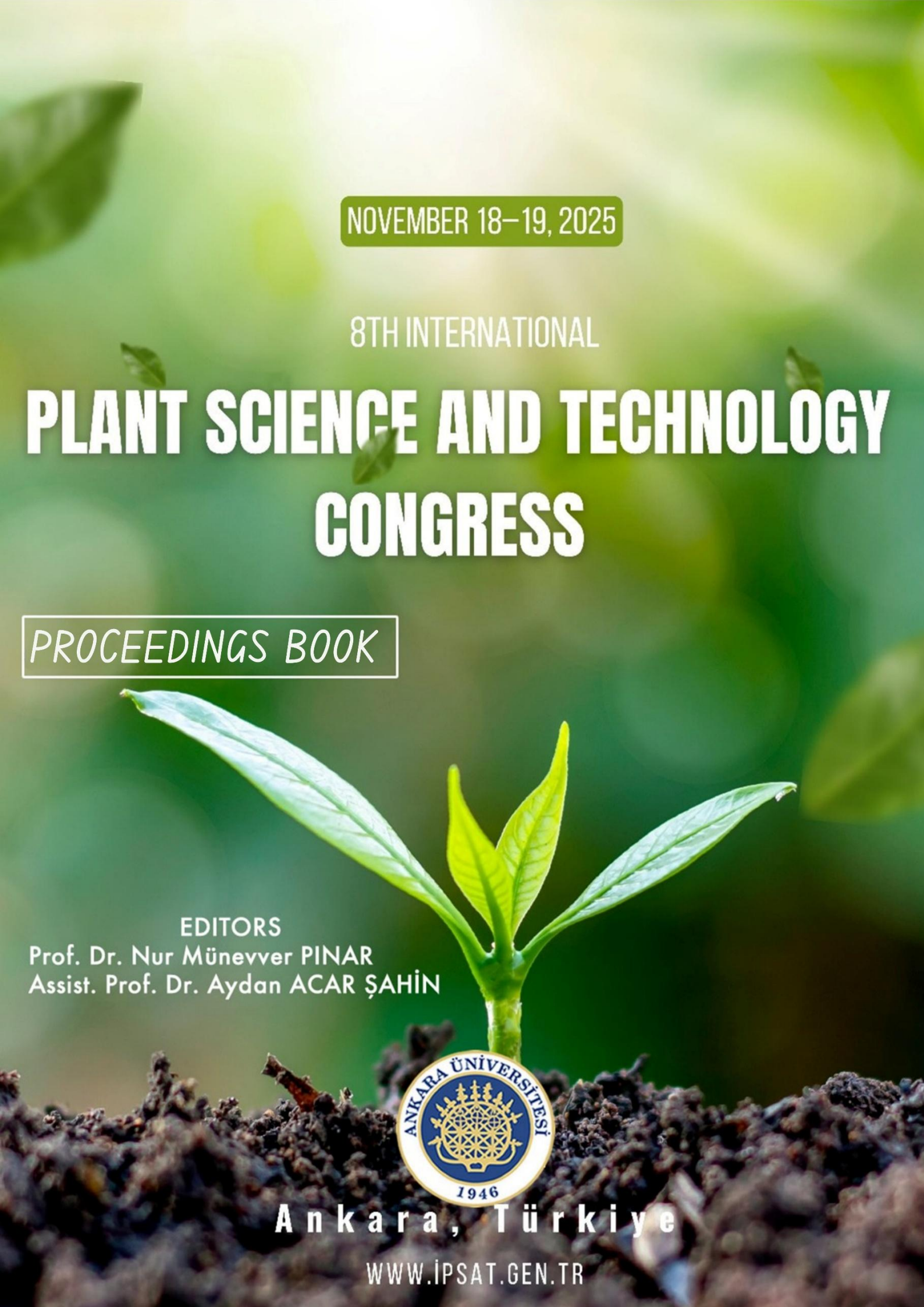
NOVEMBER 18–19, 2025

8TH INTERNATIONAL

PLANT SCIENCE AND TECHNOLOGY CONGRESS

PROCEEDINGS BOOK

EDITORS
Prof. Dr. Nur Münevver PINAR
Assist. Prof. Dr. Aydan ACAR ŞAHİN



Ankara, Türkiye

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Conference Proceedings

Editors

Prof. Dr. Nur Münevver PINAR
Assist. Prof. Dr. Aydan ACAR ŞAHİN

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PREFACE

Scientific congresses play a pivotal role in disseminating knowledge, fostering critical discussion, and opening new avenues of research. Bringing together the diverse sub-disciplines of plant science, the **8. International Plant Science and Technology** congress has served as a significant platform for scholarly exchange among researchers, academics, and professionals.

Hosted by **Ankara University** and held **online on 18–19 November 2025**, this meeting convened scientists from universities and research institutions to engage with recent advances in botany within a productive and collegial environment.

This volume contains the abstracts of invited talks, oral communications, and poster presentations, encompassing studies in plant systematics and taxonomy, ecology, physiology, genetics, anatomy, biotechnology, ethnobotany, palynology, environmental sciences, and conservation biology. The breadth of topics reflects both the current scientific level of plant science in our community and the importance of cross-disciplinary collaboration.

Our aim is not only to share existing knowledge but also to illuminate emerging research directions and strengthen scientific cooperation. We trust that the work presented here will contribute to the development of plant science and to efforts for the conservation of biodiversity.

We extend our sincere thanks to the members of the scientific and organizing committees for their efforts in preparing this book of abstracts, and to all contributors for sharing their work. We are also grateful for the support provided during the organization of the congress by **Rector Prof. Dr. Necdet ÜNÜVAR**, **Dean Prof. Dr. Canay AYKOL KOCAKUŞAKLI**, the staff of the Rectorate, **Prof. Dr. Mehmet KARATAŞ**, and the **Ant Abstract Board of Directors**.

We hope that this congress will contribute meaningfully to the accumulation of scientific knowledge in plant science and inspire future studies.
With our best regards,

Congress Chair
Prof. Dr. Nur Münevver PINAR
Department of Botany, Faculty of Science
Ankara University

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Dr. Ofélia Anjos
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University of Agricultural Sciences and Veterinary Medicine Cluj, Romania

Dr. Ferhat Celep
Kırıkkale University, Türkiye

Dr. Alexander Sukhorukov
Moscow Lomonosov State University, Russia

Dr. Rami Arafeh
Palestine Polytechnic University, Palestine

CONGRESS PROGRAM

November 18, 2025, Tuesday		
Opening Session		
10:10	10:30	Opening Remarks – Congress Chair- **Prof. Dr. Nur Münevver PINAR,** Organizing Commitee Member- **Prof. Dr. A. Emre YAPRAK** Dean - **Prof.Dr. Canay AYKOL KOCAKUŞAKLI** Rector - **Prof. Dr. Necdet ÜNÜVAR**
10:30	13:00	**Session of Invited Speakers, Moderator: Aydan Acar Şahin**
10:30	11:00	Invited Talk 1_**Carmen Galán**
11:00	11:30	Invited Talk 2_**Agnieszka Grinn-Gofron**
11:30	12:00	Invited Talk 3_**Asuman Sunguroğlu**
12:00	12:30	Invited Talk 4_**Ofélia Anjos**
12:30	13:00	Invited Talk 5_**Rodica Margaoan**
13:00	14:00	**Lunch Break**
14:00	15:40	**Session_1: Ragweed, Moderators:Victoria Rodinkova, Talip Çeter**
14:00	14:15	**Heinz Müller-Schärer** "Towards predicting evolutionary outcomes in weed biocontrol"
14:15	14:30	**Marta Pezzato** "Can the spread of *Ambrosia* pollen be a concern in Parma (northern Italy)? Analysis of 33 years of observations"
14:30	14:45	**Elisa Cardarelli** "Three decades of *Ambrosia artemisiifolia* Pollen Monitoring in One of The Most Infested Area in Europe"
14:45	15:00	**Oleksii Kremenskii** "Overlap of *Ambrosia* with *Artemisia* and *Alternaria* seasons shaping allergy risks in Ukraine"
15:00	15:15	**Aydan Acar Şahin** "Tracing Northern Source Regions of Ragweed Pollen Using HYSPLIT and Density-Based Clustering: Evidence from Gebze, Ankara, and Zonguldak (2022)"
15:15	15:30	**Serhat Karabıcak** "Comparative Investigation of *Ambrosia* Pollen in Kastamonu Atmosphere Using APS 400 and Burkard Device"
15:30	15:40	Discussion
15:50	17:30	**Session_2: Plant Ecophysiology and Biotechnological Applications, Moderators: İsmuhan Potoğlu Erkara, Gül Nilhan Tuğ**
15:50	16:05	**Shoko Tsuji** "Seasonal responses of photosynthetic fluorescence parameters in various temperate trees"
16:05	16:20	**Shoko Tsuji** "Ecophysiological Characteristic of the Water Potential Control in Tropical Canopy Trees"
16:20	16:35	**Rowida Mahmoud Abd El-Monem Omar** "In vitro Culture, Endophyte Isolation, Metabolomic Profiling, and Alzheimer's Disease Modulatory Activity of *Tecoma stans* (L.) Juss. ex Kunth"
16:35	16:50	**Israt Jahan** "Growth-Inhibitory Effects of *Alcea rosea* L. 'Red' (Henry VIII Red Hollyhock) Flower Extract on Pleural Biphasic and Sarcomatoid Mesothelioma Cell Lines"

16:50	17:05	**Adrianna Łobodzińska** "Silver and graphene oxide nanopriming mitigates of seed germination and seedling development in barley under salt stress conditions."
17:05	17:20	**Rabia Busenaz Kaya** "Optimization of Sterilization Protocols for *Albizia julibrissin* (Silk Tree) Petiole Explants: A Key Step Toward Efficient Micropropagation"
17:20	17:30	Discussion
17:40	18:10	**Session of Invited Speaker, Moderator: İlker Büyük**
17:40	18:10	Invited talk_**Marcin Nowicki**
November 19, 2025, Wednesday		
10:00	10:10	Opening Remarks_**Prof.Dr. Nur Münevver PINAR**
10:10	11:40	**Session of Invited Speakers, Moderator: Aydan Acar Şahin**
10:10	10:40	Invited Talk 1_**Alexander Sukhorukov**
10:40	11:10	Invited Talk 2_**Ferhat Celep**
11:10	11:40	Invited Talk 3_**Rami Arafeh**
11:50	13:00	**Session_1: Melissopalynology and Bee products, Moderators: Ofelia Anjos, Sibel Silici**
11:50	12:05	**Soraia Pedro** "Mapping the Physicochemical Diversity of Two PDO Honeys From Northeastern Portugal"
12:05	12:20	**Natália Roque** "Landscape Fingerprints applied to Honey Sustainability"
12:20	12:35	**Natália Roque** "Sustainable Beekeeping through Spatial Suitability Analysis in Rural Landscapes"
12:35	12:50	**Sibel Silici** "Determination of The Bioactivity of Olive Oil Extract of Propolis with Added Olive Leaf"
12:50	13:00	Discussion
13:00	14:00	**Lunch Break**
14:00	15:10	**Session_2, Melissopalynology and Pollination, Moderators: Rodica Margaon, Şenol Alan**
14:00	14:15	**Kenji Miki** "Spatiotemporal Scaling and Agent Representativeness in Pollination Service Simulations"
14:15	14:30	**Aslı Özkök** "An Important Honey Plant Blackthorn (Paliurus spina-christi Mill.)"
14:30	14:45	**Oktay Bıyıklıoğlu** "Palynological and physicochemical analysis of honey produced in Düzce province of Turkey"
14:45	15:00	**İbrahim Özkutlu** "Palynological and physical-chemical examination of honey produced in Karabük province"
15:00	15:10	Discussion
15:20	16:35	**Session_3, Integrative Plant Systematics, Phenology and Dispersal, Moderators: Ferhat Celep, Estefania Sanchez Reyes**
15:20	15:35	**Moisés Martínez-Bracero** "Phenological trends and varieties comparison on *Vitis vinifera* in Montilla-Moriles PDO (2015-2025)"
15:35	15:50	**Merve Kalas** "Macro-micromorphological Characteristics of Mericarps of Some *Galium* L. Taxa"
15:50	16:05	**Damla Kütükalan** "Taxonomic Implications Using FTIR Spectroscopy Coupled with Machine Learning: Preliminary Results in *Salvia* L."
16:05	16:20	**Havva Yalaz** "Pollen as a marker in migratory warblers: A case study of *Sylvia atricapilla* and its Mediterranean connection in Eymir Lake, Türkiye."

