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Evaluation of the Agronomic Performance of Certain Maize Varieties in Saharan Regions

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Abstract

This study aims to strengthen the resilience of Saharan agroecosystems and support the sustainability of agri-food systems in the face of climatic and environmental pressures by exploring the varietal behavior of maize in terms of silage adaptation in the Menia and Ouargla regions. The study, conducted from May 2022 to March 2023, sampled 18 maize varieties. The survey revealed the abundance of three varieties with dual affinity for both silage and grain production on cereal farms. The varieties Corruxo, Adjeeb, and Waha were cultivated on August 18, 2023, and harvested on November 25, 2023. The experiment was conducted using three replicates, with three variables to study: plant height, height of the tallest ear, and number of leaves per plant. The results showed that the Adjeeb variety performed best for silage in terms of tallest ear height and number of leaves per plant, with values of 72 cm and 16, respectively. Corruxo exhibited the highest plant height, at 222 cm. This evaluation contributes to efforts to improve cereal seeds in the face of climate change.

Keywords: Maize, Varietal performance, Saharan, Cereals, Silage variety

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Interspecific genetic diversity in Algerian forage legumes: a case study of selected populations of the genus *Lathyrus*

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Species of the *Lathyrus* genus have great potential to meet the increasing global demand for food, both for humans and livestock, especially in the context of climate change. Conserving and sustainably using *Lathyrus* genetic resources is crucial to support renewed interest in these species. In this study, the genetic diversity of six *Lathyrus* species collected from different areas in northeastern Algeria was assessed using both morphological traits and biochemical markers (seed storage proteins). The aim was to estimate the similarity between accessions and to clarify taxonomic and phylogenetic relationships. The UPGMA method was used to group accessions and build a dendrogram. Floral, leaf, seed, and plant habit traits allowed clear distinction between species, confirming their taxonomic importance. The morphological dendrogram supported Kupicha's (1983) classification for the section 1 but not for the section 4. SDS-PAGE analysis revealed 72 protein bands with species-specific patterns. However, the protein-based grouping did not completely match the morphological one, underlining the importance of combining several complementary approaches (morphological, biochemical, molecular) for reliable genetic diversity characterization.

Keywords: *Lathyrus*., genetic diversity, morphological characters, storage proteins, SDS PAGE.

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Biodiversity of Fruit Fly Communities Populations (Diptera, Tephritidae) And Dynamic of Fruit Fly, *Ceratitis Capitata* Wied. 1824 In (Khenchela) Eastern of Algeria.

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Fruit flies (Diptera, Tephritidae) are among the insect pests with the greatest economic impact in many regions of the world, particularly in Africa. They constitute a major concern in North African countries, a region commonly comprising Morocco, Algeria, Tunisia, Libya, Mauritania, and Egypt. These pests cause substantial damage to fruit crops, leading to yield losses and imposing phytosanitary constraints on national and international trade. This study investigated the diversity of fruit fly species and monitored the population dynamics of *Ceratitis capitata* on different fruit tree species, including fig, olive, and apricot, in the Khenchela region. The study was conducted over a one-year period, from November 2023 to November 2024. A trapping technique targeting adult fruit flies was applied in a mixed orchard in order to monitor population fluctuations throughout the study period. The results of adult monitoring indicated that trap captures increased with the appearance of receptive fruits in the orchard. Population levels decreased toward the end of the fruiting season, coinciding with the absence of other host fruit species within the study orchard and in relation to prevailing climatic conditions. Differences were observed between male and female captures, reflecting variations in activity patterns and responses to trapping methods. These findings demonstrate a close association between host fruit availability, environmental factors, and fruit fly population dynamics. Overall, this study provides valuable baseline information on the ecology of *Ceratitis capitata* and contributes to a better understanding of fruit fly behavior, which may support the development of effective management strategies in the Khenchela region.

Keywords: Fruits flies, Tephritidae, Diptera, Algeria, Khenchela.

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Multivariate Characterization of Soil Salinity and Fertility Gradients in Northern Saharan Wetlands (Algeria) Informed by PCA, PAM Clustering, and Random Forest Validation

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1

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This study reveals pronounced pedological heterogeneity across eight Saharan wetlands in northern Algeria-key ecosystems sustaining biodiversity and regulating salinity under growing climatic and anthropogenic pressures. Sixty-one surface soil samples (0–25 cm) were analyzed using multivariate and machine learning approaches, including Principal Component Analysis (PCA), Partitioning Around Medoids (PAM) clustering, and Random Forest classification. PCA identified two main axes: a salinity axis (PC1, 35.2%), governed by electrical conductivity (EC), Na, Cl, and SO₂; and a fertility-texture axis (PC2, 16.6%), influenced by clay content, soil organic matter (SOM), and cation exchange capacity (CEC). PAM clustering delineated three distinct soil groups: (1) moderately saline sandy soils, (2) highly saline calcareous soils in hydrologically closed depressions, and (3) nutrient-rich soils with organic enrichment in vegetated areas.

The Random Forest model achieved 91.8% classification accuracy, identifying EC, SOM, clay, Na, and Cl as the most influential predictors. Cluster distribution was strongly site-dependent ($\chi^2 = 59.93$, $p < 0.001$) and decoupled from vegetation zoning. These findings provide a robust scientific basis for targeted soil management-focusing on salinity mitigation in degraded soils, fertility preservation in productive zones, and proactive rehabilitation of moderately saline soils.

Keywords: Saharan wetlands, Soil salinity, Soil fertility, Multivariate analysis, Random Forest.

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Computational screening of eco-friendly plant protection agents against plant viral pathogens

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Plant viral diseases represent a serious threat to agricultural productivity worldwide, causing significant economic losses and compromising crop sustainability. Among these pathogens, the tobacco mosaic virus (TMV) remains one of the most persistent and destructive plant viruses, with limited availability of efficient and environmentally safe antiviral agents. Conventional chemical treatments often suffer from low efficacy, resistance development, and potential environmental toxicity, highlighting the urgent need for novel, eco-friendly plant protection strategies.

In recent years, computational approaches such as molecular docking and molecular dynamics (MD) simulations have emerged as powerful tools in pesticide discovery and design, enabling the rapid screening of bioactive compounds while reducing experimental cost and environmental impact. In this study, an *in silico* screening approach was employed to evaluate the potential of selected bioactive compounds as eco-friendly plant protection agents targeting plant viral pathogens. A library of candidate compounds was assessed for their chemical reactivity and binding efficiency toward the tobacco mosaic virus coat protein (PDB ID: 2OM3), a key structural component essential for viral infectivity.

Molecular docking studies were performed to investigate ligand–protein interactions and binding affinities, followed by molecular dynamics simulations to analyze the stability and dynamic behavior of the most promising complexes. The antiviral potential of the selected compounds was compared with that of known reference agents commonly used against plant viruses, including ningnanmycin and ribavirin.

The computational results revealed that several candidate compounds exhibited stronger binding affinity and more stable interactions with the TMV coat protein than the reference antiviral agents. These findings highlight the potential of computational screening strategies in identifying effective and environmentally friendly plant protection agents and provide a promising foundation for the development of sustainable antiviral solutions in agriculture.

Keywords: anti, tobacco, mosaic virus, molecular docking, molecular dynamics, ningnanmycin, ribavirin, antifolins analogues

*Speaker

Impact of Agricultural Biodiversity on Honey Bee Productivity and Disease Management in Algeria

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In Algeria, apiculture represents a key component of sustainable agriculture and is closely linked to local plant biodiversity. The country's rich floristic diversity, including melliferous species such as carob, rosemary, thyme, eucalyptus, jujube, citrus trees and alfalfa, plays a crucial role in the nutrition of honey bees (*Apis mellifera intermissa*), colony stability and apicultural productivity. This plant diversity also supports crop pollination and contributes to the ecological balance of agricultural ecosystems.

Field observations and research results from different Algerian regions indicate that apiaries located in diversified agricultural landscapes show improved sanitary and productive performance. These colonies exhibit higher honey yields, reduced colony mortality and increased tolerance to major apicultural diseases, particularly varroasis (*Varroa destructor*) and nosemosis (*Nosema spp.*). In contrast, areas dominated by monoculture systems, habitat degradation and excessive pesticide use are associated with higher disease prevalence and general weakening of honey bee colonies.

The integration of diversified cropping systems and agroecological practices, such as the establishment of flower strips, hedgerows and the use of native melliferous plants, has shown positive effects on honey bee health in Algeria. These practices enhance the quality and continuity of floral resources, strengthen colony immune responses and contribute to the natural regulation of pathogens and pests. In addition, they improve agricultural productivity through more effective pollination services.

In conclusion, the Algerian context clearly demonstrates that conserving agricultural biodiversity and integrating it into production systems are major levers for the development of sustainable apiculture. Strengthening the interactions between plant biodiversity, pollinators and adapted agricultural practices helps reduce the impact of apicultural diseases, increases agroecosystem resilience and supports the sustainability of agri-food systems in the face of climatic and environmental challenges.

Keywords: Honey bees Agricultural biodiversity Bee health Pathogens Sustainable agriculture

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Mushrooms, food products and protectors of forest ecosystems

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This study focused on cataloging the fungal flora associated with Algerian conifers, specifically *Pinus halepensis* Mill. and *Cedrus atlantica* (Manetti ex Endl.) Carrière. Conducted in Babor-Tababort National Park (Sétif), the research targeted the potential fruiting seasons of fungi from November to March (2023-2025). The inventory identified a total of 48 basidiomycete species across eight orders: Agaricales (13 species), Boletales (4 species), Tricholomatales (12 species), Polyporales (7 species), Cortinariales (6 species), Russulales (3 species), Cantharellales (2 species), and Auricularis with one species. Among these species, 23 are inedible, while 9 are classified as edible, including *Agaricus campestris*, *Agrocybe verveci*, *Auricularia auricula-judae*, and *Tricholoma cedretorum*. Additionally, there are 3 idiosyncratic species, 7 that are toxic, and 2 with medicinal properties: *Agaricus campestris* (known for its anti-inflammatory and anti-tumor effects) and *Ganoderma lucidum* (recognized for its hepatoprotective, anti-tumor, and anti-inflammatory benefits). The recorded species are categorized into four trophic groups: Saprobic humicolous fungi (40%) ; Symbiotic fungi (35%), including genera such as *Amanita*, *Cortinarius*, *Lactarius*, *Russula*, and *Tricholoma* ; Saprobic lignicolous fungi (19%) ; Parasitic fungi (6%). This comprehensive inventory enhances our understanding of fungal diversity in these ecosystems.

Keywords: Algerian Mushrooms, inedible, Anti, inflammatory, Symbiosis

*Speaker

Quinoa in Algeria: farmers' practices and production potential

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Quinoa (*Chenopodium quinoa* Willd.) is a pseudocereal native to South America's Andean highlands, where it has been cultivated for thousands of years due to its exceptional nutritional value and remarkable adaptability to extreme environments. Over recent decades, quinoa has gained global attention as a vital crop worldwide for enhancing food security, especially in arid and semi-arid areas vulnerable to climate change. In Algeria, quinoa was introduced recently, around 2014, as part of agricultural diversification strategies aimed at improving food security and promoting sustainable agriculture. Since its introduction, quinoa cultivation in Algeria has remained largely in an experimental phase, with trials conducted in different agro-ecological zones to evaluate its adaptability, productivity, and agronomic performance under local conditions. Taking that into account, a survey was carried out among farmers with experience or who had taken part in trials of quinoa cultivation in Biskra and Oued Souf regions, to analyze the situation of quinoa as a new crop and assess the adoption degree of farmers to cultivation practices of quinoa. The growth and success of quinoa crop in southern Algeria's dry regions since its introduction. The quantitative and qualitative data obtained through the survey were entered, processed, and statistically analyzed. The survey was carried out with 21 people and showed that the status was predominantly farmers who were recently started growing quinoa average, had higher education (university degree) and farming experience between two (2) and thirty-four (34) years. The main results indicate that the majority of farmers have little experience of growing quinoa, and that most of the trials were carried out on small areas. The Q102 variety is the most tested, and soil preparation was generally limited to ploughing, incorporating manure and preparing the seedbed. Most farmers resort to manual sowing in September, although harvesting begins around April. Yields have ranged from 5 to 35 qx/ha. Quinoa grows and performs well under real farming conditions, and there is a noticeable willingness among farmers to adopt this crop. Farmers have also reported that crop management practices are relatively easy to master. Despite constraints related to limited mechanization, particularly during sowing, harvesting, and processing of raw material into ready to consume products, farmers are considering expanding and intensifying quinoa cultivation. Overall, the prospects for the development of this crop appear promising.

Keywords: Quinoa, Arid regions, Farmers' adoption, Cultivation practices, Agronomic performance.

