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Sarajevo

12TH INTERNATIONAL CONFERENCE ON ENVIRONMENTAL SCIENCE AND TECHNOLOGY

October 14-18, 2026

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12th INTERNATIONAL CONFERENCE ON ENVIRONMENTAL SCIENCE AND TECHNOLOGY (ICOEST)



BOOK OF ABSTRACTS OF THE 12th INTERNATIONAL CONFERENCE ON ENVIRONMENTAL SCIENCE AND TECHNOLOGY (ICOEST)

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WELCOME TO ICOEST 2026

On behalf of the organizing committee, we are pleased to announce that the 12th International Conference on Environmental Science and Technology (ICOEST-2026) is held in Sarajevo, Bosnia and Herzegovina on October 14–18, 2026. ICOEST provides an ideal academic platform for researchers to present the latest research findings and describe emerging technologies and directions in Environmental Science and Technology. The conference seeks to contribute to presenting novel research results in all aspects of Environmental Science and Technology. The conference aims to bring together leading academic scientists, researchers and research scholars to exchange and share their experiences and research results about all aspects of Environmental Science and Technology. It also provides the premier interdisciplinary forum for scientists, engineers and practitioners to present their latest research results, ideas, developments and applications in all areas of Environmental Science and Technology. ICOEST is the oncoming event of the successful conference series focusing on Environmental Science and Technology. The scientific programme focuses on current advances in the research, production and use of Environmental Engineering and Sciences, with particular focus on their role in maintaining academic level in Science and Technology and elevating the science level in areas such as: water and wastewater treatment, sludge handling and management, solid waste and management, surface water quality monitoring, noise pollution and control, air pollution and control, ecology and ecosystem management, environmental data analysis and modelling, environmental education, environmental planning, management and policies for cities and regions, green energy and sustainability, and water resources and river basin management. The conference's goals are to provide a scientific forum for all international prestige scholars around the world and to enable the interactive exchange of state-of-the-art knowledge. The conference will focus on evidence-based benefits proven in environmental science and engineering experiments.

Best regards,

Prof. Dr. Özer ÇINAR
Chairman of the Conference

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ENVIRONMENTAL DATA-DRIVEN ANALYSIS OF CLIMATE EFFECTS ON THE ANTIMICROBIAL AND BIOACTIVE PROPERTIES OF HONEYBEE-DERIVED COMPOUNDS

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Abstract:

Honeybee-derived products such as honey and propolis are increasingly recognized as bioactive natural resources with significant antimicrobial and therapeutic potential. However, the influence of environmental and climatic variables on their biological activity remains insufficiently quantified. This study aims to investigate the relationship between key environmental factors and bioactive properties of honey and propolis samples collected from Cyprus through a data-driven analytical framework.

Environmental parameters, including temperature, relative humidity, and seasonal variability, were collected from five selected sampling regions in Cyprus, together with corresponding honey and propolis samples. The physicochemical properties (proline content, hydroxymethylfurfural levels) of honey samples were determined, and the chemical composition of propolis samples was characterized using GC–MS analysis. The biological activity of these samples was evaluated using disc diffusion assay against Staphylococcus aureus, Escherichia coli, Bacillus subtilis, and Enterococcus faecalis, while antioxidant capacity was determined using the DPPH radical scavenging method. Statistical analyses and predictive modeling approaches were employed to identify correlations and quantify the impact of environmental variables on bioactivity outcomes.

The results demonstrate that climatic conditions significantly influence the antimicrobial and antioxidant potential of honeybee-derived compounds. Predictive models identified temperature and humidity as key determinants, with increases in these variables statistically associated with reduced antimicrobial activity and antioxidant capacity in honey and propolis, enabling prediction of bioactive potential from environmental data. In addition, increasing temperature and humidity were associated with decreased proline and increased hydroxymethylfurfural levels in honey, indicating reduced quality, while also causing a quantitative decline in phenolic and flavonoid compounds in propolis.

This study highlights the importance of integrating environmental data analysis into the evaluation of natural bioresources and provides a perspective on how climate-driven factors shape the functional properties of honeybee-products. The findings contribute to developing environmentally informed strategies for optimizing the use of bee-derived substances in sustainable biotechnology and public health applications.

Keywords: Honeybee-Derived Compounds, Environmental Data Analysis, Climate Factors, Propolis, Honey

ENVIRONMENTAL BUSINESS MODELS IN TOURISM: INTEGRATING DIGITAL AND SUSTAINABLE ECOSYSTEMS

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Abstract:

The new tourism means that tourism companies are carrying out environmental regeneration rather than resource exploitation. The tour operator's business model is no longer focused primarily on creating "Green Packages," but also on certified distribution chains and actively renewing destinations. Business and destination systems are evolving through new digital and sustainable ecosystems. Global tour operators increasingly face the challenge of balancing tourism development with environmental sustainability, resident well-being, and crisis resilience. Transforming the management of the distribution chain can help eliminate numerous negative externalities at destinations, including inadequate waste management, environmental pollution, and harm to biodiversity. This paper examines how tour operators address industry challenges by implementing sustainable tourism policies. The study utilizes in-depth interviews with distribution chain partners to gather qualitative insights. The purpose of collecting opinions is to obtain detailed information about stakeholder behavior in new ecosystems. The study identifies changes in the internal elements of the environment to support the long-term sustainability of the company's resources and processes, while considering a new ecosystem as a broader contextual framework. The findings indicate that tour generalist specialists experiencing greater tourism pressure emphasize regulatory measures, visitor management, and spatial redistribution. Specialized tour operators focus more on lower tourism intensity, diversification, heritage interpretation, regional cooperation, and year-round tourism development. The priorities of both tour operators are related to sustainable destination management, destination mobility, stakeholder collaboration, and community participation. Stakeholders across the tourism distribution chain emphasize that overtourism poses significant challenges to achieving sustainable tourism development. Across the analyzed companies, smart tourism is framed as an important and integrated management approach. The results contribute to the understanding of tourism resilience by identifying ecosystems for sustainable destinations. Future research should consider a broader spectrum of common tourism policies for urban regeneration and improvements in residents' quality of life through stakeholder partnerships.

Keywords: Tour Operators, Sustainable Solutions, Transformations, New Ecosystems, Destination Resilience

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MICROBIAL COMMUNITIES INTERACTIONS IN FLOATING TREATMENT WETLANDS (FTW) INTEGRATED WITH MICROBIAL FUEL CELLS (MFCS) DURING HEAVY METAL REMOVAL

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Abstract:

This study evaluated floating treatment wetlands integrated with microbial fuel cells (FTW MFCs) planted with Iris pseudacorus and Phragmites australis for treatment of metal containing wastewater. A mesocosm experiment comprised three consecutive 14 day phases with binary metal loadings: Cu–Cd (phase 1), Cu–Pb (phase 2) and Cd–Pb (phase 3). In addition to metal removal rate, we monitored pH, redox potential and voltage, and characterized bacterial communities using Oxford Nanopore Technologies sequencing of the full 16S rRNA gene across root (rhizosphere), anode and cathode niches. Significant heavy metal removal occurred in all phases. While the relative abundance of major phyla remained broadly stable across niches, Proteobacteria predominated after phase 1 and Firmicutes increased during phase 2 under organic rich, anoxic conditions. At the genus level, community structure was diverse; the most abundant taxa across samples included Ruminiclostridium sp. (5.68%), Pleomorphomonas sp. (3.63%), Loriellopsis sp. (3.15%), Pseudomonas sp. (2.97%) and Rhodobacter sp. (2.96%). Principal component analysis indicated that bacterial community composition was primarily shaped by the specific binary heavy metal combinations applied, which acted as dominant selection pressures. Spatial and metal specific selection favored taxa such as Sporomusa sp. and Desulfosporosinus sp., together with Rhizobium sp., Geomonas sp., Paenibacillus sp., Paracoccus sp. and Flavobacterium sp. These genera likely reflect functional adaptation to the plant–metal–spatial dynamics in FTW MFC systems, supporting electron transfer processes and mediating heavy metal tolerance and transformation.