16:20	16:35	**Seyfullah Bekdemir** "Human-Mediated Seed Dispersal in the Islands of Tuz Lake: The Case of Tuzla Island"
16:45	17:45	**Session_4, Phytochemistry and Algal Bioprocessing, Moderator: Ekin Demiray**
16:45	17:00	**Ayşe Gözde Biçek** "Determination of Antioxidant Activity of Different Parts of Alcea calvertii (Boiss.) Boiss. by DPPH Method"
17:00	17:15	**Eda Açıkel** "Utilization of marble factory waste for the cultivation of Chlorella vulgaris in third-generation bioethanol production"
17:15	17:30	**Aybüke Kut Yılmaz** "Third-Generation Bioethanol Production from *Chlorella vulgaris* and *Dunaliella salina* Biomasses"
17:30	17:45	**Derya Keleşoğlu** "Evaluation of the Antimicrobial Activities of Selected Grape Varieties"
18:00	18:45	**Poster Flash Session, Moderators: Sibel Silici, Funda Özbek**
18:00	18:05	**Aybüke Bulat** "The preliminary results of the effects of the seed burial depth germination: a case study of Soda grandis (Freitag, Vural & N. Adıgüzel) Akhani"
18:05	18:10	**Aydan Fındık** "Teucrium karpasiticum Hadjik. & Hand Endemic to Northern Cyprus: Morphology, Anatomy, and Palynology"
18:10	18:15	**Ezgi Türk** "The Contribution of Halocnemum strobilaceum to Plant Diversity in Salt Marshes Around Tuz Lake"
18:15	18:20	**Ayla Kaya** "Morphology and Anatomy of the Endemic *Astragalus pungens* Willd"
18:20	18:25	**Pervin Soyer** "Comparative Antibacterial Activity of Extracts of *Salvia yangii* B.T. Drew"
18:25	18:30	**Pervin Soyer** "Evaluation of Antimicrobial Potential of Flower, Leaf, Seed, and Pulp Extracts of *Mahonia aquifolium* (Pursh) Nutt."
18:30	18:35	**Hikmet Sonkak** "Potential Antioxidant Properties of Wastewater Extract Remaining After the Essential Oil Process of *Ecballium elaterium* L."
18:35	18:45	Discussion
		Session 5
18:50	19:00	**Closing, Awards of Posters & Thanks**

INVITED SPEAKERS

Airborne Pollen Trends in the Iberian Peninsula

Carmen Galán[1,2*], Jose Oteros[1,2], Herminia García-Mozo[1,2], Fátima Aguilera[3], María Jesús Aira[4], Jordina Belmonte[5,6], Paloma Cariñanos[7], Delia Fernández-González[8,9], María Fernández-González[10], Santiago Fernández-Rodríguez[11], Montserrat Gutierrez-Bustillo[12], Beatriz Lara[13], Concepción De Linares[7], Stella Moreno-Grau[14], Jose María Moreno-Grau[14], Rosa Pérez-Badía[13], Antonio Picornell[15], Alberto Rodríguez Fernández[8], Javier Rodríguez-Rajo[10], Jesús Rojo[12], Luís Ruiz-Valenzuela[3], María del Mar Trigo[15], Purificación Alcázar[1,2]

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Abstract

Airborne pollen significantly impacts air quality, human health, and ecosystems. Airborne pollen significantly impacts air quality, human health, and ecosystems. Pollen data provide relevant information about the impacts of climate change on vegetation, with shifts in flowering timing serving as indicators of ecological responses. This study examines flowering timing and intensity trends for 12 anemophilous taxa across 12 locations in the Iberian Peninsula from 1994 to 2023, using data from Hirst pollen monitoring method. Statistical analyses assessed linear trends, comparing variations among woody and herbaceous taxa, as well as regional differences between Mediterranean and more temperate areas. Trends were not homogeneous across Spain. Southern regions exhibited more pronounced changes in flowering timing and intensity, aligning with greater climatic extremes observed in these areas. During this period, it has been observed increasing temperatures, especially during spring and summer; and decrease in rainfall in most places, with not clear trends. Trends on tree flowering timing start in advance in those flowering during early spring, more pronounced in the south, and flowering end in delay in spring flowering trees, prolonging the pollen season; temperature more impact on early flowering spring; for herbaceous plants, a delay on flowering start and an advance on flowering end, shortening the pollen season when lack of water availability. For tree flowering intensity trends, it has been observed an increase on flowering intensity, probably due to CO_2 impact on biomass increase; in herbaceous plants**,** increase flowering intensity in the north but decrease in the south, because of the lack of water availability, except *Artemisia* in the southeastern, well adapted to aridity.

Keywords: Aerobiology, airborne pollen flowering phenology, flowering intensity, climate change

Immunomodulatory Effects of *Hibiscus sabdariffa* Extract on M1 Macrophages

Nurbanu Özgültekin[1], Buse Kıvrak[1], Önder Helimoğlu[1], Aslıhan Öztürk[1], Petek Tuncer[1], Beyza Aktaş[1], Elif Dener Kılıç[1,2], Aslıhan Gürbüz Bolkan[3], Asuman Sunguroğlu[1*]

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Abstract

Hibiscus sabdariffa belongs to the Malvaceae family and is known by names such as "karkade," "kerkede," "roselle," "sour tea," and "African okra flower." *Hibiscus sabdariffa* (Hs, roselle; Malvaceae) is used in the food industry, cosmetics, traditional herbal beverages, and herbal medicine. There are two main varieties of HS. Known for its benefits in local applications, this plant has also been studied in scientific research, and its numerous therapeutic effects have been proven. It is used to treat conditions such as hypertension, liver disorders, fever, dyslipidemia, diabetes, liver diseases, ulcers, abscesses, and anemia. IFNs, a key member of the cytokine family, are characterized by their ability to induce antiviral activity in receptor-bearing target cells. IFNs have three subgroups, designated Types I, II, and III. Type 1 IFNs (IFN-α and IFN-β, IFN-δ, IFN-κ, IFN-ζ, IFN-ω) utilize the IFN-alpha receptor (IFNAR) complex. Type 2 IFNs (IFN-γ) signal using the IFN-gamma receptor (IFNGR). Members of type 3 IFNs are called IFN-λ. IFN-λ1 (IL-29), IFN-λ2 (IL-28A), IFN-λ3 (IL-28B), and IFN-λ4 bind to the receptor complex consisting of IL-28RA and IL-10R2. Type 1 IFNs are produced by lymphocytes, NK cells, B and T lymphocytes, macrophages, fibroblasts, endothelial cells, osteoblasts, and many other cell types. They target nearly all nucleated cells and have systemic effects.
Type 1 IFNs are produced by lymphocytes, NK cells, B-T cells, macrophages, fibroblasts, endothelial cells, osteoblasts, and many other cell types. They target nearly all nucleated cells and have systemic effects. Type 2 IFNs (IFNγ) are produced by NK, CD4+Th1, CD8+ cytotoxic T lymphocytes, and innate lymphoid cells as part of the innate immune response. The primary function of type 2 IFNs is to stimulate macrophage activation and Class II MHC molecule expression for antigen presentation. Type 3 IFNs are produced by epithelial cells, macrophages, CD8+ T cells, NK cells, Treg cells, dendritic cells, and hepatocytes. Type 3 IFN receptors are expressed on epithelial cells, so their antiviral effects are most commonly observed in barriers, the gastrointestinal, respiratory, and reproductive tracts. Therefore, Type III IFNs act as the first line of defense against viruses at barriers. The 2209 project, supported by TÜBİTAK, aimed to test the immunomodulatory activity of HS extract on M1 macrophages derived from the THP1 cell line, capable of active phagocytosis. The study investigated the effects of 25 mg/ml HS extract on type I interferon IFN-α/IFN-β, type II interferon IFN-γ, and type III interferon IFN-λ1 when administered to THP1 monocyte cell lines stimulated with lipopolysaccharide (LPS) and IFN-gamma. Our results demonstrate, for the first time, that a 25 mg/ml concentration of HS plant extract reduces IFN-λ1 expression in a time-dependent manner, and decreases IFN-γ expression were observed at 24 hours in activated monocyte cell lines. It was determined that HS exerts its anti-inflammatory effects by suppressing type 1 and type 3 IFNs.

Keywords: Malvaceae, *Hibiscus sabdariffa*, Immunomodulatory, Macrophages

Prospects of Aerobiology in Forensic Science

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Abstract

The present study emphasizes the forensic applications of fungi, with particular attention to fungal colonies, thallus fragments, and spores. Aerobiology has demonstrated significant utility in forensic science by contributing to multiple domains of investigation: detection and characterization of psychoactive substances and mycotoxins, estimation of the postmortem interval (PMI), assessment of health hazards associated with fungal growth in indoor environments, and the provision of trace evidence linking individuals, objects, and specific locations through the analysis of airborne spore occurrence. Recent research has begun to explore the application of molecular approaches - particularly DNA-based methods thereby offering novel avenues for forensic soil analysis. Such methodologies enhance the discriminatory power of traditional palynological and mycological techniques by allowing for the precise identification of fungal taxa, even in cases where morphological differentiation proves challenging. Furthermore, in the context of environmental health and building-related illnesses, there is an increasing demand for the establishment of standardized, universally accepted protocols for fungal sampling and data interpretation. The lack of developed procedures hinders the comparability and legal admissibility of results in the forensic and medicolegal context. It is therefore essential that investigating officers, forensic pathologists, and toxicologists recognize the evidential value of fungal material. Failure to account for this data may result in the loss of potentially critical information. Particular attention should be directed toward the recovery and analysis of fungal spores from human remains, the examination of visible mould colonies on corpses, and the systematic investigation of respiratory tract samples and selected internal organs (e.g., stomach and intestines) for the presence of fungal elements. Such practices not only contribute to the reconstruction of postmortem events but may also aid in distinguishing between antemortem colonization and postmortem contamination. To summarize, fungi and their propagules represent an underutilized yet highly informative category of forensic evidence. Their systematic study and integration into forensic protocols hold considerable potential for advancing the accuracy, reliability, and scope of forensic investigations.

Keywords: Fungi, Postmortem interval, Spores

Molecular Cartography of Plant–Pathogen Frontlines: A Genomic Perspective

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Abstract

Dr. Marcin Nowicki is a Research Assistant Professor at the University of Tennessee, utilizing genomics and population genetics approaches in invasive species and pathosystems management. In this talk, Dr. Nowicki will present a cross-system narrative of how genomics and molecular diagnostics are transforming our understanding of established and emerging fungal pathogens. Drawing on his work with culturable and obligate pathosystems, Dr. Nowicki will explore how genomics reveal pathogen population structure, evolutionary stability, and diagnostic vulnerabilities. The seminar will showcase how dual RNA-seq, SSRs, and field-ready molecular assays enable early detection and resistance tracking across forest and ornalemntal systems. Comparative genomics analyses have uncovered structures in these pathosystems, whereas and dual RNAseq has guided fungicide strategies and resistance breeding. Genomics-driven development of high-specificity molecular tools have enabled surveillance of a fastidious pathogen across multiple genera and U.S. states. Together, these efforts illustrate a powerful framework for pathogen preparedness, bridging plant pathology, environmental health, and mycology under a One Health umbrella.

Insights for Sustainable Utilization and Control of invasive *Acacia* Species based on their Nutritional and Phytochemical Characterization

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Abstract

Invasive *Acacia* species present significant ecological and economic problems in many regions. However, if they are harvested to control their invasive characteristics, they could also be a valuable source of bioproducts. Further studies are needed to understand how these resources can be utilised. This study provides a nutritional and phytochemical characterisation of invasive *Acacia* species grown in Portugal, for sustainable utilisation and ecological control. Seven invasive *Acacia* species namely, *Acacia melanoxylon*, *A. longifolia*, *A. cyclops*, *A. retinodes*, *A. pycnantha*, *A. mearnsii* and *A. dealbata*, were evaluated, across different plant parts, concerning their nutritional value determined through proximate composition and elemental analysis. For chemical characterisation, HPLC-DAD for quantification of major phenolic and flavonoid compounds; FTIR-ATR and FT-RAMAN spectroscopy for the identification of functional groups and differentiation the species and plant part; and LC-ESI-HRMS/MS for high-resolution molecular characterization of secondary metabolites. The combined analytical data revealed complex and diverse phytochemical compositions, with abundant bioactive constituents. Nutritional analysis of pods and leaves revealed high levels of protein, dietary fiber, and essential minerals like calcium, potassium, and magnesium. Toxicity screening on Caco-2 cells indicated no cytotoxic effects, supporting their potential for animal feed and soil improvement. Analysis of flowers of *A. dealbata*, *A. mearnsii*, and *A. retinodes*, at different flowering stage, indicated that extracts obtained during the early flowering stage exhibited higher bioactivity, likely due to the presence of chalcones. This suggests potential therapeutic applications, including treatments for dementia, diabetes and microbial infections. Using LC-ESI-HRMS/MS, several flavonoids were identified, with *A. pycnantha* and *A. cyclops* showing the highest phenolic content. Pods extracts demonstrated strong antibacterial activity against some gran positive bacteria. *Acacia* species as sources of valuable bioactive and nutrients, could provide a sustainable solution for the management of invasive species.

Keywords: Acacia, Nutritional characterization, Phytochemisty characterization, Biological activities,

Acknowledgements: This research was funded by project Acacia4fireprev - Acacia biomass exploitation: a tool to reduce wildfires risk in unmanaged forestlands (PCIF/GVB/0145/2018).

