occur in Turkey. 403 taxa are endemic and endemism rate is 40%. 895 taxa belong to monocotyledoneae and 125 taxa belong to dicotyledoneae. Five genera of geophytes, *Allium* (71), *Crocus* (46), *Fritillaria* (24), *Ornithogalum* (19) and *Iris* (17) are

represented with highest number of taxa in Turkey. In this study, 10 taxa composed of both endemic and narrow distributed are given complete with their photos, descriptions and distributions. These are: *Allium fethiyense*, *Crocus abantensis*, *C. biflorus* subsp. *pulchricolor*, *C. mathewii*, *Fritillaria forbesii*, *Fritillaria milasense*, *Iris danfordiae*, *Iris xanthospuria, Muscari muscarimi* and *Sternbergia candida*.

Key words: Muğla, Endemic Geophyte Plants, Flora, Turkey.

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PP41-MORPHOLOGICAL, ANATOMICAL, PALYNOLOGICAL AND PHYSIOLOGICAL PROPERTIES OF *Hyacinthella siirtensis*

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Liliaceae is one of the largest families in flowering plants with approximately 250 genera and 3500 taxa. However 36 genera and 461 taxa present in Turkey. *Hyacinthella* Schur is the member of this family present by 17 taxa spreading in mediterranen region. In Turkey it presented by 10 taxa and one of them is a hybrid. *Hyacinthella siirtensis* Mathew is the endemic species recorded by three different localities in the Flora of Turkey. *H. siirtensis* has been seperated by Mathew in 1973 with several characters from *H. nervosa* (Bertol.) Chouard. It is distincly seperated from *H. nervosa* with; anthers are included within the tube, and the perianth is about 5-6 mm long. In this research morphological, anatomical, palynological and physiological properties of *H. siirtensis* were studied. *H. siirtensis* samples were collected in flowering period between March and April in 2011. Some of the samples were placed in glass bottles containing 70 % alcohol for anatomic studies. Flower samples were dried for pollen properties and finaly fresh leaves and bulb samples were frozen (-20 ^{O}C) for protein profiles and sugar content. In the morphological observations, the biometric mesaurements of the plant parts were examined and the anatomical characteristics of its root, scape and leaf were investigated with staining by safranin and fast green dye. Gelatin and gliserin medium were used for for palonological studies. Protein profiles were examined according to Laemlii method with electrophoresis and the sugar content were calculated according to Torije et al. by HPLC.Threat category of *H. siirtensis* is NT (Near Threatened) and has to be evaluated. As a conculusion we have aimed to introduce the biorare endemic species *H. siirtensis* with the investigation of different characteristic properties.

Key words: *Hyacinthella Siirtensis*, Laemlii method, Turkey

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PP42-DISTRIBUTION, ECOLOGY, POLLEN AND SEED MORPHOLOGY OF RARE ENDEMIC *Astragalus isauricus* HUB.-MOR. & MATTHEWS. (LEGUMINOSAE) IN TURKEY

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Morphological features of pollen and seeds of *Astragalus isauricus* Hub.-Mor. & Matthews. (Leguminosae) from the section *Macrophyllium* Bunge. was examined by using light and scanning electron microscopy. The pollen grains are isopolar. The shape is spheroidal, with the polar axes 26-29 µm and the equatorial axes 27-31 µm. The pollen grains are tricolporate, exist granulate operculum. Perforate ornamentation type was observed. The colpus are thin and tall (Clg: 19-23 µm, Clt: 3-5 µm), porus is prolat-spheroidal. The seeds 3.07-3.85x2.07-2.85 mm, ellipsoid and reniforme. The weight of the seeds were 0.0090 gr. The colour was light brown, dark brown. Seed ornamentation is psilate under the light microscopy and psilate-reticulate under the scanning electron microscopy. *A. isauricus* spreads in Konya. The flowering time is June. Its habitat is limestone debrises and roadsides, at an altitude of 1500 m. The Red List category of *A. isauricus* is EN.

Key words: Leguminosae, *Astragalus*, Pollen morphology, Seed morphology, Endemic, Turkey

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PP43- ECOLOGICAL AND FLORISTIC CHARACTERISTICS OF MONUMENTAL TREES AS A SOURCE OF SUSTAINABLE ECO-BIOTOURISM

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In this research, ecological and floristic characteristics of monumental trees, as a source of eco-biotourism, are investigated. Sustainable eco-biotourism is a type of tourism attempting to promote sustainable use of biodiversity, by providing jobs to local populations. The Monumental Tree Tourism is the best example of Turkey's tourism differences and sustainable eco-biotourism. Monumental trees are reflected from impact of climate, soil, other ecological factors and humans in the past as well as today. Contributed to eco-biotourism of these trees have the chance of seeing in all seasons of the year, is importance ensuring life of this bio-indicator trees in the future. As a result of these studies which is done since ten years, it is made up an inventory of the monumental trees in the Eastern Mediterranean Region in Turkey, and made "Monumental Trees Tour" which was turned into eco-biotour program the first time in Turkey. Firstly, it has been identified scientific dimensions, myths and cults of these trees. Then those are determined in suitable quality and the route for eco-biotour. As a result of this, the monumental tree tours are designed as a 4-day concept tours. Thus it is provided that the local people are presented their own local culture, life, food and drinks, and generated earnings. A lot of information is also given such as status and importance in ecosystem of monumental trees, and why the creation of nature conservation policies should, to tourists along the tour program.

Key words: Monumental tree tour, Monumental tree, Ecotourism, Biotourism, Sustainable tourism

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PP44- MORPHO-ANATOMICAL, PALYNOLOGICAL AND SEED SURFACE PROPERTIES OF *Astragalus talasseus* BOISS. & BAL. ENDEMIC TO TURKEY

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Astragalus talasseus Boiss. & Bal. (Fabaceae) is an endemic plant species of the Irano-Turanian phytogeographic region. It is a member of the section *Pterophorus* Bunge and spiny shrubs. It grows in steppes of central Anatolia. Morphological, anatomical, palynological and seed surface properties of the plant were examined in this study. Morphological characters such as the shape of paripinnate leaves, rachis spiny, type of hair, the shape of bracts and bracteoles, divided the calyx lobes to the base and the stenonychioid type of standard, the flower number in the inflorescence can be helpful to distinguish species of *Astragalus*. There is secondary growth in stem anatomy. The sclarenchymatic tissue is located on the vascular bundles. The stem of this species posess tragacantha canals in pith. *A. talasseus* has equifasial leaves. The midrib region forms a projecting part and the vascular bundles are surrounded by a bundle sheath. The pollen grains of *A. talasseus* are tricolpate and prolate. The exine sculpturing is microreticulate. The general shape of the seeds is reniform and the type of seed sculpture is undulate-reticulate. Scanning electron microscopy (SEM) is used to determine the morphology of pollen and seed.

