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Plenary presentations

Views on the Concept of Progress in Biological Evolution

DUMITRU MURARIU

Secretary General of the Romanian Academy and Senior Researcher

When considering concepts regarding the evolution of the living world as a whole—from the hypothetical self-replicating primordial substance to plants, animals, and humans—one cannot avoid acknowledging that progress, advancement, ascent, or ennoblement has occurred. Evolutionary development and progress are so evident in the animal kingdom that these traits deeply impressed biologists long before the great fact of evolution, which gave rise to them, was fully understood. Viewed over a span of billions of years, evolution has undoubtedly produced results that merit the term "progress"—or, for those "allergic" to this word, any other term signifying essentially the same thing. According to some authors, death and extinction are the antitheses of biological progress. Moreover, in many evolutionary lineages, one encounters what can only be termed regression. This phenomenon is particularly striking in certain endoparasites. The nervous system, sense organs, digestive tracts, and musculature become vestigial or may disappear entirely. What remains is little more than a sac containing the reproductive organs. Even biochemical mechanisms may become simplified, with the parasite depending on the host for specific metabolic products that its (non-parasitic) ancestors were undoubtedly capable of synthesizing themselves. However, progress is also found in certain specific evolutionary lineages. Evolution is not invariably accompanied by progress, nor does it appear to be characterized by progress as an essential trait. Progress has emerged within the course of evolution, but it does not constitute its essence. The emergence of humans from their non-human ancestors is a clear example of progress within a specific evolutionary lineage. To those who might criticize this statement as anthropocentric, the only response is that such a degree of anthropocentrism is dictated by common sense. Viewed in retrospect, evolution as a whole has undoubtedly followed a general direction: from the simple to the complex, from environmental dependence to relative independence, toward increasing individual autonomy, the heightened development of sense organs and nervous systems capable of

transmitting and processing information about the organism's surroundings, and, ultimately, toward an increasingly evolved consciousness. This direction may be termed "progress" or given any other name. It must be clearly stated, however, that the fact that evolution exhibits a direction or trend does not imply it is guided by an external force or was pre-programmed. The concept of progress comprises two elements: one is descriptive—the fact that a directional change has occurred; the other is axiological—the fact that the change represents an improvement or qualitative advancement. Different criteria for defining progress may be preferable in different contexts.

3D-Printed Molecular Models and Student Learning: Three Years of Evidence, and an Invitation to Expand Across Disciplines

MARIUS MIHĂȘAN

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Opportunities and Challenges of Molecular Techniques For Microbiota Analysis

ANDREI LOBIUC

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Diversity and Synergies in Vegetable Research

CREOLA BREZEANU

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Diversity represents a strategic resource across the entire agri-food chain, spanning from genetic resources explored in breeding programs, to cropping systems and consumers. Starting from the role of the Vegetable Research and Development Station (VRDS) Bacău within the agricultural research field, this presentation illustrates how diverse national and European funding schemes and programs are integrated with complementary partnerships. The resulting outputs - comprising new cultivars, cultivation technologies, and scientific knowledge - reach the users through dedicated knowledge-transfer pathways. Ultimately, this synergy among genetic resources, collaborative networks, and funding mechanisms paves the way toward resilient and sustainable agricultural systems.

BIODIVERSITY OF AQUATIC ORGANISMS

Effects of Temperature and Photoperiod on Prolificity, Hatching Success and Survival in Laboratory Cultures of Acartia (Acartiura) clausii Giesbrecht, 1892

GEORGE EMANUEL HARCOTA

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Acartia (Acartiura) clausii is an important component of marine zooplankton, yet information on how temperature and photoperiod affect its life-history traits remains limited for Black Sea populations. This study examined the effects of six temperatures (14, 18, 20, 22, 26, and 30 °C) and three photoperiods (16L:8D, 12L:12D, and 24L:0D) on female survival, prolificity, egg hatching, development, and survival to adulthood under controlled laboratory conditions. Temperature significantly affected all measured traits, although responses differed among life stages. Prolificity was highest at 26 °C, while total hatching success peaked at 22 °C (92–98%), with an estimated optimum near 21.7 °C. Increasing temperature accelerated development but was accompanied by a marked decline in survival to the adult stage at 26 °C (0–2%) and 30 °C (0–11%). Photoperiod mainly affected reproductive output and early hatching. Continuous illumination (24L:0D) produced the highest prolificity (141–255 eggs female^{-1} 24 h^{-1}) and increased hatching during the first 24 h, whereas later hatching and survival did not differ significantly among photoperiods. Overall, conditions favoring reproduction, hatching, and rapid development did not coincide with those supporting high survival, demonstrating stage-specific responses of A. clausii to environmental conditions.

Keywords: Acartia clausii; Black Sea; temperature; development; photoperiod; egg production; hatching success; naupliar survival

Anthropogenic Vibrations and Acoustic Communication in Bombina bombina: an Experimental Field Assessment

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Acoustic communication is essential for reproductive behaviour in anuran amphibians, yet human-induced changes in the physical environment may influence their vocal activity. While the effects of airborne noise have received considerable attention, the potential impact of substrate-borne vibrations on acoustic communication remains poorly understood. This study investigated the acoustic responses of male Bombina bombina to vibrations associated with road traffic and wind turbines, compared with rainfall-induced vibrations and a silent control treatment. Field experiments were conducted at Grindul Chituc, within the Danube Delta Biosphere Reserve, Romania, during the 2023 and 2024 breeding seasons. Seven calling males were individually exposed to ten experimental treatments,

each lasting two minutes and presented in randomized order. Three advertisement call parameters were examined: call rate, call duration, and dominant frequency. Acoustic recordings obtained before, during, and after each exposure were compared to assess potential changes in vocal behaviour. The analyses revealed variation in acoustic parameters among individuals and experimental phases, without demonstrating an overall significant effect of stimulus type on call rate. Changes in dominant frequency observed during exposure to anthropogenic vibrations suggest potential adjustments in acoustic signalling, although their interpretation requires consideration of individual variability. These findings contribute to understanding how amphibians respond to vibrational disturbances in their habitats and highlight the importance of considering substrate-borne vibrations when assessing the potential ecological effects of human activities on aquatic and semi-aquatic species.

Keywords: Bombina bombina, bioacoustics, anthropogenic vibrations, acoustic communication, environmental disturbance, Danube Delta

Assessing the Effects of Diphenhydramine on Lemna minor Utilizing an Ecotoxicological Method

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Diphenhydramine is an antihistamine primarily used in treating allergic reactions, such as allergic rhinitis, and urticaria. Originating from municipal and industrial effluents, Diphenhydramine has been detected in aquatic systems, largely in water, sediments, and fish tissue. Studies that examine the toxic effects of this drug show adverse effects on some crustaceans and algae, such as Daphnia magna and Raphidocelis subcapitata (formerly Pseudokirchneriella). To further examine the effects this medication has on aquatic lifeforms, and in turn, food availability and ecosystem health, more experiments are needed. This investigation further proposes to examine the ecotoxicological effects of diphenhydramine, using the macrophyte L. minor, a known bioindicator, as a test organism. The methodology will follow the OECD 221 standard; the preliminary procedure will involve exposing L. minor to a range of diphenhydramine concentrations under controlled laboratory conditions, using negative and positive controls. Through regular observation of the macrophyte over the 7-day exposure, changes in frond number and average specific growth rate will be logged, in order to assess the toxicological effects. The obtained data will be used to construct concentration-response curves and determine EC50 and ErC50 values, allowing quantitative characterization of diphenhydramine-induced growth inhibition. To identify sublethal effects, morphological and physiological or biochemical responses may also be investigated to provide a broader characterization of plant stress. The proposed method will provide a reproducible and sensitive approach for evaluating the ecotoxicological effects of this pharmaceutical contaminant on freshwater macrophytes and supporting preliminary environmental risk assessment.

Keywords: Diphenhydramine, ecotoxicological tests, bioindicator, aquatic environment

Ecotoxicological Predictions Regarding First and Second Generation Anticoagulant Rodenticides

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The study aimed to comparative evaluate, by computational methods, the pharmacokinetic properties and ecotoxicological potential of some first-generation anticoagulant rodenticides (warfarin, coumatetralyl and chlorophacinone) and second-generation (brodifacoum, difenacoum and bromadiolone). To make the predictions, the PubChem, SwissADME and ADMETlab 3.0 platforms were used, through which we obtained structural information and predictions regarding the physicochemical, pharmacokinetic and ecotoxicological properties of the studied compounds. The results of the pharmacokinetic predictions highlighted differences between the two categories of compounds, especially in terms of gastrointestinal absorption. For the second-generation anticoagulant rodenticides, a reduced absorption was estimated, while the first-generation anticoagulant rodenticides showed a high absorption. The analysis of drug-likeness rules indicated a more favorable profile for the first-generation compounds, which complied with all five evaluated rules. In contrast, the second-generation compounds showed violations of several criteria, especially those associated with molecular weight and lipophilicity. Regarding the ecotoxicological predictions, brodifacoum and difenacoum presented similar BCF values, while bromadiolone recorded a lower value. For the first-generation rodenticides, chlorophacinone presented the highest BCF value in the analyzed group. The IGC50, LC50DM and LC50FM indicators also highlighted differences between the studied compounds, emphasizing the need for individual evaluation of the ecotoxicological profile of each substance. In conclusion, the results of the study highlight the usefulness of computational methods in the preliminary identification of potential ecotoxicological risks of anticoagulant rodenticides and the need for experimental validation of the obtained predictions.

Keywords: in silico predictions, anticoagulant rodenticides, pharmacokinetics

Protected Fish Species of Romania's Inland Aquatic Ecosystems: Ecological Requirements, Threats and Conservation Measures

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Romania's inland aquatic ecosystems are largely organised around the Danube basin and support a diverse fish fauna. It includes rheophilic, migratory, endemic and relict species of high conservation value. This paper presents an integrated analysis of Romania's protected fish species. The species are examined in relation to the typology of lotic and lentic ecosystems, to the ecological factors that shape their distribution (temperature, dissolved oxygen, hydrological regime, substrate, connectivity) and to the European and national legal framework (Habitats Directive, Water Framework Directive, Government Emergency Ordinance 57/2007, the Natura 2000 network). Species of Community interest are grouped by ecological requirements and habitat type: rheophilic species, anadromous sturgeons, endemic and relict species, benthic species and Danubian percids, and species of slow waters and wetlands. Distribution maps for the species are given in the annexes. The main threats identified act cumulatively: river fragmentation by dams, weirs and small hydropower plants, gravel and sand extraction, pollution and eutrophication, invasive species, poaching and climate change. Case studies on the Romanian darter (Romanichthys valsanicola) in the Vâlsan River and on sturgeons in the Lower Danube show that passive protection, through listing in legal annexes or designation of protected areas, is not enough. Effective conservation requires restoring longitudinal and lateral connectivity, ensuring ecological flows, protecting spawning substrates, combating poaching and monitoring populations. Restocking and ex situ conservation should be used only alongside habitat restoration, never as substitutes for it. The paper concludes that protecting fish fauna means protecting the whole aquatic system and the ecological processes that sustain it.