*Speaker

Bio-surveillance of Fruit Flies in a Pomegranate Agroecosystem in M'sila (Algeria)

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The present study was conducted in two pomegranate orchards located in Elkharza (M'sila, Algeria). The work focused on the bio-surveillance of fruit flies in these organic orchards. Two methods were combined: the use of Olipe traps and the incubation of pomegranate fruits. Results from the Olipe traps showed that the Mediterranean fruit fly *Ceratitis capitata* was the dominant species. In addition, species belonging to the orders Diptera, Coleoptera, and Araneae emerged from the incubated pomegranates. Damage caused by different pests, particularly Drosophilidae flies, was found to be significant in both orchards.

Keywords: Pomegranate, Elkharza, Olipe, Tephritidae, Drosophilidae



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Effets combinés du plomb et du NaCl sur les caractéristiques morpho-physiologiques d'*Atriplex canescens* (Pursh)

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Effets combinés du plomb et du NaCl sur les caractéristiques morpho-physiologiques d'*Atriplex canescens*(Pursh)

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Résumé

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La salinité et la pollution par les métaux lourds sont à l'origine de nombreux problèmes environnementaux. Cette étude vise à déterminer l'effet combiné de la salinité induite par le NaCl et des métaux lourds Pb(NO₃)₂ sur les paramètres morphologiques, physiologiques, biochimiques et chimiques chez *Atriplex canescens*(Pursh) Nutt . Le semis a été effectués dans des pots en plastique (16 cm de diamètre et 13,8 cm de hauteur) contenant un mélange de sable et de terreaux. Les plantes ont été irriguées avec l'eau distillée et une solution nutritive Hoagland. Après quatre mois de croissance des plantes, nous les avons soumises à des concentrations salines croissantes de 0,0.5 et 3% de NaCl combinées à quatre niveaux de 0, 800, 1600 et 2400 ppm de Pb(NO₃)₂ pour une durée d'un mois, puis nous avons effectué des analyses biochimiques et chimiques des plantes. Les résultats ont montré que l'influence combinée d'une forte salinité et du plomb a provoqué une diminution du poids sec de la partie aérienne et racinaire de la plante. L'analyse des paramètres biochimiques et physiologiques a montré une diminution de la teneur en chlorophylle (chlorophylle a, b et totale), une accumulation importante de la proline, et des antioxydants non enzymatiques (polyphénols totaux et flavonoïdes) en fonction des concentrations croissantes de salinité (NaCl) et des métaux lourds (plomb) chez *Atriplex canescens*. Les résultats relatifs au pouvoir phytoremédiateur montrent que l'augmentation de l'intensité de salinité de 0.5 à 3% NaCl a causé une augmentation d'accumulation de plomb chez *Atriplex canescens*. Une accumulation importante du Pb dans la racine d'*Atriplex* est observées en comparaison de la partie aérienne de la plante. En conclusion, *Atriplex canescens* se révèle une espèce prometteuse pour la phytoremédiation des sols salins contaminés par les métaux lourds, grâce à ses capacités de phytoaccumulation et de tolérance accrue en conditions salines. Ces propriétés doivent être prises en compte dans le développement de technologies de dépollution végétale innovantes.

Keywords: Stress salin, Stress métallique, *Atriplex canescens*, Phytoremédiation



Toward sustainable tomato protection: Environmental and economic assessment of peppermint essential oil Against *Tuta absoluta*

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The tomato leaf miner, *Tuta absoluta*, is a major pest threatening tomato production worldwide. While essential oils (EOs) are increasingly studied as eco-friendly alternatives to synthetic insecticides, their field performance, environmental impact, and economic viability remain underexplored. This study evaluated the efficacy, environmental footprint, and profitability of EOs as biopesticides for *T. absoluta* management. Based on preliminary tests, peppermint EO was selected for field trials conducted on two tomato farms, using a completely randomized design with three treatments: TEO (essential oil), TIS (synthetic insecticide), and T0 (untreated control), each replicated five times per site. Foliar and fruit damage assessments revealed that TEO significantly reduced pest damage. In S1, foliar damage decreased from 8.82 ± 0.91 (T0) to 4.62 ± 0.67 by the second observation, and from 34.86 ± 8.54 (T0) to 21.42 ± 5.19 by the sixth. Fruit damage dropped from 38.16 ± 7.32 (T0) to 10.36 ± 2.35 in S1 and from 44.95 ± 8.84 (T0) to 12.70 ± 1.87 in S2. Profitability analysis showed TEO achieved a 26% average profit, higher than T0 (1%) and comparable to TIS (30%). Environmental assessment using the Environmental Impact Quotient Field Use Rating (EIQ-FUR) showed a much lower rating for peppermint EO (1.3) than for the synthetic pesticide (29.31). This is the first comprehensive study to integrate laboratory assays, field performance, EIQ-FUR, and economic analysis for EO-based *T. absoluta* control. Peppermint EO emerges as a promising, eco-friendly biopesticide requiring further development for practical use.

Keywords: Green pesticides, Essential oil, Sustainability, Tomato pinworm.

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Impact of Partially Treated Water from Oued Gourzi Effluent on Soil Physicochemical Characteristics and Earthworm Population in Irrigated Area

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This study aims to evaluate the effect of irrigation with partially treated water from Oued El Gourzi (in El Madher area; effluent from the city of Batna in Algeria) on certain physicochemical and biological characteristics and on the earthworm population in the soil. This area is characterized by a significant and uncontrolled expansion of irrigation practices. The different cultivation and irrigation systems use wastewater effluent, which has a major effect on soil characteristics and biodiversity. Soil samples and earthworms were collected from 3 different sites with different irrigation and cultivation systems (cereal growing, arboriculture and market gardening). Each site was subject to 5 different random samples. The soil samples collected presented physical and physicochemical characteristics closely linked to the different irrigation systems and cultural practices. These are soils rich in total limestone, moderate salinity, a slightly basic pH, rich in organic matter and available in nutrient elements for plants (phosphorus, potassium and nitrogen). The ANOVA allowed us to record significant effects of each station studied on electrical conductivity, % age of organic matter, active CaCO₃, potassium, assimilable phosphorus and assimilable nitrogen. For the earthworm compartment, we characterized a

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density equivalent to 169.55/m² and an average biomass of 78.00 g/m². The taxonomic study identified 6 species of earthworms *Aporrectodea trapezoides*, *Aporrectodea rosea*, *Aporrectodea caliginosa*, *Eiseniella tetraedra tetraedra*, *Proctodrilus antipaiantipai* and *Eophila molecularri*. The Shannon diversity and evenness values were 2.059 and 0.796 in the study sites, respectively. The correlation matrix and PCA revealed a significant relationship between physical parameters and soil physicochemical characteristics, total abundance and biomass parameters.

Keywords: partially treated water, soil, physicochemical parameters, earthworm population, irrigated area



Sustainable management of agricultural waste (POTATO WASTE) in the region of OUED SOUF

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Sustainable management of agricultural waste, such as potato waste, is a major challenge in the fight against environmental pollution and the preservation of natural resources. This type of waste, although practical and widely used in various sectors, such as the manufacture of bioplastics, is a biodegradable material that can be used to combat traditional plastic pollution, which accumulates in ecosystems, threatening wildlife, flora, and human health. Sustainable management involves a series of strategies aimed at reducing pollution from agricultural waste, promoting its recycling, and encouraging ecological alternatives.

The first step towards the sustainable management of this waste is to limit its production. This can be done by replacing this type of waste with a naturally sourced, biological, renewable, and biodegradable material: bioplastics.

In this work, an attempt was made to produce a plastic based on potato starch using other non-toxic products such as glycerol.



Keywords: plastic, environment, pollution, bioplastic, Agriculture waste

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Harnessing Cactus Root Endophytes for Wheat Resilience: *Pseudomonas putida* and *P. brassicacearum* Mitigate Drought Stress and Enhance Growth

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Cacti are among the most drought-tolerant plants. As *Opuntia* is able to grow under the stress of drought, this study aims to check if endophytic bacteria isolated from cactus roots have beneficial potential for crops such as wheat during drought. Two endophytic bacterial isolates were isolated from the roots of the cactus and screened for their plant growth promoting characteristics, such as N-free growth and auxin production. These bacteria have demonstrated their potential to promote the growth of durum wheat under in-vitro conditions and have been identified as *Pseudomonas putida* and *P. brassicacearum*, following the sequencing of the 16S rRNA gene and phylogenetic analysis, and significantly improved growth parameters such as seedling length compared to the unobstructed control. After 05 days of contact of the two bacteria, *P. putida* and *P. brassicacearum*, with sprouted wheat seeds, a root growth rate of (39.88% and 62.14%, respectively) was recorded. The same effect on the growth of wheat roots is caused by the volatile substances of these bacteria deposited separately, with a rate of (53.30% and 24.18%) respectively. Symptoms of drought stress were visibly reduced on seedlings inoculated with *P. putida* and *P. brassicacearum* bacteria, a result supported by a growth rate of root parameters in length (260.83% and 179.60%), surface (21.98% and 60.17%) and scope (59.46% and 62.67%), respectively. This work opens up many perspectives for the characterization and selection of endophyte bacteria of under-used drought-tolerant species such as cacti for the improvement of the growth of field crops. These results promote the deployment of *Pseudomonas* sp as an effective biofertilizer in wheat.

Keywords: Endophytes, *Opuntia ficus, indica* L., Plant growth, promoting rhizobacteria, Drought, *Pseudomonas*, Wheat

*Speaker

The canopy's effect on the wild pistachio on the vegetation cover and species richness under a semi-arid climate south of Tebessa

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This study investigated the facilitative effects of wild pistachio (*Pistacia atlantica*) canopy on vegetation characteristics in the semi-arid ecosystem of Ghar Abada, located south of Tébessa, Algeria. The research aimed to quantify the influence of canopy cover on vegetation density, species diversity, and community structure under water-limited conditions typical of Mediterranean semi-arid regions. Field sampling was conducted between March to May in 2023 at the Ghar Abada site under semi-arid climatic conditions. A total of 510 sampling plots were established, comprising 360 plots positioned beneath *Pistacia atlantica* canopies and 150 control plots in open areas without canopy influence. Vegetation parameters assessed included total vegetation cover percentage, species richness, and biodiversity indices (Shannon-Weaver and Simpson diversity indices). Statistical analysis employed the Mann-Whitney U test to evaluate significant differences between canopy and control treatments. The canopy effect of *Pistacia atlantica* demonstrated statistically significant positive influences on all measured vegetation parameters ($p < 0.001$). Plots beneath pistachio canopies exhibited enhanced vegetation cover, increased species richness, and higher diversity indices compared to control areas, indicating a strong facilitative effect of the nurse plant on understory vegetation communities. These findings confirm the ecological importance of *Pistacia atlantica* as a nurse species in semi-arid environments, where its canopy creates favorable microhabitat conditions that promote vegetation establishment and diversity. The significant facilitative effects observed suggest that conservation and management of wild pistachio populations could serve as an effective strategy for ecosystem restoration and biodiversity enhancement in Mediterranean semi-arid landscapes.

Keywords: *Pistacia atlantica*, nurse plant effect, semi, arid ecosystem, species diversity, facilitation, Tébessa, Algeria

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The Ecological Role of Scorpion Biodiversity in Saharan Agro-ecosystems in the region of Oued Righ (M'rara)

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In the extremely arid regions of southern Algeria, sustainable agriculture depends on the delicate ecological balance of oasis systems. While scorpions are often viewed from a public health perspective, their role as a form of functional biodiversity in agricultural landscapes is often overlooked. This study examines scorpions in the Oued Righ region (M'rara region). This study aims to assess species diversity and seasonal activity patterns to evaluate their potential contribution to sustainable agriculture. To this end, field surveys were conducted in 2023 using self-sampling methods. The field surveys revealed the presence of two scorpion subspecies in the M'rara region: by the specie *Androctonus australis* at (55%) and *Androctonus aeneas* at (45%), with peak activity during the summer season from May to October. Our results show that these species occupy distinct ecological niches, with *Androctonus australis* occupying 70% of agricultural crops and *Androctonus aeneas* occupying 50% of urban habitats. The diversity and abundance of scorpions serve as a bio-indicator of the health of the oasis environment. A stable scorpion population suggests a rich and balanced arthropod community, which is essential for sustainable farming. They prey on a wide range of agricultural pests, such as locusts, beetles, and larvae that damage date palms and other crops. This study highlights the need for further research to comprehensively document and understand the scorpion fauna of the region .Such efforts are essential to develop effective conservation strategies for these species and to preserve the overall ecosystem. Furthermore, the presence of these specialized predators highlights the potential for biological prospecting of local scorpion venoms to develop selective biological insecticides.