Pollen Morphology in Asteraceae Family: Applications and Perspectives in Palynology

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Abstract

Pollen identification is often challenging. Sometimes, the exact species or genus is not attained; the classification remains only at the family level from which that pollen grain is part of. In the terminology proposal applied in melissopalynology, in 1989, Persano Oddo and Ricciardelli D'Albore classified as follows:

- Group (Gr.), this abbreviation is added to the scientific name when you are sure that the pollen examined belongs to the genus, but not to the botanical species indicated. Example: the name "*Achillea millefolium* Gr." is the name used for the pollen of the genus "*Achillea*", like the pollen granules from "*Achillea millefolium*".

- Shape (S.) is used when the botanical family is known. "*Trifolium* S." means that the pollen grain from *the Fabaceae family is similarly shaped to the pollen grain of the Trifolium* genus. The pollen grain is important to be in the same family, but it can also belong to other genera.

- Type (T.) is used when we are not sure about the family to which the pollen grains belong. The name *Apiaceae* T. means that we have identified a pollen grain that is very similar in shape and size to those of the *Apiaceae* family.

Besides this type of nomenclature in melissopalynology, reference is also made to the classification given by Zender, 1935. It divides some large families into smaller groups that include several plant genera that have similar pollen in terms of exine sculpture and size. Often, plant identification is uncertain, even if we notice the pollen form in the sediments of the honey sample analysis. A perfect example is the pollen from dandelions. In the "Ponetweb" atlas, we can see ten species of Taraxacum spp. If we search for plants with the same type of pollen (fenestrate), we can find 55 species from the *Asteraceae* family. From this perspective, it is essential to recognise the pollen shape and categorise it according to the same form. Therefore, the goal of the present work is to group plants with pollen very similar to the form of the most common plant name. The plants from the *Compositae/Asteraceae* family with the same pollen in terms of exine sculpture and size were grouped like *Compositae/Asteraceae* A, C, H, J, S and T. It is very important to use the same denotations as the field specialists to identify unknown pollen grains.

Keywords: palynology, Asteraceae family, nomenclature

Global Phylogeny, Biogeography, Flower Evolution and Pollination Biology of the mega genus *Salvia* L. (Sage) in Lamiaceae (Mint Family)

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The mega genus *Salvia* L., with approximately 1000 species, represents the largest genus in the mint family (Lamiaceae). Notably characterized by a unique staminal lever mechanism aiding in efficient pollination primarily by bees and birds. The aim of this study is to investigate the systematics, phylogeny, biogeography, flower evolution, and pollination biology of *Salvia*. Approximately 500 specimens from around the globe were used for molecular phylogeny and dating, and biogeographic studies. Additionally, approximately 250 specimens were used for floral traits evolution studies. Although studies on the pollination ecology of the genus *Salvia* are limited, we have conducted studies on about ten sympatric species in three populations. Phylogenetic analyses, including Sanger and Next Generation Sequencing approaches, strongly support *Salvia* as a monophyletic group when broadly defined to include several smaller genera (*Dorystoechas*, *Meriandra*, *Perovskia*, *Rosmarinus*, *Zhumeria*). Molecular dating suggests a gradual increase in speciation rates over the past 32 million years, accelerating significantly within the last 15 million years, correlating with dispersal from its origin in Southwest Asia and the eastern Mediterranean region. Extensive pollination studies involving morphometric analyses and observations of floral visitors revealed distinct patterns of generalization and specialization among *Salvia* species. Ecological isolation mechanisms, such as mechanical differences in flower size, phenological separation in flowering times, and behavioral preferences of pollinators, significantly contribute to reproductive isolation and diversification. Pollinator networks indicate that while many *Salvia* species are ecological generalists, specific taxa exhibit extreme specialization. This extensive study highlights *Salvia* sensu lato is a monophyletic genus and originated in Southwest Asia and the Mediterranean region. Staminal lever mechanism is a key innovation for the genus. Floral traits and ecological interactions, particularly pollinator specialization and generalization, play a critical role in the evolutionary diversification and reproductive isolation of the mega genus *Salvia*.

Keywords: *Salvia*, phylogeny, speciation, staminal lever mechanism

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Ecological carpology of the steppe plants in Eurasia

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Abstract

The ecological carpology is dealing with plant responses to the environment through their diaspores and dissemination facilities. The main goal of the present study is to provide new data about the carpological characteristics of steppe plants with different phytosociological roles. The most abundant Eurasian steppe plants in the spring are *Carex* spp. (Cyperaceae), followed by the tufted perennial grasses. Perennial dominants from Amaranthaceae (Chenopodiaceae s.str.), Asteraceae (particularly *Artemisia*), Plumbaginaceae (*Limonium*, *Goliolimon*) replace early bloomers in mid-June to October. Notably, all these dominants with short or prolonged vegetation cycles are characterized by one-seeded diaspores. Many of them have adaptations to anemochory, but the wind dispersal in *Artemisia* and some grasses like *Festuca* is not evident. One-seeded diaspores of the dominants are similar in their anatomical structure: (1) there is no evident heterodiaspory, heterocarpy or heterospermy, (2) seed protection is enforced by the foliar covers (e.g., in Amaranthaceae and Plumbaginaceae) or pericarp (Asteraceae, Poaceae), (3) seed coat is thin and thus physical seed dormancy is absent, which means that the seeds mostly germinate the next year. Nevertheless, a physiological dormancy has been detected in some plants, e.g. *Halothamnus*, which can germinate in 2–3 years after dissemination. The presence of bract-like cover (e.g. in some *Atriplex*) can also decrease germination rates. A general trend in the steppe dominants is that only one covering is likely necessary for seed protection in single-seeded fruits. The ingredients of the steppe communities (forbs) as well as many early bloomers (*Tulipa*, *Geranium*, almost all Brassicaceae) that accompany the dominants are mostly characterized by multi-seeded fruits. The seeds of the ingredients have various structure, but the thick seed covers are discovered for all forbs except Brassicaceae.

Keywords: Carpology, Fruits, Phytosociology, Steppes

Exploring the Anti-Cancer and Antioxidant Properties of *Salvia fruticosa* Mill.: A Bridge Between Ethnomedicine and Biotechnology.

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Abstract

Salvia fruticosa Mill., commonly known as East Mediterranean sage, is a well-established medicinal plant native to Palestine and the broader Eastern Mediterranean region. Traditionally it was employed for millennia to treat gastrointestinal disorders and as a potent antispasmodic, this species has garnered renewed scientific interest for its pharmacological potential. In this study, advanced biotechnological approaches were utilized to evaluate the antioxidant and anticancer properties of *S. fruticosa* extracts. The antioxidant activity was evaluated using 2,2-Diphenyl-1-picrylhydrazyl (DPPH) free radical scavenging activity assay, revealing extract's concentration-dependent activity. The extract also exhibited good antimicrobial activity against gram-positive and negative bacteria as well as fungi. Experimental assays, including MTT viability tests, scratch-wound healing and trans-well migration assays, and RT-Qpcr, were conducted on multiple human cancer cell lines: HELA (cervical carcinoma), U2OS (osteosarcoma), and SKOV3 (ovarian adenocarcinoma). The results revealed significant anti-proliferative and anti-migratory effects, underscoring the therapeutic promise of *S. fruticosa* as a candidate for future oncological applications.

Keywords: Anti cancer, HELA, *Salvia fruticosa*, SKOV3, U2OS.

ORAL PRESENTATIONS

An Important Honey Plant Blackthorn (*Paliurus spina-christi* Mill.)

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Abstract: The Blackthorn (*Paliurus spina-christi* Mill.) plant is prefered by honey bees due to its high nectar and pollen production. Monofloral blackthorn honey, particularly produced in the Thrace Region, is one of the sources of income for local beekeepers. This study investigated the botanical origins and antioxidant capacities of 24 honey samples from Edirne, Kırklareli, and Tekirdağ provinces. The results were examined and compared based on geographical differences at the provincial level. In palynological analyses, the proportion of blackthorn plant pollen in the honey (minimum of 45%) is important for determining the honey's origin. 19 of the 24 samples were found monofloral blackthorn honey (61.68-96.74%). All samples from Edirne and Kırklareli were determined monofloral blackthorn honey, whereas only 1 of 6 samples from Tekirdağ was. Total pollen count in 10 grams of honey (TPS10) was assessed to shown honey quality. Edirne and Kırklareli samples were classified as normal quality (61,418 to 65,800); three Tekirdağ samples were low (average 6,810); three were normal (average 40,913) quality. Antioxidant capacity was measured through total phenolic content (TPC), total flavonoid content (TFC), DPPH, and FRAP assays. Average TPC values were (respectively for Edirne, Kırklareli, and Tekirdağ) 696.55, 676.29, 514.51 mgGAE/kg; TFC values were 9.72, 10.63, 10.32; DPPH values were 152.11, 209.47, 243.95 SC_{50}mg/mL; FRAP values were 2.34, 1.05 1.00 µmolFeSO4/g. The results align with palynological findings, showing monofloral blackthorn honey has higher antioxidant levels compared to other high-antioxidant honeys like oak, pine, and chestnut. The results support the geographical indication of monofloral blackthorn honeys of Kırklareli and Edirne.

Keywords: Antioxidant capacity, Blackthorn honey, Geographical indication, Monofloral honey, Plant origin.

Third-Generation Bioethanol Production from *Chlorella vulgaris* and *Dunaliella salina* Biomasses

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Abstract

The rapid growth of the world's population has made it increasingly difficult to meet the rising demand for energy, one of humanity's most essential needs. Fossil fuels have become insufficient to provide this demand due to both economic and environmental constraints. Therefore, renewable energy sources are crucial to address this challenge. Among them, biofuels represent renewable and sustainable energy alternatives produced from various biomass feedstocks, including corn, rice straw, sugarcane, household waste, industrial and agricultural residues, microalgae, macroalgae, and genetically modified materials. Biofuels can be used as substitutes for, or blended with, fossil fuels in transportation, electricity generation, and heating sectors. Biomass-based bioethanol is particularly noteworthy as an environmentally friendly and sustainable alternative to gasoline. Microalgae are considered promising raw materials for bioethanol production owing to their high carbohydrate content, ability to grow in diverse aquatic environments, effective CO_2 fixation, and low land requirements compared to terrestrial crops. In the present study, bioethanol production was conducted using microalgal biomasses of *Chlorella vulgaris* and *Dunaliella salina*, both characterized by high sugar content. To increase bioethanol yield from fermentable sugars obtained from microalgal biomass, the effects of various cultivation conditions, pretreatment methods, initial substrate concentrations, nitrogen sources, and mineral salts were investigated. The growth of *Chlorella vulgaris* was evaluated in standard BG-11 medium, BG-11 supplemented with 0.5 g/L glucose, and BG-11 containing 0.5 g/L carrot pomace sugar. After 10 days, the highest growth (0.41 ± 0.004 g/L) was observed in the carrot pomace sugar medium. Similarly, *Dunaliella salina* was cultivated in standard Johnson's medium, Johnson's medium with 0.5 g/L glucose, and Johnson's medium with 0.5 g/L apple pomace sugar. On the 10th day, the highest microbial growth (0.19 ± 0.007 g/L) occurred in the apple pomace sugar medium.

Keywords: Agricultural waste, Bioethanol, *Candida boidinii*, *Chlorella vulgaris*, *Dunaliella salina*

Tracing Northern Source Regions of Ragweed Pollen Using HYSPLIT and Density-Based Clustering: Evidence from Gebze, Ankara, and Zonguldak (2022)

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Abstract

Ambrosia artemisiifolia (common ragweed) is an invasive, wind-pollinated species whose allergenic pollen can travel long distances and trigger respiratory problems. We investigated whether the high *Ambrosia* pollen levels measured in 2022 at three Turkish stations, Gebze, Ankara and Zonguldak, were the result of long-distance transport (LDT) and sought to identify probable source regions. Daily pollen counts were collected with volumetric Hirst-type traps. Meteorological variables were analyzed with non-parametric statistics to explore their relationship with airborne pollen. To trace potential origins of LDT events, 72-hour back trajectories were generated using the HYSPLIT model for days with elevated pollen concentrations. All trajectory points that passed within 100 m of the ground were extracted and clustered to highlight areas where air masses likely picked up *Ambrosia* grains. Two clustering approaches were compared: K-means, which requires a predetermined number of clusters, and DBSCAN (Density-Based Spatial Clustering of Applications with Noise), which automatically detects dense groupings and excludes noise. After parameter optimization, DBSCAN produced polygons of potential source areas, from which centroids were taken as "hotspots". *Ambrosia* pollen concentrations showed variable relationships with meteorological factors across stations, displaying negative correlations with precipitation and positive associations with temperature, humidity, and wind speed. Back-trajectory analysis indicated that air masses predominantly arrived from the north and northeast. DBSCAN outperformed K-means by providing clearer, noise-resistant clusters, identifying probable source zones around the Sea of Azov, southern part of Ukraine and the Russian Black Sea coast where ragweed populations are established. This improvement can be attributed to the fact that long-term (72-hour) back trajectory analyses cover a wide geographical domain. In such cases, algorithms like K-means, which do not take the spatial outline or the overall trajectory distribution into account, are often inadequate for capturing the underlying structure of the data. The use of clustering algorithms such as DBSCAN enables the identification of hotspots and potential source regions of long-distance transported pollen and other airborne particles, providing valuable insights into dispersal pathways and aiding in the management of invasive plant spread.