Keywords: protected fish fauna, inland aquatic ecosystems, connectivity, Natura 2000, Romanichthys valsanicola, sturgeons, conservation

Biodiversity of terrestrial organisms

Integrated Behavioral and Biochemical Responses of Lasius niger from a Historically Metal-Contaminated Terrestrial Ecosystem

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Historical metal contamination may induce biological responses that extend from cellular stress mechanisms to changes in animal behaviour. This study evaluated whether behavioural and biochemical endpoints in the ant Lasius niger could provide complementary information on ecological stress within the historically contaminated Copșa Mică–Țapu area, Romania. Workers were collected from colonies located within the contaminated landscape and from a local reference area. Biochemical assessment included superoxide dismutase (SOD), catalase (CAT), glutathione peroxidase (GPx), reduced glutathione (GSH), malondialdehyde (MDA), protein carbonyls (PC), and acetylcholinesterase (AChE). Behaviour was evaluated in 24 standardized 60-s dyadic encounters performed in experimental arenas, comprising six assays for each interaction configuration: workers from the same focal colony (FN–FN), focal versus neighbouring colonies (FN–NN), focal versus distant colonies (FN–DN), and focal versus reference-area colonies (FN–XN). Agonistic interactions, escalation dynamics, specific behavioural acts, and locomotor activity were quantified from video recordings. Aggression duration differed according to colony pairing, averaging 7.07 s in FN–FN, 11.78 s in FN–NN, 10.95 s in FN–DN, and 8.05 s in FN–XN encounters. Interactions between focal and neighbouring or distant colonies showed greater aggression duration than within-colony encounters, whereas encounters with reference-area workers were characterized by delayed escalation. Individual agonistic acts were more variable and did not show consistent differences among configurations. Locomotor tracking provided an additional quantitative measure of behavioural activity. Biochemically, ants originating from the contaminated landscape generally showed increased antioxidant responses, oxidative-damage markers, and AChE activity relative to reference workers. AChE was positively associated with aggression duration, and this relationship remained significant after

adjustment for colony category and false-discovery rate. The combined behavioural and biochemical responses indicate that L. niger can reflect ecological stress at multiple levels of biological organization. Integrating standardized behavioural assays with oxidative and neuroenzymatic biomarkers may therefore strengthen the use of ants as bioindicators in historically contaminated terrestrial ecosystems.

Keywords: Lasius niger; bioindicator; metal contamination; agonistic behaviour; locomotor activity; oxidative stress; acetylcholinesterase; terrestrial ecotoxicology

The Chorological Study of the Orchidaceae Family in the Iron Gates Natural Park

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The Orchidaceae family includes taxa of particular ecological importance, often used as indicators of the conservation status of ecosystems due to their high sensitivity to environmental variations. The Iron Gates Natural Park is home to a notable diversity of orchid taxa, favored by the geomorphological mosaic and the temperate climate with sub-Mediterranean influences. Although the area is of particular floristic interest, published data on the local distribution of orchids date mainly from earlier periods, necessitating a field reassessment. The chorological reassessment was conducted over a two-year period during the flowering season, during which the population abundance and ecological parameters of the identified species were mapped using GPS coordinates and evaluated based on sampling plots. Field research led to the identification of 17 taxa, distributed across multiple locations in all sectors of the park, confirming both historical sites and new locations. The ecological and distribution spectra reveal a structure dominated by mesophytic and xeromesophytic taxa, classified predominantly as sporadic or rare, with a significant proportion of European and Mediterranean influences characteristic of the gorge. The concentration of endangered and rare taxa highlights the park's role as a refuge for orchid diversity—particularly in the central sector—in the face of increasing anthropogenic pressures, especially from tourism. The resulting distribution maps provide a valuable scientific basis for developing long-term conservation and monitoring strategies within this protected area.

Keywords: floristic mapping, wild orchids, the Danube Gorge, endangered species, in-situ conservation

Landscape Composition, Habitat And Land-Use Type Shape Taxonomic and Functional Diversity of Butterflies in a Peri-Urban Agricultural Landscape from Transylvania

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Traditional agricultural landscapes in Transylvania are characterized by a mosaic of semi-natural grasslands and cultivated fields, where extensive management practices have historically contributed to the persistence of diverse butterfly communities. However, recent socio-economic transformations, driving agricultural intensification, urbanisation and land abandonment, are reshaping these landscapes and affecting butterfly communities. This study investigates taxonomic and functional diversity of diurnal butterfly communities across grassland and cropland habitats characterized by different land-use practices. We further assess the relative contributions of local habitat characteristics and surrounding landscape composition and examine temporal changes in butterfly communities in relation to short-term land-use changes. Butterfly communities were surveyed in 2023 and 2025 in a peri-urban agricultural landscape near Zalău, Sălaj County. Sampling was conducted along nine linear transects representing five habitat and land-use (HLU) type categories: unmanaged, grazed and mown grasslands, alfalfa fields and cereal fields. We used linear models to assess the effect of local HLU type, landscape composition, and year on butterfly diversity and functional group responses. Our results indicate that mown grasslands had the highest beneficial effect on butterfly taxonomic and functional diversity, while crop fields harboured less diverse communities. Landscape heterogeneity had a strong negative effect on species richness and several functional groups. Contrary to our expectations, annual variation had no significant effect on butterfly communities. Our findings emphasize the conservation value of extensively managed grasslands maintained through traditional mowing practices, as well as the importance of preserving large, relatively homogenous areas of semi-natural habitats within agricultural landscapes.

Keywords: butterfly communities, land-use type, agricultural landscape, functional diversity

Direct and Indirect Effects of Weather on Small Mammals in Mountain Forests: Inferences on the Role of Masting

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Although weather is one of the main factors that shape the dynamics of small mammals, its effect on the fluctuations in their abundance was little studied, especially in temperate mountains. We evaluated the effect of past and present weather on small mammals, at population and community levels, using trapping data collected between 2000-2008 in the Southern Carpathian Mountains (Romania). We used the interpolated seasonal rainfall and mean temperature in the trapping year and the three years before. We assumed that meteorological conditions in the year of survey have a direct and an indirect effect on rodent abundance, whereas the past weather has an indirect effect, mediated through tree masting. We hypothesized that: 1. Species and community abundance respond to both present and past meteorological conditions. 2. Responses to past weather are strongest in the seed specialist Apodemus flavicollis (yellow-necked mouse), weaker in the more herbivorous Clethrionomys glareolus (bank vole) and weakest in the insectivorous Sorex araneus (common shrew). 3. In low-density years, small mammal abundance is affected more by current than by past weather and vice-versa in high-density years, and this pattern is stronger in A. flavicollis. 4. Responses to past weather are stronger in beech- compared to spruce- dominated forests. Our results confirmed the first three hypotheses. However, contrary to our expectations, the response of A. flavicollis was significant only in spruce forests. Overall, A. flavicollis had a positive response to temperature and negative to precipitations, and these responses would favor yellow-necked mouse abundance in the climate change context.

Keywords: bank vole, climate change impacts, past and present weather, seasonal temperature and rainfall, yellow-necked mouse

From Specimens to Science: The Digital Transformation of Natural History Collections

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Natural science collections hold irreplaceable evidence that a species occurred in a given place at a given time, yet much of this evidence remains inaccessible, locked away in museum drawers and recorded only on handwritten labels. We show that digitization is a curatorial process rather than a data-entry task, using four legacy entomological collections held by the Zoological Museum of Babeș-Bolyai University (Cluj-Napoca, Romania). Together they comprise eight taxonomic sub-collections and 39,017 specimens collected between 1921 and 2018, spanning Carabidae, Lepidoptera, Plecoptera, Neuroptera, Orthoptera and Odonata. The workflow combined preservation of the material and systematic reorganization, transcription of original labels, assignment of unique catalogue numbers, taxonomic verification and nomenclatural updating, georeferencing of localities, and structuring of records in a database intended for publication through open infrastructures such as GBIF. The resulting data document the spatial and temporal distribution of collecting effort, the ecological and zoogeographical structure of the fauna, and occurrences of species of conservation concern, including Natura 2000 species, Romanian Red List Lepidoptera and Carpathian endemic ground beetles. The collections also hold type material of 27 taxa described by the collectors themselves. Finally, they provide a baseline for measuring environmental change, as shown by collecting sites since altered by infrastructure development and urban expansion. We conclude that digitization is an act of preservation, quality control and data mobilization. Legacy collections remain scientifically current, but only once their data are verified, georeferenced and openly published. Because both the collections and the expertise needed to interpret them are being lost, their digitization should be treated as a priority.

Keywords: natural history collections; digitization; entomological collections; biodiversity data mobilization; georeferencing; GBIF; conservation baseline; Romania

Distribution and Mitochondrial COI Diversity of the Protected Bush-Cricket Pholidoptera Transsylvanica in Ceahlău National Park

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Pholidoptera transsylvanica is a Carpathian bush-cricket listed in Annexes II and IV of the Habitats Directive, but it is not yet included in the Natura 2000 standard data form of ROSCI0024 Ceahlău. To support its listing, we compiled distribution data for Ceahlău National Park from the literature, national monitoring databases and field surveys (2022, 2024), and assessed the genetic diversity of one population using the mitochondrial COI marker. The species was recorded at 11 localities between 900 and 1,900 m a.s.l., mainly in mesophilous and hygro-mesophilous grasslands and forest edges, without significant anthropogenic pressures. Tarsal tissue was sampled non-lethally from 21 individuals at one locality, and a COI fragment was amplified and Sanger-sequenced. The 20 sequences obtained (836 bp) revealed three haplotypes, low haplotype and nucleotide diversity (Hd = 0.195; π = 0.00036) and a star-like network dominated by one central haplotype shared by 18 individuals. Negative neutrality indices (Tajima's D = −1.72; Fu's Fs = −1.14) suggest a recent population expansion. Maximum-likelihood analysis confirmed the monophyly of P. transsylvanica and its close relationship with P. brevipes, and separated the Ceahlău population from sequences from the Apuseni Mountains and Russia. These data support the inclusion of P. transsylvanica in the standard data form of ROSCI0024 Ceahlău.

Keywords: Orthoptera; Tettigoniidae; Natura 2000; haplotype diversity; Eastern Carpathians

COI Diversity and Demographic History of Two Syntopic Calopteryx Species (Odonata) in North-Eastern Romania

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Calopteryx splendens and C. virgo are riverine damselflies that depend on shaded, well-vegetated banks, making them useful riparian bioindicators. We assessed the genetic diversity of both species along the Moldova River (Suceava County) using the mitochondrial COI marker. Adults were netted in July–August 2025 at three sites where the two species occurred syntopically. A 564 bp COI fragment was sequenced from nine specimens (six C. splendens, three C. virgo) and analysed with GenBank sequences (165 in total) in DnaSP, MEGA X and haplotype networks. C. virgo showed higher genetic diversity (Hd = 0.725; π = 0.0067) than C. splendens (Hd = 0.660; π = 0.0027). A unimodal mismatch distribution and negative Fu's Fs (−7.34) suggested recent expansion in C. splendens, whereas the multimodal distribution in C. virgo indicated long-term stability or deep spatial structure. C. virgo formed a distinct monophyletic clade, while C. splendens clustered with C. xanthosoma, consistent with incomplete lineage sorting or introgression. Most Romanian sequences shared the dominant European haplotypes; private haplotypes in both species and a divergent C. splendens haplotype from Cotul Băii indicate local differentiation. These data provide a COI reference for Calopteryx in north-eastern Romania.