Keywords: sustainable agriculture, Oued Righ, scorpion, Biodiversity, Algeria

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Valorization of Saharan genetic diversity: the case of oasis wheat from Adrar, the Touat and Gourara region

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The Algerian Sahara offers enormous potential in terms of plant genetic resources, providing an alternative means of meeting food security needs, particularly for oasis wheat, which is characterized by great diversity and heterogeneity of forms and types linked by intermediaries. In this work, we have attempted to make observations on soft wheat from the Touat and Gourara oases in Adrar, summarizing the results of our own work based on the UPOV description for 7 varieties (Benmabrouk, Bahmoud, Kadoura, Chataa, Sabaga, Hamra and Oumrokba) in order to identify the varieties with maximum reliability by manipulating the following characteristics: color, shape, dimensions, ear compactness, grain beard ridges, number of grains in the ear, weight of 1000 grains, etc. Characterization enabled us to select certain varieties deemed interesting thanks to certain yield components; the Benmabrouk variety has a fairly high number of grains (77 g/epi) and a very high thousand-grain weight (87g) compared with the other varieties. Keywords: Wheat, oasis, varieties, Touat, Gourara, characters.

Keywords: Wheat, oasis, varieties, Touat, Gourara, characters.

*Speaker

Evaluation of Dried Abattoir Blood as a Soil Amendment and Its Potential to Enhance Plant Tolerance to Salinity Stress

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Agricultural sustainability in arid environments depends on enhancing agro-ecosystem resilience through biodiversity based and organic soil management practices. This preliminary study assessed the effect of incorporating dried abattoir blood directly into the soil on the vegetative growth and survival of pumpkin (*Cucurbita* sp.) under different salinity levels. Two soil treatments were used: soil amended with dried blood and non-amended soil. Plants were irrigated with water containing 0, 50, 100, and 150 mM NaCl. Vegetative growth parameters and plant survival were monitored over 15 days to evaluate plant adaptation and agro-ecosystem resilience.

Results showed that plants grown in blood amended soil consistently exhibited higher survival and better growth compared to non-amended soil under moderate and high salinity:

At 0 and 50 mM NaCl, survival was 100% in both soil types.

At 100 mM NaCl, survival was 100% in non amended soil, while all plants in blood-amended soil survived, with early signs of leaf yellowing.

At 150 mM NaCl, survival was 50% in non amended soil, while 75% survived in blood-amended soil, despite initial wilting signs.

Regarding vegetative growth, the largest improvement was observed at 50 mM NaCl, where plants in blood-amended soil had a 13% higher growth compared to non-amended soil. These findings indicate that recycling dried abattoir blood into soil improves plant resilience under salinity stress, enhancing functional biodiversity and promoting sustainable agro-ecosystems. This study demonstrates the potential of organic waste recycling as a soil amendment to strengthen plant tolerance to salinity and support sustainable agriculture in arid environments

Keywords: Agro, ecosystem resilience, functional biodiversity, dried abattoir blood, salinity stress, pumpkin

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Influence of Soil Biological Crust on Plant Productivity in Desert Ecosystems

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Understanding soil-plant-microbe interactions is essential to ensuring the health, quality, and soil-mediated ecosystem services necessary for human, plant, and animal life. Soil biological crust, a biotic community prevalent in arid zones, has a consistent influence on plant productivity. Productivity in arid zones may depend on the sensitivity of plant-biocrust interactions. The soil and its biota can shape the development of colonizing vascular plant communities. Because they occupy soil surfaces where most seeds are dispersed, biological soil crusts can help plants establish and survive by providing safe microsites that protect seedlings from drought and wind. For this reason, biocrusts are considered essential for improving plant productivity.

Keywords: Keywords: biological soil crust, productivity, vascular plants, survival

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Biodiversity as a tool for climate-resilient and sustainable agriculture

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Climate change presents considerable difficulties for global agricultural systems, encompassing more frequent droughts, heat stress, soil deterioration, and the proliferation of novel pests and diseases. Within this framework, biodiversity has become a crucial approach for bolstering the resilience and sustainability of agricultural production. This review examines the function of agricultural biodiversity in fostering climate-resilient and sustainable farming systems. The paper consolidates recent scientific research concerning various facets of biodiversity, including the genetic diversity of crops, species diversity, functional biodiversity, and soil microbial diversity. It underscores the ways in which diversified agroecosystems contribute to enhanced ecosystem services, such as soil fertility, nutrient cycling, biological pest control, pollination, and water regulation. Furthermore, the review discusses biodiversity-based agricultural practices, including crop diversification, intercropping, agroforestry, conservation agriculture, and the use of beneficial organisms. These practices are shown to enhance system stability, reduce dependence on chemical inputs, and increase farmers' capacity to adapt to climate variability and extreme weather events. Finally, the review identifies key challenges related to the implementation of biodiversity-based strategies, such as limited farmer awareness, policy constraints, and economic barriers. It concludes by emphasizing the need for integrated policies, interdisciplinary research, and capacity-building initiatives to effectively harness biodiversity as a tool for achieving climate-resilient and sustainable agriculture.

Keywords: Biodiversity, Sustainable Agriculture, Climate, Resilience, Agroecosystems, Crop Diversification.

*Speaker

Influence of palm grove maintenance gradient on arthropod diversity and distribution

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This study examines the arthropod fauna of three palm groves located in the El-Mégghaier region, aiming to highlight the influence and impact of cultivation practices, particularly palm grove maintenance, on arthropod diversity and distribution. A well-maintained palm grove (Station 1), a moderately maintained one (Station 2), and an unmaintained one (Station 3) were selected. In these last three stations, the buried pot method (Barber) was used for arthropod inventory. The values for total and average arthropod species richness vary from one station to another. The highest richness is recorded at station 3 (unmaintained palm grove) with 34 species ($S_m = 1.8 + 1.5$). This is followed by station 2 (moderately maintained palm grove) with 30 species ($S_m = 1.5 + 1.0$), while station 1, which is well maintained ($S = 21$; $S_m = 1.4 + 1.3$), is the least rich in arthropods. Overall, these arthropods are structured into different classes. Three classes (Insecta, Collembola, and Arachnida) were observed at stations 1 and 2, while five classes were noted at station 3, which was not maintained (in addition to the three classes found at the other stations, Malacostraca and Clitellata were also present). The significant presence of the Insecta class ($61.2\% \leq \text{relative abundance} \leq 85.1\%$) in all three types of palm groves should be noted.

Keywords: Palm grove, maintenance, influence, diversity, arthropods, El, Mégghaier

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The economic stakes surrounding aquaculture and agriculture in Western Algeria

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In recent decades, wetlands have gained significant importance following the recognition of their important ecological role in controlling biophysical processes, and their function as a source of environmental services for society. These environments are subject to significant human pressure; therefore, the objective of this work is to understand the interactions between different socio-professional sectors and these environments in order to determine the socioeconomic challenges and what long-term effects might these have on the environment, particularly on its biodiversity. A process of observation and analysis was adopted in the study area to carry out this work. The results reveal three economic stakes around the wetland: industrial activity, agriculture, and livestock farming. All three activities are of great importance to the local population, and each tends to exploit the environment in its own way. Users of the various wetlands are aware of the importance of these environments and the lack of water. Our approach is a tool for creating a rational management plan for better conservation and protection of the various wetlands in Western Algeria.

Keywords: aquaculture, biodiversity, socioeconomic stakes, protected area, conservation, rational management.

*Speaker

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Biodiversity of arthropod fauna in agricultural and natural environments in the Algerian Sahel

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Keywords: Keywords: Entomofauna, Inventory, Khracia, Zeralda, traps, Insects



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Eco-friendly valorization of agricultural waste: transforming pomegranate peels into sustainable environmental solutions

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Agricultural wastes, including pomegranate peels, constitute an environmental resource that remains largely underutilized and can pollute the environment when proper valorization methods are not implemented. The research project aims to transform agricultural waste through eco-friendly methods that extract bioactive substances and produce sustainable ecoproducts, including natural biopesticides and water treatment agents, with zero waste generation and no secondary pollution. The research method combines green extraction methods, which use water or food-grade ethanol to obtain plant extracts, with subsequent testing of environmental activity to assess their effects on agricultural growth environments and water quality parameters. The expected results will include reduced agricultural waste generation, improved environmental protection, enhanced sustainability of both crops and water resources, and safer use of natural agricultural materials through intelligent methods. The research demonstration is a closed-loop environmental system that uses waste materials as a source of practical value while maintaining ecological balance. The research continues to support principles of sustainable agriculture while guiding resource management practices for natural ecosystems.

Keywords: Pomegranate peels, Green extraction, Bioactive compounds, Natural biopesticides, Circular economy

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Steppe Biodiversity and Multi-Species Grazing for Sustainable Sheep Farming

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Steppe ecosystems constitute a strategic resource for sheep farming in arid and semi-arid zones, which are characterized by water scarcity and high climatic variability. In the central Algerian steppe, sheep diets rely on natural rangelands combining herbaceous and woody species with heterogeneous nutritional profiles. This study evaluates the extent to which multi-species grazing can improve the nutrition and performance of sheep flocks under water stress. Nine species typical of steppe rangelands were characterized for their chemical composition, digestibility, and energy value: *Artemisia herba-alba*, *Atriplex halimus*, *Atriplex canescens*, *Balanites aegyptiaca*, *Prosopis juliflora*, *Stipa tenacissima*, *Lygeum spartum*, and *Salsola vermiculata*. Shrubby halophytes such as *Atriplex halimus* and *Atriplex canescens* show high protein contents (16–19%) and good digestibility (≈ 65 – 86%), providing a significant nitrogen supply during periods of herbaceous deficit. *Balanites aegyptiaca* and *Prosopis juliflora* have protein levels of 18–21% and digestibility of 68–70%, making them key sources of digestible protein. Species such as false mimosa, alfa grass, and sparte complement the diet by providing regular fiber and energy intake, despite their more moderate protein contents, and play an essential role in meeting energy requirements during periods of low herbaceous availability. Zootechnical results indicate that multi-species grazing improves overall digestibility by 15–20% and enables flocks to maintain an average daily weight gain of 80–100 g and a stable body condition despite water stress. These performances demonstrate that combining herbaceous and woody species optimizes the use of pastoral resources and enhances the resilience of sheep production systems. The valorization of steppe biodiversity, particularly annual plants and grasses, contributes to a transition toward more sustainable livestock systems, less dependent on concentrated feeds and better adapted to arid and semi-arid conditions.

Keywords: Steppe biodiversity, multi, species grazing, alfa grass, sparte, sheep nutrition, flock performance, sustainability, arid zones.

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Dosage of polyphenols and flavonoids in different extracts of *Deverra scoparia* Coss & Dur (Apiaceae)

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The Algerian flora contains a high diversity of medicinal plants, which today represent an essential source for the discovery of new biomolecules that are highly effective against many diseases. This work aims to contribute to the valorization of a plant endemic to the Algerian Sahara, *Deverra scoparia* Coss & Dur (Apiaceae), through the first stage of an analytical study. This plant is of great interest in folk medicine due to its widespread local use. The different organs (flowers, stems) of the plant were subjected to the extraction of phenolic compounds by water and 70% ethanol. The extraction yields range from 10.08% to 12.84%. The semi-quantitative analysis carried out by colorimetry showed that the hydro-ethanolic extract is very rich in phenolic compounds and the aqueous extract has the highest content of flavonoids, this study was evaluated with HPLC analysis of both extracts.

Keywords: *Deverra scoparia*, extraction, dosage, polyphenols, flavonoids, HPLC.

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Diversity and floral preferences of wild Apoidea in the Khenchela region (Algeria)

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Wild bees represent essential pollinators within both natural and agricultural ecosystems. This study examined the diversity, distribution, and floral preferences of Apoidea across three stations in the Khenchela region (El Hamma, Ain Mimoun, and Remila) during the spring season (April–June 2021). Sampling was conducted through direct capture using vials, butterfly nets, and systematic field notebooks. A total of 34 species from four families were recorded: Apidae (14 taxa, 40.6%), Megachilidae (13 taxa, 38.3%), Halictidae (5 taxa, 16.4%), and Andrenidae (2 taxa, 4.7%). No representatives of Melittidae or Colletidae were observed. Notably, the rediscovery of *Ceratina cucurbitina* (Apidae), absent from regional records since 2015, constitutes a significant finding. Statistical analyses yielded a Shannon diversity index ($H' = 1.17$), Simpson's diversity index ($D = 0.66$), and evenness ($E = 0.33$), reflecting moderate diversity with pronounced dominance by Apidae and Megachilidae. Floral visitation patterns revealed that Apidae were primarily associated with cultivated crops, Megachilidae with spontaneous flora, Halictidae restricted to Asteraceae, and Andrenidae exhibiting limited visitation confined to cultivated plants.