Key words: *Astragalus talasseus,* Anatomy, Morphology, Pollen, Seed, SEM

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PP45-MORPHOMETRIC ANALYSIS APPROACH IN SOME SPECIES OF *Salix* BASED ON VEGETATIVE CHARACTERS

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The genus *Salix* L. is represented with more than 500 species in the world and 28 of species are found naturally in Turkey. This study includes comparison of morphology of some *Salix* species based on vegetative characters alone. The morphometric approach, based on an appropriate character set, allowed us to achieve our goal. Morphometric study was based on vegetative characters such as, life form, brunch habit, bud scale, leaf and twig characters of 146 specimens in 8 taxa within the genus *Salix* L. 11 vegetative characters were measured on samples that were collected from Behiçbey, Ankara. Morphometric variables including distance, descriptive and angles were subjected to standard numerical phenetic techniques. Clustering by numerical analysis of these variables allowed results about determination of the relations of *Salix* species located in Central Anatolia. The resultant phenogram seperated the taxa into two major groups. The first group includes *Salix triandra*, *S. pseudomedemii*, *S. cinerea* and the second includes *S. alba*, *S. excelsa*, *S. fragilis*, *S.babylonica*, *S. pentantroides*. In the analysis, it was found that the more closely related species are *Salix alba* and

Salix excelsa as expected. As a result, it seems that the selected characters reflect the taxonomic relationships well.

Key words: *Salix*, Numerical taxanomy, Morphometric, Central Anatolia

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PP46- ESSENTIAL OIL COMPOUNDS OF ENDEMIC C*entaurea kurdica* REICHARDT FROM TURKEY

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The genus *Centaurea* is a significant genus by means of the high number of the endemic taxa and endemism ratio in Turkey. According to the recent studies, the endemic taxa were increased to 129, and rate of endemism is 65%. Taxonomically, this taxon is very difficult and needs further studies, mainly using modern cytological and chemical techniques. The principal problems that should be solved are: some sections could be treated as genera, the exact delimitation of many species of some sections should be clarified. In this study the chemical composition of essential oil of *Centaurea kurdica* Reichardt (Asteraceae) from Turkey, belonging to Section *Cynaroides* Boiss. ex Walp. was analyzed by GC and GC-MS system. The yield of the oil was 0.20 (v/w). Twenty eight components were identified representing 92.6% of the oil. Germacrene D (27.4%), β-caryophyllene (19.3%), β-eudesmol (7.7%) and Caryophyllene oxide (6.2%) were detected as the main compounds of *C. kurdica.* The results have given some clues on the chemotaxonomy of genus and usable potentials of the plants as renewable resources.

Key words: *Centaurea*, Asteraceae, Essential oil, Germacrene D, β-caryophyllene

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PP47- ESSENTIAL OIL COMPOUNDS OF ENDEMIC C*entaurea saligna* (K.KOCH) WAGENITZ FROM TURKEY

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Centaurea L. is a polymorphous genus belonging to the Cardueae Cass. tribe of the Asteraceae family. In Turkey, the genus represented by a very large number of species, distributed in particular in the Southwest, Centre and East of the country. The systematic position of the genus has changed many times at the last days. Since then 16 new species and 2 new records were discovered from Turkey. Finally, endemic taxa were increased to 129, and the rate of endemism is 65% for Turkey. *C. saligna* is an endemic species to Turkey and a very distinct and isolated species. There is an interesting similarity with the S.W. Anatolian *C. ensiformis* P.H.Davis, but the pappus is different. *Centaurea saligna* (K.Koch) Wagenitz from Turkey is belongs to Section *Cheirolepis* (Boiss.) O. Hoffm. In this study, essential oil of this plant was extracted by hydrodistillation and the oil yield was 0.1% v/w. The

chemical composition of the essential oil was analyzed by GC and GC-MS system. Thirty eight components were identified representing 90.1% of the oil. Caryophyllene oxide (25.2%), β-eudesmol (12.5%) and germacrene D (10.2%) were detected as the main compounds in the *C. saligna* essential oil. The results were discussed with the genera patterns in means of chemotaxonomy.

Key words: *Centaurea*, Asteraceae, Essential oil, Caryophyllene oxide, β-eudesmol

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PP48- DISTRIBUTION AND ECOLOGY OF TURKISH FIRS

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Climatic factors are one of the most important factors that determine distribution range of *Abies* species, as with many other plant and animal species in the Mediterranean Basin. There are four native species belonging to genus *Abies* in Turkey: *Abies nordmanniana* Stev. (Caucasian fir), *A. bornmulleriana* Mattf. (Bornmüller's fir), *A. equi-trojani* (Aschers. et. Sint. ex Boiss) Mattf. (Kazdagi fir) and *A. cilicica* Carr. (Cilician fir). Bornmüller's and Kazdagi firs are endemic to Turkey. Cilician fir is represented by two geographically distinct subspecies: subsp. *cilicica* and subsp. *isaurica*, the latter also being endemic to Turkey. Overall mean values of climatic data (monthly average temperature, the highest and lowest temperature, rainfall and number of rainy days) for 36 years (from 1975 to 2010) within the distribution ranges of all *Abies* species in Turkey were analyzed. Monthly overall means of climatic data obtained from the distribution range of a given species were statistically compared with those of others. The results reveal that each of the *Abies* species has a distinct north-south distribution in accordance with the climatic data. Especially, Caucasian and Bornmüller's firs' climatic data were statistically different from that of *A. cilicica* subsp. c*ilicica*. Assuming that 36 years of climatic data on the species' distribution range are the relative projections of the climatic data of the distant past, it could be hypothesized that temperature and rainfall has played a major role in the diversification and distribution of *Abies* species in Turkey.

Key words: Turkish firs, Eastern Mediterranean, Biodiversity, Climatic factors

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PP49-CYTOTAXONOMICAL STUDIES OF *Clinopodium* L. (SECT. *PSEUDOMELISSA*) AND *Micromeria* benth. S. STR. (LAMIACEAE) FROM TURKEY

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The chromosome numbers of the taxa of the genera *Clinopodium* L. and *Micromeria* Benth. s. str., *Clinopodium cilicicum*, *C. congestum*, *C. dolichodontum*, *C. serpyllifolium* subsp. *barbatum*, *C. serpyllifolium* subsp. *brachycalyx*, *C. serpyllifolium* subsp. *giresunicum*, *C. serpyllifolium* subsp. *serpyllifolium*, *Micromeria cremnophila* subsp. *amana*, *M. cremnophila* subsp. *anatolica*, *M. cristata* subsp. *phrygia*, *M. cristata* subsp. *orientalis*, *M. elliptica*, *M. graeca* subsp. *graeca*, *M. Juliana*, *M. myrtifolia*, *M. nervosa*, which grow naturally in Turkey were counted. In this study we used squash

method for chromosome preparation. In our study, only *Clinopodium serpyllifolium* subsp. *barbatum* has a somatic chromosome number of 2n=16 while the taxa of *C. serpyllifolium* subsp. *brachycalyx*, *C. serpyllifolium* subsp. *giresunicum*, *C. serpyllifolium* subsp. *serpyllifolium*, *C. cilicicum*, *C. congestum*, *C. dolichodontum*, *Micromeria myrtifolia*, *M. cremnophila* subsp. *anatolica* have 2n=22 chromosomes, and *M. cremnophila* subsp. *amana*, *M. elliptica*, *M. cristata* subsp. *phrygia*, *M. cristata* subsp. *orientalis*, *M. juliana*, *M. graeca* subsp. *graeca*, *M. nervosa* have 2n=30 chromosomes.