Keywords: Heavy Metals, Floating Constructed Wetlands, Bioenergy, NGS, Wastewater Treatment

ASSESSMENT OF NUISANCE AND ALLERGENIC ENVIRONMENTAL ODOUR SOURCES IN BUDAPEST

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Abstract:

Environmental odours have become an increasingly important component of urban environmental quality, influencing air quality, public health, and the overall well-being of residents. Rapid urbanization, climate change, and the growing intensity of industrial and agricultural activities have altered emission characteristics, creating new challenges for environmental management and air quality protection.

This study investigates the occurrence and impacts of nuisance and allergenic odour sources in Budapest, with particular attention to emissions originating from biological, agricultural, and vegetation-related sources. The research aims to identify the dominant contributors to odour pollution, examine the factors influencing odour dispersion, and evaluate their effects on perceived environmental quality and human health.

The analysis is based on a structured questionnaire survey conducted among residents of Budapest. The collected responses provide information on odour perception, exposure frequency, spatial distribution of complaints, and associated health effects. In addition, the study explores the relationship between odour occurrence, meteorological conditions, and self-reported physical and psychological symptoms, offering a broader perspective on urban air quality assessment.

It is hypothesized that agricultural and livestock-related emissions represent the primary sources of nuisance odours, while naturally occurring volatile organic compounds (VOCs) emitted by vegetation and airborne allergens, particularly pollen, also substantially influence odour perception and environmental comfort. Furthermore, odour intensity and complaint frequency are expected to vary according to local meteorological conditions and spatial characteristics. Continuous exposure to unpleasant odours may adversely affect both physical health and psychological well-being.

The results emphasize the importance of incorporating odour assessment into integrated air quality management strategies. Improved monitoring techniques, effective emission reduction measures, and community-based reporting systems can contribute to enhanced environmental quality and more sustainable urban planning. The findings provide valuable information for policymakers and environmental professionals seeking to develop adaptive strategies for reducing odour-related impacts in urban environments.

Keywords: Nuisance Odour, Air Quality, Environmental Monitoring, Allergenic Effects, Public Perception

COMPRESSED AIR ENERGY STORAGE IMPLEMENTATION IN ABANDONED MINES: THE CASE OF SELMECBÁNYA

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Abstract:

The increasing share of renewable energy sources creates major challenges for grid stability due to the intermittent nature of wind and solar power. Large-scale energy storage technologies are therefore essential to balance fluctuations between electricity generation and demand. One promising solution is Compressed Air Energy Storage (CAES), which stores surplus electricity as compressed air and later converts it back into electrical energy during periods of high demand.

This study investigates the feasibility of constructing a CAES facility in the historic mining region of Selmecbánya (Banská Štiavnica, Slovakia). The area contains an extensive network of underground mine workings developed over centuries of precious metal mining, offering potential infrastructure for underground energy storage. The research evaluates whether these existing geological formations and mining structures could support a modern CAES system while preserving environmental values and cultural heritage.

The methodology combines geological, engineering, and techno-economic analyses. Geological investigations assess rock stability, permeability, hydrogeological conditions, and potential air leakage within the volcanic andesite and rhyolitic tuff formations characteristic of the Štiavnica volcanic complex. The study also examines the integration of wind energy to provide renewable electricity for the compression process.

A conceptual CAES system was designed, including compression units, underground storage caverns, and expansion turbines. Preliminary economic analysis estimates total investment costs between 28 and 35 billion HUF, with projected annual revenues of 4–7 billion HUF and an estimated payback period of 6–10 years, depending on operational and market conditions.

The results suggest that, with appropriate engineering solutions and environmental safeguards, the Selmecbánya mining area could provide a technically feasible location for a CAES facility. Reusing historical underground infrastructure may significantly reduce construction costs while supporting sustainable land use. The research demonstrates how former mining landscapes can contribute to renewable energy storage, supporting both the energy transition and the revitalization of post-mining regions.

Keywords: Renewable Sources, Energy Surplus, Abandoned Mines, Underground Storage, Sustainability

URBAN FORESTRY STRATEGIES FOR REPURPOSING CAMPUS TERRAIN VAGUE: THE CASE OF DÜZCE UNIVERSITY CAMPUS

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Abstract:

University campuses function as small-scale urban ecosystems where natural, semi-natural, and built environments coexist. Within these campuses, underutilized green spaces, abandoned parcels, unmanaged vegetation patches, drainage corridors, and transitional areas often exhibit the characteristics of terrain vague. Although these spaces are generally perceived as neglected or low-value landscapes, they provide significant opportunities for ecological restoration, biodiversity enhancement, and climate adaptation through sustainable urban forestry practices.

This study proposes a conceptual framework for repurposing terrain vague within the Düzce University Campus using urban forestry strategies. The framework identifies potential terrain vague areas based on their ecological condition, land-use characteristics, vegetation structure, and management status. Restoration priorities include increasing native tree and shrub diversity, improving habitat connectivity, conserving naturally regenerated vegetation, restoring degraded soils, managing invasive species, and enhancing deadwood habitats where appropriate. In addition, the framework integrates nature-based solutions such as rainwater retention, carbon sequestration, urban heat mitigation, and ecological corridors to strengthen campus resilience against climate change.

Beyond ecological improvements, the proposed approach promotes multifunctional campus landscapes by incorporating environmental education, citizen science, and participatory management involving students, academic staff, and campus administrators. These interventions aim to transform neglected green spaces into living laboratories that support research, sustainability education, and ecosystem service delivery while fostering stronger connections between people and nature.

The proposed framework demonstrates how urban forestry can provide an innovative and transferable strategy for repurposing campus terrain vague. The Düzce University Campus is presented as a pilot case for integrating ecological restoration, climate adaptation, biodiversity conservation, and participatory governance into the sustainable management of underutilized campus landscapes. The framework offers practical guidance for universities seeking to convert neglected campus spaces into resilient, multifunctional, and ecologically valuable green infrastructure.

Keywords: Terrain Vague, Urban Forestry, University Campus, Ecological Restoration, Biodiversity Conservation, Climate Adaptation

EUROPEAN CATFISH (SILURUS GLANIS) IN TÜRKIYE: PRODUCTION TRENDS AND AQUACULTURE POTENTIAL

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Abstract:

The European catfish (Silurus glanis) is an economically important freshwater species widely distributed in Türkiye, with potential for the diversification of inland aquaculture. This study evaluated the current status and aquaculture potential of the species in Türkiye using official capture and aquaculture production statistics from 2015 to 2025 and published scientific literature on its culture. Capture production declined from 549 t in 2015 to 79 t in 2025, representing an 85.6% decrease over the study period. Aquaculture production was first recorded at 8 t in 2017 and varied considerably between years. Production increased to 121 t in 2019 and reached a maximum of 156 t in 2024 before declining to 24 t in 2025. Research conducted in Türkiye has focused on several aspects of European catfish culture, including controlled reproduction and gamete management, larval rearing and feeding, stocking density, and nutritional requirements. Despite these research efforts, aquaculture production remains limited, suggesting that a stable production pattern has not yet been established. Further studies are needed to identify the factors responsible for this variation and to improve production practices. Applying research findings in commercial production may help develop European catfish culture in Türkiye and diversify freshwater aquaculture.