Keywords: Odonata; damselflies; DNA barcoding; haplotype diversity; riparian habitats

Biotehnologies for enviromental protection and resources' valorization

Valorization of Goldenberry Calyx in Sustainable Food Packaging: A Circular Economy Perspective

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The growing demand for sustainable food packaging has increased interest in renewable raw materials and the valorization of agricultural by-products. Goldenberry (Physalis peruviana) calyx represents a lignocellulosic resource with potential applications in biodegradable packaging systems. From a circular economy perspective, its incorporation into starch-based materials offers an opportunity to transform agricultural residues into value-added components. Cassava starch is a promising biodegradable matrix due to its film-forming properties, while goldenberry calyx fibers may contribute to improving the structural characteristics of the resulting composites. The suitability of these materials for food packaging depends on several factors, including fiber concentration, compatibility with the starch matrix, plasticizer selection, and processing conditions. Attention should be given to achieving an appropriate balance between mechanical performance, flexibility, and moisture resistance. Furthermore, the presence of bioactive compounds in goldenberry calyx suggests potential applications in active food packaging. Their antioxidant and antimicrobial properties could be investigated in relation to food preservation and packaging functionality. The integration of goldenberry calyx into biodegradable starch-based packaging systems illustrates a promising approach to agricultural by-product valorization, resource efficiency, and the development of environmentally responsible alternatives to conventional plastic packaging.

Keywords: Physalis peruviana; agricultural by-products; biodegradable packaging; cassava starch; circular economy; sustainable materials

Impact of Non-Thermal Atmospheric Plasma on In Vitro Rhizogenesis and Stomatal Micromorphology in Solanum tuberosum L.

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It is well known that the large-scale use of chemical pesticides and fertilizers in order to improve plant cultures productivity has a negative impact on both ecosystems and plant-based food consumer health. Thus, finding alternative solutions to improve plant growth and development has gained increasing interest among researchers in the last few decades. In vitro tissue culture is a non-conventional plant growth method which allows plant micropropagation starting from a single plant segment, named explant, in aseptic conditions. Non-thermal plasma has been shown to have an eliciting effect on plant defence mechanisms at a molecular level, due to the high content of reactive oxygen and nitrogen species (RONS). Solanum tuberosum (potato) is a major staple crop propagated primarily by vegetative means. This study evaluates the impact of plasma-treated water (PTW) on the in vitro morphogenesis of two local potato cultivars originating from traditional crops in Suceava County. Apical explants were regenerated on Murashige & Skoog nutrient medium, supplemented with PTW, and it has been shown that indirect plasma treatment tends to inhibit root development. Conversely, scanning electron microscopy (SEM) of the foliar epidermis demonstrated a positive effect on both stomatal density and surface. Therefore, this study provides an interdisciplinary perspective by integrating non-thermal plasma technology, plant tissue culture, and morpho-anatomical characterization.

Keywords: Solanum tuberosum, non-thermal plasma, morphogenesis, in vitro propagation, scanning electron microscopy

Status of Side Stream Valorization for Protein Ingredient Production in Romania

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This study examined how side streams in Romania are used to produce protein ingredients and biomass for animal feed. The analysis drew on published studies, technical documentation, and commercial listings to assess the resulting products, their uses, and their stages of development. In a study of samples collected in Cluj County, flours made from oilseed press cakes contained approximately 22% to 38% protein. Flours from flaxseed, hempseed, and pumpkin seed press cakes are marketed for food use. Sunflower meal is sold as a feed ingredient, and a protein-rich flour has been produced from this coproduct by laboratory-scale extraction. A pilot project in Iași reused wastewater from recirculating aquaculture systems to cultivate spirulina and the microalga Chlorella vulgaris, producing protein-rich biomass for potential use in fish feed. In Mizil, a facility acquired by the German manufacturer Leiber processes spent brewer's yeast on an industrial scale to produce dried biomass that supplies microbial protein for animal feed. For flours already on the market, data on batch-to-batch variation in composition and performance in food formulations would help identify suitable applications. For protein fractions obtained in the laboratory, validating recovery yields at pilot scale and estimating raw material availability would help assess the potential for scaling up production.

Keywords: alternative proteins, agri-food coproducts, biomass for animal feed, circular economy

Household Vegetable Waste Hydrolysates - An Accessible Source of Biostimulants? A Study on Allium cepa

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Reusing organic waste to obtain plant biostimulants is a promising direction for sustainable agriculture, in line with the principles of the circular economy. This study evaluated the effect of hydrolysates obtained from household vegetable waste on the growth and foliar pigment content of onion (Allium cepa). Five plant hydrolysates were prepared: from the protective root tissues of beetroot (Beta vulgaris), carrot (Daucus carota) and celeriac (Apium graveolens var. rapaceum), from the epicarp of cucumber (Cucumis sativus), and from a mixture of these. Sixty bulbs were first rooted in water for 4 days. They were then divided into six groups of 10 bulbs each and kept for 120 hours in the hydrolysates or, for the control group, in water. Biomass gain was measured. Leaf chlorophyll and anthocyanin content were assessed using non-invasive portable optical analysers. The data were processed statistically with PAST 4.03. Bulbs grown in the celeriac hydrolysate showed the highest biomass gain (35.16%). The control also showed a high gain, while the other hydrolysates, especially the mixture, produced smaller increases. Chlorophyll content did not differ significantly between groups. After 4 days of treatment, bulbs treated with the beetroot hydrolysate had the highest anthocyanin content. This was significantly higher than in the groups treated with the other hydrolysates, but not significantly higher than in the control. The results suggest that plant hydrolysates have biostimulant potential and that non-invasive optical methods are useful for rapidly monitoring plant responses, with biochemical changes becoming detectable after 4 days of treatment.

Keywords: biostimulants, plant hydrolysates, household organic waste, circular economy, Allium cepa, chlorophyll, anthocyanins

Mining the Teredo navalis L. Microbiome for Biotechnologically Relevant Enzymes

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Teredo navalis is a xylotrophic and xylotrepetic shipworm from the Teredinidae family. Lignocellulose is a complex heteropolymer comprised of cellulose, hemicellulose, pectin, and lignin. These bivalves' ability to assimilate the sugars present in lignocellulose stems from their unique gill microbiota, which consists of bacteria capable of synthesizing carbohydrate-active enzymes (CAZymes). These enzymes have a multitude of biotechnological applications, including saccharification, textile processing, and carbohydrate modification for obtaining value-added compounds. Our aim was to investigate the gill microbiome of T. navalis specimens captured from the Romanian coast of the Black Sea to identify novel CAZymes. Raw data from Illumina shotgun sequencing of ten T. navalis gill tissue samples was trimmed, assembled and annotated. Coding sequences annotated using dbCAN2 were analyzed and correlated with the gill taxonomic composition. Metagenomic data analysis revealed a plethora of putative CAZyme-encoding genes, mostly associated with Gammaproteobacteria, with presumed specificity for hemicellulose, cellulose, lignin, and marine polysaccharides and their associated oligo- and monomers, including several genes encoding for putative lytic polysaccharide monooxygenases. The 4081 annotated CDS represent an excellent basis for the identification of novel biotechnologically relevant enzymes.

Keywords: metagenomics, shipworms, lignocellulose degradation, cellulolytic enzymes, CAZymes

Romanian Black Sea Macroalgae: Associated Microorganisms and Biotechnological Potential of Ulvan Polysaccharide

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Coastal macroalgae play a key ecological role along the Romanian Black Sea, where seasonal conditions influence algal diversity and associated microorganisms. Two sampling campaigns at Constanța–Pescărie and Plaja Pupa compared early spring (18 March 2026; 44.215641° N, 28.645306° E; water/air temperature 7.1 °C / 8 °C, a pH value of 8.0–9.0 and 85% humidity) and summer (16 August 2026, 12:00–16:00; 44.217826° N, 28.641919° E; water/air temperature 25.5–26.5 °C / 20–29 °C, a pH value of 8.1–8.4 and 66–75% humidity). Macroscopic and microscopic analyses showed a clear seasonal increase in algal diversity: spring sampling yielded Ulva flexuosa (0.45 m) and U. rigida (1.0 m), whereas summer communities expanded to diverse green, brown, and red algae at all developmental stages, spanning Chlorophyta (U. lactuca, U. rigida, U. linza, U. compressa, U. intestinalis, putative U. ohnoi / U. pseudo-ohnoi for sequencing, Cladophora spp.) and Rhodophyta (Ceramium rubrum, Spermothamnion spp.) alongside U. rigida–C. rubrum epiphytism. Using an optimized SoCK DNA extraction protocol, higher yields were obtained (U. rigida: 223.4 ng/µL; U. flexuosa: 359.6 ng/µL), allowing ITS1-5.8S rDNA-ITS2 sequencing and GenBank validation of U. rigida (PZ466414) and U. flexuosa subsp. flexuosa (PZ466415). MALDI-TOF MS analysis of 202 algal-associated (epiphytes and endophytes) and seawater isolates identified 40 cultivable bacterial taxa, mainly Pseudomonas, Vibrio, Aeromonas, and Acinetobacter, plus four cultivable yeasts (Saccharomyces cerevisiae, Candida glabrata, C. parapsilosis, Debaryomyces hansenii). Mild acidic extraction of ulvan sulfated polysaccharide (~2.1% yield) showed non-lethal bacteriostatic and fungistatic effects (>97% viability), inhibiting Candida albicans ATCC 10231 (59.36%) and early-stage Staphylococcus aureus CMGB47 (53.50%), while Pseudomonas aeruginosa CMGB40 growth was

increased (31.78% after 21 hours). Electrostatic binding between negatively charged ulvan and Crystal Violet explained biofilm assay interference, suggesting applications in pollutant biosorption and eco-friendly anti-fouling coatings. Overall, these findings highlight Romanian Black Sea macroalgae and ulvan as sustainable bioresources for environmental biotechnology.