Keywords: Wild Apoidea, Pollination, Floral choices, Khenchela.

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Growing Possibilities of Some Artichoke Varieties in Kyrgyzstan Bishkek-Chuy Region

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The research was conducted at the research and experimental farm of Faculty of Agriculture, Kyrgyzstan-Türkiye Manas University. Olympus, Green Globe, Imperial Star, and Sambo F1 Artichoke varieties were used as plant material. In experiment, seeds were sown in a plastic tunnel on March 15, 2017. Artichoke seedlings were planted in the field on April 28, 2017. The research was planned according to a randomized plot experimental design with 4 replications, each containing 20 plants. In results, artichoke plants had vegetative growth in first year after planting and no yield was obtained; yield was observed in second year. The maximum head weight was obtained from Sambo F1 with 360.57 g, followed by Imperial Star, Olympus, and Green Globe varieties with 221.75 g, 194.95 g, and 143.36 g respectively. This research, first of its kind in the Chuy region of Kyrgyzstan, clearly showed that artichokes can be successfully grown in experimental region.

Keywords: Vegetable growing, Artichoke, Variety, Yield, Kyrgyzstan

*Speaker

Biostimulants application in vegetable crops under salinity stress environment

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Vegetables are important nutritional sources for human health and a balanced diet, contributing significantly to the development of carotenoids, vitamins, polyphenols, carbohydrates, and fiber. Yield and quality are paramount in vegetable farming. Recently, global climate change and poor agricultural practices have exacerbated the negative effects of abiotic stress factors, leading to yield and quality losses. Salinity is a significant stress factor, often limiting plant growth in greenhouse vegetable cultivation. Therefore, researchers are proposing different approaches to mitigate the negative effects of salinity. Various studies have reported that some biostimulants reduce the negative effects of salt stress. The present review examines recent studies on the effects of biostimulants, including humic acids, seaweed extracts, protein hydrolysates, N-containing compounds, chitosan, biopolymers, inorganic compounds, and beneficial fungi and bacteria, on vegetable species. The aim is to determine the effectiveness of these applications and their tolerance to salt stress, thereby providing a future perspective.

Keywords: Beneficial microorganisms, global climate change, salt stress, sustainable agriculture, vegetable farming

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†Speaker

Purslane's Drought Tolerance: a Keystone trait for Agricultural Biodiversity

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In an era of increasing climate unpredictability and environmental degradation, the resilience and sustainability of our global agri-food systems depends on the basic principle of biodiversity. Overcoming monocultural models is a smart strategic choice for integrating agricultural biodiversity which is increasingly recognized as an important step for enhancing ecosystem resilience, stabilizing crop productivity, and shaping sustainable food pathways.

Portulaca oleracea .L (**purslane**) as a typical example, known for its exceptional abiotic stress tolerance, nutritional richness, and ecological flexibility, it surpasses its common identity as a weed plant to emerge as a vital component of practical agro-biodiversity. This undervalued crop thrives where others fail and may contribute to ecosystem health and human food security.

In this study, we aimed at testing purslane's tolerance to drought stress in the phase of germination of two local cultivated ecotypes. To simulate the dry climate, different water potential of PEG 6000 solutions (From -0,25 to -1,98Mpa) were used to germinate seeds on petri dishes at 25°C. The results showed a moderate impact on seed germination by medium to high drought intensity. For both ecotypes, in terms of tolerance and germination rates. This highlights P. Oleracea's potential as important biodiversity element and ecosystem natural resilience power. A promising food source in regions with harsh environmental conditions, especially those impacted by drought, which is a major challenge for sustainable agro- ecosystems. More investigations are advised.

Keywords: *Portulaca oleracea* L., Drought stress, Germination, Sustainable Agriculture, Biodiversity.

*Speaker

Hypolipidemic effect of an Algerian Mushroom

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Disorders of lipid metabolism are becoming increasingly prevalent worldwide, largely driven by rapid shifts in lifestyle and environmental factors. These conditions, which result from abnormal fat accumulation, exert serious adverse effects on human health. Among them, hyperlipidemia and obesity represent multifactorial disorders that contribute to numerous life-threatening diseases. Edible mushrooms are among such natural sources, providing hypolipidemic compounds including fungal sterols (ergosterol and derivatives) and polysaccharides (β -glucans, chitins, etc.), which have demonstrated the ability to inhibit lipid absorption and biosynthesis in both in vitro and in vivo studies. Within this context, the present study aims to investigate the hypolipidemic activity of *Terfezia clavari*. Four different extracts were assessed for their inhibitory activity against pancreatic lipase and α -amylase. The study also evaluates their antioxidant capacities, as well as their mycochemical profile. Mycochemical tests showed a notable interesting richness in terms of secondary metabolites. However, hexanic and chloroformic extracts showed the most potent activity. These data provide evidence that truffle species represent a promising source of biologically active compounds that could by further investigations provide support and alternative to the currently used drugs.

Keywords: Edible mushrooms, lipid metabolism, mycochemical profile, hypolipidemic, antioxidant, *Terfezia clavari*.

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Activities of the National Research Centre and the Academy of Scientific Research and Technology in Egypt in the conservation of wild medicinal plants outside their natural habitats (Ex situe)

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Egypt is a biodiversity hotspot, home to a rich array of plant species found nowhere else in the world. Unfortunately, increasing population, increasing human activities, climate change, global warming, environmental pollution, competition or displacement by invasive species have led to the rapid decline of many plant species.

Global plant extinction rates have increased dramatically over the past 50 years. Conservation efforts are especially challenging across the different phyto-geographical regions in the Egyptian deserts, where habitat loss and competition with invasive species threaten the existence of native plant species. Therefore conservation of the plant biodiversity is critical. The genetic diversity of plants is essential to ensure their survival and maintain ecosystem resilience. Conservation efforts (*In situ and Ex situ*) are expected to play a greater role as climate change progresses. Thus, Egyptian Academy of Scientific Research and Technology launched several initiatives to participate in the conservation of wild medicinal plants by funding national projects in this field. The National Research Centre also contributed to these efforts by implementing some projects funded by the Academy or the Centre itself. These projects were carried out by research teams from the Centre, Egyptian universities, and other research centers. Examples include the National Project for the Egyptian Encyclopedia of Wild Medicinal Plants (Two phases), the National Project for Establishing a National Seed Bank for Wild Plants, and the three-phase *ex-situ* conservation of endangered medicinal plants, targeting some of the most critically endangered endemic species.

This presentation will shed light on those projects, their outputs, and their contribution for the conservation of heritage knowledge of medicinal plants and their genetic resources.

Keywords: Medicinal Plants, Conservation, Encyclopedia, endemic, In situ, Ex situ, seed bank

*Speaker

Agro-physiological and molecular expressions of low temperature stress in vegetables

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In agriculture, although agro-productivity increases with some practices such as soil tillage, irrigation, fertilization, pesticide use, and plant breeding, it decreases due to biotic and abiotic stress. These stress factors may sometimes act individually or collectively, limiting productivity or even eliminating it. Managing stress factors is one of the major concerns of agricultural scientists. In particular, controlling constraints imposed by abiotic stress is very difficult. This challenge is further aggravated by the duration and intensity of stress, as well as the complexity of the plant's tolerance mechanisms. One of abiotic stress factors limiting agricultural productivity is low temperature. Individually, low temperature disrupts seed germination, seedling vigor and emergence, water and mineral nutrient uptake, and the exchange of photosynthetic assimilates between source and sink tissues in various plant species. It also reduces photosynthetic capacity associated with excessive ROS accumulation, thereby negatively affecting growth and development processes. The degree of plant sensitivity to cold stress is naturally defined by the climatic conditions in which they grow. Cold-sensitive tropical and subtropical species adapt poorly to cold stress, whereas temperate plants that tolerate seasonal temperature fluctuations can adapt better to cold conditions. Most research about alleviating stress is based on externally applied chemicals, hormones, and similar treatments, which are applications to reduce the effects of low temperature. However, both the effectiveness of these applications is limited, and their costs constitute an important constraint. Therefore, there is a necessity to work on more practical methods. In this context, developing genotypes with higher cold tolerance thresholds on a species basis is essential. In this review, acclimation, and recovery processes under low temperature stress conditions in different vegetable species were assessed comprehensively through agronomic, physiological, and molecular approaches.

Keywords: Vegetable, low temperature, agronomy, physiology, molecular work

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[†]Speaker

Diversity and life-history attributes along several agroecosystems (Tebessa, Eastern Algeria): the ground beetle communities as a model of study

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Ground beetles represent pivotal terrestrial arthropods and good bioindicators in order to assess the health state of ecosystems in general and agroecosystem in particular. This study aimed to evaluate, from one hand, the carabids' taxonomic diversity related to agricultural ecosystems: bean field (Agr1) and wheat field (Agr2), from the other hand, the life-history attributes under semi-arid climate in the Eastern Algeria. Weekly, from December 2024 to April 2025, pitfall traps were installed to collect specimens. The findings allowed the sampling of 149 ± 14.79 individuals, belonging to 6 species grouped in 5 genera and 2 subfamilies. The most abundant subfamily is Harpalinae (87.24%) and the most abundant species is *Cimindis setifensis* Lucas, 1842 (30.20%). Diversity indices showed an important diversity ($H' = 2.02$, $E = 0.93$, $1-D = 0.88$). The spatial quantitative and qualitative similarity were high (Jaccard index = 0.98, Morista index = 0.97). This latter was confirmed by the ANOSIM analysis, which indicated no significant differences in carabid communities between stations. Based on NMDS, small-sized, zoophagous and brachypterous species are related to agroecosystems.

Keywords: Functional traits, Carabid beetles, Semi, arid, Taxonomic diversity.

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Elevation Rewires Native Arbuscular Mycorrhizal Fungal Networks in Mediterranean Soils Beneath an Endangered Wild Grapevine

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Native arbuscular mycorrhizal fungi (AMF) are fundamental members of soil biota, playing crucial roles in nutrient cycling, soil aggregation, and plant productivity across ecosystems. Nevertheless, the processes through which environmental gradients shape AMF communities and their interaction networks in the calcareous-clayey soils of northern Tunisia remain insufficiently understood. In this study, we examined how altitude and related soil characteristics influence the diversity, composition, and co-occurrence networks of native AMF inhabiting soils associated with the endangered wild grapevine, *Vitis vinifera* subsp. *sylvestris*, across low-, mid-, and high-altitude sites. AMF-specific amplicon sequencing of rhizosphere soils and root endosphere samples was integrated with community profiling, structural equation modelling (SEM), and network analysis. Altitude generated contrasting diversity trends between plant compartments: AMF diversity declined with increasing altitude in the rhizosphere but rose within the root endosphere. SEM indicated two distinct assembly pathways. In the root endosphere, altitude exerted a strong direct influence on AMF composition, whereas in the rhizosphere its effects were largely indirect, mediated by shifts in soil pH, phosphorus, calcium, and electrical conductivity. Co-occurrence networks further revealed altitude-driven reorganization of AMF interactions, with mid-altitude soils hosting the most complex network architectures and distinctive keystone taxa, including *Funneliformis mosseae*, *Dominikia gansuensis*, *Gigaspora polymorpha*, *Gigaspora candida*, and *Acaulospora foveata*. These taxa showed strong associations with soil nutrient availability and cation exchange capacity, highlighting their potential contributions to phosphorus mobilization, stress mitigation, and the enhancement of soil structure. Overall, our findings demonstrate that altitude acts as a selective filter on native AMF communities through interconnected root- and soil-mediated pathways, reshaping belowground networks and their prospective roles in soil functioning within Mediterranean perennial ecosystems. The study also establishes a microbial framework to support conservation and restoration strategies for wild

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grapevine habitats.

Keywords: Arbuscular mycorrhizal fungi, Soil microbial communities, Elevation gradient, Mediterranean soils, Root endosphere and rhizosphere, Co, occurrence networks, Keystone taxa



Assessment of environmental quality in agricultural and forest landscapes of Tebessa (Eastern Algeria) using the Mean Individual Biomass (MIB) index: Carabid beetles as bioindicators

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Agricultural intensification drives habitat disturbance, profoundly impacting carabid beetle communities, which serve as effective bioindicators of environmental quality. In this survey, ground beetles mean individual biomass (MIB) was analysed in four stations belonging to two types of ecosystems: agroecosystem (Agr1 and Agr2) and forest (For1 and For2). Weekly and by the usage of forty Barber traps, a total of 320 individuals, belonging to 12 species were recorded. Forest stations exhibited significantly higher MIB values (MIBFor1=286.03 mg; MIBFo2=286.35 mg) compared to agricultural stations (MIBAgr1=134.94 mg; MIBAgr2= 140.29 mg). The average MIB in forests (286.19 mg) was more than double that in agricultural stations (137.62 mg). A Mann–Whitney U test confirmed that this difference was statistically significant ($U = 42.50, p < 0.05$), reflecting a greater dominance of large-bodied carabid species in forest habitats *e.g.* *Compalita maderae* and *Machrothorax morbillosus*. Lower MIB in agricultural landscapes indicates higher disturbance and a prevalence of smaller species typical of cultivated environments *e.g.* *Amara simplex*. These results demonstrate that MIB is a simple yet powerful bioindicator for detecting habitat quality and disturbance gradients. Forest habitats play an important role in maintaining diverse and well-structured carabid beetle communities, while agricultural landscapes tend to favor smaller, disturbance-tolerant species.