Keywords: Silurus glanis, Capture Production, Production Variability, Species Diversification, Freshwater Aquaculture

ENHANCING WORKPLACE HEALTH THROUGH ACTIVE GREEN EXERCISE BREAKS IN PLANT-PURIFIED INDOOR ENVIRONMENTS

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Abstract:

Contemporary office work is characterized by prolonged sedentary behaviour, psychological demands, and extensive time spent in indoor environments. Workplace health promotion therefore requires approaches that address both behavioural and environmental determinants of well-being. Active breaks and exposure to nature have independently been associated with beneficial physical and psychological outcomes, while indoor plants may contribute to healthier and more restorative workplace environments. This paper explores the potential of integrating active green exercise breaks with plant-enriched indoor environments as a complementary nature-based strategy for workplace health promotion. A narrative review of relevant literature was conducted to examine evidence concerning workplace active breaks, green exercise, indoor plants, indoor environmental quality, psychological restoration, and nature-based approaches to health promotion. Particular attention was given to the potential environmental and psychological pathways through which plant-enriched environments and movement-based breaks may influence employee health and well-being. Evidence indicates that active breaks can interrupt prolonged sitting and support physical and mental well-being, while green exercise may provide additional restorative benefits through simultaneous exposure to nature and physical activity. Experimental evidence indicates that indoor plants can contribute to improved indoor environmental quality through the removal of selected airborne pollutants, while also positively influencing occupants' perceptions of comfort, freshness, and the overall indoor environment. The integration of movement opportunities with nature-enriched indoor environments may therefore address complementary dimensions of workplace health. Active green exercise breaks in plant-enriched indoor environments represent a promising, interdisciplinary approach to workplace health promotion. Rather than treating indoor vegetation as a standalone air-purification intervention, its potential value may lie in combining environmental, restorative, and behavioural benefits. Further empirical research is needed to determine whether integrating these approaches produces measurable benefits beyond those of individual interventions.

Keywords: Active Breaks, Environmental Health, Green Exercise, Indoor Plants, Nature-Based Interventions, Workplace Health

HEALTH AND URBAN FORESTS: EXPLORING THE ROLE OF NATURE EXPOSURE IN PROMOTING HEALTH AND WELL-BEING

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Abstract:

Rapid urbanization has increased the importance of creating urban environments that support both environmental sustainability and human health. Urban forests, including parks, street trees, and other tree-dominated green spaces, provide a range of ecosystem services while offering opportunities for direct contact with nature. This paper explores the role of urban forests and nature exposure in promoting human health and well-being, with particular attention to the environmental and psychosocial pathways through which urban nature may contribute to healthier urban living. A narrative review of relevant literature was conducted to examine the environmental benefits of urban forests, the health effects associated with nature exposure, and the principal mechanisms linking urban green spaces with human health. Evidence concerning environmental quality, mental and physical health, psychological restoration, physical activity, social interaction, and green exercise was considered. The reviewed evidence indicates that urban forests provide multiple environmental benefits, including air pollution mitigation, temperature regulation, carbon sequestration, stormwater management, biodiversity support, and noise attenuation. Exposure to green spaces has also been associated with improved mental well-being, reduced psychological stress, increased physical activity, and beneficial physical health outcomes. These effects appear to arise through interconnected environmental, behavioural, psychological, and social pathways. In particular, green exercise may combine the physiological benefits of physical activity with the restorative potential of natural environments, providing an accessible pathway through which urban forests can support health and well-being. Urban forests should be recognized as an important component of health-promoting urban infrastructure. Their value extends beyond ecological and aesthetic functions, as they can simultaneously contribute to environmental quality, opportunities for physical activity, psychological restoration, and social well-being. Integrating health considerations into urban forest planning may therefore support the development of more sustainable, resilient, and health-promoting cities. Further research is needed to clarify how the characteristics, accessibility, and quality of urban forests influence their health-related benefits.

Keywords: Environmental Health, Green Exercise, Green Spaces, Human Health, Nature Exposure, Urban Forests, Urban Planning, Well-Being

CYBER ATTACKS ON SHIPS: ENVIRONMENTAL THREATS, CASE STUDIES, AND PROPOSED SOLUTIONS

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Abstract:

The maritime sector has undergone a radical transformation in recent years with rapidly advancing digitalization and automation processes. Automatic Identification Systems (AIS), Global Positioning Systems (GPS), Industrial Control Systems (ICS), and smart port infrastructures used on ships have increased operational efficiency but have also brought new security risks. Since ships form the backbone of international trade, cyber attacks have the potential to disrupt not only a single company but also the global supply chain.

Cyber threats to maritime transport vary, including GPS spoofing, AIS manipulation, ransomware attacks, social engineering-based breaches, and cyber sabotage targeting port operations. These attacks create both direct security risks (e.g., route misdirection) and economic losses (e.g., operational disruption).

While the International Maritime Organization's (IMO) regulations, enacted in 2021, mandate ship operators to develop cyber risk management plans, current research indicates that these measures are often superficial. Therefore, cybersecurity in the maritime sector is not merely a technical issue but also a strategic priority.

In recent years, several cyberattacks have caused significant economic and commercial losses for companies involved, including the NotPetya attack (2017) targeting 76 Maersk ports, the GPS spoofing incident (2017) in the Black Sea where position signals of 20 ships were manipulated leading to false position reports, the ransomware attack on the Port of San Diego (2018), the cyberattack on COSCO Shipping Lines (2018) which left its US offices offline for days, and the MSC cyberoutage (2020) which disrupted offices and cargo services for days. These cases demonstrate that maritime transport operations are extremely vulnerable to cyberattacks, and a single attack can trigger a chain reaction in the global supply chain. Therefore, cyberattacks in the maritime sector show that security, both for ships and port infrastructure, cannot be ensured solely through physical measures. The current situation indicates that cyber threats have transcended being a purely technical problem, acquiring strategic, economic, and even geopolitical dimensions.

Cyberattacks will increase further in the coming years with the proliferation of autonomous and semi-autonomous ships, and will emerge as one of the most significant problems facing the maritime sector.

Keywords: Maritime Transportation, Cyberattacks, GPS Spoofing, Digitalization in the Maritime Sector, Port Infrastructure Reliability

COMPARING CURVE NUMBER AND MODIFIED GREEN–AMPT INFILTRATION FOR HYDRAULIC CAPACITY ASSESSMENT: A MEDITERRANEAN WATERSHED CASE STUDY

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Abstract:

Climate change is making short-duration rainfall extremes more frequent and intense across the Mediterranean, so dependable urban hydrologic–hydraulic modelling relies on an accurate representation of infiltration. Yet, for mixed urban–rural Mediterranean watersheds, controlled tests of the Curve Number (CN) method against Green–Ampt-type schemes in the EPA Storm Water Management Model (SWMM) are rare. This study compared CN and the Modified Green–Ampt (MGA) method through two SWMM models of the Bostanlı watershed (İzmir, Türkiye; 33.09 km², 85 subcatchments) that differed only in infiltration formulation. Each model was automatically calibrated with OSTRICH's Dynamically Dimensioned Search algorithm against 55 days of hourly observed discharge, using the de-correlated Kling–Gupta efficiency (KGE') as the single objective; the calibrated parameters then drove an 11-year (2014–2025) continuous simulation. In calibration, CN reached KGE' = 0.82 and Nash–Sutcliffe efficiency (NSE) = 0.69, against 0.83 and 0.73 for MGA; both schemes were thus informative in KGE' terms and good to very good by NSE, with MGA slightly ahead on all metrics. This narrow gap contrasted with their divergence over the 11-year run: CN simulated 84% higher surface runoff than MGA and more than triple its flood volume, although both models flagged the same critical locations in the network. On the grounds of parameter origin, representation of spatial heterogeneity and parsimony of calibration, the study recommends CN as the defensible choice for diagnosing hydraulic capacity; in data-constrained Mediterranean watersheds, its simulated runoff and flooding offer a conservative foundation for climate-resilient drainage design.