Keywords: Black Sea, macroalgae, Ulva, epiphytes and endophytes, MALDI-TOF MS, ulvan, environmental biotechnology

Phytochemical Potential, Ecological Impacts and Sustainable Applications of Invasive Parthenocissus quinquefolia and Parthenocissus inserta

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Parthenocissus quinquefolia and Parthenocissus inserta are two invasive plant species in Romania, introduced from North America to Europe for ornamental purposes. Despite their negative ecological effects, including disruption of native plants and allelopathic effects, these species may become promising sources based on their bioactive compounds. This paper summarizes current knowledge regarding their phytochemical composition, biological activities, ecological impact and potential industrial applications, while highlighting research gaps and future perspectives. P. quinquefolia has been more extensively investigated, the extracts showing bioactive compounds with antiproliferative and antifungal activities, and different applications, including pH-responsive biodegradable hydrogels and natural colorants. Furthermore, this species may contribute to pollinator nutrition, environmental monitoring and the phytoremediation of contaminated soils. However, the invasive behaviour requires effective management strategies. Overall, the valorization of P. quinquefolia and P. inserta could turn these challenging species into valuable resources for developing ecological products, supporting human health and reducing environmental impacts. Further research is required, particularly on the chemical composition, biological properties and sustainable applications.

Keywords: Parthenocissus quinquefolia. Parthenocissus inserta, bioactivity, anthocyanins, invasive plants

Advancing Sustainable Biotechnologies: Green Chemistry Principles in Micropropagation, Biofertilization, and Food Enrichment

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The integration of green chemistry principles with sustainable biotechnology facilitates a fundamental shift toward efficient resource management in food and agriculture. Controlled in vitro micropropagation of medicinal and aromatic plants provides an eco-friendly source of bioactive compounds that could replace synthetic preservatives, antioxidants and flavorings in food matrices. Furthermore, transforming industrial beverage waste into functional ingredients exemplifies a circular approach to food production. In addition, extracts obtained from fruit residues can be blended with complementary organic waste, including eggshells, whey, or spent coffee grounds, to design soil biostimulants or biofertilizers tailored to support plant growth and development. By combining eco-friendly biotechnology, chemical-free food processing, and organic farming, it is possible to create a sustainable cycle that replaces synthetic additives, minimizes pollution, and recovers valuable resources.

Keywords: in vitro propagation, bioactive compounds, waste valorization, biofertilization, circular economy, food enrichment

The Effect of Biostimulants on Physiological and Biochemical Processes in Selected Cultivated Plant Species

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The continuous growth of the global population highlights the need for the ongoing improvement of agricultural production technologies in order to achieve high, stable, and sustainable crop yields. The aim of this study was to evaluate the physiological and biochemical changes occurring in Triticum aestivum L. and Zea mays L. seedlings in response to the application of biostimulants (Cropmax and Albit), both under saline stress conditions (100 mM NaCl) and in its absence. Albit contains poly-β-hydroxybutyric acid (PBH), a natural biopolymer synthesized by beneficial soil bacteria (Bacillus megaterium and Pseudomonas aureofaciens), as well as a complex of substances that enhance and balance its effects: magnesium sulfate, potassium phosphate, potassium nitrate, urea, and conifer extract. The composition of the Cropmax biostimulant includes 17 amino acids, micronutrients (Fe, Zn, Cu, Mn, Mo, B), enzymes, and vitamins (C and E). Two experiments were conducted, each comprising six experimental treatments, with 10 seeds per treatment, and three replicates. In the first experiment, seeds of both plant species were hydrated in distilled water and subsequently immersed in the test solutions for 2 hours. They were then placed in Petri dishes lined with filter paper and periodically moistened with distilled water for 10 days. At the end of the experimental period, root and shoot lengths, as well as seedling fresh weight, were measured. In addition, photosynthetic pigment contents, namely chlorophyll a and b and carotenoids, were determined. In the second experiment, 7-day-old seedlings were periodically watered with the test solutions for one week. The contents of photosynthetic pigments and total phenolic compounds, as well as the different water fractions in the leaves, were analyzed. The mean values and standard errors were calculated using IBM SPSS Statistics 23, and the means were compared using Duncan's multiple range test. The results revealed variations in physiological and biochemical responses depending on the plant species and the biostimulant applied, highlighting the importance of adapting biostimulation strategies to the specific characteristics of each crop.

Keywords: Biostimulants, salinity stress, wheat, maize

Production and Quality Evaluation of Functional Bread Enriched With Buckwheat

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Buckwheat is a raw material of considerable interest due to its nutritional composition, being a source of plant-based proteins, dietary fiber, vitamins, minerals, and bioactive compounds, particularly polyphenols. This study aims to valorize buckwheat flour in the production of a bakery product with improved nutritional value. During the research, experimental formulations containing different proportions of buckwheat flour were developed, focusing on the physicochemical, sensory, and nutritional characteristics of the bread. The results were compared with those of a control bread, prepared using a traditional recipe based on wheat flour. The main objective of this research was to identify the optimal proportion of buckwheat flour that would allow the production of bread with improved nutritional properties while maintaining appropriate technological and sensory characteristics. The study contributes to the diversification of bakery products and the valorization of plant-based raw materials with functional potential.

Keywords: buckwheat, functional bread, buckwheat flour, formulation, physicochemical quality, sensory analysis, nutritional value

Using Surface Swabs to Collect Low Microbial Biomass for Genomic Surveillance of Antibiotic-Resistant Bacterial Strains

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Frequently touched surfaces in shared spaces act as reservoirs and transmission routes for bacteria. Clinically relevant genera such as Acinetobacter, Klebsiella, Pseudomonas and Staphylococcus persist on dry surfaces for days to months, where bacteria from many individuals mix and may exchange antibiotic resistance genes (ARGs). Surface sampling is non-invasive and repeatable. It captures the resistance determinants circulating in a population, complements clinical surveillance and serves as an early-warning tool within a One Health framework. Because surface swabs collect very low microbial biomass, the first step was to establish a workflow yielding DNA suitable for ARG detection and Oxford Nanopore metagenomic sequencing. Sterile swabs were collected twice a month for one year from four frequently touched surfaces (ATM keypads, handrails, canteen counters and medical-office door handles) and preserved in DNA/RNA Shield. Genomic DNA was extracted with the ZymoBIOMICS DNA Miniprep Kit (Zymo Research) and quantified by Qubit fluorometry. DNA integrity was assessed by PCR amplification of the 16S rRNA gene (V3–V4 region and full-length gene, ~1,500 bp). Twenty-five extracts were screened for the carbapenemase gene blaIMP by TaqMan real-time qPCR (genesig blaIMP kit, Primerdesign), with positive and no-template controls. ATM keypad swabs yielded the most DNA (median 0.24 ng/µL vs. 0.02–0.05 ng/µL on the other surfaces). Full-length 16S was amplified in all samples, and blaIMP was detected in 1/25 samples, from an ATM keypad. Despite their very low biomass, surface swabs provide DNA suitable for targeted ARG detection, provided that DNA quality is assessed by full-length 16S amplification and fluorometric quantification. The detection of

blaIMP, a metallo-β-lactamase gene conferring carbapenem resistance, on frequently touched campus surfaces supports continued surveillance. The DNA/RNA Shield–Zymo workflow was adopted for Nanopore sequencing to characterise the broader resistome.

Keywords: antibiotic resistance genes; blaIMP; high-touch surfaces; low-biomass DNA; One Health

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LED Spectrum and Amino Acid Biostimulation Modulate Phenylpropanoid Gene Expression and Antioxidant Capacity of Radish Microgreens

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Microgreens are valued functional foods, concentrating vitamins, minerals and antioxidant phytochemicals at levels often several-fold higher than mature plants. We investigated how LED light quality and amino acid biostimulation shape the physiology and secondary metabolism of radish (Raphanus sativus L.) microgreens grown under white light (control) or three blue/hyper-red LED spectra with 10% UV (blue:red 70:30, 30:70, 50:50) and irrigated with water or an amino acid biostimulant (NATURAMIN WSP®). Photosynthetic parameters, histo-anatomy, total polyphenols, DPPH antioxidant activity and phenylpropanoid gene expression (PAL, F3H, DFR, ANS) by RT-qPCR were evaluated. The biostimulant slightly reduced Fv/Fm (0.78 vs. 0.80). In water-irrigated plants, the red-dominated spectrum yielded the highest chlorophyll index and total polyphenol content (~35 vs. ~26 mg GAE/g in the control). With the biostimulant, coloured spectra lowered polyphenols but induced the strongest antioxidant activity (84–85% vs. 52–56% inhibition). PAL and F3H were up-regulated under coloured light, peaking under the balanced spectrum plus biostimulant (2.7- and 3.3-fold). ANS was induced only by the biostimulant (up to 3.2-fold), whereas DFR was repressed under blue-dominated light. Light spectrum and biostimulation thus jointly reprogram phenylpropanoid metabolism, offering a basis for producing microgreens with enhanced functional value.

Keywords: microgreens, LED light, biostimulant, phenylpropanoid genes, RT-qPCR, antioxidant activity

Quantitative Evaluation of Bioactive Compounds and Antimicrobial Activity of Hydroalcoholic Extracts of Hemp (Cannabis sativa L.)

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Hemp (Cannabis sativa L.) is rich in antioxidant and antimicrobial secondary metabolites, yet the combined influence of genotype and growing conditions on its phytochemical profile is poorly characterized. We evaluated 70% ethanol extracts (1:4 w/v) of six industrial hemp cultivars grown on four substrates (cellulose, potting soil, peat, peat with vermicompost) and two light spectra (white, red) (48 variants). We measured total phenolic content (TPC, Folin–Ciocâlteu), DPPH radical scavenging and antimicrobial activity (disk diffusion) against Staphylococcus aureus, Bacillus clausii and Escherichia coli. Olivia accumulated the highest TPC (up to 2.25 mg GAE/g FW, potting soil, red light), and red light generally increased TPC. The strongest DPPH inhibition occurred on peat for Zenit (94.18%), Succesiv (87.99%) and Ratza (86.87%), whereas Secuieni Jubileu and Dacia Secuieni declined sharply on peat–vermicompost (down to 29.09% and 3.13%). Antioxidant capacity did not consistently follow TPC, and light effects on it were cultivar-dependent. Extracts were active mainly against Gram-positive bacteria, with maximum inhibition zones of 22 mm for Secuieni Jubileu against B. clausii (cellulose, white light) and 20 mm for Olivia against S. aureus (red light), while E. coli was largely resistant (zones generally not exceeding the solvent control). Tailoring substrate and light to each cultivar can thus optimize hemp extracts for pharmaceutical and cosmeceutical uses.