Keywords: Carabidae, Mean Individual Biomass, bioindicator, habitat disturbance, forest, agroecosystem, Tebessa

*Speaker

Evaluation of the Insecticidal Activity of Aqueous and Essential Oil Extracts of Eucalyptus as Eco-Friendly Pest Control Agents

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This study aims to evaluate the effectiveness of aqueous and oil extracts of Eucalyptus for use as insecticides against aphids. The aqueous extract of Eucalyptus leaves was prepared through soaking and cutting, while the oil extract was obtained using a Kelvinator device. Five successive concentrations of the aqueous extract (1 mg, 1.5 mg, 5 mg, 10 mg, and 20 mg) and four successive concentrations of the oil extract (15 μ L, 10 μ L, 7.5 μ L, and 5 μ L) were tested. The treatment was applied to aphids via direct spraying, and observations were recorded at 24 and 48 hours. The results demonstrated that eucalyptus leaf extracts were toxic to aphids, with 100% mortality at 20 mg for the aqueous extract and 15 μ L for the oil extract. Additionally, the findings indicated that time significantly affected mortality, with the 48-hour results showing increased aphid mortality over time.

Keywords: Aqueous extract, Oil extract, Insecticide, Eucalyptus, Aphid

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Isolation and Microscopic Identification of Major Storage Fungi Associated with Wheat Grains in Adrar, Algeria

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Wheat grain samples were collected from different storage systems in Adrar Province, southern Algeria, with the aim of detecting and identifying microbial contamination associated with post-harvest storage conditions. The sampling covered a variety of storage methods, including modern silo systems and traditional storage structures such as plastic bags, flour bags, jars, and metal mesh containers. These storage environments were selected due to their potential influence on fungal growth and grain quality deterioration under arid climatic conditions.

Fungal isolation was performed using standard microbiological techniques based on direct plating of wheat grains on suitable culture media. After incubation, fungal colonies were purified and identified based on their macroscopic and microscopic characteristics. Microscopic examination was carried out using a laboratory microscope to observe fungal structures, including conidia, conidiophores, and hyphal morphology, which are essential for accurate identification.

The results revealed the presence of several major fungal genera commonly associated with stored wheat. The predominant fungi included *Aspergillus flavus*, *Aspergillus niger*, *Penicillium* spp., *Fusarium* spp., *Alternaria alternata*, as well as *Rhizopus* spp. and *Mucor* spp. These fungi are recognized as typical storage fungi, some of which are capable of producing mycotoxins that can negatively affect grain quality and food safety.

This study highlights the importance of storage conditions in influencing fungal contamination of wheat and provides essential baseline data for improving storage management practices and developing preventive strategies to ensure cereal safety and quality in arid regions.

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Keywords: Wheat grains, Fungal isolation, Microscopic identification, Grain storage, Food safety, Mycotoxins



Performance Enhancement of a Fin-Enhanced Solar Air Collector for Sustainable Thermal Applications

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This study compares a conventional solar air collector with a modified design fitted with 5 cm cylindrical fins. Experiments were carried out under real solar conditions in El Oued. The modified collector produced a higher outlet air temperature (56.8 °C) than the conventional unit (54.8 °C). Energy efficiency increased to 22% compared with 20.4%, while exergy efficiency reached 7.17% versus 6.9%. Numerical simulations showed strong agreement with experimental results ($R^2 > 0.95$). The fins improve heat transfer, which makes the system useful for drying crops, heating greenhouses, and reducing moisture in stored grains. Lower humidity helps prevent fungal growth and reduces losses after harvest, improving food safety. This solar system also provides a clean and low-energy option compared with traditional heating, making it suitable for dry and semi-dry regions.

Keywords: Keywords: Solar air collector, Numerical, Experimental, fins, heat transfer.

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Effect of Humidity, Temperature, and Pollution on Air Quality Using Two-Way ANOVA

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This study investigates the effects of humidity levels and environmental type (urban, industrial, agricultural, coastal) on Air Quality Index (AQI) using a Two-Way ANOVA model. Three humidity levels (low, medium, high) were analyzed with five replications per cell. Results indicate significant main effects of humidity and environment type ($p < 0.001$), while the interaction effect was not statistically significant. Pollution concentration showed strong correlation with AQI ($r = 0.89$), while temperature showed moderate correlation ($r = 0.61$). The study confirms the usefulness of factorial experimental design in environmental statistics.

Keywords: Air Quality Index (AQI), Relative humidity, Urban and industrial environments, Coastal and agricultural zones, Two, factor ANOVA, Interaction effect, Pearson correlation, Environmental modeling



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Reducing Chemical Dependency in Agriculture: Natural and Innovative Strategies for Sustainable Plant Protection

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Currently, the sustainability of agricultural production is not limited to achieving high yields alone. Protecting the environment and safeguarding human health are also of great importance. Environmental and biological problems arising from intensive chemical use have increased the tendency toward more balanced and sustainable methods in the fight against plant diseases. For many years, chemical pesticides have been regarded as the most effective solution for controlling pests and diseases. However, the development of resistance by harmful organisms to these chemicals has led to more intensive pesticide use, conflicting with the principles of sustainable agriculture. Therefore, current research focuses on alternative methods that can reduce dependency on chemicals.

Plant extracts, compost use, and biological control methods found in traditional agricultural practices are considered environmentally friendly options. For example, wood ash can serve as a nutrient source for plants while also providing a protective effect against certain pests. Rich in potassium and calcium, wood ash can help regulate soil pH while supporting plant growth. However, since the effectiveness of such natural methods may vary depending on the amount applied, timing, and environmental conditions, it is more appropriate to use them in combination with other control strategies rather than relying on them alone.

One of the most significant advantages of natural methods is that they support the ecosystem rather than suppress it. In this way, a more long-term balance can be achieved in agricultural production. Today, integrating these methods with modern technologies makes plant protection efforts more effective. For instance, Next-Generation Sequencing (NGS) technology enables the rapid and accurate detection of pathogens that cause plant diseases. Early identification of diseases reduces unnecessary pesticide use, helping to lower costs while minimizing environmental damage. Furthermore, the detailed examination of microorganisms present in soil and plants allows for the identification of beneficial species and the development of biological control methods.

The future of sustainable agriculture depends on evaluating traditional and modern methods together. Combining the advantages offered by natural products with the analytical capabilities provided by technology may represent an important step toward reducing chemical dependency. This approach will contribute not only to the protection of nature but also to safer food production and the long-term continuity of agriculture.

*Speaker

Keywords: Sustainable agriculture, natural plant protection, reduction of chemical pesticides, next, generation sequencing, integrated disease management



A Literature Review on the Antiviral Potential and Mechanisms of Action of Essential Oils in Combating Plant Viruses Within the Scope of Sustainable Agriculture

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One of the biggest problems encountered in agricultural production is the diseases caused by plant viruses and the serious yield losses caused by these diseases. Today, synthetic chemical pesticides are used intensively to combat these viruses and the insects that carry them. However, the unconscious use of these chemicals leads to pollution in soil and water resources, threatens human health, and causes harmful organisms to gain resistance against these drugs over time. These negativities have made it mandatory to develop safer, environmentally compatible, and sustainable new control methods in agriculture. This review study examines the use potential and mechanisms of action of essential oils, produced by plants as a natural defense mechanism, against viruses that damage agricultural products.

Performed chemical analyses show that essential oils are quite rich in terms of terpenes and phenolic compounds. The most important feature of these components is their high ability to dissolve in oil. Thanks to this feature, essential oils easily overcome biological barriers and show effect against viruses in three different ways. The first is directly targeting the structure of the virus; oil components prevent the virus from proliferating by fragmenting the outer coat of the virus or disrupting its genetic material. The second is the prevention of carriers; by showing a repellent effect against harmful insects such as aphids and whiteflies that carry viruses from plant to plant, the spread of the virus is stopped from the very beginning. The third and most remarkable one is the stimulation of the plant's own immune system. When essential oils are applied to the plant, the plant activates defense mechanisms as if there is an attack and becomes resistant to the virus.

The biggest obstacle in transferring these successful results obtained in laboratory studies to the field is that volatile oils evaporate quickly in the open air. However, the use of methods such as nano-encapsulation with developing technology can ensure that these oils maintain their effect for a long time. As a result, essential oils are a much safer option compared to harmful chemicals and should be evaluated as a promising natural resource for the control of plant viruses in agriculture in the future process.

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Keywords: Sustainable Agriculture, Essential Oils, Plant Viruses, Biological Control, Antiviral Activity



A Literature Review on the Evaluation of Phenolic Compounds Obtained by Recycling Agricultural Wastes Within the Scope of Sustainable Agriculture as Antiviral Agents

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Production activities intensifying to meet the food and industrial product demand of the rapidly increasing world population cause millions of tons of agricultural industrial waste to be released on a global scale every year. These organic wastes, which are mostly left to the environment, burned, or left to rot in landfills considering they have no economic value, constitute a serious source of environmental pollution and also mean the loss of potential biomass energy. Simultaneously, the spread of viral pathogens posing a threat to both agricultural production and public health is increasing; however, problems such as the high cost, toxic side effects, and resistance development of existing antiviral agents and synthetic chemical drugs make the struggle difficult. In this context, within the framework of sustainable agriculture and circular economy principles, evaluating agricultural wastes not just as trash to be disposed of, but as a cheap and abundant raw material source for the recovery of high value-added bioactive molecules has become a strategic necessity. This review study examines the potential use, chemical profiles, and mechanisms of action of phenolic compounds obtained by recycling agricultural by-products as broad-spectrum antiviral agents in the light of literature.

Performed phytochemical characterization studies show that citrus peels, pomegranate wastes, grape pomace, and olive industry by-products, in particular, are rich reservoirs in terms of phenolic structures such as hydroxytyrosol, resveratrol, hesperidin, punicalagin, and quercetin. The antiviral efficacy of these phenolic extracts occurs through a general biochemical mechanism independent of the virus type. Findings in the literature explain this mechanism on three basic axes. First, the virucidal effect is the disruption of virion integrity by phenolic compounds physically interacting with the protein coat or lipid envelope forming the outer structure of the virus, rendering the virus unable to cause infection. Second, adsorption inhibition is the prevention of the virus from binding to host cell receptors and entering the cell by blocking the attachment proteins on the virus surface. Third, Replication Inhibition is the stopping of viral proliferation by inhibiting critical enzymes such as polymerase and protease used by viruses that succeed in entering the cell to copy their genetic material.

The use of these natural extracts obtained from agricultural wastes as antiviral agents offers a much lower cost and safer alternative compared to synthetic chemicals. Furthermore, this approach reduces the carbon footprint by decreasing the waste load and adds an integrated

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The Importance of Using Treated Water in Agriculture Under Changing Climate

Conditions

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Abstract

Climate change is intensifying water scarcity, increasing variability in precipitation patterns, and placing unprecedented pressure on agricultural water resources. Under these changing climatic conditions, the use of treated water has emerged as a critical strategy for sustaining agricultural production and enhancing water security. Treated wastewater and alternative water sources offer significant potential to supplement conventional irrigation supplies, particularly in arid and semi-arid regions where freshwater availability is increasingly limited.

This study examines the importance of using treated water in agriculture within the context of climate change adaptation. It evaluates the role of treated water in maintaining crop productivity, improving water-use efficiency, and reducing dependence on overexploited freshwater resources. The study also addresses the potential risks associated with treated water use, including salinity, pathogen transmission, and the accumulation of contaminants, and discusses management practices required to mitigate these challenges.

Drawing on recent scientific evidence and selected case studies, the study highlights that properly treated and well-managed water resources can support resilient agricultural systems while contributing to environmental sustainability. Furthermore, the integration of treated water into agricultural practices is discussed as a key component of climate-resilient farming strategies, particularly when aligned with appropriate regulatory frameworks, monitoring systems, and farmer awareness programs.

The study concludes that expanding the safe and efficient use of treated water in agriculture is essential for adapting to climate change, ensuring long-term food security, and promoting sustainable water management at both local and global scales.