Keywords: Curve Number, Green–Ampt, Mediterranean Watershed, OSTRICH, SWMM, Urban Drainage

PHYSIOLOGICAL AND BIOCHEMICAL RESPONSES TO OZONE EXPOSURE AND RECOVERY IN GALIUM VERUM AND HELICHRYSUM ITALICUM

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Abstract:

Tropospheric ozone can impair plant physiological performance and alter biochemical traits relevant to medicinal plant quality. This study aimed to evaluate ozone sensitivity and recovery in Galium verum and Helichrysum italicum under controlled environmental conditions by integrating photosynthetic, biochemical, and antioxidant assessments. We evaluated plants under control conditions, after ozone exposure, and after a recovery period. Measurements included net CO_2 assimilation, stomatal conductance, chlorophyll a and b contents, total phenolic content, and antioxidant activity determined using DPPH, ABTS, FRAP, and CUPRAC assays.

In the datasets presented, ozone significantly reduced net CO_2 assimilation and stomatal conductance, accompanied by decreases in chlorophyll a and b contents. Assimilation declined by approximately 45–57%, whereas stomatal conductance decreased by approximately 86–87%. Recovery varied between the groups: assimilation increased significantly in the Romanian group and no longer differed significantly from the control, whereas the Moldovan group remained significantly below its control. Stomatal conductance recovered partially in both groups but remained depressed, and chlorophyll contents did not return to control levels. Total phenolic content increased following ozone exposure and remained elevated during recovery. Antioxidant responses depended on the assay: ABTS activity decreased following exposure, whereas DPPH activity showed limited changes, and FRAP and CUPRAC values did not differ significantly among treatments.

These findings indicate that ozone-induced physiological impairment can persist despite increased phenolic accumulation and largely maintained antioxidant activity in several assays. Integrating gas exchange, pigment measurements, and complementary antioxidant assays provides a more comprehensive assessment of ozone responses than any single indicator.

Acknowledgement: This work was supported by a grant from the CNCS – UEFISCDI, project number PN-IV-P8-8.3-ROMD-2023-0022.

Keywords: Helichrysum italicum, Galium verum, Ozone Stress, Photosynthetic Parameters, Antioxidant Activity

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EFFECTS OF SEWAGE SLUDGE SOURCE AND APPLICATION RATE ON PHYSIOLOGICAL AND BIOCHEMICAL RESPONSES OF HELIANTHUS ANNUUS

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Abstract:

Sewage sludge valorization as a growing-substrate amendment requires assessing plant responses because its composition and effects vary by source and application rate. This study evaluated the effects of sewage sludge from three wastewater treatment plants in Arad, Timișoara, and Alba Iulia, Romania, on the physiological and biochemical responses of sunflower (Helianthus annuus L.).

We incorporated sludge from each source into a commercial growing substrate at 0.95, 1.43, 1.90, 2.38, and 3.57%, alongside an unamended control. We used FTIR spectroscopy to characterize sludge functional groups, and we determined Zn, Cu, and Cr concentrations in substrates and leaves. Plant assessments included net CO_2 assimilation, stomatal conductance, photosynthetic pigments, total phenolic and flavonoid contents, and DPPH radical-scavenging activity.

Responses varied with sludge source and application rate and were frequently non-linear. Net CO_2 assimilation and stomatal conductance reached their highest values at 2.38% sludge for all three sources. Alba Iulia sludge produced the highest assimilation rate, approximately 4.4 µmol m^{-2} s^{-1}, compared with approximately 3.7 µmol m^{-2} s^{-1} in the control. Chlorophyll responses were generally positive with Timișoara and Alba Iulia sludge, whereas 3.57% Arad sludge reduced chlorophyll a below the control. Phenolic content peaked at 1.43% Arad sludge, while Timișoara sludge at 2.38% produced the highest flavonoid content and DPPH inhibition, approximately 59% compared with 26% in the control. At 3.57%, phenolic content declined below control levels for all sources.

These findings demonstrate that sludge source and application rate influence sunflower physiological performance and biochemical responses. Intermediate rates enhanced selected indicators, but higher rates did not consistently provide additional benefits. Application-rate selection should therefore integrate plant responses with trace-element accumulation data to assess each sludge source's suitability.

Keywords: Helianthus annuus, Sewage Sludge, Substrate Amendment, Trace-Element Accumulation, Photosynthetic Performance, Phenolic Compound

INTEGRATED PHYSIOLOGICAL AND BIOCHEMICAL ASSESSMENT OF RADISH CULTIVAR RESILIENCE TO DROUGHT AND OZONE UNDER ELEVATED CARBON DIOXIDE

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Abstract:

Drought and tropospheric ozone constrain plant growth and productivity, while rising atmospheric CO_2 concentrations may alter stress sensitivity and recovery. This study compared the physiological and biochemical responses of three Raphanus sativus L. cultivars—'Johanna', 'Helga', and 'Rozaria'—to identify the most resilient cultivar under drought or ozone exposure at different CO_2 concentrations.

We grew four-week-old plants under controlled conditions at 400, 800, or 1200 ppm CO_2 and subjected them to either seven days of water deprivation followed by rewatering or 100 ppb ozone followed by recovery. Net CO_2 assimilation and stomatal conductance were measured using a portable gas-exchange system. Photosynthetic pigments were quantified by HPLC–DAD, volatile organic compounds by GC–MS, and total phenolic and flavonoid contents spectrophotometrically. Data were analyzed using two-way ANOVA followed by Tukey's test.

Both stresses reduced net CO_2 assimilation, stomatal conductance, and chlorophyll content across cultivars. Elevated CO_2 partially mitigated these effects and supported recovery, although responses varied by cultivar and stress treatment. 'Johanna' combined high photosynthetic capacity, comparatively stable stomatal conductance, effective recovery after drought, and pronounced phenolic accumulation following ozone exposure. 'Helga' exhibited pronounced flavonoid and pigment responses but the largest drought-induced decline in assimilation, indicating biochemical adjustment accompanied by greater physiological impairment. 'Rozaria' recovered photosynthetic activity after drought and showed marked changes in antioxidant-related metabolites; however, substantial stomatal limitation and greater ozone sensitivity under elevated CO_2 suggested lower overall resilience.

'Johanna' showed the most consistent physiological performance and recovery under the tested conditions, identifying it as a promising cultivar for cultivation under elevated CO_2 and episodic abiotic stress. These findings highlight the value of integrating physiological recovery with biochemical responses when assessing cultivar resilience.

Keywords: Ozone Stress, Drought Stress, Plant Photosynthesis, Plant Metabolites

BETWEEN DROUGHT AND FLOODING: PHYSIOLOGICAL AND BIOCHEMICAL RESPONSES OF HELICHRYSUM ITALICUM TO CONTRASTING WATER EXTREMES

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Abstract:

Both water deficit and excessive soil moisture can impair the physiological performance of aromatic plants, highlighting the need to characterize their responses to contrasting water regimes. This study evaluated Helichrysum italicum responses to drought and flooding by integrating measurements of photosynthetic performance, pigment composition, and antioxidant activity.

Plants were subjected to drought or flooding and compared with plants maintained under control conditions. Net CO_2 assimilation and stomatal conductance were measured using a GFS-3000 gas-exchange system. We also assessed photosynthetic pigments and antioxidant activity to characterize physiological and biochemical responses to each stress.

Drought altered photosynthetic performance and pigment composition and induced changes in antioxidant capacity, indicating adjustments in carbon assimilation and biochemical processes under limited water availability. Flooding reduced photosynthetic performance and modified pigment composition, consistent with impaired carbon assimilation under excessive soil moisture. Antioxidant activity also changed, suggesting antioxidant defenses played a role in responses to both stresses. Together, the findings indicate that drought and flooding affect multiple components of plant functioning, with changes in photosynthetic performance occurring alongside alterations in pigment composition and antioxidant capacity.

The integrated assessment of gas exchange, photosynthetic pigments, and antioxidant activity provides complementary indicators of H. italicum responses to contrasting water stresses. These findings contribute to understanding the physiological and biochemical adjustments of this aromatic species and provide a basis for further evaluation of its tolerance to water deficit and excessive soil moisture.

Acknowledgement: This work was supported by a grant from the Romanian National Authority for Scientific Research, CNCS – UEFISCDI, project number PN-IV-P8-8.3-ROMD-2023-0022.