Keywords: Cannabis sativa L., polyphenols, antioxidant activity, DPPH, antimicrobial activity, abiotic elicitors

Valorization of Red Grape Seed (Vitis vinifera L.) By-Products As a Functional Ingredient in Muffin Formulations: A Circular Bioeconomy Approach

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This study explores the valorization of red grape seeds (Vitis vinifera L.), a major lignocellulosic by-product of the winemaking industry, through their conversion into a plant-based powder for use as a functional ingredient in bakery products. Grape seed powder (GSP) was obtained by processing the seeds and then incorporated into muffin formulations at substitution levels ranging from 0.5% to 5% (w/w). The fortified products were characterized for their physicochemical, nutritional, and sensory attributes. The work targets consumers who seek dietary diversification and foods formulated with natural, minimally processed ingredients. Sensory evaluation was carried out on five fundamental quality attributes: colour, taste, texture (consistency), appearance, and odour. Each attribute was scored on a five-point hedonic scale (1 = lowest, 5 = highest acceptability). The organoleptic assessment showed that muffins with 1.5% GSP had the most favourable sensory profile, with a pleasant colour and a well-balanced aroma. At this level, GSP addition improved the overall organoleptic quality of the samples compared with the other formulations. These findings show that winery residues can be turned into value-added food ingredients. The proposed approach follows the principles of the circular economy: it minimizes agro-industrial waste and improves resource efficiency. It also supports the development of sustainable, environmentally responsible food technologies within the framework of biotechnologies for environmental protection and resource valorization.

Keywords: grape seed powder; Vitis vinifera L.; winery by-products; functional bakery products; sensory analysis; circular economy; waste valorization; sustainable food technologies

Ecology and sustainable development

Medicinal Plants and Edible Forest Development in the Bichiș Area, Mureș County, Romania: An Innovative Approach to Environmental Education and Biodiversity Conservation

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The present study investigates the spontaneous medicinal flora of Bichiș, Mureș County, Romania, with the aim of assessing its ecological, educational and sustainable-use potential. Field research conducted over a one-year period documented the distribution of medicinal plant species across the main habitats of the study area and explored their potential integration into environmental education activities and the development of a demonstrative edible forest. A total of 22 medicinal plant species belonging to 13 botanical families were identified. The highest species richness was recorded in grasslands, forest edges and anthropogenic habitats, each supporting eight medicinal species, while wetland habitats contributed specialized hygrophilous species and increased the overall floristic diversity of the studied area. The results highlight the ecological importance of habitat heterogeneity and the complementary role of different habitat types in supporting medicinal plant diversity. The study also indicates that traditional land-use practices may contribute to maintaining certain semi-natural habitats, although land-use intensification and habitat fragmentation may pose risks to biodiversity conservation. Based on the identified plant resources, habitat diversity and accessibility of the study area, the development of an educational botanical trail and a demonstrative edible forest is proposed. The innovative aspect of the study consists in using knowledge of spontaneous medicinal plants not only as a resource for sustainable plant use, but also as a practical tool for environmental education, biodiversity awareness and interpretation of local ecosystems. The proposed educational approach can support species identification, understanding of plant–habitat relationships, appreciation of local ethnobotanical knowledge and promotion of sustainable natural resource management. The methodology, combining systematic field observations, fixed observation points, photographic documentation, habitat analysis and

GIS integration, provides a framework that may be adapted to other rural and semi-natural landscapes with similar ecological characteristics. The study demonstrates that the medicinal flora of Bichiș represents a valuable local natural and educational resource, with potential contributions to biodiversity conservation, environmental literacy and community engagement.

Keywords: Medicinal plants; spontaneous flora; biodiversity conservation; environmental education; edible forest; ethnobotany; habitat diversity; sustainable use of natural resources; botanical trail; Bichiș; Transylvania; GIS

Effects of Bat Guano, Mouse Feces and Commercial Fertilizer on Seed Germination and Early Growth of Lolium perenne

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Mammalian excreta provide organic inputs that may influence plant establishment, linking animal activity to nutrient cycling in terrestrial ecosystems. Their effects on germination and early seedling development, however, require further experimental investigation. This study evaluates the responses of Lolium perenne to aqueous extracts of bat guano and mouse feces, compared with a water control and a commercial fertilizer treatment. We address three questions: (1) Do treatments affect germination success and timing? (2) Do seedlings differ among treatments in biomass, root and shoot length, and the number of roots and leaves? (3) Do the two sources of mammalian excreta produce distinct responses, and how do these compare with those induced by commercial fertilizer? The experiment includes ten replicates per treatment, with germination monitored daily over 14 days and seedling development assessed on days 5 and 14. Integrating germination dynamics with biomass and morphological measurements will allow us to assess whether treatment effects vary across early developmental stages and plant structures. These comparisons will help clarify the potential of mammal-derived inputs to promote or inhibit early plant development, providing a basis for understanding one pathway through which mammals may influence plant establishment.

Keywords: Lolium perenne; bat guano; mouse feces; seed germination; seedling growth; organic inputs

Behavioural Responses of the Entomophagous Species Trichogramma evanescens and Bracon hebetor to Biologically Active Substances With Kairomonal Properties

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One of the innovative and promising approaches to addressing plant protection challenges is the use of biologically active substances with kairomonal properties. Within contemporary plant protection strategies, the regulation of pest insect population densities represents a key component of trophic chains and food webs, contributing to improved environmental quality and creating opportunities for the production of environmentally friendly agricultural and food products. The aim of this study was to evaluate the efficacy of biologically active substances with kairomonal properties in modulating the behavioural responses of the entomophagous insects Trichogramma evanescens and Bracon hebetor, with a view to enhancing their parasitism potential against different ontogenetic stages of insect pests. Biologically active substances exhibiting kairomonal properties were obtained and evaluated for their potential to enhance the biological performance of the entomophagous species Trichogramma evanescens and Bracon hebetor. An alcohol-based extract of eggs of the laboratory host Sitotroga cerealella was used as a source of kairomonal cues for T. evanescens, whereas an alcohol-based extract derived from the excreta of the laboratory host Galleria mellonella was employed as a kairomonal source for B. hebetor. The results demonstrated that exposure to these kairomonal substances enhanced the host-searching activity of female T. evanescens and B. hebetor, increasing their responsiveness to host eggs and larvae as potential targets for parasitism compared with the untreated control. The presence of substances with kairomonal properties was shown to significantly increase the fecundity of T. evanescens females. Mean fecundity reached 30 eggs per female, compared with only 20 eggs per female in the control treatment. Furthermore, female host-searching activity directed towards eggs suitable for parasitism increased approximately 1.6-fold relative to the control. This enhancement resulted in an approximately 10% increase in the proportion of parasitized eggs compared with the

control treatment. Preliminary experiments demonstrated that biologically active substances extracted from the larval excreta of the laboratory host Galleria mellonella exhibit kairomonal properties and substantially stimulate the activity of the entomophagous species Bracon hebetor. In particular, these kairomonal substances enhanced the host-searching and parasitism activity of B. hebetor females, resulting in an approximately 30–40% increase in larval parasitism rates compared with the control treatment. The findings demonstrate that biologically active compounds released by pest insect species, primarily associated with intraspecific chemical communication, may also function as kairomonal cues exploited by other species of entomophagous insects. This phenomenon represents a promising avenue for further research and practical application in biological plant protection, particularly through the development of strategies aimed at stimulating host-searching behaviour and enhancing the biological control efficacy of both released and naturally occurring entomophagous populations.

Keywords: Trichogramma evanescens, Bracon hebetor, kairomon, plant protection, entomophagous

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Cultivar-Dependent Response of Organically Grown Pepper (Capsicum annuum L.) to a Vermicompost–Seaweed Biostimulant Treatment Under Open-Field Conditions

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The range of inputs authorised in organic vegetable production is narrow, and biostimulants based on vermicompost and seaweed extracts are among the few options available for sustaining crop performance. Their efficacy is, however, frequently genotype-specific and has seldom been assessed in locally bred cultivars. This study evaluated the response of two pepper (Capsicum annuum L.) cultivars created at the Vegetable Research and Development Station Bacău: the long pepper 'Marinică' and the round pepper 'Creolica', to a biostimulant treatment consisting of sequential applications of a vermicompost-based liquid fertiliser and an Ecklonia maxima extract. The experiment was carried out in a certified organic open field in north-eastern Romania, in a 2 × 2 factorial design (cultivar × treatment) with three replicates. Plant height, stem diameter and leaf chlorophyll and anthocyanin indices were determined at three phenological stages, and fruit number per plant, fruit dimensions and mean fruit weight at harvest. Irrespective of treatment, 'Marinică' developed taller plants and set 61.8% more fruits per plant than 'Creolica', while fruit dimensions remained within the range typical of each varietal type. As a mean of the two cultivars, the biostimulant treatment increased plant height at the first assessment by 9.6%, the leaf anthocyanin index at fruiting by 27.6% and fruit number per plant by 12.8%. The cultivar × treatment interaction was significant for the latter two traits: the increases were recorded in 'Marinică' (+57.0% and +20.7%, respectively), whereas no significant response was detected in 'Creolica'. Leaf chlorophyll index and mean fruit weight were not influenced by the treatment. These first-year results show that the response of pepper to the tested biostimulant treatment is genotype-dependent and support the screening of cultivar responsiveness before such inputs are included in organic cultivation technologies.

Keywords: Ecklonia maxima; biostimulants; organic vegetable production; genotype × treatment interaction; leaf anthocyanins

Wetland Habitats and Plant Species of Relict Significance in the Nemira Mountains

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This study documents the occurrence of plants of relict biogeographical interest in the Apa Roșie and Apa Lină wetlands of the Nemira Mountains, including the Plăieșii de Jos peat bog. There were considered many floristic observations from repeated field visits, field photographs and spot pH measurements from 2016, 2018, and 2023. We found Empetrum nigrum and Lysimachia europaea at Plăieșii de Jos, Vaccinium oxycoccos, Ligularia sibirica and Spiraea salicifolia in both sectors, and Pedicularis palustris at Apa Lină. The sites include Sphagnum carpets, tall-herb wetland communities and shrub stands along woodland margins. Recorded pH ranged from 4.6 to 6.2. At Apa Lină, the median of the three readings in each survey year rose from 5.1 in 2016 to 5.3 in 2018 and 5.6 in 2023. At Apa Roșie, the 2023 range (5.1–5.3) exceeded the values reported in 2016 and 2018. This pattern suggests a local decrease in acidity. If higher pH persists alongside increased inputs of base-rich water, the composition of the moss layer could change and acidic microhabitats could shrink, diminishing the refugial value of these wetlands for acidophilous plants. Repeated pH measurements and vegetation surveys at fixed points would help test this hypothesis.

Keywords: Nemira Mountains, relict flora, peatlands, pH

Response of Pest and Pathogen Populations in Vegetable Crops to Interannual Climatic Anomalies: A Case Study From the Bacău Area

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This study investigates how the number of days with extreme temperatures influences the occurrence and seasonal development of plant pests and pathogens, compared with mean temperatures. Field crops of white cabbage (Brassica oleracea L. var. capitata), common bean (Phaseolus vulgaris L.) and tomato (Solanum lycopersicum L.) were studied under both conventional and organic management. Naturally infested plants were assessed at ten-day intervals from May to September over three consecutive years. The key pests and pathogens were monitored, including Phyllotreta spp., Plutella xylostella (Linnaeus, 1758), Myzus persicae (Sulzer, 1776), Aphis fabae (Scopoli, 1763), Tetranychus urticae (Koch, 1836), Aleyrodes proletella (Linnaeus, 1758), Xanthomonas spp. and Phytophthora infestans (Mont.) de Bary. The assessment was based on the degree of attack (DA, %) and seasonal dynamics parameters, including the timing of attack onset and peak (expressed in 10-day intervals), maximum attack intensity, and the area under the progress curve (AUPC). Several climatic indicators were calculated from daily weather records: mean and maximum temperatures, the number of days with Tmax ≥ 30 °C, midday vapour pressure deficit, and growing degree-days. Statistical analysis of year-to-year anomalies showed that the number of heatwave days was negatively associated with the attack of several pests and of late blight, and that this association was stronger than the one with mean temperature. The highest infestation levels occurred in the year with the fewest extreme heat events. Under the conditions of north-eastern Romania, recurrent heatwaves appear to limit the development of several key pests and pathogens, indicating that climate-based indicators such as the number of days with Tmax ≥ 30 °C could improve the timing of phytosanitary interventions in both conventional and organic vegetable production.