Acknowledgement: This study was supported by TUBITAK project no 120Z406.

Keywords: Ambrosia, Pollen, Atmosphere, Long distance transportation, DBSCAN algorithm

Determination of Antioxidant Activity of Different Parts of *Alcea calvertii* (Boiss.) Boiss. by DPPH Method

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Abstract

Free radicals are reactive compounds that interact with intracellular molecules and cause oxidative damage. Such damage leads to structural deterioration of nucleic acids, proteins, and lipids, disrupting cellular functions and contributing to the development of various diseases. Antioxidants are molecules and compounds that protect cells by neutralizing free radicals. Malvaceae family is generally known for its high antioxidant potential. Alcea calvertii (Boiss.) Boiss. (Malvaceae), locally known as "hatmi" or "hiro," is a widely used plant in traditional medicine for various purposes. Traditionally, the flowers of this plant are used by boiling them in water. In this context, based on ethnobotanical insights, our research group previously investigated the total phenolic and flavonoid contents and metal chelating capacities of different parts of A. calvertii collected in July 2020 from Van, Türkiye, and, as reported by Biçek et al. (2023), the plant was found to be rich in phenolic and flavonoid compounds with strong metal chelating capacity along and high antioxidant activity. In the present study, the free radical scavenging activity of A. calvertii was determined using 2, 2-diphenyl-1-picrylhydrazyl (DPPH). The DPPH radical scavenging assay is widely used for evaluating antioxidant capacity. Plant parts (seeds, leaves, flowers, and roots) were extracted using both ethanol and infusion methods. The IC_{50} values of the extracts for each plant part were calculated separately based on their activity at different concentrations. According to the results, the infusion extract of the seed part showed the highest antioxidant activity with the lowest IC_{50} value (19.14 ± 0.41 µg/mL). In contrast, the ethanol extract of the seed part exhibited the lowest antioxidant capacity with a significantly higher IC_{50} value (56.43 ± 6.71 µg/mL). Leaf extracts prepared by infusion (28.95 ± 0.73 µg/mL) and ethanol (28.60 ± 4.11 µg/mL) methods showed similar IC_{50} values. The flower (ethanol extract, 34.31 ± 0.96 µg/mL) and root (infusion extract, 31.68 ± 2.65 µg/mL) parts demonstrated moderate antioxidant activity. In conclusion, both the extraction method and the plant part used had a significant impact on the antioxidant capacity for A. calvertii. Previous studies on other members of the Malvaceae family similarly report that seed extracts exhibit higher radical scavenging activity when prepared by infusion compared to other extraction methods. When considered together with existing data, these findings indicate that A. calvertii has potential as a natural source of antioxidants and could be suitable for applications in the pharmaceutical or food industries. Moreover, this study emphasizes the critical role of extraction methods in determining antioxidant capacity, even among different parts of the same plant.

Keywords: *Alcea calvertii*, Antioxidant Activity, DPPH, Radical Scavenging Capacity

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Taxonomic Implications Using FTIR Spectroscopy Coupled with Machine Learning: Preliminary Results in *Salvia* L.

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Abstract

Salvia L. is an economically important plant group and the largest genus in the Lamiaceae family. The infrageneric classification of genus *Salvia* is still controversial. Morphological and molecular studies provided useful insights addressing the taxonomic problems in many plant groups. Attenuated Total Reflectance-Fourier Transform Infrared Spectroscopy (ATR-FTIR) is a rapid, sensitive, and cost-effective method to analyze the various components of a sample at the same time, even when the sample is very small. The study mainly aims to explore taxonomic implications of spectral data to help resolve infrageneric grouping of the genus *Salvia.* Additionally it aims to establish a rapid method to detect economically important plant groups in the field and the customs. In this study, 79 *Salvia* L. taxa were examined using the ATR-FTIR Spectroscopy. The spectral data were examined to assign corresponding bands (ie: fingerprint region, CH region, etc.) following the previous studies. Whole range (4000-450 cm^{-1}) spectral data and significant peaks corresponding to certain bands were statistically analyzed for discrimination of *Salvia* samples by using Principal Component Analysis (PCA), Linear Discriminant Analysis (LDA), and Support Vector Machine (SVM). Also, Hierarchical Cluster Analysis (HCA) was performed to show the systematic relationship. According to early results, ATR-FTIR spectral data analysis combined with machine learning achieved a discrimination accuracy of 79-90% at the subgenus and species levels. Clustered dendrograms were most helpful at the sectional level and supported the phylogenetic studies. Further analysis and characterization studies are ongoing to fulfill the aim of the study.

Keywords: FTIR spectroscopy, *Salvia,* Taxonomy, Machine learning

Evaluation of the Antimicrobial Activities of Selected Grape Varieties

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Abstract

The grapevine (*Vitis vinifera* L.) is a perennial plant that has been cultivated since ancient times. Owing to its low water requirements and ease of cultivation, it has become widely distributed across various geographical regions from prehistoric times to the present day. The grapevine has numerous uses, including applications in wine, vinegar, molasses, cosmetics, and the health industry. Recent studies have demonstrated that grape-derived products may have beneficial effects in the prevention and treatment of several diseases such as cancer, cholesterol-related disorders, and Alzheimer's disease. In this study, six grape varieties (Sauvignon Blanc, Viognier, Malbec, Syrah, Kalecik Karası, and Öküzgözü) were collected from vineyards located in Toklümen Village, Kırşehir Province. For extract preparation, grape berries were crushed and their juices were filtered. The remaining solid parts were ground using liquid nitrogen and added to the filtered juice. The obtained mixture was combined with 96% ethyl alcohol at a 1:1 ratio and shaken for three days. Subsequently, pure extracts were obtained using an evaporator and lyophilizer. The final extracts were prepared by mixing the pure extracts with 80% ethyl alcohol at a 1:5 ratio. The antimicrobial activities of the extracts were evaluated against 18 bacterial strains and one fungal species. Among the tested varieties, Öküzgözü exhibited the broadest antimicrobial spectrum, showing activity against 14 microorganisms, whereas Sauvignon Blanc demonstrated the narrowest spectrum, being effective against six microorganisms. According to the MIC (Minimum Inhibitory Concentration) test results, the grape extracts exhibited antimicrobial activity within a concentration range of 0.039–20 mg/mL, depending on the grape variety and bacterial strain. Based on the findings, *S. infantis*, *E. faecium*, *S. aureus*, and *S. epidermidis* were identified as the most sensitive microorganisms, as they were affected by all extracts, while *C. albicans* was determined to be the most resistant species, showing no sensitivity to any of the grape extracts. This study demonstrates that the antimicrobial effects of grape extracts vary depending on the grape variety. It is suggested that further research involving a greater number of grape cultivars could contribute to a more comprehensive understanding of the antimicrobial properties of grapes.

Keywords: asma, antimikrobiyal, *vitis vinifera*, MİK, toklümen

Acknowledgment: We sincerely thank Kutlu SALİHOĞLU for conducting the fieldwork and collecting the samples for this thesis, and Kavaklıdere Winery Inc. for their valuable support to our study.

Utilization of marble factory waste for the cultivation of *Chlorella vulgaris* in third-generation bioethanol production

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Abstract

The relentless expansion of the global economy has contributed to a continuous rise in energy demand and the accumulation of greenhouse gases, prompting an urgent need for renewable and sustainable energy sources. In this regard, third-generation biomass has emerged as a promising candidate due to its rapid growth, high biomass yield, widespread availability, geographic adaptability, and cost-effectiveness. Among third-generation biomass sources, microalgae are particularly valuable because of their high carbohydrate content and lignin-free structure, which facilitates efficient saccharification and reduces the need for intensive pretreatment, making them highly suitable for bioethanol production. In the present study, *Chlorella vulgaris* which is cultivated in the presence of marble waste was employed for bioethanol production. During 14 days of mixotrophic cultivation, the highest biomass yield was achieved when marble waste concentration was 1 g/L and biomass production reached 0.39 g/L. On the other hand biomass yield was 0.33 g/L in photoautotrophic medium. To optimize fermentable microalgal sugar release, 5 g/L algae biomass was pretreated using various (1, 2.5, 5, and 7.5%) alkaline H_2O_2 and dilute H_2SO_4 concentrations. The highest reducing sugar concentration was obtained using the 1% H_2SO_4 dilute acid pretreatment method. Bioethanol production by *Saccharomyces cerevisiae* was determined at initial biomass concentrations of 5, 10, and 15 g/L, resulting in maximum yields of 1.48 ± 0.03, 2.18 ± 0.04, and 3.08 ± 0.05 g/L, respectively, after 24 hours. Overall, these findings demonstrate the potential of utilizing locally available industrial waste to enhance microalgal growth and bioethanol production, highlighting the feasibility of integrating third-generation biomass into sustainable biofuel production systems.

Keywords: Bioethanol, *Chlorella vulgaris*, Marble factory waste, *Saccharomyces cerevisiae*, Third-generation

Three decades of *Ambrosia artemisiifolia* Pollen Monitoring in One of The Most Infested Area in Europe

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Abstract

In north-western Milan area (Italy), *Ambrosia artemisiifolia* is one of the main cause of allergic rhinitis and asthma during end-summer. Monitoring of *Ambrosia* pollen, together with factors that may affect its concentration, is crucial to evaluate the exposure for human population. The allochthonous leaf beetle *Ophraella communa* feeds preferentially on this weed and, accidentally introduced in Italy in 2013, has been related to a drastic decrease in *Ambrosia* pollen in the Milan area. In our study, we evaluated the evolution of *Ambrosia* pollen load in that area, concurrently with the presence of *O. communa*, and the possible impact on human health. Moreover, we compared *Ambrosia* pollen concentration in different stations within and around the Milan city. Pollen were sampled by five Hirst volumetric traps, three located in Legnano, Magenta and Rho operating from 1995 to 2025, while Milan and Lodi were added in 2025. Clinical data were collected by three allergy clinics in the surroundings of the first three abovementioned monitoring stations, from 2005 to 2024. Seasonal Pollen Integral showed a significant down trend in Legnano, Magenta and Rho since 1995, although, starting from 2018, fluctuating values were observed. A general decrease of *Ambrosia* infested areas after the spreading of *O. communa* was recorded, even if, through time, a marked drop in the number of areas where *O. communa* was present and an increased ratio between areas with *O. Communa* and areas infested by *Ambrosia* was also observed. Rate of *Ambrosia* pollinosis were highly variable: significant reduction throughout the study period was recorded only in the allergic clinic located in the area less infested by Ambrosia. Preliminary differences in Ambrosia pollen load were detected during 2025, between urban and rural areas. Long-term monitoring of *Ambrosia* pollen load and related factors confirmed to be fundamental to disentangle the weed's health impact.

Keywords: *Ambrosia artemisiifolia*, Health impact, *Ophraella communa*, Pollen, Ragweed

Silver and graphene oxide nanopriming mitigates of seed germination and seedling development in barley under salt stress conditions.

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Abstract

Salt stress is one of the most important abiotic factors affecting seed germination and seedling growth and development. Salinity causes ion imbalance and reduced water availability in the soil solution, which negatively affects all phases of germination and seedling growth. This study aimed to investigate the potential protective roles of silver nanoparticles (AgNPs) and graphene oxide nanoparticles (GO-NPs) against salt stress symptoms in barley (*Hordeum vulgare*) seeds. To verify this assumption, we first confirmed that salt stress induced by sodium chloride (NaCl) at concentrations of 150 and 200 mM significantly inhibited seed germination and seedling development compared to the control. Various concentrations of silver and graphene oxide nanoparticles were applied in the form of nanopriming under salinity stress conditions in an attmept to reverse these effects. The study showed that nanopriming of barley seeds with silver nanoparticles (AgNPs) had protective potential against the inhibitory impact of NaCl. In addition, AgNPs nanopriming had a stimulating effect on the antioxidant activity in the tested seeds, which was confirmed by determining the reactive oxygen species (ROS) content, the activity of antioxidant enzymes (SOD, CAT, GR and GPX), increased glutation level and gene expression in the tested seeds. Importantly, exposure to silver nanoparticles did not disrupt the native seed microbiome, indicating that the treatment is potentially safe for non-target organisms in the plant environment. Preliminary observations on the nanopriming of seeds with graphene oxide indicate a similar protective effect to that of silver nanoparticles, but future research is needed. In conclusion, nanopriming with AgNPs and GO-NPs shows potential in mitigating the effects of salt stress, improving both germination and seedling growth in barley.