Key words: Chromosome number, *Clinopodium*, *Micromeria*, Turkey

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PP50- NUCLEAR DNA CONTENT OF AN ENDEMIC SPECIES FROM TURKEY: *Silene sangaria* (CARYOPHYLLACEAE)

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The nuclear DNA amount and chromosome number of *Silene sangaria,* an endemic species for Turkey, were determined using karyological and flow cytometrical analyses techniques. The somatic chromosome number of the species was counted as 2n = 4x = 48. For flow cytometry analysis, young leaves were chopped in an $MgSO_4$ buffer (with propidium iodide) on ice in a petri dish. Nuclei, which were stained with propidium iodide, were analyzed on an EPICS XL model flow cytometer. The nuclear DNA content (2C-value) of *S. sangaria* was found to be 4.76 ± 0.20 pg. This study contributes to the data on the nuclear DNA content of angiosperm taxa.

Key words: Caryophyllaceae, Endemic, Flow cytometry, Nuclear DNA Amount, *Silene sangaria*

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PP51-PALYNOLOGICAL NOTES ON SUBGENUS *Podospermum* (*Scorzonera* L.-ASTERACEAE) FROM TURKEY

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In the present study, pollens of all Turkish representatives of subgenus *Podospermum* DC. (*Scorzonera* L.-Asteraceae) were investigated by using light (LM) and scanning electron microscopy (SEM). According to the LM and SEM observations, it was found that the pollen types are generally isopolar, radially symmetric, triangular in polar view, and lophate, with lophae ornamentation that are echinate-perforate and exine thickness ranging from 6,99 to 8,75 µm. Oblate-spheroidal pollen shapes were observed in all examined taxa. The present study found that the lacunae ornamentation of all examined taxa is perforate-microreticulate. Lacunae width varies between 6.75 and 13.19 µm among the examined taxa.

Key words: Asteraceae, *Scorzonera*, *Podospermum*, Pollen

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PP52- REDESCRIPTION, DISTRIBUTION AND CONSERVATION STATUS OF CRYPTIC ENDEMIC CRUCIFEROUS SPECIES *Ricotia tenuifolia* SIBTH. ET SM.

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In this study, *Ricotia tenuifolia* Sibth. et Sm. which is a cryptic species of the genus *Ricotia* L. has been examined. Hitherto there was no available data for this species excluding type specimen and Huber-Morath's specimen. Both records did not include enough information about biology of this species like, flowering time, phenology, ecology, chromosome numbers, pollen type etc. We examined ca. 30 individual specimens and prepared a new description correcting some mistakes. Pollen grains and seed micromorphologic characters were illustrated here for the first time with SEM (Scanning Electron Microscopy) photos. Finally, habitat characteristics were determined and the current conservation status of the species was reassessed using IUCN Red list categories and criteria and Critically Endangered (CR) categories was recommended at regional, national and global levels.

Key words: *Brassicaceae*, *Ricotia tenuifolia*, Redescription, Thread categories

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PP53- MORPHOLOGICAL, PALYNOLOGICAL, KARYOLOGICAL AND ECOLOGICAL STUDY ON TURKISH ENDEMIC *Onopordum caricum* HUB.- MOR. (ASTERACEAE)

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In this study, morphological, palynological, karyological and ecological features of *Onopordum caricum* Hub.-Mor. was investigated. *Onopordum* L. is the member of *Asteraceae* that presented by 50 taxa spreading in worldwide; especially in Mediterranean region. The genus *Onopordum* was represented by 19 species (total 20 taxa) in Turkey. Among them 6 taxa are endemic for Turkey. *O. caricum* is the endemic species recorded by three different localities in the Flora of Turkey. These are; Muğla-Köyceğiz,7 km northwest of Köyceğiz (type locality), 4 km from Datça to Marmaris and 32 km west of Muğla. However; this study demonstrated that the taxon was also spread in Datça and Bozburun peninsula and among Bodrum, Muğla and Fethiye. In this study palynological, karyological and seed features of *O. caricum* were reported for the first time. In the morphological observations, the biometric measurements of the plant parts were examined. The morphological properties determined in our study are generally similar to the characteristic features found in the Flora of Turkey. In our study, plant length was up to150 cm, basal leaves were 25-45 x 10-20 cm, flowers were up to 22 mm and seeds were 4-4.7 x 2-2.9 mm, oblong-obovate and ornamentation was transversely rugulose. Chromosome number was found to be 2n=34. The pollen type was 3-zonocolporate, pollen shape was oblate-spheroidal and ornamentation was echinate in the investigated species. Some physical and chemical properties of soil samples were determined. It has been observed that the taxon usually

grown in light alkali, non-salted, loamy-sand soils. According to observations; its habitats are near the seaside, plains, in field and open forest sides of *Pinus brutia* Ten.

Key words: *Onopordum*, Endemic, Turkey

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PP54- OPTIMIZATION OF DNA ISOLATION AND ISSR-PCR FOR THREE ENDEMIC *Petrorhagia* SPECIES

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In this study, optimization of DNA isolation and ISSR-PCR were undertaken for three endemic *Petrorhagia* species, *P. lycica, P. pamphylica* and *P. peroninii*. A modified CTAB protocol yielded high quality DNA when compared to commercial DNA isolation kits. Approximately 6.6 to 23 µg DNA was obtained per 100 mg dried leaf tissue. ISSR protocol was also optimized for these three *Petrorhagia* species based on concentrations of $MgCl_2$, primer, dNTP and template DNA. Clear and reproducible amplifications were obtained by using 2 mM $MgCl_2$, 1.5 µM primer, 2 mM dNTPs and 4 ng template DNA. Among 24 ISSR primers tested, 10 of them produced satisfactory results. We analyzed 5 individuals for each endemic *Petrorhagia* species with these primers. In total 287 bands were produced and the number of amplified bands varied between 17 and 41. The primers $(GT)_8$ YC, $(AGC)_6G$ and $(AGC)_6C$ gave highly polymorphic band pattern at species level. The optimized DNA isolation and ISSR-PCR procedures could be employed to study the genetic diversity of three endemic *Petrorhagia* species.