Keywords: Wastewater Reuse in Agriculture, Water Scarcity, Climate-Resilient Farming, Treated Water Reuse.

A Literature Review on the Antiproliferative and Antiviral Effects of Essential Oils of *Artemisia* and *Lamiaceae* Families from Algerian Flora

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Abstract

The flora of Algeria, forming a critical transition zone between the Mediterranean climate in the north and the extreme conditions of the Sahara Desert in the south, holds strategic importance for medicinal plants due to its high rate of endemism and phytochemical diversity. This review aims to investigate the phytochemical profiles and the molecular bases of biological activities of species belonging to the *Asteraceae* and *Lamiaceae* families, which stand out with the morphological and physiological adaptations they have developed against the harsh ecological conditions of the region. Essential oils synthesized as a defense strategy to survive under drought and high-temperature stress, lie at the center of the pharmacological potential of these plant groups. Analyses performed using Gas Chromatography-Mass Spectrometry (GC-MS), one of the leading modern analytical methods, reveal that representatives of both families contain a chemical matrix quite rich in monoterpenes such as 1,8-cineole, camphor, thujone, borneol, and alpha-pinene. The high lipophilic character of these detected terpenoids endows them with the ability to interact with biological membranes and disrupt the integrity of cellular and viral structures. When evaluated in terms of antiproliferative activity, it is observed that these volatile components pass through cancer cell membranes, suppress intracellular signaling pathways, and trigger apoptosis; furthermore, providing selective cytotoxicity by showing minimal toxic effects on healthy cells offers a critical advantage regarding therapeutic reliability. A similar mechanism is observed in antiviral activity, where the entry and proliferation of viruses into the host cell are prevented by the disintegration of lipid-structured viral envelopes and the inhibition of viral replication enzymes. However, findings in the literature emphasize that this potent biological response stems from the synergistic interaction formed by the major and minor components within the essential oil, rather than a single molecule. Consequently, essential oils from the Algerian *Asteraceae* and *Lamiaceae* families,

thanks to their multi-targeted mechanisms of action, represent powerful natural resources that should be evaluated as new-generation drug candidates in both cancer treatment and the control of viral infections.

Keywords: *Asteraceae*, *Lamiaceae*, Essential oils, Selective cytotoxicity, Antiviral activity.



Rooting Performance of *Helichrysum italicum* (L.) Moench Cuttings as Affected by Indole-3-Butyric Acid, Magnesium Sulfate, and Cutting Season

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Abstract

This study was conducted to determine the effects of indole-3-butyric acid (IBA) and magnesium sulfate (MgSO₄) applications on the rooting of *Helichrysum italicum* (L.) Moench cuttings. The experiment was carried out under greenhouse conditions using cuttings collected in spring and autumn, arranged in a split-split plot design based on randomized blocks. Four different IBA doses (0, 50, 100, and 200 mg L⁻¹) and three MgSO₄ doses (0, 1, and 2 kg da⁻¹) were applied, and parameters such as rooting rate, root number, root length, and fresh and dry root weights were evaluated.

The results revealed that rooting occurred only in cuttings collected in autumn, while no root formation was observed in spring cuttings. Although the individual effects of IBA and MgSO₄ were not statistically significant, their interaction had significant effects ($p < 0.05$; $p < 0.01$) on root development parameters. The highest root number was obtained from the combination of 200 mg L⁻¹ IBA + 2 kg da⁻¹ MgSO₄. However, the most consistent and favorable results in terms of root length, as well as fresh and dry root weights were achieved with 50 mg L⁻¹ IBA combined with MgSO₄ applications.

In conclusion, autumn was identified as the most suitable season for rooting *Helichrysum italicum* cuttings, and the combination of 50 mg L⁻¹ IBA with 1 kg/da MgSO₄ significantly enhanced overall root development. These findings suggest that such treatments can be effectively used to improve the success of vegetative propagation.

Keywords: *Helichrysum italicum*, indole-3-butyric acid (IBA), magnesium sulfate, stem cuttings, rooting, seasonal variation.

Assessment of Climate Change in Konya Closed Basin Within the Framework of Water Flow Observation

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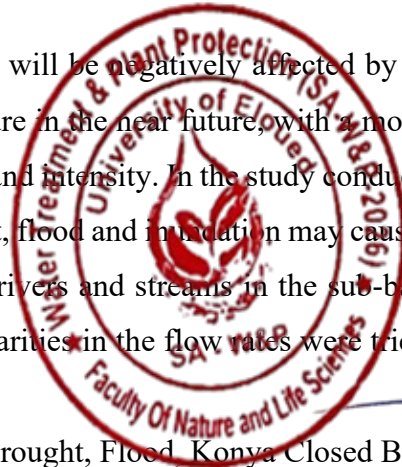
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Abstract

One of today's current problems is climate change. Climate change has become the most talked about global problem on a global scale. In the world and in our country, climate change is increasing day by day and is manifesting itself with devastating effects. The duration, frequency and severity of extreme weather events are increasing and have devastating consequences. Excessive rainfall, extreme heat, heat and cold waves lead to drought, severe storms, forest fires, floods and inundations, loss of life and property. It is known that the most fundamental causes of climate change are increasing greenhouse gases and environmental pollution.

It is thought that Turkey will be negatively affected by climate change and will have a hotter and drier climate structure in the near future, with a more uncertain climate structure in terms of precipitation amount and intensity. In the study conducted on how the effects of global climate change such as drought, flood and inundation may cause changes on rivers, the changes in the flow rates measured in rivers and streams in the sub-basins of the Konya closed basin were examined and the irregularities in the flow rates were tried to be revealed with statistical averages.

Keywords: Climate change, Drought, Flood, Konya Closed Basin.



Biostimulants Application in Vegetable Crops Under Salinity Stress Environment

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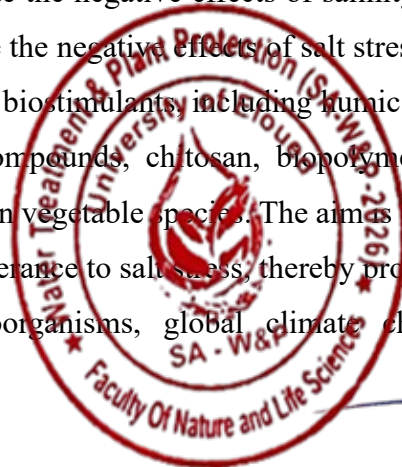
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Abstract

Vegetables are important nutritional sources for human health and a balanced diet, contributing significantly to the development of carotenoids, vitamins, polyphenols, carbohydrates, and fiber. Yield and quality are paramount in vegetable farming. Recently, global climate change and poor agricultural practices have exacerbated the negative effects of abiotic stress factors, leading to yield and quality losses. Salinity is a significant stress factor, often limiting plant growth in greenhouse vegetable cultivation. Therefore, researchers are proposing different approaches to mitigate the negative effects of salinity. Various studies have reported that some biostimulants reduce the negative effects of salt stress. The present review examines recent studies on the effects of biostimulants, including humic acids, seaweed extracts, protein hydrolysates, N-containing compounds, chitosan, biopolymers, inorganic compounds, and beneficial fungi and bacteria, on vegetable species. The aim is to determine the effectiveness of these applications and their tolerance to salt stress, thereby providing a future perspective.

Keywords: Beneficial microorganisms, global climate change, salt stress, sustainable agriculture, vegetable farming.



Growing Possibilities of Some Artichoke Varieties in Kyrgyzstan Bishkek-Chuy Region

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Abstract

This study was conducted to determine whether artichoke can be cultivated in Chuy (Bishkek) region of Kyrgyzstan during 2017-2018. As plant material, Olympus, Green Globe, Imperial Star and Sambo F₁ hybrid artichoke varieties were used. In experiment, seeds were sown in a plastic tunnel on March 15, 2017. Artichoke seedlings were planted in the field on April 28, 2017. The research was planned according to a randomized plot experimental design with 4 replications, each containing 20 plants. In results, artichoke plants had vegetative growth in first year after planting and no yield was obtained; yield was observed in second year. The maximum head weight was obtained from Sambo F₁ with 260.57 g, followed by Imperial Star, Olympus, and Green Globe varieties with 221.75 g, 194.95 g, and 143.36 g, respectively. This research, first of its kind in the Chuy region of Kyrgyzstan, clearly showed that artichokes can be successfully grown in experimental region.

Keywords: Vegetable growing, Artichoke, Variety, Yield, Kyrgyzstan.



Reducing Chemical Dependency in Agriculture: Natural and Innovative Strategies for Sustainable Plant Protection

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Abstract

Currently, the sustainability of agricultural production is not limited to achieving high yields alone. Protecting the environment and safeguarding human health are also of great importance. Environmental and biological problems arising from intensive chemical use have increased the tendency toward more balanced and sustainable methods in the fight against plant diseases. For many years, chemical pesticides have been regarded as the most effective solution for controlling pests and diseases. However, the development of resistance by harmful organisms to these chemicals has led to more intensive pesticide use, conflicting with the principles of sustainable agriculture. Therefore, current research focuses on alternative methods that can reduce dependency on chemicals.

Plant extracts, compost use, and biological control methods found in traditional agricultural practices are considered environmentally friendly options. For example, wood ash can serve as a nutrient source for plants while also providing a protective effect against certain pests. Rich in potassium and calcium, wood ash can help regulate soil pH while supporting plant growth. However, since the effectiveness of such natural methods may vary depending on the amount applied, timing, and environmental conditions, it is more appropriate to use them in combination with other control strategies rather than relying on them alone.

One of the most significant advantages of natural methods is that they support the ecosystem rather than suppress it. In this way, a more long-term balance can be achieved in agricultural production. Today, integrating these methods with modern technologies makes plant protection efforts more effective. For instance, Next-Generation Sequencing (NGS) technology enables the rapid and accurate detection of pathogens that cause plant diseases. Early identification of diseases reduces unnecessary pesticide use, helping to lower costs while minimizing environmental damage. Furthermore, the detailed examination of microorganisms

present in soil and plants allows for the identification of beneficial species and the development of biological control methods.

The future of sustainable agriculture depends on evaluating traditional and modern methods together. Combining the advantages offered by natural products with the analytical capabilities provided by technology may represent an important step toward reducing chemical dependency. This approach will contribute not only to the protection of nature but also to safer food production and the long-term continuity of agriculture.

Keywords: Sustainable agriculture, natural plant protection, reduction of chemical pesticides, next-generation sequencing, integrated disease management.



A Literature Review on the Evaluation of Phenolic Compounds Obtained by Recycling Agricultural Wastes Within the Scope of Sustainable Agriculture as Antiviral Agents

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Abstract

Production activities intensifying to meet the food and industrial product demand of the rapidly increasing world population cause millions of tons of agricultural industrial waste to be released on a global scale every year. These organic wastes, which are mostly left to the environment, burned, or left to rot in landfills considering they have no economic value, constitute a serious source of environmental pollution and also mean the loss of potential biomass energy. Simultaneously, the spread of viral pathogens posing a threat to both agricultural production and public health is increasing; however, problems such as the high cost, toxic side effects, and resistance development of existing antiviral agents and synthetic chemical drugs make the struggle difficult. In this context within the framework of sustainable agriculture and circular economy principles, evaluating agricultural wastes not just as trash to be disposed of, but as a cheap and abundant raw material source for the recovery of high value-added bioactive molecules has become a strategic necessity. This review study examines the potential use, chemical profiles, and mechanisms of action of phenolic compounds obtained by recycling agricultural by-products as broad-spectrum antiviral agents in the light of literature.

Performed phytochemical characterization studies show that citrus peels, pomegranate wastes, grape pomace, and olive industry by-products, in particular, are rich reservoirs in terms of phenolic structures such as hydroxytyrosol, resveratrol, hesperidin, punicalagin, and quercetin. The antiviral efficacy of these phenolic extracts occurs through a general biochemical mechanism independent of the virus type. Findings in the literature explain this mechanism on three basic axes. First, the virucidal effect is the disruption of virion integrity by phenolic compounds physically interacting with the protein coat or lipid envelope forming the outer structure of the virus, rendering the virus unable to cause infection. Second, adsorption inhibition is the prevention of the virus from binding to host cell receptors and entering the cell

by blocking the attachment proteins on the virus surface. Third, Replication Inhibition is the stopping of viral proliferation by inhibiting critical enzymes such as polymerase and protease used by viruses that succeed in entering the cell to copy their genetic material.

The use of these natural extracts obtained from agricultural wastes as antiviral agents offers a much lower cost and safer alternative compared to synthetic chemicals. Furthermore, this approach reduces the carbon footprint by decreasing the waste load and adds an integrated economic value to agricultural production. As a result, waste-derived phenolic compounds have great potential as eco-friendly and sustainable natural bioactive substances that should be evaluated in future biomedical and agricultural applications.