Keywords: Germination, Graphene oxide, Nanopriming, Salt stress, Silver nanoparticles

Pollen as a marker in migratory warblers: A case study of *Sylvia atricapilla* and its Mediterranean connection in Eymir Lake, Türkiye

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Abstract

The ecological roles and habitat preferences of bird species are closely linked to interactions between their feeding grounds and local vegetation. Pollen grains adhering to a bird's bill or feathers serve as reliable ecological indicators, reflecting short but significant plant visits and providing insights into feeding behavior. This study aimed to investigate the feeding ecology, specific feeding grounds, and potential migration routes of the mid-distance migrant Blackcap (*Sylvia atricapilla*), which uses Eymir Lake and its surroundings as a stopover site during migration. To achieve this, traditional bird ringing data were complemented with pollen analysis from the birds' bills. The study material consisted of *S. atricapilla* individuals caught during migration monitoring efforts conducted by the Eymir Ornithology Research Center. All birds were ringed to avoid resampling. Pollen grains were carefully collected from the birds' bills using a scraping method to prevent biological contamination. Samples were processed according to standard palynological techniques and mounted on permanent slides for light microscopy. Pollen types were identified to the family or genus level. Pollen analysis revealed distinct feeding preferences in *S. atricapilla*. A significant majority of the pollen belonged to *Citrus* species, indicating frequent visits to citrus-dominated areas. The second most common pollen type originated from a monocot plant taxon, while pollen from woody and coniferous species such as Rosaceae and Pinaceae appeared only occasionally and in low amounts. The most striking finding was the presence of *Citrus* pollen, which does not occur naturally around Eymir Lake. This strongly indicates that the birds had visited citrus-rich regions, specifically in the Mediterranean, before arriving at the stopover site. These findings confirm that Eymir Lake serves as an important stopover point for *S. atricapilla* on their migratory route to or from the Mediterranean. While the pollen data offer valuable clues about their recent feeding grounds and migration direction, broader sampling across multiple stations is needed to fully map out their migration routes.

Keywords: *Sylvia atricapilla*, Migration, Blackcap, Pollen Analysis, Feeding Ecology.

Towards Predicting Evolutionary Outcomes In Weed Biocontrol

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Abstract

Evolution has traditionally been a historical and descriptive science, and predicting future evolutionary processes has long been considered impossible. Yet, predictive approaches are now increasingly being developed and used in medicine, agriculture, biotechnology and conservation biology. Species introductions can trigger rapid evolutionary changes but predicting evolution in novel ecological networks has been largely neglected. This is relevant for importation biological control of weeds, for which the evolvability of host specificity and target control efficacy of biological control agents (BCAs) are critically important. We (1) synthesise recent progress in evolutionary predictions, focusing on predicting how the genetic and phenotypic makeup of populations will be different in the future; (2) map these predictions onto the procedure in Importation Biological Control; (3) outline three scenarios for eco-evolutionary-derived expected outcomes for control efficacy and host specificity in biological weed control; (4) present a proof-of-concept case study in which we experimentally explored the eco-evolutionary dynamics under ambient and future climate change scenarios of the invasive weed common ragweed, *Ambrosia artemisiifolia,* and the North American leaf beetle *Ophraella communa,* accidentally introduced and established in Europe since 2013, and now a prospective BCA. Combining Evolve & Resequence studies with behavioral and performance bioassays constitutes a promising strategy and powerful toolbox to assess potential risks and changes in control efficacy of BCAs. Finally, we (5) delineate a way forward towards predicting biological control outcomes, showing how eco-evolutionary stability in host use can be empirically assessed, paving the way for more robust risk evaluations and evidence-based decision-making in sustainable invasive plant management.

Keywords: *Ambrosia artemisiifolia*, biological control, *Ophraella communa*, plant-insect interaction.

Growth-Inhibitory Effects of *Alcea rosea* L. 'Red' (Henry VIII Red Hollyhock) Flower Extract on Pleural Biphasic and Sarcomatoid Mesothelioma Cell Lines

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Abstract

Alcea rosea L. 'Red' commonly known as Henry VIII Red Hollyhock is a tall ornamental species within the family Malvaceae. It is distinguished by its prominent, large, crimson-red inflorescences, which contribute to its horticultural and aesthetic significance. In addition to its embellishing contribution, the flowers of this plant have long been utilized in traditional medicine and ethnobotany, particularly for alleviating respiratory disorders and skin-related ailments. They are rich in flavonoids, anthocyanins, tannins, and polysaccharides, and current research is investigating these bioactive constituents for their potential therapeutic applications, including antioxidant, antimicrobial, and cytotoxic activities, as well as anti-inflammatory effects. Freshly collected Henry VIII red hollyhock flowers from the Tigris River shoreline in Diyarbakır (mid-June) were air-dried and extracted with a methanol-to-water solution (5:1, v/v). Different concentrations (500, 250, 125, 62.5, 31.25, and 15.625 µg/mL) of the extract dissolved in 5% DMSO were subsequently tested *in vitro* to determine cytotoxic effects on healthy lung epithelial cells (MeT-5A) and two malignant pleural mesothelioma cell lines i.e., NCI-H2052 (sarcomatoid) and NCI-H2452 (biphasic) via the MTT assay (3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide assay). At the tested concentrations, the suppression of proliferation in healthy lung epithelial cells (MeT-5A) was markedly lower than that observed in cancer cell lines. Moreover, exposure to 15.625 and 31.25 µg/mL concentrations stimulated proliferation in healthy lung epithelial cells (MeT-5A), with viability rates of 117.47% and 107.38%, respectively, whereas no comparable proliferative response was observed in the cancer cell lines. Overall, sarcomatoid mesothelioma cells (NCI-H2052) exhibited more pronounced dose-dependent antiproliferative responses compared to biphasic mesothelioma cells (NCI-H2452). Treatment at 500 µg/mL elicited the strongest inhibitory effect on pleural mesothelioma (NCI-H2052), corresponding to a reduction in viability to 59.46%.

Keywords: Anti-proliferation, Henry VIII red hollyhock, Malignant pleural mesothelioma, Methanol flower extract, MTT assay

Palynological and physical-chemical examination of honey produced in Karabük province

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Abstract

Honey is a sweet bee product obtained by honeybees (*Apis mellifera*) collecting plant nectar, secretions from living plant parts, or secretions from sap-sucking insects that live on the plant. Honey is combined with their own enzymes to reduce the water content and store it in the honeycombs. Honey is a sweet bee product composed of sugars, amino acids, minerals, vitamins, essential oils, and aromatic substances. Throughout history, honey has been used not only as a food but also in the treatment of ulcers, constipation, upper respiratory infections, and wound healing. Identifying the sources of the secretions or nectars collected by honeybees is important for determining the quality of the honey. Furthermore, the physicochemical properties of honey provide information about its quality and reliability. In this study, 19 honey samples provided by beekeepers from different locations in Karabük province were compared through palynological and physicochemical analyses. Based on the obtained data, 13 polyfloral flower honeys and six monofloral linden honeys were identified. According to palynological studies, the following families were identified: Fabaceae, Cistaceae, Lamiaceae, Poaceae, Malvaceae, Ranunculaceae, and Brassicaceae. The TPN-10g values, indicating pollen density, of the honeys examined ranged from 225.296 to 4.346. Physiochemical analyses revealed that proline, a parameter indicating honey quality, ranged from 1586 to 500.8 mg/kg. The F/G ratio, used to determine crystallization rate and a helpful parameter in determining botanical origin, ranged from 0.97 to 1.22. Based on the obtained data, all honeys analyzed conformed to the Turkish Food Codex bee products communiqué. It is believed that the diversity of the plants from which the bees collect nectar, as well as climate and environmental factors, are influential in the differences in the physicochemical analysis parameters of the honeys.

Keywords: Bee, Honey, Pollen, TPN-10g, Karabük

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Spatiotemporal Scaling and Agent Representativeness in Pollination Service Simulations

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Abstract

Pollination services, mediated by pollinators such as honeybees and bumblebees, are critical ecosystem functions that support approximately 35% of global food production. In recent years, concerns have arisen regarding the stability of these services due to environmental changes and pollinator declines, highlighting the need for quantitative assessments. In this study, we developed an agent-based simulation that models pollinators navigating in response to floral volatile organic compounds (BVOCs). A particular focus is placed on constructing a theoretical framework for spatiotemporal scale conversion between simulation space and real-world dynamics, especially when one agent represents multiple pollinators. We examined the validity of this representational approach by analyzing the relationship between agent numbers and pollination efficiency, based on attractant depletion dynamics and residence time around floral sources.The simulation incorporates stochastic movement when attractant gradients fall below detection thresholds, enabling agents to engage in random walks. As a result, even under identical initial conditions, each simulation trial produced distinct foraging trajectories. This random behavior mimics real pollinator variability, including spontaneous directional changes and exploratory behavior. We confirmed that agents demonstrated diverse behavioral patterns and resource consumption dynamics across repeated trials, allowing the model to capture ecological uncertainty and variability. The ability to reproduce such randomness provides a robust foundation for evaluating system responses to various ecological configurations. Our results suggest that this agent-based model can serve as a flexible and realistic tool for assessing pollination processes and planning responses to environmental change.

Keywords: Pollination service, Agent-based simulation, BVOCs

Macro-micromorphological Characteristics of Mericarps of Some *Galium* L. Taxa

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Abstract

In this study, the macro-micromorphology of 8 taxa, collected from Eskişehir, within the genus *Galium* L. (Rubiaceae) was examined using a scanning electron microscope (SEM) to assess the significance of mericarp features as taxonomic characters. Except for *G. odoratum*, the other taxa have two mericarps. Mericarp shapes varied from broadly ovoid, subglobose, broadly ellipsoid-reniform, or subreniform-elliptic. Mericarp surfaces were papillate and setaceous in *G. rotundifolium* and *G. odoratum*, slightly granular in *G. rivale*, irregularly veined-fine granular in *G. humifusum*, irregularly veined, locally depressed, and sparsely granular in *G. verum* subsp. *verum*, tuberculate in *G. incanum* subsp. *elatius*, rugulose in *G. album* subsp. *pycnotrichum* and wavy-veined in *G. paschale*. In micromorphological studies, mericarp ornamentation of taxa is almost round papillate in *G. rotundifolium*, with an irregularly wavy-lined; papillate in *G. odoratum*, with square-rectangular cells and striations; distinctly granular in *G. rivale* (macroecinate), with striped surfaces; folded, deeply fissured, with small papillae in *G. incanum* subsp. *elatius*; net-like in appearance, irregularly striped, deeply folded in *G. humifusum*; elongated rectangular or reticulate cells, deeply fissured or folded in *G. verum* subsp. *verum*, and irregular cells with small papillose protrusions in *G. album* subsp. *pycnotricum*. It has been emphasized that the morphology and micromorphology of mericarps carry significant taxonomic value in distinguishing taxa.

Keywords: Rubiaceae, *Galium*, Mericarp, Morphology

Landscape Fingerprints applied to Honey Sustainability

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Abstract

The characterisation of honeys from different regions, each with different characteristics, involves biophysical and ecological factors. This process can be carried out using a Geographical Information System (GIS), which uses software such as ArcGIS to provide tools for spatial analysis and modelling. By integrating different data sources, GIS enables comprehensive analysis, supporting calculations and simulations of geographic landscapes. This tool is important for characterising and adapting the specification of Protected Designation of Origin (PDO) honeys, which depend on this variable. This study integrates geospatial analysis with land cover, mainly landscape metrics, which can be useful to quantify many aspects of the structure, composition and spatial arrangement of landscapes, to investigate the influence of landscape composition and structure on PDO honey production. Several landscape metrics were studied; however, the ones with a significant correlation with honey PDO regions are: number of apiaries, total area, number of different land use patches, degree of landscape division (DIV) and the edge density (ED), which represents the amount of edge relative to the total landscape area. In addition, Shannon's Diversity Index (SDI) is considered as it measures the relative diversity of patches within the landscape, while Shannon's Evenness Index (SEI) assesses the distribution and abundance of these patches. Together, these metrics provide valuable insights into the spatial structure and ecological dynamics that influence PDO honey production. This exploratory study serves as a tool for further research. It allows a spatio-temporal assessment of these variables, providing important insights into past trends and helping to predict future variations in beekeeping activity. As an important tool for the management of PDO honey production, this approach supports decision-making by providing a detailed understanding of the environmental and ecological dynamics that influence the quality and sustainability of honey.

Keywords: Honey, landscape metrics, PDO, Spatial distribution, bekeeping suitability

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Sustainable Beekeeping through Spatial Suitability Analysis in Rural Landscapes

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Abstract

Beekeeping plays a crucial role in the resilience of rural areas, contributing significantly to both environmental sustainability and socio-economic development. However, the sector faces several challenges, including climate change, habitat loss, pests, predators, and diseases affecting bee populations. The study aims to identify the most suitable areas for beekeeping, supporting better decision-making in selecting optimal apiary locations and prioritising interventions in vulnerable regions. A multi-criteria analysis was applied in a Portuguese honey region with Protected Designation of Origin (PDO) status. Several criteria were categorised into three classes: topographical (n = 3), environmental (n = 5) and climatic (n = 4). Data were ranked by experts using the Analytical Hierarchy Process (AHP). The use of geospatial data at municipal scales, combined with Geographic Information Systems (GIS) analysis, to promote the comprehensive evaluation of the salient features of the landscape (e.g. the presence and the richeness of honey flora, proximity to water sources and rural roads) and the potential constraints (e.g. rugged terrain, climatic extremes) that may impact honey production and bee health. It is evident that the most significant individual factor, among topographic criteria, is solar exposure (63%). In contrast, land use, combining land use, land cover, and richness of apicultural flora (53%), is the environmental factor with the highest influence. Climatic factors are most influenced by annual rainfall (50%). Notably, professional beekeepers with apiaries ranging from 31 to 100 hives strategically located their apiaries in areas classified as very highly suitable (73.2%), thus demonstrating a comprehensive understanding of both the activity specificities and the territory. These insights are of particular value to beekeepers and policymakers, as they underscore pivotal factors for optimising beekeeping practices and safeguarding the quality of honey, especially within the context of Protected Designation of Origin (PDO). Moreover, the proposed approach combines a flexible and scalable framework applicable to other regions with similar beekeeping potential.