Key words: *Petrorhagia*; ISSR-PCR; DNA isolation

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PP55- MORPHO-ANATOMICAL, PALYNOLOGICAL AND SEED SURFACE PROPERTIES OF *Astragalus strictifolius* BOISS.

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Astragalus strictifolius Boiss. (Fabaceae) is a member of the section *Rhacophorus* Bunge and spiny shrub. It grows in mountain slopes of central and eastern Anatolia. Morphological, anatomical, palynological and seed surface properties of the plant were examined in this study. Morphological characters and measurements such as rachis, leaflets, bracts, inflorescense diameter, calyx, corolla parts of standard, wing and keel, ovarium and pods are examined. Also hair types of rachis, leaflet and calyx are determined. There is secondary growth in stem anatomy. The sclarenchymatic tissue is located on the vascular bundles. The stem of this species posess tragacantha canals in pith. *A. strictifolius* has equifasial leaves. The midrib region forms a projecting part and the vascular bundles are surrounded by a bundle sheath. The pollen grains of *A. strictifolius* are tricolpate and prolate spheroidal. The exine sculpturing is microreticulate. The general shape of the seeds is oblong-elliptic

and the type of seed sculpture is rugulate-reticulate. Scanning electron microscopy (SEM) is used to determine the morphology of pollen and seed.

Key words: *Astragalus strictifolius,* Anatomy, Morphology, Pollen, Seed, SEM

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PP56-A KARYOLOGICAL INVESTIGATION ON *Artemisia fragrans* Willd. FROM TURKEY

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In Turkey, the genus *Artemisia* L. is represented by 23 species, distributed particularly in the Inner, Central and Eastern parts of the country. Most *Artemisia* species are used in traditional medicine in gastritis and as a tonic and antihelmentic. Decoction extract is used as antiseptic in wounds. *Artemisia* species (Asteracae) are widely used medicinal plants in folk medicine. In this study karyology of *Artemisia fragrans* was studied for the first time. Karyogram and idiograms of the plant were also prepared. The chromosome number of *Artemisia fragrans* was found as 2n = 36 and haploid karyotype formula as 10m+5sm+3M. Metaphase chromosome length range from 5.16 to 4.15 µm and the total haploid chromosome length was 85.51 µm. The results were discussed with genus patterns.

Key words: *Artemisia fragrans,* Karyotype, Morphology

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PP57-A MORPHOLOGICAL AND KARYOLOGICAL INVESTIGATION ON *Artemisia spicigera* C. Koch FROM TURKEY

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The genus *Artemisia,* small herbs and shrubs, is one of the largest and most widely distributed genera of the Asteraceae family. Over 250 species of *Artemisia* L. are distributed throughout the world and about 23 of these are documented in the Flora of Turkey. Members of this genus, have a characteristic scent or taste have botanical and pharmaceutical interest, and are used in the liquer-making industry. The purpose of the present study is to determine morphological, morphometrical, karyological features of the *Artemisia spicigera* C. Koch species from East Anatolian region. Some morphological features of the species like mophology of capitula, involucra, involucral leaves (phyllaries), stem leaves, pistil, stamen and achene have been investigated. Karyogram and idiograms of the plant were also prepared. The chromosome number of *Artemisia spicigera* was found as 2n = 18 and haploid karyotype formula 6m + 2sm+1M. Metaphase chromosome length ranging from 4.97 to 4.75 µm and the total haploid chromosome length was 43,42 µm. The results were discussed with genus pattern.

Key words: *Artemisia spicigera,* Karyotype, Morphology.
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PP58-DISTRIBUTION AREA, POPULATION SIZE OF LOCAL ENDEMIC *Minuartia saxifraga* (FRIV.) GRAEBN. SUBSP. *tmolea* MATTF. AND ITS NEW RED LIST CATAGORY

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The distribution area, population size and threat factors of *Minuartia saxifraga* subsp. *tmolea* are investigated in this work. This species is local endemic to Mt. Bozdağ in Ödemiş (Tmoleus), İzmir-Turkey. According to Red Data Book of Turkish Plants, it is in VU (vulnerable) category. Results of the field studies showed that the species prefer massive schistose rocks between 1650-2100 m in Mt. Bozdağ (Tmoleus). The field studies conducted on populations showed that the distribution area is narrow (0,62 km²) and the number of individuals is approximately 1196. Although there isn't any problem with the number of seed set, seeds have the problem of holding the rocks. They germinate only in certain lichenes on rocks. These lichenes are at first *Ramalina* sp., than *Umbilicaria* sp., *Dermatocarpon* sp., *Aspicilia* sp., *Candelariella* sp., *Lecanora sulphurea*, *Lecanora* sp. and *Parmelina* sp. Populations were only under natural threats just as broken into pices of the rocks but nowadays, ski run activities and reforestration going to be major threat factors on them. According to these data; we propose that the threat category of this species is changed to CR B1ab (i,ii,iii) (Critically Endangered) and that its distribution area must be protected.

Key words: *Minuartia*, Population, Threatened Factors, Red List

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PP59-MORPHOLOGY, DISTRIBUTION AND THREAT CATEGORY OF GENUS *Chrysophthalmum* SCHULTZ BIP. FROM TURKEY

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The genus *Chrysophthalmum* Schultz Bip. is represented by 3 species in Turkey which 2 of them are endemic. *C. gueneri* Aytac & Anderb. is a local endemic species and only distributed in type locality in Gevne Valley. *C. dichotomum* Boiss. & Heldr. is distributed in few localities in Germany and one locality in Isparta. The non-endemic species *C. montanum* (DC.) Boiss. has a cosmopolitan distribution pattern in Turkey. In this study, morphology, threaten categories, distribution patterns, and phytogeographical regions of *Chrysophthalmum* Schultz. Bip. species in Turkey were presented in the light of the data obtained from the field surveys, herbarium, and literature research.

Key words: *Chrysophthalmum*, Distribution, Endemic, Morphology

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PP60- DETERMINATION OF INTRA- SPECIES GENETIC VARIATION OF THE ENDEMIC SPECIES, *Phlomis physocalyx*, BY USING ISSR MARKERS

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In this study, level of intra- species genetic variation of endemic species, *Phlomis physocalyx*, was investigated by using ISSR markers. In the current study, 193 samples from 5 populations of *P. physocalyx* were used. At the end of screening, 123 polimorfic and 5 monomorfic ISSR bands were obtained. The results of this study, indicated that Nei (1972)'s genetic variation ranged from 0.14 to 0.32, Shannon Index varied 0.20 to 0.48, percentage of polimorfic loci varied from 50 to 118. The gene flow value was estimated as 1.736 among the populations. When the UPGMA dendrogram constructed based on Nei's genetic distance value, except for one population (MYD-1969), four populations clustred together.