Keywords: Helichrysum italicum, Drought Stress, Photosynthetic Parameters

EPIGEIC ARTHROPOD COMMUNITIES IN DIFFERENT HABITAT TYPES OF THE RECI NATURE RESERVE

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Abstract:

The Reci Nature Reserve is characterized by a highly heterogeneous habitat mosaic comprising dry sandy dunes, wet interdunal depressions, native and non-native tree stands, open grasslands, and areas with abundant dead wood. Such structural differences may strongly influence epigeic arthropod communities, particularly spiders, which are sensitive indicators of habitat and microenvironmental conditions. This study aimed to compare epigeic arthropod and spider communities across different habitat types and to evaluate their potential as bioindicators of habitat characteristics.

Field sampling was conducted monthly from March to November 2025 in five structurally distinct habitats: an open clearing, native alder and birch stands, a non-native pine stand, and a dead-wood-rich habitat. Arthropods were sampled using Barber pitfall traps. Specimens were sorted and identified, with spiders determined to species level, followed by ecological and multivariate statistical analyses.

A total of 10,457 arthropod specimens were collected, including 848 adult spiders representing 10 families and 40 species. Lycosidae and Gnaphosidae were dominant. Spider diversity and mean species richness were highest in the open clearing, reaching 10.2 species per trap, while the homogeneous pine stand had the lowest values. The dead-wood habitat hosted the highest number of individuals. Multivariate analyses revealed clear differences in spider community composition, with open and dead-wood habitats being distinct from forested habitats.

The results demonstrate that epigeic arthropod, particularly spider communities respond strongly to habitat structure and microenvironmental conditions. Maintaining the habitat mosaic, including open areas and dead-wood, is therefore essential for conserving the biodiversity and ecological value of the Reci Nature Reserve and for supporting future biodiversity monitoring.

Acknowledgement: This research was supported by the Márton Áron Talent Management Scholarship (Bálint Balassi Scholarship Programme).

Keywords: Epigeic Arthropods, Spiders, Habitat Diversity, Habitat Mosaic, Biodiversity, Dead Wood, Nature Conservation

ASSESSMENT OF FOREST DECLINE IN THE MOHOȘ PEAT BOG

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Abstract:

The Mohoș Peat Bog is a valuable peatland ecosystem whose ecological condition has been affected by increasing environmental stress and substantial mortality of the dwarf Scots pine (Pinus sylvestris forma turfosa) population. This study aimed to assess the current ecological condition of the peat bog, quantify the extent and spatial distribution of pine mortality, and evaluate changes in vegetation condition between 2013 and 2025.

A combination of remote sensing and image-analysis methods was applied. Aerial RGB and multispectral imagery was acquired using a DJI Mavic 3M drone. Vegetation condition was assessed using the Normalized Difference Vegetation Index (NDVI), including a time-series analysis covering 2013–2025. ImageJ was used for image-based counting of damaged and dead trees.

The results indicate a pronounced decline in vegetation condition. The insect outbreak recorded in 2014 and the extensive pine mortality observed in 2024 are clearly reflected by decreases in NDVI values and changes in the distribution of NDVI classes. Within a 45-m-wide peripheral zone covering 14.5 ha, an estimated 1,831 dead trees were recorded, compared with 32,066 dead trees in the 65.5-ha inner zone. Thus, mortality was substantially greater in the interior of the peat bog.

The findings demonstrate severe and spatially heterogeneous vegetation degradation and indicate stronger ecological stress in the inner peat-bog zone. The integration of drone-based remote sensing, NDVI time-series analysis, and image-based tree counting provides an efficient and objective approach for ecological monitoring. The results can support conservation management, long-term monitoring, and climate change adaptation strategies for the Mohoș Peat Bog.

Acknowledgement: This work was supported by the Institute for Research Programmes of the Sapientia Foundation (Grant No. 13/9/21.05.2025).

Keywords: Peat Bog, Pine Mortality, UAS/UAV, NDVI, Insect Infestation, Ecological Monitoring, Nature Conservation, Climate Change

PATENT LANDSCAPE OF SNAIL-DERIVED PRODUCTS AND PROCESSING BY-PRODUCTS IN THE CIRCULAR BIOECONOMY

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Abstract:

The international patent landscape demonstrates that innovation involving snail-derived materials has expanded considerably over the past decade, with the overwhelming majority of inventions focusing on snail mucus extraction, purification, and its applications in cosmetics, pharmaceuticals, wound healing, and regenerative medicine (ESPACENET, WIPO PATENTSCOPE, Patsnap Eureka). Patents describing efficient collection methods, purification technologies, and the recovery of bioactive compounds such as glycosaminoglycans, soluble proteins, and antimicrobial molecules dominate current intellectual property portfolios. In contrast, significantly fewer patents address the valorization of snail shells, which are primarily utilized as sources of calcium carbonate for biomaterials, composite fillers, adsorbents, and bioceramics. Even more limited is the patent activity related to snail meat processing and the recovery of value-added products from processing residues. Notably, comprehensive utilization of snail-processing waste—including shells, internal organs, mucus residues, and other by-products—remains largely underdeveloped. Very few inventions propose integrated technologies for nutrient recovery, environmentally friendly fertilizers, hydroponic cultivation, or circular biorefinery systems. This substantial technological gap represents an important opportunity for future innovation. The development of sustainable processing methods capable of converting all snail-derived by-products into high-value agricultural, environmental, and industrial products would strongly support circular bioeconomy objectives while reducing waste generation. Future patent activity is therefore expected to shift toward integrated resource recovery, green extraction technologies, bioactive molecule isolation, eco-friendly fertilizers, and multifunctional biomaterials, reflecting the growing global demand for sustainable and zero-waste biotechnological solutions.

Acknowledgement: This work was supported by a grant of the Romanian Ministry of Education and Research, CNCS - UEFISCDI, project number PN-IV-P7-7.1-PTE-2024-0387, within PNCDI IV.

Keywords: Patents, Snail Products, Snail By-Products, Circular Bioeconomy

VALORIZATION OF HELIX POMATIA BY-PRODUCTS FOR SUSTAINABLE BIOTECHNOLOGICAL APPLICATIONS

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Abstract:

The processing of edible snail (Helix pomatia) is mainly focused on the recovery of muscular tissue, while visceral and glandular fractions remain underutilized and may enter residual waste streams despite containing potentially valuable biomolecules and nutrients. Their targeted recovery could support both waste reduction and the development of new biotechnological applications. This study aimed to assess the valorization potential of organic by-products generated from H. pomatia processing, with particular emphasis on the hepatopancreas and other glandular tissues and secretions.

A literature-based comparative study was conducted using published data on tissue composition, nutritional characteristics, physiological function, contaminant accumulation and reported technological applications. Particular attention was given to protein and mineral content, bioactive macromolecules and safety-related limitations.

Published studies show that flour obtained from hepatopancreas can contain 42.26% protein and substantial levels of magnesium and other minerals, supporting its potential as a secondary nutritional resource (Muntean et al., 2024). However, the hepatopancreas is also a major detoxification organ and an important site of cadmium accumulation, emphasizing the need for contaminant monitoring before further use (Manzl et al., 2004). Beyond nutritional valorization, glandular products broaden the biotechnological relevance of snail-derived biological fractions. H. pomatia mucus contains acidic glycoproteins, mannose- and fucose-containing glycoconjugates, lipids and mineral elements, while salivary secretions include both mucous components and enzymes (Greistorfer et al., 2017; Pirger et al., 2004).

Overall, edible snail processing by-products should be regarded as distinct biological resources than undifferentiated organic waste. Selective separation, characterization and safety assessment are essential for their sustainable valorization within circular waste-management strategies.

Acknowledgement: This work was supported by a grant of the Ministry of Education and Research, CNCS - UEFISCDI, project number PN-IV-P7-7.1-PTE-2024-0387, within PNCDI IV.