Keywords: heatwave days; pest seasonal dynamics; degree of attack; organic and conventional farming; climate variability

Circular Economy and Sustainable Natural Resource Management: Opportunities for Reducing Environmental Impact

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Against the backdrop of increasing anthropogenic pressures on the environment, the progressive depletion of natural resources, and the intensifying effects of climate change, the transition towards a circular economy represents a strategic pathway towards sustainable development. Unlike the traditional linear economic model, based on extraction, production, consumption and disposal, the circular economy seeks to retain the value of resources within the economic system for as long as possible through waste prevention, reuse, repair, recycling and resource recovery. This paper aims to examine the role of circular economy principles in optimising natural resource management and mitigating the environmental impacts of anthropogenic activities on ecosystems. The methodological approach is based on a critical review and synthesis of relevant scientific literature, European strategic policy documents, and key indicators relating to resource efficiency and sustainable waste management. Within this framework, a comparative assessment of Romania's progress against the European Union average is undertaken, drawing on Eurostat data and indicators such as the circular material use rate and waste recycling rates. The paper highlights the principal opportunities associated with implementing circular practices across sectors such as industry, agriculture and waste management, with particular emphasis on reducing raw material consumption, improving water and energy efficiency, recovering secondary resources and limiting pollutant emissions. Furthermore, it examines the challenges associated with waste collection and recycling infrastructure, investment requirements, regulatory frameworks, and levels of awareness among economic and societal stakeholders. The analysis highlights the potential of the circular economy to contribute to natural capital conservation, alleviate pressures on ecosystems and enhance resource-use

efficiency. Integrating circular economy principles into environmental policies and regional development strategies may provide an effective means of achieving sustainability objectives and fostering a resilient economy with a reduced environmental footprint.

Keywords: circular economy; sustainable development; natural resources; environmental protection; waste management; resource efficiency

Climate Change and Ecosystem Resilience: Challenges and Strategies For Sustainable Development

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Climate change represents one of the most significant global challenges of the twenty-first century, exerting considerable pressure on the structure, functioning and stability of natural and human-modified ecosystems. Rising average temperatures, changing precipitation patterns and the increasing frequency and intensity of extreme weather events contribute to habitat degradation, shifts in species distributions and disruptions to ecological processes, thereby affecting the capacity of ecosystems to provide essential ecosystem services. This paper aims to examine the relationship between climate change, ecological vulnerability and ecosystem resilience, highlighting key adaptation mechanisms and strategies for reducing climate-related risks in the context of sustainable development. The methodological approach is based on a review and synthesis of relevant scientific literature, international reports on climate change and biodiversity, and European strategic policy documents concerning climate change adaptation. Particular attention is given to indicators relevant to assessing ecosystem vulnerability, including temperature and precipitation variability, the frequency of extreme climatic events, changes in land cover and biodiversity dynamics. The analysis seeks to identify the principal types of ecosystems vulnerable to climate change and to examine the factors influencing their capacity to adapt and recover following environmental disturbances. Particular emphasis is placed on strategies for strengthening ecological resilience, including the conservation and restoration of natural habitats, the development of green infrastructure, sustainable water resource management and the implementation of nature-based solutions. Furthermore, the paper explores opportunities for integrating climate adaptation measures into environmental protection policies and spatial development planning. The paper emphasises the importance of an integrated and interdisciplinary approach to reducing ecosystem vulnerability and strengthening the capacity of ecosystems to respond to

climate change. Promoting adaptation strategies informed by scientific evidence, ecological monitoring and sustainable management practices can contribute to biodiversity conservation, the maintenance of ecosystem services and the achievement of sustainable development objectives.

Keywords: climate change; ecological resilience; ecosystem vulnerability; climate change adaptation; biodiversity; sustainable development.

Research on the Quality of Water Resources in the Argeș River Basin, 2018–2024

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This study assesses how the quality of surface and groundwater resources in the Argeș River Basin changed between 2018 and 2024. The assessment is framed by the Water Framework Directive 2000/60/EC and the Romanian legislation that transposes it. The analysis draws on monitoring data and river basin management plans from the Argeș-Vedea Water Basin Administration. It examines anthropogenic pressures (point sources, diffuse sources and accidental pollution), physico-chemical indicators (dissolved oxygen, BOD_5, COD-Cr, nutrients), biological indicators (phytoplankton, benthic macroinvertebrates), chemical status and the relationship between discharge and water quality. Urban wastewater treatment plants generate over 90% of the organic and nutrient load, and more than 70% of the 349 plants monitored in 2024 were not operating properly. The droughts of 2022–2024 lowered discharges (in 2024, to 36% of the long-term mean) and intensified the effects of pollution. The share of river water bodies in good ecological status rose from 24.86% to 56.76%. However, small tributaries in the Romanian Plain (Cârcinov, Dâmbovnic, Sabar, Colentina) remain in moderate or poor status. Reservoirs such as Budeasa mostly show moderate ecological potential and a trend towards eutrophication. Between 2023 and 2024, the share of water bodies in poor chemical status fell from 25.8% to 11.4%. The remaining failures are mainly due to ubiquitous PBT substances. Groundwater is generally in good status, except for the Colentina body (ROAG03), which is affected by nitrates and phosphates. Based on these results, the study proposes a programme of measures for 2026–2030. It focuses on upgrading wastewater treatment, rehabilitating sewer networks, good agricultural practices, and automated monitoring with early warning.

Keywords: Argeș River Basin, water quality, Water Framework Directive, ecological status, eutrophication, Budeasa Reservoir, groundwater

Assessing the Impact of Anthropogenic Activities on Urban Ecosystems in the Context of Sustainable Development

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The rapid expansion of urban areas, the intensification of economic activities and increasing anthropogenic pressures on the environment pose major challenges to maintaining ecological balance and ensuring sustainable development. Urban ecosystems are undergoing significant transformations driven by changes in land use, the fragmentation of natural habitats, air, water and soil pollution, and the reduction of green spaces. These processes adversely affect biodiversity, ecosystem functioning and the quality of life of urban populations. This paper aims to assess the impact of major anthropogenic activities on urban ecosystems by examining the relationships between urbanization processes, environmental degradation and sustainable development objectives. The proposed methodological approach is based on a review and synthesis of relevant scientific literature, European and national strategic policy documents, and the examination of key indicators used to assess urban environmental quality. Particular attention is given to indicators relating to air quality, changes in urban green space coverage, the extent of land artificialisation and pressures on biodiversity. The analysis seeks to identify the main drivers of urban ecosystem degradation and explore opportunities to mitigate anthropogenic impacts through the implementation of integrated environmental management measures. Potential solutions examined include the development of green infrastructure, the expansion of urban natural areas, the promotion of sustainable mobility, improved resource efficiency and the integration of ecological principles into spatial planning. The paper highlights the importance of an interdisciplinary approach to assessing and managing anthropogenic pressures on urban environments. Integrating ecological indicators into local development strategies, alongside the implementation of nature-based solutions, can contribute to enhancing

urban ecosystem resilience, conserving biodiversity and improving environmental quality, in line with sustainable development objectives.

Keywords: urban ecosystems; anthropogenic pressures; sustainable development; biodiversity; environmental quality; green infrastructure

The Adaptive Response of Leaf Chicory to Different Levels of Water Stress

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The objective of this study was to evaluate the response of Cichorium intybus var. foliosum to water deficit applied over a four-week period. The objective of the research was to highlight the dynamics of growth processes, as well as the morphological and physiological changes induced by different water supply regimes. In order to achieve the aforementioned objective, the experiment was meticulously organized into three distinct treatment groups. Group V1 was used as the control group. The water supply level in this group corresponded to field capacity (100% FC). Group V2 was subjected to moderate water stress (50% FC). Group V3 was exposed to severe water stress (25% FC). The gravimetric method was employed to ensure that the moisture levels remained consistent for each treatment. This method entailed the periodic weighing of the pots, with any lost water being replenished to maintain a constant water level throughout the experiment. The response of the plants was evaluated on a weekly basis, with biometric and physiological parameters being monitored at four distinct assessment points: an initial assessment, two interim assessments, and a final assessment. The results show that C. intybus maintained its capacity for vegetative growth, continuing the process of leaf formation throughout the four-week experiment, even under severe water-deficit conditions (V_3). However, a reduction in water availability led to a decrease in certain growth parameter values, demonstrating the negative influence of water stress on vegetative development rates. From a physiological standpoint, analysis of photosynthetic pigments revealed variations in chlorophyll content depending on the water supply regime. At the same time, a significant accumulation of anthocyanins was observed, with the highest value recorded in the variant with the greatest concentration of these pigments during the third assessment. This accumulation may indicate the activation of antioxidant and photoprotective mechanisms in response to abiotic stress conditions. Overall, the results suggest that C. intybus var. foliosum exhibits a certain capacity to adapt to water deficit by maintaining vegetative growth through morphological and biochemical adjustment mechanisms.

Keywords: Cichorium, gravimetric method, fresh biomass, plant growth

Assessment of the Effects of Biostimulants on Biometric, Physiological, and Elemental Parameters in Allium cepa L.

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In the context of current challenges related to the sustainability of agricultural systems, the use of plant biostimulants represents a promising strategy for optimizing plant growth and development and improving resource use efficiency. Due to its sensitivity to various substances and the possibility of quantifying biological responses, Allium cepa L. serve as a versatile experimental model for investigating morphological, physiological and elemental changes induced by exogenous factors. The present study aimed to evaluate the effects of three commercial biostimulant formulations based on seaweed extracts (Plantella, 3%), chitosan (Altosan, 0.2%), and mycorrhizal fungi (AgriMicofol, 0.5%) on the biometric, physiological, and elemental parameters of Allium cepa L. bulbs. The experiment was conducted under laboratory conditions using bulbs maintained in an aqueous medium and assigned to three treatment groups and an untreated control group. Following a five-day exposure period to the biostimulant solutions, gravimetric parameters, chlorophyll and anthocyanin contents, and several derived physiological indices were evaluated. The elemental composition of plant ash obtained by calcination at 500 °C was determined using X-ray fluorescence spectrometry (XRF). Statistical analysis revealed significant differences among the experimental groups in final fresh biomass, dry biomass, ash content, chlorophyll content, water content, and the chlorophyll-to-anthocyanin ratio. The AgriMicofol treatment was associated with higher mean for fresh biomass (2.87 ± 0.50 g) compared with the control group (2.20 ± 0.53 g), as well as higher chlorophyll content (77.56 ± 11.11 versus 66.65 ± 26.14). Furthermore, a significant positive correlation was identified between fresh biomass and chlorophyll content across the experimental groups ($r = 0.42$; $p < 0.05$). XRF analysis revealed variations in the elemental profile of plant ash among the experimental groups, with the Altosan treatment exhibiting the highest mean concentrations for most of the elements analyzed, particularly K, Ca, Zn, and Mn. The findings highlight the differential responses of plants to the

investigated biostimulant formulations, suggesting that changes in growth parameters and pigment content are not necessarily accompanied by similar variations in elemental profiles. These observations emphasize the importance of an integrated approach to evaluating the effects of biostimulants on plants.