Key words: *Phlomis physocalyx*, Endemic, Genetic Variation, ISSR

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PP61- EXTRACTION OF *Marrubium vulgare* L. BY SUBCRITICAL WATER EXTRACTION AND HYDRODISTILLATION AND DETERMINING THE COMPONENTS BY GC-MS

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Subcritical water extraction, using water under external pressurization above its boiling point as an extraction solvent, received much attention to extract desired polar compounds from herbs or plants [1]. Subcritical water extraction offers an efficient, non-toxic, and environmental-friendly alternative to conventional organic liquid solvent extraction techniques.*Marrubium vulgare L.* (White Horehound or Common Horehound) is a flowering plant in the family *Lamiaceae*, native to Europe, northern Africa and Asia. As biocontrolling plant: *Marrubium vulgare* L. is also used as a natural grasshopper repellent in agriculture. *Marrubium vulgare* L. has some benefits as guaiacol, appetizing, digestive, wound healing and tranquilliser. In this study *Marrubium vulgare L.* which is grown in Mersin was extracted by hydro distillation (HD) and subcritical water extraction (SbCWE) at 100°C, 125°C and 150°C temperatures. Dichloromethane was used to extract organic compounds. Extracts were determined by GC-MS. For GC-MS results; 19, 17 and 21 signals were received from SbCWE at 100°C, 125°C and 150°C, respectively and 22 signals were received from HD. The major component was Marrubiin at all temperatures for SbCWE, while Caryophyllene was the major component for HD. The amount of the components depends on the extraction methods and conditions.

Key words: Subcritical water extraction, *Marrubium vulgare* L., Convential Extraction Methods
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PP62-SEED GERMINATION AND CONSERVATION OF RARE ENDEMIC *Campanula teucrioides* BOISS. (CAMPANULACEAE)

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Effects of stratification and GA_3 on seed germination of *Campanula teucrioides* Boiss.are investigated in this work. *Campanula teucrioides* is endemic to İzmir, Ödemiş Bozdağlar in Turkey. According to Red Data Book of Turkey, it is in VU (vulnerable) category. Results from the present study will contribute to the conservation of this threatened endemic plant of Bozdağ. Studies were conducted in the treeless peaks, subalpine zones between 1600-2170 m. in İzmir-Ödemiş, Bozdağ above the ski complex. Seeds of *C. teucrioides* were collected from randomly selected individuals of spatially separated populations in the Bozdağ, during autumn season of 2009. TTC test, using 1% solutions of 2,3,5- triphenyl tetrazolium chloride (TTC), was performed to determine seed viability. The unchilled (control) and chilled seeds were treated with different concentrations of gibberellic acid (GA_3), under alternating light/dark (12-h light period and 12-h dark period) and complete dark conditions at an alternating temperature of 25/15ºC. A two-way anova (General Line Model [GLM]) was carried out on the germination data to assess the effects of the fixed factors (grup and treatment) and their interaction on germination percentage light and constant dark conditions. As a result of TTC test, *C. teucrioides* seed viability was determined as 88%. A two-way ANOVA indicated significant effects of GA_3 and chilling on germination percentage; whereas among their interaction were not significant. Results from the present study will contribute to the conservation of this threatened endemic plant of Bozdağ.

Key words: *Campanula teucrioides,* conservation, seed biology.

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PP63-POLLINATION BIOLOGY OF *Sideritis tmolea* P.H. DAVIS (LAMIACEAE)

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The pollination of *Sideritis tmolea* P.H. Davis is investigated in this work. *Sideritis tmolea* is endemic to İzmir, Ödemiş Bozdağlar in Turkey and it has a distribution between 1450 and 2100 m. According to Red Data Book of Turkey, it is in VU (vulnerable) category. With this study; growing and vitality situations of reproductive organs, effective pollinators and pollination type of the plant were determined. Studies of growing and receptivity stages of reproductive organs were performed on 30 flowers. It was observed that the pre-receptive stage of style is between 3-4.5 mm whereas the receptive stage is between 4.5-5.6 mm. Stigma was receptive when the style lenght pass through the stamen levels. It promoted allogamy to plants. Pollen viability is 58.8%±12.9 and not related with the stigma receptivity. Pollination observations in the field, pollinators and their visitation periods were determined. Ten pollinators were observed on the plants. These are *Bombus incertus*, *B. pratorum*, *B. hortorum*, *Apis mellifera, Anthophora bimaculata, Halictus tetrazonianellus, Bombylus major, Carcharodus orientalis, Polyommatus icarus, Macroglossum stellatarum.* Effective pollinators of

these taxa are *Bombus incertus, B. pratorum, Apis mellifera, Anthophora bimaculata.* The assessments of breeding system involved 17 inflorences include 105 verticillate for seven plants were performed. According to these data; we conclude that, it is completely self-incompatible and obligate-allogam.

Key words: *Sideritis tmolea*, breeding system, floral biology, pollination

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PP64- THREAT CATEGORIES OF SOME ENDEMIC SPECIES OF SECT. *Malacothrix* (FABACEAE)

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Section *Malacothrix* belonging to *Astragalus* L. is presented by 16 taxa in Flora of USSR, 90 in Flora Iranica and 4 in Flora of Iraq. While it is composed of 17 species in Flora of Turkey, 10 are endemic. The endemism ratio in this section is %59. In present study a short description and threat category of five species of *Astragalus* sect. *Malacothrix* (i.e. *A. bashkalensis* Chamb., *A. tauricolus* Boiss., *A. bakirdaghensis* Podlech, *A. pseudotauricola* (Ponert) Podlech and *A. sarikamishensis* Podlech) is discussed. Descriptions, localities, distribution map and photos of these species are given. The new threat category of these species is indicated as CR and the reasons for this threat category are discussed.

Key words: *Astragalus*, *Malacothrix*, Threat Category, Endemic, Turkey

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PP65- MORPHOLOGICAL, KARYOLOGICAL AND PALYNOLOGICAL INVESTIGATION ON TURKISH ENDEMIC *Centaurea kurdica* REICHARDT SPECIES

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In Turkey, the genus *Centaurea* L. is represented by 183 species including 114 endemics, distributed particularly in the Southwest, Central and Eastern parts of the country. The ratio of endemism is quite high (62.1%) in the genus. The purpose of the present study is to determine morphological, morphometrical, karyological and palynological features of the endemic *Centaurea kurdica* Reichardt species from East Anatolian region. Some morphological features of the species like mophology of capitula, involucra, involucral leaves (phyllaries) and achene have been investigated. Karyogram and idiograms of the plant were also prepared. The chromosome number of *Centaurea kurdica* was found as 2n = 18 and haploid karyotype formula 6m + 2sm+1M. Metaphase chromosome length ranging from 5.81 to 3.91 µm and the total haploid chromosome length was 41.09 µm. The results of the light microscope investigation of pollen revealed that it has radially symmetrica, iso-polar tricolporate, spheroid type pollen and exine ornamentation was also determined as scabrate.