Keywords: Geographic Information Systems; Multicriteria analysis; Analytic Hierarchy Process; Suitability

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Palynological and physicochemical analysis of honey produced in Düzce province of Turkey

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Abstract

Honey, the only food produced by insects and consumed by humans, not only provides a significant source of energy but also offers numerous health benefits. Numerous studies have demonstrated that honey possesses antioxidant, antimicrobial, anticancer, antitumor, antidiabetic, and anti-inflammatory properties. These bioactive properties of honey are largely due to the various proteins, enzymes, and phenolic compounds it contains, and these compounds are highly dependent on the honey's floral source. However, with the recent increase in the economic value of honey, interest in adulteration and adulteration in honey production has also increased. These low-quality honeys often contain either no enzymes or very low levels of phenolic compounds. Therefore, determining honey's physicochemical properties and floral source can eliminate many concerns regarding food safety. In this study, 14 honey samples obtained from Düzce province in 2024 were examined for physicochemical and palynological properties. As a result of palynological examination, 12 of the 14 honey samples were identified as monofloral chestnut honey, while 2 samples were identified as multifloral honeys, largely originating from the *Castanea sativa* and Fabaceae families. Other common taxa identified in the examined honeys were *Rhododendron*, *Erica*, Asteraceae, Rosaceae, Lamiacae, and *Cistus*. The proline content of the examined honeys was determined to range from 1159 mg/kg to 252.3 mg/kg, while the diastase number was determined to range from 48.5 to 17.7. The HMF value, an indicator of the heat treatment and freshness of the honey, was determined to be a maximum of 9.4 mg/kg. When examined in terms of sugar groups, the Fructose + Glucose ratio (F+G) was calculated to be between 74.67% and 63.9%, while the F/G ratio was calculated between 1.39 and 1.12. Palynological analyses of honey produced in Düzce province show that it contains a high abundance of chestnut honey and largely complies with the criteria set by TGKBT.

Keywords: Honey, Düzce, Melissopalynology, Proline, HMF

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Overlap of *Ambrosia* with *Artemisia* and *Alternaria* seasons shaping allergy risks in Ukraine

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Abstract

Seasonal allergic diseases are rapidly spreading worldwide and in Ukraine. They are particularly associated with respiratory forms of allergy and show a steady upward trend, affecting millions of people each year (Rodinkova, Yuriev, 2019). According to expert estimates, about 10 million inhabitants of Ukraine suffer from allergic diseases (Bohomolov, 2020). The leading allergenic factor to which the largest number of such patients are sensitized is ragweed pollen (*Ambrosia artemisiifolia*), which is recorded in the air during the second half of summer and autumn. Due to the ongoing full-scale war in Ukraine, the number of territories invaded by such invasive weeds as ragweed is increasing (Lipińska, H., Lipiński, W. 2023). Along with pollen sensitization, the prevalence of sensitization to fungal spores, particularly *Alternaria* and *Cladosporium*, is also increasing; these occupy a leading place among inhalant allergens, especially in late summer and early autumn (Reznik, Rodinkova et al. 2023). Moreover, according to aerobiological studies, ragweed (*Ambrosia*) pollination coincides with wormwood (*Artemisia*) pollination and with the active sporulation of *Alternaria*. The aim of our study was to determine the periods when the factors of the late-summer and autumn pollination wave act simultaneously on sensitized individuals, thereby intensifying the manifestations of allergic diseases. Pollen of weeds and fungal spores was collected using a volumetric method at the Educational and Research Laboratory for the Study of Environmental Allergenic Factors, National Pirogov Memorial Medical University, Vinnytsia, during March–October 2020–2024. The pollen calendar was created using the Aerobiology Web Tool. To achieve this aim, we assessed the seasonal dynamics of pollen release from *Ambrosia* and *Artemisia* species, as well as sporulation of *Alternaria* in Vinnytsia during 2020–2024, and identified the periods of their simultaneous activity. The start, peak, and end dates of the pollination/sporulation seasons for each allergen were determined annually. Based on these data, we compiled a calendar of pollination/sporulation for the three main allergenic producers of the autumn pollination wave (Fig. 1).

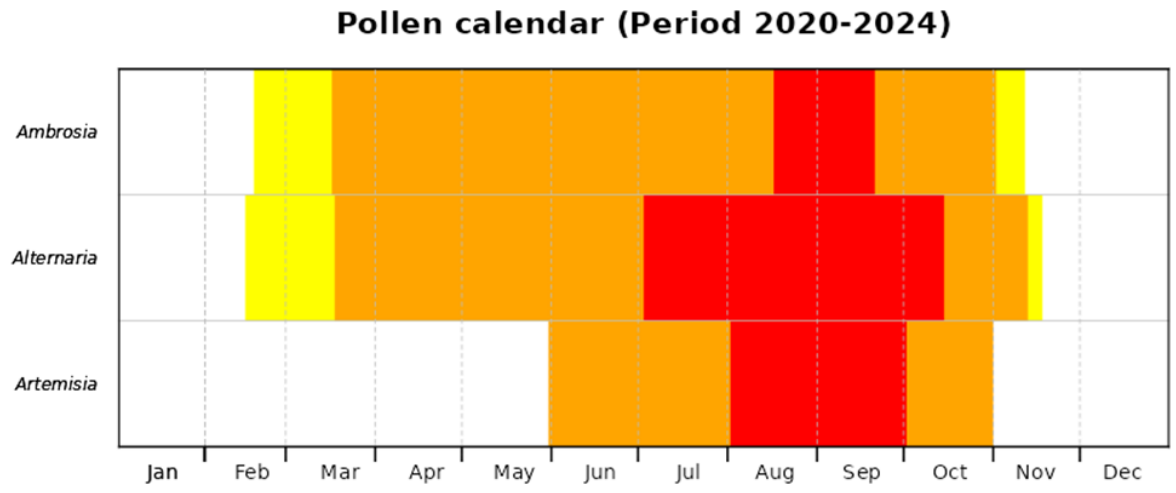


Fig. 1. Calendar of pollination/sporulation of the main producers of allergenic pollen/spores in Vinnytsia during 2020–2024.

The main producers of allergenic pollen/spores of the autumn pollination wave, Ambrosia, *Artemisia* and *Alternaria*—showed high activity in the second half of summer and early autumn. Analysis of aerobiological monitoring data for 2020–2024 revealed stable seasonality of pollination/sporulation of these allergens with marked annual fluctuations. *Alternaria* showed the most intensive sporulation in August and September (Fig. 1). *Ambrosia* species pollinated from March to November, but peak pollen concentrations were registered in August–September (Fig. 1). *Artemisia* pollen was detected from June to October, with peak concentrations in August and September (Fig. 1). Over the 2020–2024 period, the overall interval of simultaneous presence of pollen and spores from the three taxa lasted from July to October. The most intensive and hazardous period was August–September, when high concentrations of all three allergens were recorded simultaneously. Thus, the autumn pollination wave in Ukraine has a complex and multifactorial nature, combining simultaneous exposure to weed pollen and fungal spores, which determines its particular clinical significance for patients with seasonal allergic diseases.
Conclusions

1. During the late-summer and autumn period (July–October), prolonged active pollination/sporulation of *Artemisia*, *Ambrosia*, and *Alternaria* is observed.
2. The most critical period of the season is August–September, when peak activity of all three major allergens (*Ambrosia*, *Artemisia*, *Alternaria*) is recorded. At this time, patients are subjected to a combined allergenic burden, which significantly increases the likelihood of clinical manifestations of allergic diseases.
3. For clinical practice, it is essential to consider the prolonged overlap of pollination and sporulation seasons when planning therapeutic and preventive measures, as well as when conducting differential diagnosis of ragweed allergy and other sensitizations.

Keywords: *Ambrosia, Artemisia, Alternaria*, calendar of pollination/sporulation, Aerobiology

Optimization of Sterilization Protocols for *Albizia julibrissin* (Silk Tree) Petiole Explants: A Key Step Toward Efficient Micropropagation

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Abstract

Albizia julibrissin (silk tree) is an economically and ornamentally valuable species widely used in landscaping and traditional medicine. Establishing a reliable *in vitro* propagation system for this species requires an optimized sterilization protocol that minimizes microbial contamination while maintaining tissue viability. In this study, petiole explants of *A. julibrissin* were subjected to twelve sterilization treatments involving different sodium hypochlorite concentrations (0.25%, 0.5%, and 0.75%), exposure durations (10 and 15 minutes), and ethanol pretreatments (30 and 60 seconds). The survival rate, tissue necrosis, contamination frequency, and contamination source were evaluated throughout a four-week culture period. Results showed that extending ethanol exposure to 60 seconds did not significantly reduce contamination, except in ST11 and ST12. Ethanol exposure of petiole explants for 60 seconds caused minor tissue necrosis but did not affect the survival rate of explants. Increasing NaOCl exposure time from 10 to 15 minutes significantly decreased contamination in most treatments, except ST9 and ST10. Complete disinfection was achieved in ST9, ST10, and ST12. Increasing NaOCl concentration alone did not guarantee sterilization efficiency, indicating that exposure time plays a critical role. Overall, these results emphasize the importance of balancing disinfection intensity and tissue tolerance to achieve aseptic cultures. This study represents an initial yet essential step toward developing an efficient and reproducible micropropagation protocol for *A. julibrissin* in Turkey.

Keywords: *Albizia julibrissin*, sterilization, sodium hypochlorite, petiole explants, *in vitro* culture, micropropagation

Can the spread of *Ambrosia* pollen be a concern in Parma (northern Italy)? Analysis of 33 years of observations

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Abstract

Ambrosia produces highly allergenic pollen representing a public health concern in some Italian regions. Since the mid-1990s, in Parma territory, a significant increase in the spread of ragweed pollen and plants has been observed, with a significant increase in sensitised individuals. In 2013, with *Ophraella communa* (Oc) apparition, has begun the mitigation of the ragweed pollen spread. The aim of our study was to update the situation by comparing data over a long period. The study was performed in Parma, sampling airborne pollen by a Hirst trap. Pollen data from 1992 to 2024 were analysed comparing two periods (1996-2012 *vs* 2013-2024), based on the first sighting of ragweed and Oc, respectively. We examined (according to Rojo et al., 2019) pollination start (ST.JD), end (EN.JD), peak date (PJ.JD) as DOY (Day of the Year), duration (LN.PS), peak value (PL.VAL), pollen integral (SM.PS), length of the pre-peak period (SM.PRPK), pre-peak period pollen integral (SM.PRPK), post-peak period length (LN.PSPK), post-peak period pollen integral (SM.PSPK). Mean seasonal temperatures, precipitations and annual relative humidity (RH) were analysed. Linear regression and U Mann-Witney test were performed by SPSS-29. SM.PS (R^2=0.54), SM.PRPK (R^2=0.31) and PK.VAL (R^2=0.39) have been steadily increased until 2013. The apparition of Oc reduced *Ambrosia* pollen significantly: SM.PS (P=0.038) and SM.PRPK (P=0.027). Moreover, a later peak date before *vs* after Oc apparition period (P=0.48) was observed just as significant increase of the annual mean temperature (P=0.001), as for summer (P=0.013) and autumn (P=0.006), and the decrease for annual RH (0.017). The study highlights the concern of ragweed pollen spread. Despite Oc apparition showed to mitigate the increasing trend of airborne ragweed pollen concentrations, no intervention to counteract structurally *Ambrosia*, as the Lombardy Region has been doing for over 25 years, could have consequences for public health and lead to an increase in healthcare expenditure.

Keywords: *Ambrosia*, Environmental health, Human health, *Ophraella communa*, Pollen spread.