Keywords: Helix pomatia, By-Products, Hepatopancreas, Circular Bioeconomy, Biotechnology

ENVIRONMENTAL PERFORMANCE OF PADDY RICE PRODUCTION IN TÜRKIYE: A LIFE CYCLE ASSESSMENT APPROACH

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Abstract:

Paddy rice cultivation significantly affects the environment, mainly through methane emissions from flooded fields and the extensive use of agricultural inputs. This study assesses the environmental performance of paddy rice production in Türkiye at the farm level, identifying major environmental hotspots and evaluating potential mitigation strategies. Four alternative scenarios were developed, focusing on water management, post-sowing incorporation timing, and straw management strategies to improve the environmental performance of paddy rice production. The functional unit was defined as 1 tonne of paddy rice at 14% moisture content. A from cradle-to-farm-gate perspective was adopted with regard to the system boundary. Primary data were collected from 10 rice farms through face-to-face interviews and field surveys, while secondary data were obtained from databases and scientific literature. Environmental performance was evaluated across thirteen impact categories.

The results varied considerably among farms, reflecting differences in management practices and input use. For climate change, the environmental impact range was from 3351 kg CO_2 ton^{-1} to 48,432 kg CO_2 ton^{-1}. Reductions were mainly observed in methane-related impact categories, particularly climate change, human toxicity, non-cancer effects, and photochemical ozone formation, while freshwater ecotoxicity showed only minor changes. The best environmental performance was achieved in the straw management scenario. Additionally, fertilizer use and associated nitrogen emissions represented significant contributors across the majority of evaluated environmental impact categories.

Overall, the findings indicate that mitigating the environmental burden of paddy rice production requires integrated, farm-specific strategies addressing water, post-sowing incorporation timing, and straw management. The results also suggest that fertilizer use should be further investigated with the support of soil analyses to improve the sustainability of paddy rice production.

Acknowledgement: This study was supported by the Scientific Research Projects Coordination Unit of Erciyes University. Grant No: FBA-2024-14046.

Keywords: Life Cycle Assessment, Paddy Rice, Methane Emissions, Environmental Hotspots, Straw Management

ELEMENTAL DIFFERENCES IN SCOTS PINE NEEDLES FROM THE MOHOȘ AND FÂNTÂNA DINTRE BRAZI PEAT BOGS

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Abstract:

The Mohoș peat bog is a unique protected wetland near Lake Sfânta Ana in the Eastern Carpathian Mountains of Romania, hosting numerous rare species of glacial-origin flora and fauna. Its thick peat layer preserves plant remains dating back thousands of years, while characteristic peatland species, including peat mosses, sundews, and Scots pine (Pinus sylvestris), occur throughout the bog. In recent years, extensive Scots pine dieback has been observed, likely associated with warmer and drier conditions that may have weakened the trees and increased their susceptibility to bark beetle attack, including species of the genus Ips.

The aim of this study was to compare the elemental composition of one-year-old needles from living Scots pines at the Mohoș peat bog with those from Scots pines at the Fântâna dintre Brazi peat bog, located approximately 100 km to the north, where the trees remained healthy. Scots pines at Mohoș had higher mean Mn, Fe, Cr, Si, and Ba concentrations and lower Sr, Rb, K, and Cu concentrations than those at the reference site, while no differences were observed in Ca, Mg, Zn, Na, or Al. However, all measured element concentrations fell within the ranges reported for Scots pine, except for K, which was slightly lower at Mohoș. Notably, Rb and K concentrations were approximately 65% and 31% lower, respectively, at Mohoș than at the reference site. The approximately 50% decrease in the Rb/K ratio suggests that Rb uptake or homeostasis was affected disproportionately relative to the change in K status.

The results suggest that tree weakening at the Mohos peat bog was more likely associated with lower K concentrations than with elevated levels of potentially toxic elements. Given the essential role of K in maintaining osmotic balance and regulating stomatal function, reduced K levels may have impaired stomatal regulation and increased water loss, potentially contributing to drought stress.

Acknowledgement: This work was supported by the Institute for Research Programmes of the Sapientia Foundation (Grant No. 13/9/21.05.2025).

Keywords: Mohoș Peat Bog, Scots Pine (Pinus sylvestris), Elemental Composition, Nutrient Status, Tree Dieback

RED WINE DEALCOHOLISATION BY ROTARY EVAPORATION: CHANGES IN ANTIOXIDANT ACTIVITY, PHENOLIC CONTENT AND COLOUR

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Abstract:

The increasing demand for low-alcohol and alcohol-free beverages has led to the development of technological strategies capable of reducing ethanol content while trying to preserve wine quality. Although alcohol levels can be managed through pre or post fermentation stages, post-fermentation dealcoholisation remains particularly relevant when ethanol reduction is required within the finished product. This study aimed to evaluate the effect of dealcoholisation by rotary evaporation under reduced pressure on the antioxidant, phenolic and chromatic characteristics of two experimental red wine blends, Rubra Nova and Armony.

The wines were processed by rotary evaporation at 60 °C and 100 rpm under automatically regulated vacuum, after which the initial volume was restored with distilled water. Antioxidant activity was determined using the DPPH assay, total phenolic content by the Folin–Ciocâlteu method, while colour parameters and visible absorption profiles were evaluated by UV–Vis spectrophotometry.

Dealcoholisation caused only minor decreases in DPPH inhibition, from 87.08% to 86.40% for Rubra Nova and from 83.77% to 83.04% for Armony. Total phenolic content slightly increased from 1723.40 to 1743.59 mg GAE/L and from 2373.78 to 2425.80 mg GAE/L, respectively. More pronounced changes were observed in colour intensity, which increased by approximately 24% and 19%, respectively, although the overall UV–Vis spectral profiles remained similar before and after treatment.

Therefore, rotary evaporation largely preserved the antioxidant and phenolic characteristics of the wines while producing moderate, wine-dependent chromatic changes. The results support its potential as a technological approach for producing dealcoholised wines with limited alteration of key quality parameters. Further studies should include organoleptic evaluation, together with energy consumption and environmental performance, to determine whether the dealcoholised product retains the characteristic sensory profile of wine and to assess the overall sustainability of the process at larger scale.

Acknowledgement: Funding for the equipment used in the study has been provided by The European Commission and The Romanian Government (project POSCCE 621/2014).

Keywords: Dealcoholised Wine, Rotary Evaporation, Antioxidant Activity, Total Phenolic Content, Chromatic Characteristics

STRUCTURAL AND PHYTOCHEMICAL TRAITS OF HELICHRYSUM IN RELATION TO ABIOTIC STRESS RESPONSES

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Abstract:

Helichrysum species are aromatic plants whose secretory structures and secondary metabolites contribute to ecological adaptation and biological activity. This study integrated two complementary approaches: structural and phytochemical characterization of Helichrysum italicum and evaluation of volatile organic compound emission patterns in Helichrysum plants exposed to abiotic stress. H. italicum specimens were examined macroscopically and by optical microscopy, gas exchange was measured across increasing photosynthetically active radiation, and volatile and phenolic constituents were investigated by GC–MS and HPLC-DAD. In a complementary experiment, plants grown from seeds under controlled conditions were exposed to temperature, drought and flooding treatments, and their volatile emissions were monitored. Microscopy revealed glandular trichomes with cells arranged in two tiers and two apical cells, multicellular ribbon-shaped trichomes, embedded stomata and differentiated palisade and spongy tissues. Net assimilation and stomatal conductance increased with irradiance, while intercellular CO_2 declined and extracellular CO_2 remained comparatively stable. GC–MS showed a complex volatile profile, with linalool and linalyl acetate among the most abundant compounds in the hydrolats. The stress experiment identified benzaldehyde, benzeneacetaldehyde, linalool, myrtenal and benzyl alcohol, while emission patterns varied according to the applied stress. HPLC-DAD detected chlorogenic, caffeic, chicoric and trans-ferulic acids together with naringenin, with differences among plant organs and extraction solvents. These findings connect diagnostic leaf anatomy with phytochemical diversity and environmentally responsive volatile emissions. The integrated approach supports a more complete characterization of Helichrysum and provides a basis for relating anatomical and chemical traits to plant responses under changing environmental conditions.