Key words: Turkey, Endemic**,** *Centaurea kurdica,* Karyotype, Pollen

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PP66-MORPHOLOGICAL, KARYOLOGICAL FEATURES AND POLLEN MORPHOLOGY OF ENDEMIC *Psephellus pyrrhoblephara* BOISS. FROM TURKEY

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Centaurea L. has been divided recently into four genera. According to the revised system these genera are *Centaurea*, *Rhaponticoides* Vaill., *Psephellus* Cass. and *Cyanus* Mill. One of these is *Psephellus* that has 75–80 species and a distribution with a centre in East Anatolia, Caucasian and northwest Iran; only a few species occur outside from this area. In this study, morphological, morphometrical, karyological and detailed pollen morphology of the endemic *Psephellus pyrrhoblephara* Boiss., was studied for the first time. In the morphologic study of the plant, some morphological and morphometrical features was observed and compared with the Flora of Turkey records. Karyogram and idiograms of the plant were also prepared. The chromosome number of *Psephellus pyrrhoblephara* was found as 2n = 30 and haploid karyotype formula 8m + 2sm+5M. Metaphase chromosome length ranging from 2.36 to 1.34 µm and the total haploid chromosome length was 26, 16 µm. The results of the light microscope investigation of the pollen revealed that they have radially symmetrica, iso-polar tricolporate, spheroidal type and exine ornamentation was also determined scabrate. The results were discussed with genus patterns.

Key words: Turkish endemic**,** *Psephellus pyrrhoblephara,* Morphology, Pollen, Karyotype

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PP67-THREE PRECIOUS *Gagea* SALISB. (LILIACEAE) SPECIES IN TURKEY

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Gagea Salisb. (Liliaceae) is represented by 250 taxa in the world. The Flora of Turkey recognises 26 taxa within the boundaries of Turkey, 3 of which were considered endemic. The endemic species are *G. sivasica* Hamzaoglu, *G. tenuissima* Miscz. and *G. bithynica* Pascher. The Red List categories of *G. sivasica* and *G. tenuissima* are CR, *G. bithynica* is LC. The flowering time of *G. bithynica* is between March and May. It grows at wet places and coniferous woods, at an altitude of 1200-2100 m. It spreads from west to southeast part of Turkey and East Mediterranean element. The flowering time of *G. tenuissima* is between December and April. It grows at the stony slopes. It is known only from Artvin and Euxine element. The flowering time of *G. sivasica* is April. It grows at the siliceous slopes. It is described from Sivas and known only from the type location and Euxine element.

Key words: Gagea, Endemic, Ecology, Turkey

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PP68-THE IMPORTANCE OF BIODIVERSITY INVESTIGATION IN THE TRANSECT FLORISTIC ZONES

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Turkey with respect to the geographic zones and endemic plants is one of the richest countries in the world. The regions which are rich in endemic plant species in the Mediterranean, Central Anatolia and Eastern Anatolia Geographic Regions. The rate of endemism varies depending on the age of mountains, the degree and duration of isolation and topographic features. The subject of the current study, the Melet Basin is rich in plant diversity with Auxin and Colchic flora and riparian ecosystem. In the Melet Basin, riparian zones are are important ecosystems due to their capacity to sustain numerous plant and animal communities. The studies carried out in this area is aimed to study the biodiversity andy conservation in ecosystems for sustainable use.

Keywords: Biodiversity conservation, biodiversity, Auxin flora, Colchic flora.

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PP69- THE USE OF AN ENDEMIC IRANIAN PLANT, *Echium amoenum* AGAINST THE ETHYL METHANESULFONATE AND THE RECOVERY OF MUTAGENIC EFFECTS

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In this study, potential genotoxic effects of ethyl methanesulfonate (EMS) that caused mutagenicity on variety of organisms were tried to resolve methanol extract of *Echium amoenum* Fisch & C. A. Mey from family of Boraginaceae which is an endemic plant and used as an alternative treatment among public in Iran. *Drosophila* wing somatic mutation and recombination test (SMART) were used to determine genotoxic and anti-genotoxic effects in our investigations. For this purpose, three-day-old trans-heterozygous larvae of *mwh/flr*^{3} genotype of *Drosophila melonogaster* were used in all of our experiments. The larvae were fed chronically on *Drosophila* instant medium (DIM) including 1ppm EMS. However, in another application group, different concentrations (1,2 and 4 ppm) of methanol extracts of *E.amoenum* (EA_{met}) were added to DIM including 1 ppm EMS ($EMS+EA_{met}$). Then, for the mature individuals wing preparates were prepared within the mediums which include control group that only has SDB and the negative control group that contains dimethyl sulfoxide (DMSO) and application groups in different concentration that contain EMS and $EMS+EA_{met}$. Total induction frequency at the normal wing phenotype of EMS application group was observed 2,00. In the $EMS+EA_{met}$ application group, the value of 1ppm EA_{met} 1,49, value of 2ppm EA_{met} 1,08, value of 4ppm EA_{met} 0,72 was determined. This decrease observed between EMS and $EMS+EA_{met}$ application group in terms of total induction frequency is statistically significant ($p < 0.05$).

Key words: *Echium amoenum,* ethyl methanesulfonate, genotoxic and anti-genotoxic effects.

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PP70-THE TAXONOMIC POSITION OF A TURKISH ENDEMIC SPECIES *Thermopsis turcica* (FABACEAE/THERMOPSIDAE) KIT TAN, VURAL & KÜÇÜKÖDÜK"

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Thermopsis turcica is a local and an endemic species with narrowly distributed in Turkey and it has a very interesting character in view of fruiting formation having three carpel within Legumes. Some researchers in Turkey advocate that the species should be evaluated within new genera close to *Thermopsis* due to very different fruit shape. These reproductive characters of this Turkish relict species is never seen in other *Thermopsis* species all around the world. Hence, Turkish taxonomists are still discussing the ambiguous taxonomic position of this species. Therefore, phylogenetic analyses were conducted and the sequences of the internal transcribed spacers (ITS) 1 and 2 and the 5.8S gene belonging to rDNA are sequenced. Maximum Parsimony and Neighbor Joining approaches were used for determining the phylogeny of *T. turcica* in relation to other species. The result based on the phylogenetic reconstruction indicates that *T. turcica* is nested clearly in core of the *Thermopsis* genera. The species seems very close to *T. chinensis*.