In vitro Culture, Endophyte Isolation, Metabolomic Profiling, and Alzheimer's Disease Modulatory Activity of *Tecoma stans* (L.) Juss. ex Kunth

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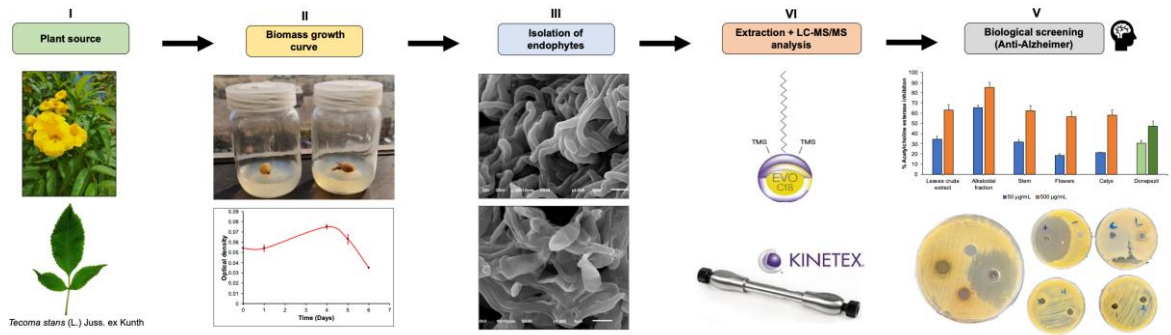
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Abstract

Tecoma stans (L.) Juss. ex Kunth (Bignoniaceae) is a promising plant traditionally used for various ailments, mainly diabetes, attributed to its alkaloidal content and other diverse bioactive constituents. It has attracted significant interest in plant biotechnology, although only a limited number of studies have been reported to date. Our study aimed to improve the production of secondary metabolites through *in vitro* culture techniques, isolate potential endophytic microorganisms, and profile the bioactive compounds of *T. stans*. Callus cultures were successfully established from leaf explants and optimized using modified Murashige & Skoog media to stimulate metabolites production. In parallel, two first report endophytic fungi were isolated from leaf tissues and cultured for potential bioactivities. Targeted LC-MS/MS analysis of different *Tecoma* aerial parts, supported by Chinese Pharmacopoeia and ChemSpider databases, revealed the presence of diverse alkaloids and flavonoids. Secondary metabolites in both leaves and callus extracts were profiled using UPLC-TripleTOF-MS analyzed by ReSpect database. Biological assays using *in vitro* models, demonstrated significant acetylcholinesterase inhibitory activity and antibacterial effects against *Porphyromonas gingivalis*, highlighting the potential of *T. stans* in Alzheimer's disease modulation. These findings emphasize the value of combining plant tissue culture and endophyte isolation as a sustainable, green and controllable platform for the discovery and production of valuable bioactive natural products.

Keywords: *Tecoma stans*; plant tissue culture; endophytes; HPLC-MS/MS analysis; secondary metabolites overproduction



Graphical summary of the study workflow.

Comparative Investigation of *Ambrosia* Pollen in Kastamonu Atmosphere Using APS 400 and Burkard Device

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Abstract

Ragweed (*Ambrosia artemisiifolia* L.) pollen is considered highly allergenic worldwide. This pollen is believed to be the primary cause of respiratory diseases, including seasonal rhinitis and asthma. Currently, atmospheric pollen is monitored globally through approximately 1000 pollen samplers, most of which require microscopic examination by experts for the identification of pollen and spores. Although Hirst-type volumetric spore and pollen traps, developed in the early 1950s, are considered the 'gold standard', they have some limitations and disadvantages in meeting modern monitoring requirements. The collection of atmospheric pollen over seven-day periods and the microscopic examination of these samples lead to delays in data analysis and sharing. Additionally, factors such as potential differences in taxonomic identification among pollen experts have been reported in various studies in the literature. Due to these disadvantages, automatic particle recognition systems have recently begun to become widespread. Unlike methods that require microscopic examination, automatic systems offer advantages such as speed, high resolution, and labor savings through continuous monitoring. This study conducted a seasonal comparative analysis of *Ambrosia* pollen in the Kastamonu atmosphere using a manual Burkard device and an automatic counting device (APS 400). Both devices were installed on the roof of the Faculty of Science at Kastamonu University. Daily *Ambrosia* pollen concentrations detected with both devices between July and October 2025 were determined and compared. *Ambrosia* pollen concentrations in the Kastamonu atmosphere were generally similar between July and October, as measured by the APS-400 and Burkard devices; however, there were differences in daily average pollen concentrations. In terms of peak dates, the Burkard device detected 10 pollen/m^3 on September 7, 2025, and the APS-400 detected 12 pollen/m^3 on August 16, 2025. The APS-400 device is a fast and practical pollen monitoring tool that reduces labor requirements compared to traditional methods, allowing for the display of real-time pollen and spore concentrations. These features make the device a significant advantage. However, the APS-400 device is considered to be partially successful in detecting *Ambrosia* pollen in the atmosphere. Further work is needed to improve pollen and spore detection techniques with automated counting devices.

Keywords: *Ambrosia,* Atmosphere, APS 400, Burkard, Kastamonu

Acknowledgment: This study was supported by the TUBITAK 1001 project with the code 123Z779 "Investigation of atmospheric pollen and spores of Merkez, İnebolu and Tosya districts located in different climatic regions of Kastamonu province". This study was also supported by the TUBITAK 1002-A project with the code 125Z737 "Hourly Determination and Source of *Ambrosia* L. Pollen Detected in the Kastamonu Atmosphere".

Human-Mediated Seed Dispersal in the Islands of Tuz Lake: The Case of Tuzla Island

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Abstract

In isolated ecosystems like islands, the floristic structure is typically shaped by natural dispersal filters and environmental conditions. It is known that anthropogenic effects disrupt this isolation in such ecosystems. To evaluate these effects, the flora of an island in the west of Tuz Lake was investigated. This island is seperated from others because a road, used by a nearby salt pan's operations, runs through it. Compared to 52 neighboring islands, it was determined that only 10 of the total 90 species and infraspecific taxa found on the study island were unique to it. The species found exclusively on the island with road were *Atriplex lasiantha*, *Carex divisa*, *Carthamus lanatus*, *Centaurea iberica*, *Cichorium intybus*, *Delphinium peregrinum*, *Elymus elongatus*, *Lepidium draba*, *Myosotis stricta* and *Scolymus hispanicus* determined as species that predominantly spread in ruderal and disturbed habitats. Since the island's only connection to the mainland is the road, which is frequently and periodically used by trucks for salt pan's activities, suggest these species arrived on the island via vehicles. The restricted dispersal on this island demonstrates human-mediated dispersal through vehicle movements and the selective establishment of species with high colonization potential. This situation indicates that sensitive ecosystems, such as inland islands, can have their natural dispersal filters invalidated even by minimal physical connections, thus potentially causing significant changes in their plant communities.

Keywords: Anthropogenic Effect, Tuz Lake, ruderal species, seed dispersal

Acknowledgment: This study was supported by the TUBITAK 1001 project with the code 122Z763 " Tuz Gölü'nde Bulunan Adaların Bitki Çeşitliliği Örüntüsünün ve Bu Örüntünün Nedenlerinin Araştırılması".

Seasonal responses of photosynthetic fluorescence parameters in various temperate trees

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Abstract

Light is essential for plant photosynthesis, but when light irradiating leaves is too strong, it causes damage, especially in photosystem II (PSII), leading to reduced photosynthetic activity (photoinhibition). To date, the rates of photodamage and repair have been analyzed in algae and agricultural crops. On the other hand, there have been few studies measuring light damage rates or repair rates between plants with different growth niches, and it remains unclear how differences in these rates are related to environmental adaptation. In this study, we investigated the actual state of 12 evergreen broad-leaved trees and 6 deciduous broad-leaved trees with different growth niches, such as drought tolerance and shade tolerance, under different seasonal conditions. The results of calculating the rate constants (kpi) for light damage (inactivation) and repair (krec) showed that the 18 woody plants exhibited different properties in terms of the balance between kpi and krec, suggesting that they employ different strategies for coping with excessive light energy. Additionally, a positive correlation was observed between PSII repair rate and leaf nitrogen content, and a negative correlation between PSII repair rate and LMA (leaf area per dry weight). These results have already been reported in previous seminar presentations. To further investigate these correlations, we measured changes in PSII quantum yield using chlorophyll fluorescence measurements in the 18 woody plant species growing under different environmental conditions, and analyzed the results by season. Furthermore, we analyzed these results in conjunction with quantitative measurements of pigments related to heat dissipation and photosynthesis measurement results. The results showed that light inhibition was less likely to occur in deciduous trees during the strong light of summer, and seasonal variability was also observed in evergreen trees. We verified whether the seasonal variability in light inhibition among species could be explained by measurements of PSII electron transport using chlorophyll fluorescence.

Keywords: Photoinhibition; Photosynthesis ; Photosystem II (PSII) ; Seasonal change ; High light stress

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Ecophysiological Characteristic of the Water Potential Control in Tropical Canopy Trees

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Abstract

Plant physiological characteristics represent their hydraulic strategies. A plant can directly controls its water potential through regulation of stomata on leaves. The hydraulic resistance is on the other hand characterized by using pressure-volume curve (P-V curve). In this chapter, by using PCA, I try to understand the water-use strategy of canopy trees in a tropical rain forest and relate the identified strategies to morphological traits. The PCA calassified the nine study species into five groups with different strategies, which are understood as combinations of three basic strategies - water stress avoidance via stomatal closure in response to external and internal conditions and water stress tolerance. Further, ecological meaning of those strategies is discussed. Some species are characterized by relatively low avoidance and low tolerance, probably because water stress is not severe in tropical rainforest. I argue that water potential-associated avoidance seems to serve to prevent embolism, which is basically tuned to photosynthesis under perhumid conditions. This study demonstrates ecophysiological differentiation in water potential strategies among nine tropical canopy tree species. Through pressure–volume curve analyses, we quantified key traits such as turgor loss point (Ψtlp), saturated osmotic potential (Ψsat), and hydraulic resistance (R), and identified interspecific variation in both drought avoidance and tolerance strategies. These findings contribute to our understanding of plant water-use strategies and emphasize the need to consider hydraulic diversity when assessing forest responses to climate change.

Keywords: Plant water potential; Pressure-volume curve (P-V curve); Water stress; LMA; Tropical rain forest

Acknowledgements: We appreciate to Shoko Sakai of Department of Geography, Hong Kong Baptist University , Yoshiko Kosugi of Kyoto University and Kouki Hikosaka of Tohoku University. This research is partly supported by JSPS KAKENHI Grant-in-Aid for Trans-formative Research Areas A : BVOC climate control (23A401), Grant-in-Aid for Scientific Research (Fundamental Research C) and Nagahisa of General Foundation's research support found.

Determination of The Bioactivity of Olive Oil Extract of Propolis with Added Olive Leaf

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Abstract

Propolis is a popular bee product that stands out with its beneficial biological properties and contains many active ingredients. Until now, researchers have extracted propolis using varios solvents. One of these solvents is vegetable oils. Among vegetable oils, olive oil stands out from other vegetable oils with its high bioactivity. In this study, the bioactivity of olive leaf extract added to olive oil extract of propolis (OEP) was investigated. Olive tree leaves (*Olea europeae* L.) of different geographical origins were included in the study. Appropriately dried leaves were pulverised and added to OEP at different concentrations and homogenized. The total phenolic content (Folin Ciocalteu method), antioxidant (phosphomolybdenum method), and antiradical (DPPH method) activity of olive leaf added at different concentrations were analyzed. According to the results obtained, the highest total phenolic content was determined in Bursa (Gemlik and Trilye) samples at 50% concentration; 101.26 mg GAE/ml, 107.83 mgGAE/ml, respectively. We found that the total phenolic content of propolis samples added to other olive leaf extracts was similar to OEP. Similarly, olive leaf extracts added at the same concentration increased antioxidant and antiradical activity. The study concluded that olive leaf extract can enhance the bioactivity of OEP, which is preferred instead of alcohol and chemical solvents.

Keywords: olive leaf, olive oil, propolis, total phenolic, antioxidant activity

Acknowledgements: The authors thank to Scientific Research Projects Unit of Erciyes University for funding and supporting the study with the project number of FYL-2020-10714

Mapping the Physicochemical Diversity of Two PDO Honeys From Northeastern Portugal

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Abstract

The production of honeys with Protected Designation of Origin (PDO) is essential to preserve the unique characteristics associated with specific regions and ensure authenticity and quality through strict certification standards. However, the specifications of PDO regions may be affected by climate change and man-made changes in land use, which can impact the natural environment for beekeeping. Continuous monitoring of honey characteristics is therefore essential to maintain the quality standards of this qualification. This study focuses on two PDO honeys from the north-east of Portugal. The unique characteristics of these honeys are shaped by the Mediterranean and mountainous landscapes, which play a significant role in developing their distinctive aromas and physicochemical properties. In this study, honey quality parameters were evaluated using the standard methods of the International Honey Commission, namely: acidity, pH, water activity (Aw), moisture content, electrical conductivity, colour (CIELab coordinates and Pfund colour scale), viscosity, total polyphenols and flavonoid content. A Geographical Information System was used to relate the physicochemical parameters with the geographical location of each sample, providing insight into the influence of biophysical conditions on honey characteristics. To construct the mapping classification model (and for better visualisation), three or five levels were used, depending on the analytical parameter and the legal limits. The results highlight the different physicochemical parameters and the significant differences in their spatial distribution between the two PDO regions studied. This study underscore the importance of ongoing monitoring and spatial analysis to ensure the continued quality and authenticity of PDO honeys. Future research should focus on long-term monitoring, increasing the number of analyses within the same region and expanding to other environmental variables to gain a deeper understanding of the evolving challenges faced by beekeepers.