Acknowledgement: This work was supported by the Romanian National Authority for Scientific Research, CNCS–UEFISCDI, project PN-IV-P8-8.3-ROMD-2023-0022.

Keywords: Helichrysum italicum, Abiotic Stress, Trichomes, Volatile Organic Compounds, GC–MS, HPLC-DAD, Phenolic Compounds

INDOOR AIR QUALITY IN RESIDENTIAL, OFFICE AND RETAIL ENVIRONMENTS: POLLUTANT VARIABILITY AND FORMALDEHYDE EXPOSURE

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Abstract:

Indoor air quality is strongly influenced by building characteristics, ventilation, occupant activity, and the use or storage of consumer products. This study comparatively assessed indoor air pollutants in three contrasting microenvironments: a residential apartment, a general retail store, and an office. The investigated parameters included particulate matter (PM1, PM2.5, and PM10), formaldehyde (HCHO), total volatile organic compounds (TVOC), and, where available, carbon dioxide (CO_2). Portable indoor air quality analyzers were used for repeated monitoring, while formaldehyde-related exposure was further evaluated using chronic daily intake (CDI), hazard coefficient (HQ), and lifetime cancer risk (LCR) estimates. In the residential apartment, pollutant levels varied markedly among rooms and across the seven-day monitoring period. Formaldehyde-related LCR values calculated with the exposure model used in the study exceeded the 1×10^{-6} benchmark in several room-day combinations, with the highest value observed in the living room. In the retail environment, twelve-month monitoring revealed clear spatial and temporal variability, with the plastics and detergent areas showing comparatively elevated HCHO and TVOC levels; the highest modeled LCR occurred in the plastics area. In the office, HCHO increased during the working day from approximately 9 ± 5 to 27 ± 14 µg/m³, while PM2.5 averaged 13.9 ± 2.9 µg/m³ during working hours, and particulate matter showed higher levels during the cold season. Overall, the three environments exhibited distinct pollutant profiles, indicating that indoor exposure depends not only on pollutant concentration but also on source type, occupancy pattern, ventilation, and duration of exposure. The results support environment-specific monitoring and source-control strategies for reducing chronic indoor exposure.

Keywords: Indoor Air Quality, Formaldehyde, Particulate Matter, TVOC, Exposure Assessment, Health Risk

DIATOMS AS INDICATORS OF EARLY-STAGE ECOLOGICAL CHANGE IN THE MOHOȘ PEAT BOG, ROMANIA

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Abstract:

Mountain ombrotrophic peatlands are highly sensitive ecosystems, yet early ecological changes caused by several environmental factors are not always easily detectable at the level of visible vegetation. Therefore, we investigated benthic diatom communities as indicators of ecological status in the Mohoș Peat Bog, a Natura 2000-included, highly protected peatbog in the Eastern Carpathians, Romania.

During 2025–2026, we conducted an ecological survey, focusing on five pools within the bog, distributed along a potential disturbance gradient: one adjacent to the designated tourist trail, two near a channel surrounding the bog, and two in less accessible inner zones. Multiple periphyton samples were collected primarily from Sphagnum moss and prepared for diatom identification and quantitative assessment (% relative abundance). Field measurements included water temperature, pH, specific conductivity and ORP.

The diatom assemblages were species-poor (2–9 taxa per sample), reflecting the acidic and nutrient-poor conditions of the habitat. Communities were overwhelmingly composed of acidophilic and aerophilic Eunotia species, and dominated exclusively by Eunotia paludosa, accompanied by Kobayasiella parasubtilissima and Pinnularia subcapitata, indicators that confirmed the strongly acidic (pH 3–4), low-conductivity (<100 $\mu S \cdot cm^{-1}$), dystrophic conditions. However, clear differences emerged along the hypothesized disturbance gradient: Kobayasiella parasubtilissima, a very sensitive indicator of nutrient enrichment, was subdominant in the four less accessible pools but declined significantly near the tourist trail (as did the Eunotia paludosa). Conversely, Eunotia bilunaris, more tolerant to nutrient-enrichment, increased significantly and became co-dominant in all samples from the tourist-exposed pool.

Our results suggest that, beside other possible disturbances, tourism – however controlled and restricted it may be – may contribute to the onset of local eutrophication in acidic peat bogs. Diatoms, positioned at the base of aquatic food webs, can therefore provide a sensitive early-warning tool for detecting ecological deterioration in protected peatlands before changes become apparent in characteristic and conservation-priority vegetation.

Acknowledgement: This study is supported by the Research Programs Institute of the Sapientia Hungarian University of Transylvania.

Keywords: Conservation, Diatoms, Eutrophication, Mohoș, Peat Bog

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EVENT-BASED ASSESSMENT OF RAINFALL–WATER DEPTH–TURBIDITY DYNAMICS AT THE OUTLET OF AN AGRICULTURAL DRAINAGE CATCHMENT IN THE CUKUROVA REGION, TÜRKIYE

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Abstract:

Understanding how rainfall events translate into short-term changes in drainage-channel water depth and turbidity is important for interpreting hydraulic and turbidity responses in agricultural drainage systems. This event-based observational field study investigated rainfall-water depth-turbidity relationships in an approximately 9,495-ha agricultural drainage subcatchment located within the command area of the YS2 main irrigation canal in the Yuregir Plain, which forms part of the Lower Seyhan Plain in the Cukurova Region, Türkiye. The area, formerly known as the Akarsu Irrigation District, is currently managed within the Lower Seyhan Plain Left Bank Irrigation Association, with the L4 gauging station serving as its main drainage outlet. Water depths at L4 were recorded hourly using a limnigraph, while turbidity was monitored at 15-min intervals using an Aqua TROLL 800 multiparameter sonde. Hourly rainfall data were obtained from the L8 Meteorological Station, which is located within the study subcatchment. To identify independent rainfall events, we compared minimum inter-event times (MIETs) of 3, 6, 12, and 24 hours. Based on the observed drainage response at L4, the 12-hour MIET and a minimum event rainfall depth of 1.0 mm were selected. This yielded 44 independent events. Event rainfall depth was significantly and positively correlated with the event-induced increase in water depth (Δh; Spearman's $\rho = 0.586$) and turbidity increase (ΔTurb; $\rho = 0.540$). Maximum hourly rainfall intensity showed stronger positive correlations with both Δh ($\rho = 0.652$) and ΔTurb ($\rho = 0.572$) ($p < 0.001$), indicating a closer association of rainfall intensity with short-term water-depth and turbidity responses than total event rainfall depth alone. We evaluated water depth-turbidity hysteresis for 36 of the 44 events; 17 were classified as clockwise (CW) and 19 as counterclockwise (CCW). Antecedent 24-h rainfall (P24) did not differ significantly between CW and CCW events ($p = 0.179$), whereas antecedent 72-h rainfall (P72) was significantly higher for CW events ($p = 0.022$). Rainfall occurred during the preceding 72-h in 76.5% of CW events and 36.8% of CCW events ($p = 0.023$). These findings indicate that both event rainfall depth and maximum hourly rainfall intensity are significantly associated with water-depth and turbidity responses at the L4 drainage outlet. The stronger correlations observed for maximum hourly rainfall intensity underscore the relevance of rainfall intensity when interpreting short-term drainage responses. More importantly, the association between antecedent 72-h rainfall and hysteresis direction suggests that pre-event rainfall conditions may help explain differences in the timing and coupling of hydraulic and turbidity responses. Overall, the study demonstrates the value of event-based, high-frequency field monitoring for interpreting rainfall-driven water-depth and turbidity dynamics in agricultural drainage subcatchments.