Key words: Molecular systematic, Taxonomy, ITS, rDNA, Turkey

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PP71- DISTRIBUTION AND THREAT CATEGORIES OF *Alcea* L. and *Althaea* L. SPECIES IN TURKEY

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Alcea L. is represented with 18 and *Althaea* L. (Malvaceae) with 4 taxa (species and subspecies) in Turkey. In this study the new threat categories of taxa attributed to these genera (including non endemics), regarding to their distribution in our country, are given. The threat category of taxa, which was not given in Red Data Book of Turkish Plants, is evaluated due to their distributions. The threat categories of two species are changed; *Alcea kurdica* (Schltdl.) Alef. as LC and *A. guestii* Zohary as CR, whereas their categories were indicated as VU in Red Data Book. Threat categories of *Alcea pisidica* Hub.-Mor., *A. fasciculiflora* Zohary, *A. flavovirens* (Boiss. & Buhse) Iljin are changed as DD to CR, regarding to the recent field studies. Threat categories of *Alcea acaulis* (Cav.) Alef., *A. apterocarpa* (Fenzl) Boiss. and *A. calvertii* (Boiss.) Boiss. remain the same as mentioned in Red Data Book. The threat reasons of taxa in their distribution area are discussed.

Key words: *Alcea*, *Althaea,* Malvaceae, Turkey

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PP72- DISTRIBUTION AND THREAT CATEGORIES OF *Alcea* L. and *Althaea* L. SPECIES IN TURKEY

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Alcea L. is presented with 18 taxa and *Althaea* L. (Malvaceae) with 4 taxa (species and subspecies) in Turkey. In this study the new threat categories of taxa attributed to these genera (including non endemics), regarding to their distribution in our country, are given. The threat category of taxa, which were not given in Red Data Book of Turkish Plants, is evaluated due to their distributions. The threat categories of two species are changed, *Alcea kurdica* (Schltdl.) Alef. as LC and *A. guestii* Zohary as CR, whereas their categories were indicated as VU in Red Data Book. Threat categories of *Alcea pisidica* Hub.-Mor., *A. fasciculiflora* Zohary, *A. flavovirens* (Boiss. & Buhse) Iljin are changed as DD to CR, regarding to the recent field studies. Threat categories of *Alcea acaulis* (Cav.) Alef., *A. apterocarpa* (Fenzl) Boiss. and *A. calvertii* (Boiss.) Boiss. remain the same as mentioned in Red Data Book. The threat reasons of taxa in their distribution area are discussed.

Key words: *Alcea*, *Althaea,* Malvaceae, Turkey

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PP73-TAXONOMIC STUDIES ON RARE ENDEMIC SPECIES FROM TURKEY: *Helianthemum germanicopolitanum* BORNM. (CISTACEAE)

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The genus *Helianthemum* Mill. includes 12 annual or perennial species in the Flora of Turkey, 4 of which are endemic. In this study, morphological, cytological, micromorphological and palynological characteristics of the rare endemic *Helianthemum germanicopolitanum* Bornm., are studied for the first time. This species is grown on chalky and limestone slopes in Çankırı province. Two locations are determined from Çankırı and these are recorded as GPS data. In morphological studies, detailed descriptions of the *H. germanicopolitanum* and characteristic features are given. Besides, seed morphology is studied by SEM. According to that, seeds are broadly ovoid. The seed coat ornamentation is rugulate-verrucate; warts are in irregular groups. Chromosome number is found 2n=19 and 2n=21. Mitotic and meiotic chromosome studies are still in progress. The pollen grains are tricolporate, medium sized and spheroidal. Apocolpial area is rather narrow. Exine is very thin. Exine ornamentation is identified as perforate on LM studies and striate-perforate on SEM studies.

Key words: *Helianthemum germanicopolitanum*, Cistaceae, Rare endemic, Morphology, Palynology, Chromosome number, Seed micromorphology

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PP74-CLONAL DIFFERENCES IN PHYSIOLOGICAL AND MORPHOLOGICAL ADAPTATION OF *Populus nigra* IN RESPONSE TO DROUGHT STRESS

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Black poplar (*Populus nigra* L.) is native to the Asian part of Turkey and has a wide distribution in country with its three subspecies *nigra, caudina* and *usbekistanica*. Human activities and ongoing climate chance altering the riparian ecosystems and gene introgression between genetically distinct black poplar populations caused significant reduction in regeneration capacity of the species in their native stands. Therefore, many native black poplar populations have been disappeared completely in recent years in Turkey. To conserve and manage Turkey's valuable black poplar heritage, conservation programmes have been started with identification of five natural populations in eastern part of Turkey. Then, the selection of black poplar clones from native populations in different regions of Turkey. By this way, 297 black poplar clones were selected and transferred to a clone bank located in the Behiçbey Nursery, Ankara. The aim of this study was to evaluate genetic composition the clone bank to understand adaptability of clones to different climatical conditions. In the current study, genetic variation of the collection was assessed by using many morphological characters such as bud set and flash dates, apical form, branch angel, branch number and leaf defoliation as well as growth parameters in a field trial established with 297 black poplar clones in Ankara for two years. The major selection criterion in that period was the tolerance to drought stress. Results of the study indicated the difference between first and the last bud flashed clones was 45 days. However the same high differences have not been observed in the bud set. Clonal differences in growth parameters under drought stress was so high that average differences between the first and the last clone was more than 3 m in height and 30 cm in diameter. Except branch angel, high correlation between (%25) other morphological characters and growth parameters under drought stress was also indicated in the study. These results suggest us that it is possible to select potential commercial black poplar clones that can be used in plantations established in different regions of Turkey.

Keywords: *Populus nigra,* Black Poplar, Drought, Morphology, Physiology

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PP75 -SEED PHYSIOLOGY OF *Fraxinus ornus* subsp. *cilicica*, AN ENDEMIC WOODY TAXON IN TURKEY

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Fraxinus ornus subsp. *cilicica* is an endemic woody taxon on Taurus Mountain in Southern Turkey. The tree is one of the most destroyed species for handles of shovel and picks in rural areas. In this research, seed physiology of the species was studied to explore the dormancy, germination, and storage characteristics of the seeds. The seed material was collected from eight different provenances in southern Turkey. This study has shown that seeds of the species have physiological dormancy and need about 18-20 weeks prechilling for germination. The seed is very desiccation tolerant and can be stored for long time with low moisture content at lower temperatures. *Fraxinus ornus* subsp. *cilicica*

populations should be conserved in some dense sites. Seedlings should be produced from the local seed sources and some plantations should be established in appropriate sites. In its distribution regions, this flowering tree should also be used in urban plantations.

Key words: *Fraxinus ornus* subsp. *Cilicica,* Endemic, Germination, Seed physiology

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PP76-SEED CHARACTERISTICS OF *Flueggea anatolica*, AN ENDEMIC WOODY PLANT IN TURKEY

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Flueggea anatolica, found in recent decades, is an endemic woody species in Turkey. Its existence is critically endangered due to the distribution in limited areas. The *ex situ* conservation of this species is very important. In this study, both morphological and physiological seed characteristics of the species were investigated in detail. Seeds were collected from all known three small provenances of the species. Seed weight, seed size, seed dormancy, pretreatment for the germination, and desiccation sensitivity of the *Flueggea anatolica* seeds were determined. Some suggestions were presented for *in situ* and *ex situ* conservation of this endemic species.