Keywords: Sustainable Agriculture, Agricultural Waste Recycling, Phenolic Compounds, Antiviral Activity, Circular Economy.



Microbial Approaches That Can Increase Plant Resistance Mechanisms Under Drought Stress Conditions: Algae

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Abstract

Enhancing the efficiency of water utilization in plants, especially in agricultural activities carried out in arid and semi-arid regions, has become a necessity today to find new approaches that increase the resistance mechanisms of plants experiencing water scarcity. This study focuses on algae, whose applications have recently begun to spread due to their positive effects on increasing plant resistance and improving plant growth. Seaweed or, in other words, algal products, improve the germination of plant seeds and seedling development. They help plants develop tolerance to environmental stress conditions. Algae contain vitamins A, B1, B12, C, D, riboflavin, niacin, pantothenic and folic acid, as well as trace amounts of various plant nutrients and plant growth regulators. Due to the presence of metabolites that affect plant growth, these substances have recently begun to be produced as biofertilizers that support plant growth. Commercial preparations are marketed in liquid and solid fertilizer form. These products can be obtained from seaweed, or produced in some countries by organizing various algae production systems or facilities. Depending on the type of algae, the mechanisms of action may differ depending on the plants. In stressed plants, the plants can increase antioxidant enzyme activity and provide protection against peroxidases, making plants more resistant to water scarcity conditions. Today, the increasing problem of drought due to climate change is a significant issue in terms of production, yield, product quality, and food security. Plants develop various mechanisms called abiotic stress under water deficiency conditions. As a result of these mechanisms, photosynthetic activity decreases, and consequently, the harvest index decreases. For this purpose, it has been determined that algae, which are recommended for foliar application, contribute to the development of resistance mechanisms in plants against the negative effects of drought, that they have effects on processes such as photosynthesis, respiration, and assimilation, and that they increase the activity of various low-antioxidant defense compounds and various antioxidant defense enzymes. This study has been investigated the mechanisms of action of different algal species for different plant species. The study have been concluded that the mechanisms of action differed depending on the algal species, there was a general decrease in antioxidant enzyme activities, and plant growth parameters were positively affected depending on the application doses, which could be reflected in yield. This

study has been investigated the mechanisms of action of different algal species for different plant species. The study has been concluded that the mechanisms of action differed depending on the algal species, with a general decrease in antioxidant enzyme activity. However, it is believed that further studies are needed to investigate the effectiveness of algae under drought stress conditions, focusing on different plants in field conditions, identifying algae suitable for regional conditions, and researching their effectiveness. In this study, it has also been suggested that, given Algeria's status as a coastal country, the establishment of a seaweed industry is necessary. Given the country's potential for producing commercial products containing various algae, the study aims to draw attention to the effectiveness of algae in agricultural activities, particularly in plant cultivation in arid and semi-arid regions.

Key words: Plant Resistance Mechanism, Drought stress, Algae, Biofertilizer, Seaweed.



NECESSITY OF RAINWATER HARVESTING FOR SUSTAINABLE VEGETATION IN WATER-DEFICIT REGIONS

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Abstract

This study aimed to offer a sustainable solution to the water scarcity problem with rainwater harvesting (RWH) for supporting agro-production in regions having frequent droughts experiences. The information used in this work was mostly obtained from the findings of previous studies worldwide. Failure in rain and consequently severe drought events have led to remarkable crop losses in some huge crop production centers including Konya plain of Turkey particularly during 2020 and 2025 crop growing seasons. Therefore, in water-scarce environments, RWH has become one of the most viable solutions for increasing agricultural production. According to the comprehensive assessment, the most important issue for RWH has been found to be the correct selection of the site. In that context, the main parameters for site selection such as rain, topography, land cover/use, and soil characteristics should be determined properly by modern technologies such as drones, and geographical information system (GIS). In large areas, ponding systems can be presented as a suitable application for water collection. In arid regions like Africa, different RWH systems such as tied ridges (TR) can be applied for some field crops such as maize farming for better rainwater use efficiency (RWUE). In areas like semi-arid Kenya Karapınar province of Turkey, where rainfall is low and wind erosion is intense, small pits, basins, and ridge-type water retention systems can be used to provide supplementary watering for drought-resistant trees and forage crops.

Key words: Drought, Rainwater harvesting, Site selection, Sustainable water resources management, Environmental conservation.

A Literature Review on the Antiviral Potential and Mechanisms of Action of Essential Oils in Combating Plant Viruses Within the Scope of Sustainable Agriculture

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Abstract

One of the biggest problems encountered in agricultural production is the diseases caused by plant viruses and the serious yield losses caused by these diseases. Today, synthetic chemical pesticides are used intensively to combat these viruses and the insects that carry them. However, the unconscious use of these chemicals leads to pollution in soil and water resources, threatens human health, and causes harmful organisms to gain resistance against these drugs over time. These negativities have made it mandatory to develop safer, environmentally compatible, and sustainable new control methods in agriculture. This review study examines the use potential and mechanisms of action of essential oils, produced by plants as a natural defense mechanism, against viruses that damage agricultural products.

Performed chemical analyses show that essential oils are quite rich in terms of terpenes and phenolic compounds. The most important feature of these components is their high ability to dissolve in oil. Thanks to this feature, essential oils easily overcome biological barriers and show effect against viruses in three different ways. The first is directly targeting the structure of the virus; oil components prevent the virus from proliferating by fragmenting the outer coat of the virus or disrupting its genetic material. The second is the prevention of carriers; by showing a repellent effect against harmful insects such as aphids and whiteflies that carry viruses from plant to plant, the spread of the virus is stopped from the very beginning. The third and most remarkable one is the stimulation of the plant's own immune system. When essential oils are applied to the plant, the plant activates defense mechanisms as if there is an attack and becomes resistant to the virus.

The biggest obstacle in transferring these successful results obtained in laboratory studies to the field is that volatile oils evaporate quickly in the open air. However, the use of methods such as nano-encapsulation with developing technology can ensure that these oils maintain their

effect for a long time. As a result, essential oils are a much safer option compared to harmful chemicals and should be evaluated as a promising natural resource for the control of plant viruses in agriculture in the future process.

Keywords: Sustainable Agriculture, Essential Oils, Plant Viruses, Biological Control, Antiviral Activity



economic value to agricultural production. As a result, waste-derived phenolic compounds have great potential as eco-friendly and sustainable natural bioactive substances that should be evaluated in future biomedical and agricultural applications.

Keywords: Sustainable Agriculture, Agricultural Waste Recycling, Phenolic Compounds, Antiviral Activity, Circular Economy



Valorization of Microflora for Sustainable Agriculture

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In response to the growing challenges of sustainability in agriculture, the valorization of microflora through microbial biotechnologies emerges as a promising alternative to conventional chemical inputs. The **BIOPOSI+** project aligns with this approach by developing a natural biostimulant based on beneficial microorganisms selected for their agronomic and ecological properties.

This study aims to design a synergistic formulation integrating indigenous microbial strains capable of promoting optimal plant growth, enhancing natural plant defenses, and supporting soil health. The methodology involves the isolation, characterization, and cultivation of microorganisms of interest, followed by efficacy testing under semi-controlled conditions on crops such as durum wheat and tomato.

Experimental results demonstrated enhanced root growth, a significant reduction in fungal disease symptoms (Fusarium, downy mildew, powdery mildew..etc), and higher yields compared to untreated controls. These outcomes highlight the potential of beneficial interactions between plants and valorized indigenous microflora.

In conclusion, **BIOPOSI+** illustrates the central role of microbial biotechnology in the agroecological transition. Future perspectives include product standardization, large-scale evaluation, and integration into sustainable agricultural programs.

Keywords: Microbial biostimulants, microorganisms, soil health, optimized yield, agroecological technologies.

*Speaker

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Comprehensive Assessment of Phenological, Morpho-Physiological, Nutritional, Phytochemical, and Antioxidant Properties of Early- and Late-Maturing Pearl Millet (*Pennisetum glaucum*) Cultivars in Semi-Arid Algeria

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Pearl millet (*Pennisetum glaucum* L.) is a resident secondary cereal crop, valued for its tolerance to drought, heat, and poor soil fertility. Despite its nutritional and agronomic potential, it remains underutilized in many regions, including Algeria. This study aimed to evaluate the phenological, morpho-physiological, phytobiological, and physicochemical characteristics of two locally cultivated millet cultivars, representing early-maturing (yellow type) and late-maturing (green type) groups. Phenological and morpho-physiological assessments included plant height, panicle length, panicle neck length, number of nodes, number of leaves, number of tillers, leaf area, relative water content, and photosynthetic pigment contents. Principal component analysis revealed clear positive correlations among the studied traits, supporting the classification of cultivars according to their maturation cycle. Overall, the early-maturing yellow cultivar generally exhibited superior growth traits and higher photosynthetic pigment accumulation compared to the late-maturing green cultivar. Phytobiological evaluation indicated that the crude extract yield was higher in the yellow cultivar. Both cultivars accumulated substantial amounts of flavonoids, with the highest levels observed in the yellow cultivar. Total polyphenols were present in moderate amounts in both cultivars, reflecting their potential as sources of bioactive compounds. Physicochemical analysis showed that both cultivars had high dry matter content, with the yellow cultivar slightly higher than the green. Total sugar content was also higher in the yellow cultivar, while the green cultivar had relatively lower sugar levels. Crude fat and protein content were generally higher in the yellow cultivar, whereas ash content was slightly higher in the green cultivar, indicating differences in mineral composition between the two types. Antioxidant activity, assessed through DPPH and ABTS radical scavenging assays, was notable for both cultivars. The early-maturing yellow cultivar demonstrated the strongest radical scavenging capacity, highlighting its higher potential for contributing to antioxidant intake.

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Overall, the results underscore the nutritional quality, bioactive compound content, and antioxidant potential of pearl millet grains, particularly the early-maturing yellow cultivar. These findings emphasize the crop's potential as a functional food and support its promotion in semi-arid regions of Algeria. They provide valuable insights for breeding programs aimed at enhancing both agronomic performance and nutraceutical properties, thereby contributing to food security under challenging environmental conditions.

Keywords: Millet, *Pennisetum glaucum*, chlorophyll, phenology, polyphenols, flavonoids, biological activities.



Effet de l'utilisation des pesticides dans un milieu agricole sur une population de lézard *Scincus scincus* dans la région d'El Oued

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Since humans began to control production processes, particularly the mobilization of water resources, processes of degradation and disturbance have emerged that disrupt the proper functioning of ecological processes governing biocenoses. This has consequently led to the erosion of current biodiversity, mainly due to agricultural activities involving fertilizers, chemical inputs, and pesticides. Indeed, the widespread success of these substances in agricultural applications aimed at optimizing crop productivity has resulted in a rapid expansion of their production and use.

However, the toxicological properties of pesticides, their ubiquity, persistence, and presence and concentration within the food chain constitute a real danger. They are currently considered among the major environmental pollutants.

In this context, the present study is based on investigating the effects of pesticide use in order to assess its impact on a population of the lizard *Scincus scincus*, a well-known and edible species found in Saharan terrestrial ecosystems.

This study relies on the measurement of catalase enzyme activity in two populations sampled from two different sites: Douar El Ma and Hassi Khalifa.

The results of the enzymatic assays revealed a highly significant induction of catalase activity in lizards sampled from Hassi Khalifa compared to those from Douar El Ma.

Keywords: Agriculture, pesticides, enzymatic assay, *Scincus scincus*, El Oued.

*Speaker

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Dietary analysis of the common kestrel (*Falco tinnunculus* Linnaeus, 1758) in the hyper-arid Souf region of southeastern Algeria: ecological role of a raptor in a fragile desert ecosystem

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This study examines the diet of the common kestrel (*Falco tinnunculus* Linnaeus, 1758) in the Souf region of southeastern Algeria, based on the analysis of 46 regurgitated pellets. A total of 22 prey species were identified, belonging to five orders and 11 families. Rodents constituted the primary food source, accounting for 63.8% of all prey items and 80.3% of the total biomass. The lesser Egyptian gerbil (*Cariacus gerbillus* Olivier, 1801) alone represented 46.5% of the total biomass. Insects comprised 27% of prey items by number, while birds and reptiles accounted for 11.6% and 5.9% of the total biomass, respectively. An equitability index of approximately 0.73 indicates a relatively balanced exploitation of available prey, consistent with the kestrel's generalist and opportunistic feeding strategy. These findings emphasize its ecological role as a natural pest controller in agricultural landscapes. Furthermore, this study contributes to regional faunistic knowledge and underscores the importance of conserving this raptor to promote ecosystem stability and sustainable agriculture.

Keywords: pellets, generalist, opportunistic, ecosystem stability, sustainable agriculture.