Acknowledgement: Path4Med "Demonstrating Innovative Pathways Addressing Water and Soil Pollution in the Mediterranean Agro-Hydro-System".

Keywords: Agricultural Drainage Subcatchment, Turbidity, Water Depth, Rainfall Event, Hysteresis, Antecedent Rainfall

PRELIMINARY FINDINGS ON MICROPLASTIC SPECIES ACROSS URBAN AIRBORNE PARTICLE FRACTIONS IN ISTANBUL

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Abstract:

Intensive anthropogenic activities in urban environments turn the atmosphere into an important vector for microplastic transport, making these particles a potential exposure source for urban populations. Although studies on atmospheric microplastics have increased considerably, their size-resolved distribution and transport dynamics remain insufficiently characterized. In this study, atmospheric particles were collected at the Istanbul Technical University campus using a high-volume six-stage cascade impactor across six size fractions. The size distribution and polymer composition of the collected particles were characterized using μ-Raman spectroscopy, while their regional transport pathways and potential source regions were evaluated through HYSPLIT back-trajectory analysis. As a preliminary outcome, results from the first sampling day conducted on 7 November 2025 are presented. Particle mass was dominated by the coarse and mid-sized fractions, while the contribution of the ultrafine fraction remained comparatively limited. Micro-Raman analysis revealed carbonaceous, soot-like signals across all size fractions, suggesting a substantial contribution from traffic-related and combustion sources. The identified microplastics comprised polypropylene, polyethylene, polyethylene terephthalate, polyamide, and polystyrene. The corresponding HYSPLIT back-trajectories indicated a predominantly regional/local origin of the air masses reaching the sampling site on that day. These preliminary findings highlight the presence of atmospheric microplastics in an urban campus setting and underscore their relevance as a potential exposure pathway for urban populations.

Acknowledgement: This work has been supported by Yildiz Technical University Scientific Research Projects Coordination Unit (FKD-2025-7174).

Keywords: Atmospheric Microplastics, Cascade Impactor, Size-Fractionated Distribution, Micro-Raman Spectroscopy, HYSPLIT

PFAS ANALYSIS IN FRESHWATER SYSTEMS: APPLICATION OF EPA METHOD 1633A TO LAKES DURUSU AND EĞIRDIR

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Abstract:

Per- and polyfluoroalkyl substances (PFAS) are among the anthropogenic contaminants that have gained increasing attention in recent years due to their high environmental persistence, mobility, and widespread occurrence in aquatic environments. The presence of PFAS in environmental waters, often at low ng/L levels, necessitates the use of highly sensitive and selective analytical methods for their reliable determination. In this study, the application of an isotope dilution LC-MS/MS approach based on EPA Method 1633A for the determination of PFAS in surface water samples was evaluated, and the method was applied to samples collected during the summer season from Lakes Durusu and Eğirdir and their associated water systems. During sample preparation, isotopically labeled internal standards were used, PFAS compounds were extracted using weak anion exchange (WAX) solid-phase extraction (SPE), and the resulting extracts were analyzed by LC-MS/MS. Five target PFAS compounds—perfluorooctanoic acid (PFOA), perfluorooctanesulfonic acid (PFOS), perfluorobutanesulfonic acid (PFBS), perfluorohexanesulfonic acid (PFHxS), and hexafluoropropylene oxide dimer acid (HFPO-DA)—were quantitatively evaluated.

The summer results showed that PFOA was the predominant compound detected at all sampling sites in both lake systems. In Lake Durusu and its associated water systems, PFOA concentrations ranged from 0.2 to 1.7 ng/L, with a mean concentration of 1.12 ng/L. In Lake Eğirdir and its associated water systems, PFOA concentrations ranged from 0.1 to 0.9 ng/L, with a mean concentration of 0.47 ng/L. PFOS was detected only at three sampling sites in Lake Durusu, whereas it remained below the detection limit in Lake Eğirdir samples. PFBS, PFHxS, and HFPO-DA were below the detection limits in samples from both study areas. The results demonstrate the applicability of the EPA Method 1633A-based isotope dilution LC-MS/MS approach for the determination of target PFAS at low ng/L levels in environmental waters, while the widespread occurrence of PFOA in both lake systems highlights the importance of systematically monitoring the spatial and seasonal variations of these contaminants.

Acknowledgement: This study was supported by the Scientific and Technological Research Council of Türkiye (TÜBİTAK).

Keywords: PFAS, EPA Method 1633A, LC-MS/MS, PFOA, Surface Water

SEA CUCUMBER FARMING AND SASI TRADITION: SYNERGY BETWEEN CORPORATE SOCIAL RESPONSIBILITY AND LOCAL WISDOM IN SUPPORTING THE CONSERVATION OF NATURAL RESOURCES BY THE AMBEL INDIGENOUS COMMUNITY IN RAJA AMPAT

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Abstract:

Sasi represents a form of local wisdom among the people of Raja Ampat for regulating the use of marine resources by managing access to benefits within specific areas or timeframes. However, ensuring the sustainability of its implementation requires overcoming various challenges, thus requiring an approach that supports both conservation and the community's utilization of natural resources. This study aims to analyze the implementation of the Corporate Social Responsibility (CSR) program by PT Pertamina Patra Niaga Refinery Unit (RU) Kasim through the development of sea cucumber aquaculture cages in Waifoi Village, Raja Ampat, and its contribution to the sustainability of community-based natural resource management. The study employed a case study design, with data collected through participatory observation, in-depth interviews, and focus group discussions (FGD). Informants were selected through purposive sampling, taking into account the knowledge and involvement of KTH Waifoi members in the program's implementation. Data were analyzed descriptively to determine the program's relevance to the sasi tradition. The results indicate that the sea cucumber aquaculture CSR program aligns with the values of the sasi tradition and supports natural resource management and conservation efforts, particularly regarding sea cucumbers in Waifoi Village.

Keywords: Sasi, Corporate Social Responsibility (CSR), Sea Cucumber Farming, Natural Resource Conservation, Sustainability

ENVIRONMENTAL POLLUTANTS AND INFLAMMATORY BOWEL DISEASE: A SHORT REVIEW OF THE EXPOSOME EVIDENCE

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Abstract:

Inflammatory bowel disease, comprising Crohn's disease and ulcerative colitis, is a chronic immune-mediated disorder whose incidence has risen in newly industrialised regions in parallel with urbanisation. Because genetic susceptibility cannot explain such rapid changes, environmental exposures are increasingly investigated. This short review aims to summarise current evidence linking environmental pollutants to IBD and to identify research priorities for environmental science. A narrative review of peer-reviewed literature identified through PubMed and Crossref searches up to September 2026 was conducted, focusing on epidemiological and experimental studies of ambient air pollution, micro- and nanoplastics, per- and polyfluoroalkyl substances, titanium dioxide nanoparticles and waterborne exposures. Long-term exposure to nitrogen dioxide and nitrogen oxides has been associated with a modestly increased IBD risk, whereas associations with particulate matter are inconsistent. Patients with IBD excrete more faecal microplastics than healthy individuals, and in animal models microplastics disrupt the intestinal barrier and gut microbiota and aggravate colitis. Evidence for PFAS is mixed: an exposure-response association with ulcerative colitis was reported in one highly exposed community but was not confirmed in another. Titanium dioxide nanoparticles exacerbate experimental colitis, and catchment-level pasture exposure has been linked to Crohn's disease, consistent with waterborne transmission of Mycobacterium avium subspecies paratuberculosis. Overall, the evidence is biologically plausible but largely observational or experimental, and causality has not been established. Integrating exposure science, environmental monitoring and population-based IBD data within an exposome framework is needed to clarify these associations and to inform preventive environmental policy.

Keywords: Air Pollution, Exposome, Inflammatory Bowel Disease, Microplastics, Per- and Polyfluoroalkyl Substances

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