Key words: *Flueggea anatolica*, Seed characteristics, Conservation

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BIODIVERSITY CONSERVATION AND TOURISM WORKSHOP

ORAL PRESENTATIONS

(Listed in the order of Presentation in the Scientific Program)

TOURISM POTANTIAL OF ENDEMIC PLANT RICHNESS OF TURKEY

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Our country possesses a magnificent potential in terms of biological variety. Endemic flora and fauna sources of our country are considered to be high value factors of Turkey's tourism product. However, this potential necessitates employment of a very sensitive balance in preservation versus usage of this assortment in terms of what is called Ecotourism. The idea behind the Ecotourism must assume promotion of these resources to our own people and visitors and a well determined preservation program. It will be very advantageous to preserve the biological wealth by attracting interest to the Ecotourism and combining biological assets with the other continuing cultural values of Anatolia in promoting Turkey's tourism product.

Key words: Endemic plants, ecotourism, cultural continuation of Anatolia

*Presenting author

THE PLANT SPECIES OF FETHİYE AND THE PLANTS WITH TYPE SPECIMENS FROM FETHİYE AREA

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In this study, the photographs and information gathered from "the Fethiye Plants Book" preparation which was carried out as a field and literature surveys for about a year will be presented. It was found from the literature studies that there were 398 plant taxa in Fethiye in where the type specimens were found first time in Fethiye. Among the rich plant families with these are Asteraceae with 5, Lamiaceae with 4, Campanulaceae with 4, Caryophyllaceae with 4, and Scrophulariaceae with 4 taxa. About 33of the type specimens belonging to Fethiye are the Mediterranean Phytogeograpic Region elements. According to the IUCN categories, there are 14 species in EN, 12 in LC, 6 in VU, 4 in CR and 1 in NT status.

Key Words: Plants of Fethiye, Type Specimen, Conservation Status, Muğla, Turkey.

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AS AN ELEMENT OF INTANGIBLE CULTURAL HERITAGE ''SIĞLA''

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Sığla (sweetgum, *Liquidambar orientalis* Miller) which is most widely spread in Muğla, Turkey, is a relict (remnant) and endemic plant (grown in a certain region). After certain operations, bark and oil

can be obtained from this tree, also called ‘‘Günlük’’. These products were evaluated as trade items and exported in the past years, but today its production come to a standstill because of some various reasons. Sweetgum bark used as an incense and sweetgum oil (Styrax Liquidus) used especially in perfume and pharmaceutical industries have an important place as one of the elements of Muğla’s folk culture. Sweetgum is widely used as a traditional treatment among the public and its bark for incense in funeral houses, belief and worship centers. The fresh leaves of this tree are cooked. The locations of the sweetgum trees are ideal picnic areas with their cool and fresh air. Due to its importance for folk culture, sweetgum and günlük bark has been taken consider as an intangible cultural heritage (SOKÜM) inventory element of Muğla. The prepared file related to the subject has been sent to Ministry of Culture and Tourism, General Directorate of Research and Education and it has been tried to draw attention to sweetgum for intangible cultural heritage (SOKÜM).

Keywords: Sweetgum, *Liquidambar orientalis,* styrax, cultural heritage
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PROJECT STRATEGIES FOR THE PROTECTION OF BIOLOGICAL DIVERSITY OF THE YALOVA MODEL FOREST

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Establishment of Model Forest in Yalova with a participative approach contained the sustainability of forests aimed at fulfilling all the criteria to be a member of the International Model Forest Network in the membership process and Yalova Model Forest Strategic Plan was prepared in a participatory approach, directly and indirectly in the protection of biological diversity. Two separate part to be addressed, in first part; effort to become rehabilitated forest ecosystems and degraded ecosystems, in the second part; non-wood forest products that can be described as a form of discipline of gathering wild products and their alternatives and growing forms of culture in order to reduce the negative effects. The studies in the strategic plan focused on some fruit cultivars, medicinal and aromatic plants, bulbs, plants and natural fungi tuberous and wax with the benefit of sustainable conservation and uses and tourism purposes. In addition, the maximum extent permitted by ecological conditions species should be bring together to be created as a result of modeling with other areas of food forest gardens, wildlife and ecotourism, as well as the use of nutrition and for protection of genetic resources. Production of value added products and creation of new marketing techniques seen as a guarantee for of sustainable protection and uses of the forest.

Keywords: Model forests, biological diversity, non-timber forest products, ecotourism

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INCIRKOY ECO-VILLAGE and YESILUZUMLU SLOW CITY: SUSTAINABLE LIFE

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In pursuit of technology, the human mind is in an extremely chaotic state: while we eagerly rush towards dazzling novelties, we have managed to reduce the quality of life, nature, soil, water and air to incredibly low levels. We have ignored environmental conditions totally and usurped everything we

laid our hands on, acting heedlessly of our own welfare, let alone of the well-being of forthcoming generations. Yet, it is possible to enjoy existing wealth and treasures, without consuming them all at once. It is possible to preserve, share and enrich these riches and carry them over tens and thousands of years. That is why we have set out on the venture of "Incirköy Eco-Village and Yeşilüzümlü CittaSlow", with the aim of preserving the natural environment, the greenery, the vineyards and olive groves in Incirköy and Yeşilüzümlü, the rear garden of Fethiye. Above all, we wish to establish a sustainable life for the beautiful residents in this area. For this purpose we have instigated natural farming and organic apiculture. We wish to cultivate healthy food and share it with others.
We are confident that we shall be playing host to sensitive people who are aware of the value of existing environmental treasures; who are desirous of preserving them and who are keen to ensure a sustainable life for these riches.We know that we shall achieve our aim in this wonderful venture with solidarity and sharing our experiences with each other.

Keywords: İncirköy Ecovillage, Yeşilüzümlü Slow City, Sustainable Life, Organic farming
*Presenting author

A CASE STUDY FOR BIO-CULTURAL DIVERSITY CONSERVATION: TaTuTa PROJECT

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TaTuTa is the name of the project on "Eco-Agro Tourism and Voluntary Knowledge and Skills Exchange on Organic Farms", organized by Bugday Association for supporting ecological living. This Project aims to support ecological farming in Turkey. But on the other hand it brings out a lot more then this with other Buğday Association Projects. One of the total output of these projects is conserving the local residents with their natural habitat. The presentation will give detailed information about TaTuTa Project and it will also show connections with other Projects and the total outputs.

Keywords: Agrotourism, Ecotourism, Organic farming
*Presenting author

GREEN MARKETING FOR SUSTAINABLE TOURISM

Merve ESRİNGÜ

Marketing aims to increase the consumption and green living aims to decrease it. So how can we bring green and marketing together? This presentation aims to discuss the sustainable tourism with its marketing facilities. In the beginning it will discuss the aim of sustainable tourism and its marketing style. After that it will come up with some good cases and then will end with how green marketing has to be planned.

Key Words: Green marketing, Ecotourism, sustainability
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