Keywords: biostimulants; biomass; chlorophyll; anthocyanins; elemental composition

Ambrosia Artemisiifolia in the Urban Environment: Seasonal Variation of Plant Traits Under Natural Conditions

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The seasonal variation of mass and water content in the organs of the invasive species Ambrosia artemisiifolia is insufficiently documented under natural conditions. The study followed how these parameters vary depending on the month of harvest and light exposure. Leaves, roots and stems were harvested in June, August and September, from sunny and shaded areas, and inflorescences were analyzed in September. The following parameters were determined: • gravimetric (g): fresh mass (FW), turgid mass (TW; leaves, stems, inflorescences), dry mass (DW) and ash mass (A); • calculated: water content (WC, %), relative water content (RWC, %), DW/FW ratio (g/kg) and ash content (AC, % of DW); • specific leaf area (SLA, cm^2/g). The most pronounced changes occurred in September. Compared with June, dry mass increased from 0.14 to 1.15 g in roots and from 0.15 to 2.31 g in stems ($p < 0.001$ in both cases). Leaf masses remained stable. Although the proportion of water in fresh mass decreased in all vegetative organs, relative water content decreased significantly in leaves and remained high in stems. The proportion of ash in dry mass remained stable in leaves and decreased progressively in stems. In September, leaves and inflorescences had a higher water content than roots and stems. Differences associated with light exposure were isolated. In September, leaf relative water content was lower at sunny than at shaded sites (69.4% compared to 78.5%, $p = 0.027$). At shaded sites, SLA increased over the season from 204 to 334 cm^2/g ($p = 0.001$). The seasonal dynamics were characterised by dry-mass accumulation in roots and stems and by a decrease in the proportion of water in vegetative organs. Sampling month was associated with wider variation than light exposure, and the differences in hydration and specific leaf area suggest leaf plasticity under the conditions studied.

Keywords: Ambrosia artemisiifolia; plasticity; specific leaf area; seasonal variation

Uses of Campanulaceae Taxa in the Flora of Romania: A Critical Assessment and Implications for Conservation

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This study provides a critical synthesis of the uses of certain Campanulaceae taxa in the Flora of Romania, distinguishing between current practices, traditional or historical records, and purely experimental applications. The table lists 57 taxon × use category combinations involving 31 taxa, with ornamental, food, medicinal, sociocultural, ecotechnical, and educational uses. The number of documentary records describes the composition of the corpus and does not measure the actual frequency of use. Ornamental documentation predominates, while food and medicinal practices are largely regional and historical. For Romania, historical records, horticultural offerings, and ex situ cultivation are documented; the extent and continuity of these uses remain insufficiently known. Category ratings reflect the documented representativeness and are distinct from the certainty of the record or the validation of efficacy. Gaps regarding the resource's provenance, regeneration, and harvesting intensity limit the assessment of sustainability. The results support taxon-specific documentation and the use of propagated material in cultivation, with priority given to the conservation of vulnerable populations.

Keywords: Campanulaceae; ethnobotany; horticultural uses; conservation

Ecosystems, pollution and associated pathologies in human health

A Preliminary Study of Suspected Microplastic Particles in the Bîc River, Republic of Moldova

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Microplastic pollution represents an environmental concern in freshwater ecosystems, particularly in urban rivers exposed to multiple anthropogenic pressures. Wastewater discharges, stormwater runoff, and plastic waste fragmentation constitute potential pathways for the introduction of these particles into aquatic environments. Investigating their occurrence requires a clear distinction between presumptive identification based on morphological characteristics and confirmation of polymer composition through spectroscopic analysis. This preliminary study addresses suspected microplastic particles in the Bîc River within the Chișinău urban area and its downstream sector, Republic of Moldova. The objective was the presumptive identification and morphological characterization of suspected microplastic particles in river water samples, as an initial stage of a broader investigation. Water samples were collected from four monitoring sites at two sampling depths. Sample preparation included filtration, oxidative digestion of organic matter, density separation, and staining. Optical microscopy was used to examine particle shape, colour, and approximate size. Particle identification remains presumptive at this stage, as optical examination alone does not establish polymer composition. The next phase of the research will include Fourier-transform infrared (FTIR) and Raman spectroscopy to verify whether the suspected particles are microplastics and identify their polymer composition. The presentation addresses the preliminary analyses performed, the limitations of optical microscopy in confirming polymer identity, and the planned spectroscopic verification, providing the basis for further investigation of microplastic contamination in the investigated river sector.

Keywords: Bîc River; microplastics; environmental monitoring; water pollution

Modulation of $ALCL_3$-Induced Neurobehavioral Responses in the Giant African Snail (Achatina fulica) By Dietary Supplementation with Creatine Monohydrate

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Alzheimer's disease is one of the most common neurodegenerative disorders associated with progressive cognitive decline and memory impairment. This study aimed to evaluate the potential neuroprotective effects of creatine monohydrate and calcium supplementation in an experimental model of aluminum-induced cognitive impairment using the terrestrial gastropod Achatina fulica. Cognitive impairment was induced by exposure to aluminum chloride applied to the habitat substrate. Behavioral and memory-related responses were assessed using the T-maze test, Novel Object Recognition test, Open Field test and response-to-stimulus evaluation. In addition, shell length, shell width and body weight were measured before and after treatment in order to monitor possible effects of supplementation on growth and general biological condition. The results indicated that creatine monohydrate supplementation improved behavioral performance in aluminum-exposed specimens, suggesting an attenuation of cognitive impairment. The observed responses support a potential protective effect of creatine against aluminum-associated neurobehavioral alterations. Morphometric assessment also allowed the evaluation of general growth-related effects during the experimental period. Overall, these findings suggest that creatine monohydrate may exert neuroprotective effects in an aluminum-induced model of cognitive impairment in Achatina fulica. This model may represent a useful alternative approach for preliminary screening of compounds with potential relevance in neurodegenerative disease research.

Keywords: Achatina fulica; creatine; aluminum chloride; cognitive impairment

In Vitro Assessment of Sodium Benzoate (E211) Cytotoxicity on Mammalian Cell Lines Models

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The widespread use of food additives has raised concerns about the potential adverse effects of long-term exposure, particularly in the context of the simultaneous consumption of multiple additives. For instance, several studies have investigated the cytotoxic effects of sodium benzoate (SB) on rat cortical neuron cultures and human HeLa tumor cells, finding that even a 0.1% concentration – commonly added to soft drinks – resulted in a significant reduction in cell viability (Park et al., 2011). However, low cytotoxic activity of SB used in cosmetic products was reported in human fibroblasts (CCD1072Sk) (Spindola et al., 2018). In light of the above, the present study evaluated the cytotoxic activity of sodium benzoate (E211), a chemical preservative with antimicrobial properties used to inhibit the growth of bacteria, yeasts, and molds in acidic environments. Two normal cell lines served as the biological material, namely: MCF-12A (ATCC CRL-3598 – human epithelial cells isolated from the mammary gland, and Vero (ATCC CCL-81) – kidney cells derived from the African green monkey (Cercopithecus aethiops). The cells were exposed to concentrations of 12.5, 25, 50, and 100 μg/mL for 24 and 48 hours. The assessment of cytotoxic effects was carried out by determining cell viability (MTT assay), analyzing morphological changes via light microscopy, and evaluating cell survival capacity (clonogenic assay). After 24 hours of exposure to BS, Vero cell viability ranged from 94.23% (12.5 μg/mlL) to 77.65% (100 μg/ mlL), indicating a moderate cytotoxic effect, whereas for MCF-12A cells, viability ranged from 95.71% to 90.98%, demonstrating an absence of cytotoxicity. However, after 48 hours of exposure, at the minimum and maximum tested concentrations, cell viability values were 81.58% and 67.62% (Vero cell line) and 65.37% and 51.24% (MCF-12A cells), respectively, revealing a significant cytotoxic effect of this additive, particularly on the MCF-12A cell line.

Keywords: sodium benzoate, MTT assay, cell morphology test, clonogenesis assay.

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Occupational Tinea Pedis in Iraqi Farmers: Clinical Patterns and ITS-PCR Profiling of Dermatophyte Species

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Agricultural workers are particularly exposed to tinea pedis through closed footwear, heat, humidity and contact with soil and livestock. This study describes the clinical forms and the causative dermatophyte species in Iraqi farmers. Interdigital scrapings from 50 male agricultural workers were examined by direct microscopy with 20% potassium hydroxide (KOH), culture on Sabouraud dextrose agar (SDA) and dermatophyte test medium (DTM). The internal transcribed spacer (ITS) region of ribosomal DNA was amplified by polymerase chain reaction (PCR) with the primers ITS1 and ITS4. The interdigital form with scaling and maceration predominated (66%), followed by vesicular lesions (22%), hyperkeratosis (8%) and mixed presentations (4%). Among the 47 isolates identified by ITS-PCR, Trichophyton mentagrophytes was dominant (42.6%), followed by T. rubrum (29.8%), T. interdigitale (12.8%), Microsporum canis (8.5%), T. verrucosum (4.3%) and M. audouinii (2.1%). The presence of zoophilic species points to livestock and companion animals as additional sources of infection. ITS-PCR is a reliable complement to culture for species-level identification, supporting prevention adapted to rural workers.