Keywords: Honey, PDO, Physicochemical, Spatial distribution

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POSTER PRESENTATIONS

The preliminary results of the effects of the seed burial depth germination: a case study of *Soda grandis* (Freitag, Vural & N. Adıgüzel) Akhani

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Abstract

Soda grandis is an endemic, annual xerohalophyte that belongs to the family Amaranthaceae. Determining the optimum conditions of germination and growth are vital in conservation of endemic plant species like *Soda grandis* whose population shows fluctuations through years. These fluctuations may be caused by erosion at the distribution area after heavy rains due to lack of plant cover. During erosion seed burial depth maybe changed and the aim of this study is to obtain data related to the effects of seed burial depth on germination success of *Soda grandis* seeds. The samples were collected from the type locality in Nallıhan Ankara in November of 2024. Seeds were stratificated at 4 ºC for 3 weeks to break dormancy. Soil used in the experiment was taken from the same location as the plant samples to better simulate the natural growing conditions. To eliminate unwanted seeds and pathogens the soil was heated to 110 ºC for 60 minutes. After this the soil was sifted with a 2mm sieve to create even texture. To identify the effects of burial depth the experiment was designed with 5 different depths (0 - surface, 1, 2, 5 and 8 centimeters) and two seed conditions as “perianth intact” and “perianth removed”. Seeds were placed indoors, under sunlight. Any other factors such as growing conditions, amount of water and watering schedule were the same for all seeds. A total of 400 seeds were used, and this experiment took place between January 2025-March 2025. Data analysis with Kruskal-Wallis test shows meaningful difference related to germination and different perianth and seed burial depth conditions. It is seen that the highest rate of germination in seeds with the perianth is at 2 centimeters depth and in seeds without the perianth is at 1 centimeter depth. These findings show that the success at germination is affected by the combination of the presence of perianth and burial depth of seeds. In addition to these results, it has been observed that seeds without perianth were more likely to get rot during the germination process.

Keywords: Burial depth, Germination, Seed burial, Soda grandis

Teucrium karpasiticum Hadjik. & Hand Endemic to Northern Cyprus: Morphology, Anatomy, and Palynology

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Abstract

This study aimed to determine the morphological characteristics of the endemic *Teucrium karpasiticum,* which naturally occurs in Northern Cyprus, and to elucidate its stem and leaf anatomical structures, as well as its pollen morphology. Morphological studies included measurements on an average of 20 specimens, detailed examination of the vegetative and generative organs of the species, and the findings were supported by drawings. For anatomical studies, sections were taken from the stem and leaves of the plant, preserved in 70% alcohol, and identified and photographed. The plant is a nearly shrubby perennial. The stems are branched and densely covered with hairs. Leaves are 4-13 x 2.5-7.6 mm, obovate-rhombic-oblanceolate. Inflorescence capitate, 6-15 mm in diameter. Bracts leaflike, bracteoles lacking. Calyx 4.3-5.4 x 1.7-3 mm, tubular; corolla 7.6-8.5 x 1.2-1.7 mm, dark pink, lilac, or white. Nutlets 1-1.7 x 0.6-1.2 mm, black or dark brown, broadly obovate. The stem anatomy is round in cross-section. The cortex consists of several rows of collenchyma and parenchyma tissue. The endodermis consists of a single row of large cells. The cambium is indistinct, the vascular bundles are annular, and the pith is parenchymatous. The leaves are bifacial, composed of two rows of palisade and three or four rows of spongy parenchyma. Both surfaces are densely covered with glandular hairs. Stomata are diacitic and are observed only on the lower surface of the leaf. The pollen grains are tricolpate, and the exine is from supratectal granules to perforate. The basic shape of pollen grains is perprolate (P/E 2.10-2.34 □m).

Keywords: *Teucrium karpasiticum*; morphology; anatomy; palynology; Northern Cyprus

Morphology and Anatomy of the Endemic *Astragalus pungens* Willd.

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Abstract

Astragalus L. (Fabaceae) species have medical, economic, and ecological importance in our country. They are also highly valued in the production of gum tragacanth and selenium. In this study, *Astragalus pungens* Willd. collected from Eskişehir/Sarayören was examined morphologically and anatomically. The plant is a spiny, short, perennial shrub. The leaves are imparipinnate and have a spiny main axis. Leaflets, 3-7x1-2 mm, narrowly elliptic; usually 5-8, rarely 9 pairs. Upper and lower surfaces are densely bifurcated. Stipules, 4-6x1-2 mm, triangular. The inflorescence is a spike of yellow flowers with short pedicels, 1-2 mm long, at the apex of the main leaf axis. Bracts are 3-5 mm long, less than 1 mm wide, lanceolate. Bracteolar linear. Calyx, 8-9 mm, tubular; corolla, 5-parted, all parts glabrous. Legume 7-10x2-3 mm. Secondary structure is visible in the root. The outermost layer is a protective periderm. Beneath it lies a multi-row, small, square-oval, irregularly arranged secondary phloem. The cambium is prominent and ring-shaped. Secondary xylem, with small to large-diameter tracheary elements, occupies a large area and fills the pith. The leaf is isolateral and consists of two rows of palisade parenchyma cells under the upper and lower epidermis. The midrib is prominent and large. The leaf is amphistomatic, with anomocytic stomata. The rachis is nearly round in cross-section, and a thick cuticle layer is present on the top. There is a single row of rectangular epidermis cells underneath and 3-5 rows of parenchymatic cells towards the inside. The pith consists of round-shaped parenchymatic cells of various sizes.

Key words: Anatomy, *Astragalus pungens*, gum tragacanth, morphology.

The Contribution of *Halocnemum strobilaceum* to Plant Diversity in Salt Marshes Around Tuz Lake

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Abstract

Interactions between plants play a key role in regulating biodiversity and the composition of communities and ecosystems, and have spillover effects on the ecosystem through their impact on resource availability and habitat conditions. For many years, interactions between plants have been assessed mostly in terms of negative relationships, such as competition. However, positive interactions, especially facilitation, have been relatively neglected, but in recent years there has been an increase in studies to determine the effects of positive interactions on the ecosystem. Eventhough the effects of facilitation on ecosystems are still not sufficiently clarified. In this study, we investigated the contribution of *Halocnemum strobilaceum* to plant diversity in and around Salt Lake. Within the framework of facilitation mechanism between plants, the effects of this species on the microhabitat and how it affects the presence of other species were investigated. The study was carried out on an island in Tuz Lake –free from human impact, Yavşan Tuzlası - relatively sheltered and the rangelands of Sağlık village - under the influence of grazing. Within the scope of the study, environmental parameters such as soil temperature, humidity, salinity, pH and light intensity were measured and comparatively analyzed between sampling pairs with or without *H. strobilaceum*, and plant species and number of individuals in the sampling areas were also recorded. As a result of statistical analysis, it was determined that the soil salinity was significantly lower in the areas where *H. strobilaceum* was found. It was observed that differences in environmental parameters facilitated the settlement of other plant species and increased species diversity and number of individuals. The findings of the study suggest that *H. strobilaceum* plays a facilitating role by improving environmental conditions in the stressed habitats and functions as a nurse plant that shapes the plant community structure.

Keywords: Facilitation, *Halocnemum strobilaceum*, Nurse Plants, Positive Interactions, Salt Marshes

Potential Antioxidant Properties of Wastewater Extract Remaining After the Essential Oil Process of *Ecballium elaterium* L.

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Abstract

Essential oils are the principal products of aromatic plants. However, depending on the method utilized to extract these essential oils, varied sorts of waste are created. During hydrodistillation, the extraction of essential oil from the plant results in considerable quantities of plant material being leached into the water in contact with it. *Ecballium elaterium* (L.) A. Rich. is a unique plant, especially recognized for its fruits, which are the source of its nomenclature. The term "exploding cucumber" originates from the Greek word "ekvallo," which translates to "to throw," signifying the expulsion of seeds as the fruit matures (Anzano et al., 2024). Despite the toxicity of the fruit and juice of the plant, which can lead to severe consequences such as tachycardia, dyspnea, anorexia, diarrhea, and, in extreme instances, death from convulsions and asphyxia (Gry, 2006), it has been utilized in the treatment of rheumatism, jaundice, sinusitis, fever, hepatic disorders, and constipation owing to its high concentration of active compounds (Attard et al., 2005; Souilah et al., 2020). The plant's seeds comprise unsaturated fatty acids and steroids, the leaves encompass volatile chemicals, terpenes, phenolics, and sugars, while the fruits contain triterpenes with an oleanoic acid structure as precursor compounds (Anzano et al., 2024). This study determined the antioxidant properties by DPPH and ABTS assays of the wastewater extract from fruits of *Ecballium elaterium* L. remaining after essential oil production by the Clevenger apparatus. The results obtained highlight the value and antioxidant capacity of the wastewater.

Keywords: wastewater; antioxidant; aromatic plant; Cucurbitaceae

Comparative Antibacterial Activity of Extracts of *Salvia yangii* B.T. Drew

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Abstract

Salvia yangii B.T. Drew has garnered interest due to its medicinal and pharmacological potential. Antibacterial activity of *S. yangii n*-hexane and methanol extracts was evaluated against Gram-positive (*Staphylococcus aureus* ATCC 29213, *Bacillus cereus* NRRL B-3711, *Enterecoccus faecalis* ATCC 29212), Gram-negative (*Pseudomonas aeruginosa* ATCC 27853) standard bacteria strains. The antibacterial potency was assessed through agar diffusion assay and further analyzed by broth microdilution method to determine minimum inhibitory concentrations (MICs). The *n*-hexane extract produced inhibition zones of 12-14 mm and exhibited strong activity with MIC values of 19.53 µg/mL (*B. cereus*), 39.06 µg/mL (*S. aureus, P. aeruginosa*), and 78.12 µg/mL (*E. faecalis*). In contrast, the methanol extract yielded only small inhibition zones (4-6 mm) and higher MIC values (625-1250 µg/mL). According to these results, the antibacterial potential is associated with the presence of lipophilic secondary metabolites such as terpenoids and non-polar bioactive compounds extracted with *n*-hexane. These findings suggest that *S. yangii n*-hexane extract represents a promising natural candidate for developing antimicrobial agents, particularly effective against clinically relevant pathogens such as *S. aureus* and *P. aeruginosa*.

Keywords: *Salvia yangii, Perovskia atriplicifolia*, antimicrobial activity.

Evaluation of Antimicrobial Potential of Flower, Leaf, Seed, and Pulp Extracts of *Mahonia aquifolium* (Pursh) Nutt.

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Abstract

Mahonia aquifolium (Pursh) Nutt. is a therapeutically significant plant historically utilized for its therapeutic qualities. Nonetheless, comparable assessments of various plant components and extraction solvents regarding their antimicrobial efficacy remain limited. The antimicrobial properties of *n*-hexane and 70% ethanol extracts of *M. aquifolium* flower, leaf, seed, and pulp parts were investigated in this research. To assess the antimicrobial minimum inhibitory concentrations (MICs) of *M. aquifolium* extracts, the broth microdilution method was used against Gram-positive (*Staphylococcus aureus* ATCC 29213, *Bacillus cereus* NRRL B-3711, *Enterococcus faecalis* ATCC 29212), Gram-negative (*Pseudomonas aeruginosa* ATCC 27853), and *Candida* species (*Candida albicans* ATCC 90028, *Candida krusei* ATCC 6258).The MIC values of the *n*-hexane and 70% ethanol extracts ranged from 0.625 to 5 mg/mL. Standard bacteria cultures with low MIC values are more susceptible than yeast cultures. When the MIC values of all tested plant extracts were compared with each other, it was observed that the 70% ethanol leaf, seed, and pulp extracts showed the highest antibacterial activity (MIC 0.625-1.25 mg/mL), while *n*-hexane extracts provided broad-spectrum inhibition with consistent MICs of 1.25-5 mg/mL against all bacteria. All extracts were insufficient in terms of antifungal activity (MIC 2.5-5 mg/mL).These results suggest that polar phytochemicals in ethanol extracts are the main contributors to the antimicrobial effect. Future studies should focus on isolating active constituents and evaluating their mechanisms of action and potential applications in natural therapeutic or preservative formulations.

Keywords: *Mahonia aquifolium* (Pursh) Nutt., antimicrobial activity, MIC values.

AWARDS

The following participants were recognized for their outstanding scientific contributions and presentations during the 8th IPSAT Congress. Awards were given in two categories: Oral and poster presentations.

Oral Presentation Awards

- **1st Place: Adrianna Łobodzińska:** "*Silver and graphene oxide nanopriming mitigates seed germination and seedling development in barley under salt stress conditions"*
- **2nd Place: Marta Pezzato:** "*Can the spread of Ambrosia pollen be a concern in Parma (northern Italy)? Analysis of 33 years of observations"*
- **2rd Place: Damla Kütükalan**: "*Taxonomic Implications Using FTIR Spectroscopy Coupled with Machine Learning: Preliminary Results in Salvia"*

We have two winners for the second prize.

Poster Presentation Awards

- **1st Place: Ezgi Türk** "The Contribution of *Halocnemum strobilaceum* to Plant Diversity in Salt Marshes Around Tuz Lake"
- **2nd Place: Hikmet Sonkak** "Potential Antioxidant Properties of Wastewater Extract Remaining After the Essential Oil Process of *Ecballium elaterium* L."

We sincerely congratulate all award recipients and thank them for their valuable contributions to the congress.

8TH INTERNATIONAL PLANT SCIENCE AND TECHNOLOGY CONGRESS

PROCEEDINGS BOOK