Keywords: dermatophytosis, occupational mycosis, agricultural workers, ITS-PCR, Trichophyton

Beyond the Screen: Microbial Contamination and Health Risks Associated With Electronic Devices

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The widespread use of electronic devices has become an integral part of contemporary life. Current estimates indicate approximately 5.64 billion internet users and 5.81 billion mobile phone users worldwide. In Romania, approximately 17.8 million internet users and 25.3 million active mobile cellular connections have been reported. Due to their frequent handling and often inadequate sanitation, personal electronic devices may provide suitable surfaces for microbial survival and transfer. The microbiota associated with frequently used electronic devices comprises diverse microorganisms, including species belonging to the genera Staphylococcus, Escherichia, Klebsiella, Micrococcus, Bacillus, Pseudomonas, and Candida. Consequently, these devices may serve as potential reservoirs and transmission surfaces for opportunistic pathogens. This study aimed to assess the level of microbial contamination on electronic devices frequently used by students and to identify behavioral factors potentially associated with increased contamination and related health risks. Data were collected through direct microbiological analysis of selected devices and questionnaire-based surveys. Inappropriate use and inadequate sanitation of electronic devices may pose potential risks to human health. Microbiological analyses revealed considerable differences in contamination levels among the devices examined. Headphones accounted for the largest proportion of the total microbial load (42.1%), followed by laptops (25.3%), computer mice (16.0%), keyboards (9.3%), and mobile phones (7.3%). Moreover, food consumption during device use, particularly the consumption of sugar-rich products, was associated with increased total microbial loads on the analyzed surfaces. Overall, the results indicate that frequently handled electronic devices may represent important microbial reservoirs. Regular cleaning and disinfection, improved hand hygiene, and

avoiding food consumption during device use may contribute to reducing microbial contamination and limiting potential health risks.

Keywords: electronic devices; microbiota; microbial load; hygiene practices; health risks

Anxiolytic-Like Effects of Morus alba and Morus nigra Leaf Extracts and Morin in a Zebrafish Model of Scopolamine-Induced Cholinergic Dysfunction

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Alzheimer's disease is a progressive neurodegenerative disorder primarily characterized by cognitive decline, memory impairment, and severe dysfunction of the central cholinergic system. Beyond cognitive deficits, neuropsychiatric symptoms, particularly anxiety, frequently afflict patients, accelerating disease progression and significantly reducing quality of life. Natural antioxidants and polyphenolic compounds from medicinal plants are increasingly investigated for their potential to alleviate both cognitive and behavioral manifestations of neurodegeneration. Leaves of Morus alba and Morus nigra are rich in bioactive polyphenols with established antioxidant and neuroprotective properties. This study evaluated the anxiolytic-like effects of hydroalcoholic extracts from Morus alba (MAE) and Morus nigra (MNE) leaves, as well as the flavonoid morin, in an adult zebrafish (Danio rerio) model subjected to scopolamine-induced cholinergic dysfunction and anxiety. Zebrafish were treated once daily via immersion for 8 days with MAE or MNE at low (1 µg/L) and high (10 µg/L) concentrations, or morin (20 µM). Scopolamine (100 µM) was administered 30 minutes prior to behavioral testing, while imipramine (71 µM) served as a positive reference drug. Novelty-provoked anxiety and locomotion were evaluated using the Novel Tank Diving Test (NTT). Scopolamine induced pronounced anxiety-like behavior, markedly reducing time spent in the top zone ($p < 0.00001$) and increasing freezing duration ($p < 0.00001$). Treatment with MAE, MNE, and morin significantly reversed these deficits in a dose-dependent manner, with high-dose extracts (MAE-H and MNE-H, 10 µg/L) restoring exploratory behavior to levels comparable to imipramine. Total distance traveled remained unchanged, confirming specific anxiolytic activity without motor impairment. In conclusion, Morus alba and Morus nigra extracts exert potent anxiolytic-like effects, highlighting their therapeutic potential in managing anxiety associated with Alzheimer's disease and cholinergic neurodegeneration.

Keywords: Alzheimer's disease; Morus alba; Morus nigra; morin; scopolamine; zebrafish; anxiolytic; cholinergic dysfunction; Novel Tank Diving Test

Ecotoxicological Assesment of Organic Contaminants in the Iron Gates Reservoir

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The Iron Gates reservoir system acts as a major sink for organic contaminants along the Danube River due to its high sediment retention capacity and altered hydrodynamic conditions. More than 50% of incoming suspended solids are retained, promoting the accumulation of fine sediments that can adsorb and store hydrophobic pollutants. Previous studies have identified various contaminants in this area, including pharmaceuticals, pesticides, persistent organic pollutants, endocrine-disrupting compounds, and per- and polyfluoroalkyl substances. More than it, increased water flow and flooding may cause sediment resuspension, releasing accumulated pollutants and turning sediments into secondary sources of contamination. This study employed admetSAR3.0 and ADMETlab3.0 to assess the potential ecotoxicological effects of four frequently detected contaminants: sulfamethoxazole, erythromycin, diclofenac and terbuthylazine. Predicted toxicity endpoints were evaluated across aquatic organisms from different trophic levels. All four compounds showed potential toxic effects on several species, including Pseudokirchneriella subcapitata, Daphnia magna, Pimephales promelas, Lepomis macrochirus, Oncorhynchus mykiss, Cyprinodon variegatus and Tetrahymena pyriformis. Among these, T. pyriformis appeared particularly sensitive. Additionally, terbuthylazine was predicted to have potential hepatotoxic effects in humans. Overall, the findings highlight the potential ecological risks associated with organic contaminants in the Iron Gates reservoir system, as well as the possible human health implications of terbuthylazine exposure. Further experimental validation and continuous environmental monitoring are needed to better understand contaminant persistence, distribution, and associated environmental risks.

Keywords: Iron Gates, organic contaminats

Phenotypic Antibiotic Susceptibility Profiles of Pseudomonas spp. Isolated During the February 2026 Campaign at the Târgu Mureș Wastewater Treatment Plant

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The dissemination of antibiotic-resistant bacteria (ARB) and antibiotic resistance genes (ARGs) in aquatic environments represents an increasingly concerning public health issue, particularly in the context of wastewater treatment. This study presents the results of a sampling campaign conducted in February 2026, which investigated the dissemination of ARB and ARGs within the Mureș River basin (Romania) at two sampling points: the influent (inlet) and the effluent (outlet) of a wastewater treatment plant.

Isolates belonging to the Pseudomonas genus were characterized phenotypically using the disk diffusion method (Kirby–Bauer) on Mueller-Hinton agar, with results interpreted according to EUCAST breakpoints (version 15.0/16.0), and genotypically using PCR, targeting clinically relevant resistance genes.

A total of 20 isolates from the influent and 15 isolates from the effluent were phenotypically analyzed. These were isolated on a specific culture medium (Cetrimide agar) and subsequently confirmed via a fluorescence test. All isolates that tested positive were evaluated for susceptibility to 8 types of antibiotics: piperacillin-tazobactam (TZP - 30µg), ceftazidime (CAZ - 10µg), cefepime (FEP - 30µg), imipenem (IPM - 10µg), ciprofloxacin (CIP - 5µg), gentamicin (CN - 10µg), erythromycin (E - 15µg), and tetracycline (TE - 30µg).

The results of the antibiograms were statistically processed using Microsoft Excel. The prevalence of susceptible, resistant, and multidrug-resistant (MDR) isolates was expressed as the percentage of the total number of isolates analyzed for each sampling point. At the influent sampling point (20 isolates), the most effective antibiotics were: cefepime (80%), imipenem (75%), and ceftazidime (70%); while at the effluent sampling point (15 isolates), the most effective antibiotics were: piperacillin-tazobactam (83.33%), imipenem (75%), and ciprofloxacin (72.73%).

These preliminary results require further analysis of the correlation between phenotype and genotype at the isolate level, in order to draw conclusions regarding the burden of antibiotic-resistant bacteria as well as antibiotic resistance genes.

This research is part of the project: "Understanding and creating water-derived ecosystem services for the production of drinking water and treated wastewater for reuse in agriculture" – COFOUND-Water4All-WATERPATH (Contract 103/01.04.2025), funded via UEFISCDI (with the participation of the European Commission); UBB is a partner in this project, while the University of Florence (Italy) serves as the coordinator.

Keywords: antibiotic-resistant bacteria, antibiotic resistance genes, Pseudomonas spp., Kirby–Bauer disk diffusion method, multidrug resistance

Antimicrobial Susceptibility Testing of Enterobacteriaceae Isolated During the February 2026 Campaign From the Târgu Mureș Wastewater Treatment Plant

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The presence of antibiotic-resistant bacteria (ARB) and antibiotic resistance genes (ARGs) in aquatic environments is a highly concerning issue, particularly within wastewater treatment plants. This study presents the results of a sampling campaign conducted at two locations: the inlet (influent) and the outlet (effluent) of the Târgu Mureș Wastewater Treatment Plant.

Isolates belonging to the Enterobacteriaceae family were characterized phenotypically using the disk diffusion method (Kirby–Bauer) on Mueller-Hinton agar, with results interpreted according to the breakpoints established by EUCAST (version 15.0/16.0), and genotypically, via PCR, targeting clinically relevant resistance genes.

A total of 20 isolates from the influent and 3 isolates from the effluent were phenotypically analyzed. These were isolated on a specific culture medium (MacConkey agar) and subsequently confirmed via a oxidase test. All isolates that tested oxidase-negative were evaluated for susceptibility to 10 types of antibiotics: ampicillin (AMP - 10µg); piperacillin-tazobactam (TZP - 30µg); ceftazidime (CAZ - 10µg); cefepime (FEP - 30µg); imipenem (IPM - 10µg); ciprofloxacin (CIP - 5µg); entamicin (CN - 10µg); erythromycin (E - 15µg); tetracycline (TE - 30µg); trimethoprim/sulfamethoxazole (SXT - 25µg).

The results of the antibiograms were statistically processed using Microsoft Excel. The prevalence of susceptible, resistant, and multidrug-resistant (MDR) isolates was expressed as a percentage of the total number of isolates analyzed for each sampling point. At the inlet sampling point (influent = 20 isolates), the most effective antibiotics were: imipenem (100%), ceftazidime (95%), piperacillin-tazobactam (90%); whereas at the outlet sampling point (effluent = 3 isolates) the most effective antibiotics were: piperacillin-tazobactam, ceftazidime and imipenem (100%).

These preliminary results require further analysis of the correlation between phenotype and genotype at the isolate level, in order to draw conclusions regarding the burden of antibiotic-resistant bacteria as well as antibiotic resistance genes.

This research is part of the project: "Understanding and creating water-derived ecosystem services for the production of drinking water and treated wastewater for reuse in agriculture" – COFOUND-Water4All-WATERPATH (Contract 103/01.04.2025), funded via UEFISCDI (with the participation of the European Commission); UBB is a partner in this project, while the University of Florence (Italy) serves as the coordinator.

Keywords: antibiotic-resistant bacteria, antibiotic resistance genes, Enterobacteriaceae, Kirby–Bauer disk diffusion method, multidrug resistance

Biochemical Changes Associated With Chronic Alcohol Consumption

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Alcohol consumption represents a significant health risk factor, being associated with the development of cardiovascular, hepatic, digestive, and neurological conditions, as well as mental health disorders including depression, anxiety, and cognitive impairment. Women exhibit a greater vulnerability to the harmful effects of alcohol compared to men, developing complications over a shorter period of exposure. Through its multisystemic effects, harmful alcohol consumption impacts not only the individual's health but also family and social stability; furthermore, it constitutes a major reason for seeking medical services.

Keywords: harmful ethanol consumption, health risks, chronic conditions, systemic complications

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