*Speaker

Pharmacological and Ethnobotanical Study of Three Medicinal Plants in the Wilaya of Tizi-Ouzou

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Medicinal plants remain an important source of healthcare in developing countries in the absence of a modern medical system. In Algeria, the use of plant-based medicine is deeply rooted in the culture, supported by a rich diversity of hundreds of plant species. As part of the characterization of medicinal plants, an ethnobotanical survey focusing on three species (*Globularia alypum*, *Marrubium vulgare*, and *Pistacia lentiscus*) was conducted in the Tizi-Ouzou region. Using 160 questionnaire forms, the surveys were carried out from April to the end of July 2023. The results showed that women use medicinal plants more frequently, accounting for 60% of users, and the dominant age group was 40–50 years (26.9%). The main source of information acquisition among respondents was family knowledge (44.6%). The aerial parts of the plants, particularly the leaves, were the most commonly used, mainly in the fresh state. The diseases most frequently treated with these plants were digestive and intestinal disorders, respiratory, dermatological, renal and hepatic diseases, as well as diabetes.

Keywords: Ethnobotany, Kabylia, *Globularia alypum*, *Marrubium vulgare*, *Pistacia lentiscus*.

*Speaker

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Converting vegetable organic waste into nano silica particles: water treatment as an application

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Large amounts of agricultural waste were there, which focused our attention on how to utilize them. The extraction of silica from peanut peel is the major topic of this essay. Large-scale material burning may have negative environmental effects. Consequently, trash removal is required. In this work, we investigate the extraction of nanostructured silica utilizing an alkali leaching extraction technique from widely accessible agricultural waste sources, such as groundnut shell. X-ray diffraction (XRD), scanning electron microscopy (SEM), and Fourier transform infrared (FT-IR) methods were used to analyze the isolated silica nanoparticles. The isolated silica nanoparticles have a unit size of 40 nm and a very high specific surface area, according to the microstructural study. The presence of SiO₂ in the sample was verified by XRD. The presence of silanol and siloxane groups is shown by FT-IR analysis. This accomplishment entails a reduction in the environmental pollution brought on by the careless dumping of silica nanoparticles and peanut peel for use in innovative materials.

Keywords: Agriculture waste, Silicon oxide, XRD, FTIR.

*Speaker

Biodiversity for Sustainable Agriculture



Water Management



Harnessing Tunisia's Dam Reservoirs for Floating Solar Energy: Addressing Water Scarcity and Energy Demand

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Tunisia's water scarcity and growing energy demand create a compelling case for floating photovoltaic (FPV) systems on its dam reservoirs. With 12 major dams holding over 2 billion m³ capacity and exceptional solar irradiance, Tunisia possesses significant potential to deploy FPV technology that addresses both challenges simultaneously. Floating solar systems offer multiple advantages over land-based installations, including reduced land consumption, lower operating temperatures (approximately 20°C cooler⁹), and enhanced energy yield of up to 33.3%. Critically for water-stressed Tunisia, FPV systems can reduce water evaporation by approximately 30%, preserving precious water resources while generating clean electricity. The cooling effect of water beneath panels increases system efficiency by 10-15% compared to terrestrial counterparts. Despite challenges including panel corrosion, ecological impacts on aquatic ecosystems, and higher initial costs, pilot projects such as the 200 kW Qair installation on Tunis Lake (2022) demonstrate technical feasibility. With FAO-backed initiatives and World Bank funding supporting integration of FPV with evaporation control technologies, Tunisia's dams could significantly contribute to the national 3.8 GW renewable energy target by 2030. This dual water-energy approach positions FPV systems as a strategic solution for sustainable development in Mediterranean semi-arid regions facing similar resource constraints.

Keywords: Floating photovoltaic systems, Water evaporation reduction, Water, energy nexus, Solar power efficiency, dams

*Speaker

Evaluation of Plant-Based Biomass for the Biosorption of Red Ponceau 4R from Aqueous Solutions

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This study evaluates the efficiency of a plant-based biomass for the removal of the food dye Red Ponceau 4R (RP4R) from aqueous solutions through batch adsorption. A parametric study was conducted to investigate the influence of contact time, solution pH, biomass dosage, temperature, and initial dye concentration on the biosorption process. The results indicate that the optimal conditions correspond to a biosorbent dose of 1 g/L and a pH of 1.5. Biosorption efficiency increases with increasing initial RP4R concentration in the range of 15–100 mg/L, and adsorption equilibrium is achieved within 50 minutes. These findings demonstrate the strong potential of plant-based biomass as an effective biosorbent for the treatment of dye-contaminated wastewater.

Keywords: Biosorption, Biomass, dye Red Ponceau, plant vegetable



*Speaker

Agro-waste-derived adsorbent for aqueous L-tyrosine removal: a sustainable water treatment approach

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The protection of water resources is a cornerstone of biodiversity conservation and demands the development of efficient, sustainable, and economically viable wastewater treatment technologies. This study presents an eco-friendly physicochemical approach for the removal of L-tyrosine from aqueous solutions through the valorization of agricultural waste as a precursor for activated carbon production. The treatment strategy integrates coagulation–flocculation using aluminium sulphate with adsorption onto biomass-derived activated carbon. Textural characterization of the synthesized adsorbent revealed a highly developed porous structure with a specific surface area of approximately 760 m²/g, enabling enhanced adsorption of organic contaminants. The results demonstrate that coagulation alone achieves limited removal efficiency, whereas the combined coagulation–adsorption process exhibits a pronounced synergistic effect, leading to removal efficiencies exceeding 90% under optimized conditions. The proposed hybrid process offers a cost-effective and environmentally sustainable alternative to conventional treatment methods, while simultaneously promoting waste valorization. These findings highlight the strong potential of biomass-based activated carbon coupled with conventional coagulation for advanced wastewater treatment applications.

Keywords: Organic pollutants, Recovery, waste, plants, Wastewater, Physicochemical processes, Elimination.

*Speaker

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Decentralized Treated Wastewater Reuse in Arid Areas: Integrating a Participatory and WEFE Nexus Approach

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Ghardaïa, a Saharan city in Algeria, faces strong pressure on its water resources. Water supply relies mainly on the Albian aquifer, exploited at depths exceeding 400 meters, yet the available volumes remain insufficient to meet the region's growing demographic and economic needs. Treated wastewater can represent a valuable complementary resource to mitigate water scarcity in such arid areas (Bekaddour et al. 2024). However, this potential resource remains largely underutilized and sometimes poses environmental and health risks, particularly in zones that are not connected to collective sanitation networks.

In this context, a decentralized wastewater treatment and reuse unit was established in Ghardaïa within the framework of the MASSIRE project, funded by the International Fund for Agricultural Development (IFAD) and implemented in partnership with the Amidoul Foundation, in the eco-district of Tafilelt. The system, based on Enviro-Septic technology (DBO Expert), treats an average flow of 12 m³ per day without energy input. The secondary-treated effluent is currently used to supply a drip irrigation network covering 2,500 m² of green space, including approximately 200 plants from 17 ornamental species.

Within the PRIMA project *MORFEUS* (2025–2028), this work aims to **evaluate an open-channel solar-based tertiary treatment as an integrated WEFE Nexus solution**, improving the microbiological quality of treated effluents while simultaneously supporting passive energy valorization, forage production for livestock, and the preservation of oasis ecosystems.

The methodology is based on monitoring the treatment performance before and after solar disinfection, while assessing the compliance of water quality with national and international reuse standards. In addition, an experimental plot of forage crops (alfalfa and sorghum) will be irrigated with these treated waters to evaluate their impact on the yield of the forage.

The project also adopts a participatory approach: the results will be shared not only within scientific frameworks but also with civil society, including tourism accommodation owners who currently discharge wastewater into septic tanks, as well as with institutional stakeholders through workshops and information sessions. This approach aims to promote the local adoption of decentralized wastewater reuse solutions and to enhance the hydrological, agricultural, and ecological resilience of Saharan oases.

*Speaker

Keywords: Decentralized treatment, Wastewater reuse, Treated wastewater, Arid areas, WEFE Nexus approach



Necessity of Rainwater Harvesting for Sustainable Vegetation in Water-Deficit Regions

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This study aimed to offer a sustainable solution to the water scarcity problem with rainwater harvesting (RWH) for supporting agro-production in regions having frequent droughts experiences. The information used in this work was mostly obtained from the findings of previous studies worldwide. Failure in rain and consequently severe drought events have led to remarkable crop losses in some huge crop production centers including Konya plain of Turkey particularly during 2020 and 2025 crop growing seasons. Therefore, in water-scarce environments, RWH has become one of the most viable solutions for increasing agricultural production. According to the comprehensive assessment, the most important issue for RWH has been found to be the correct selection of the site. In that context, the main parameters for site selection such as rain, topography, land cover/use, and soil characteristics should be determined properly by modern technologies such as drones, and geographical information system (GIS). In large areas, ponding systems can be presented as a suitable application for water collection. In arid regions like Africa, different RWH systems such as tied ridges (TR) can be applied for some field crops such as maize farming for better rainwater use efficiency (RWUE). In areas like semi-arid Konya-Karapınar province of Turkey, where rainfall is low and wind erosion is intense, small pits, basins, and ridge-type water retention systems can be used to provide supplementary watering for drought-resistant trees and forage crops.

Keywords: Drought, Rainwater harvesting, Site selection, Sustainable water resources management, Environmental conservation.

*Speaker

Assessing the quality of treated wastewater for irrigation: case study of Kais wastewater treatment plant (WWTP)

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1

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Abstract:

The study was conducted to determine the suitability of treated wastewater from Kais WWTP for irrigation purposes, during the months of February and April 2024. The suitability of this water for irrigation was evaluated based on the main irrigation indices: pH, electrical conductivity (EC), sodium adsorption ratio (SAR), soluble sodium percentage (%Na), permeability index (PI), residual sodium carbonate (RSC), and magnesium adsorption ratio (MAR). The results indicate that the pH values of all samples fall within the normal range (6.5–8.5) recommended for irrigation water. Values of residual sodium carbonate are above the recommended thresholds of 1.5 meq_dm⁻³ for fine-textured soils and 2.5 meq_dm⁻³ for other soil types, indicating that these waters are unsuitable for irrigation. Additionally, all water samples showed magnesium adsorption ratio below the permitted limit of 50%, categorising them as suitable for irrigation. However, the calculated permeability index values (59–60) suggest that these waters are of marginal quality (class II). In terms of sodium and chloride concentration, all water samples were found as non-suitable for irrigation. According to the Richards classification, which assesses the relationship between sodium adsorption ratio and electrical conductivity, these waters exhibit high salinity with low alkalinity hazard (C3-S1). Additionally, the Wilcox classification, based on electrical conductivity and the percentage of sodium, reveals that these waters are of good quality for irrigation. These results indicate that the waters pose irrigation risks, particularly due to their high salinity. To mitigate these risks, the implementation of special management practices and adoption of salt-tolerant crops will be crucial.

Keywords: Keywords: treated wastewater, Kais WWTP, suitability, irrigation

*Speaker

Development of a wastewater filtration system for agricultural irrigation using nanoparticles from date kernels

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Wastewater desalination for irrigation is essential in regions with limited water resources. Date kernels, as a primary agricultural waste, constitute a valuable raw material for producing high-performance adsorbents. Converting this waste into activated carbon and nanoparticles for water treatment aligns with circular-economy and green-chemistry principles. This study aims to develop and assess an integrated filtration system utilizing activated carbon and nanoparticles derived from date kernels. The focus is on the system's capacity to purify wastewater to meet agricultural irrigation standards. The date kernels were carbonized and chemically activated to produce activated carbon, and nanoparticles were also prepared. Advanced techniques were used to analyze the porosity and surface morphology of these materials. A prototype filtration unit was then constructed. During experiments, wastewater either synthetic or real was passed through the filter to evaluate pollutant and heavy metal removal. The system demonstrates excellent adsorption performance owing to the high surface area of the activated carbon and the effectiveness of nanoparticles in pollutant reduction. Results show a notable decline in contaminant levels, confirming that date pit filters are a cost-effective, eco-friendly alternative to traditional wastewater treatment methods.

Keywords: Wastewater, Agricultural irrigation, Filtration system, Nanoparticles, Date stones, Water treatment, Nanotechnology

*Speaker

Dynamic Modeling of Nitrate in the Sebdou River and the Application of Best Management Practices to Mitigate Nitrate Pollution

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A major problem facing the water sector in Africa, particularly in Algeria, is deteriorating water quality, which is strongly influenced by nutrient inputs to agricultural watersheds. To mitigate the effects of agricultural activities and enhance water quality, this study considered the impact of different best management practices (BMPs) in agriculture. The main objective of the research was to evaluate the impacts of various agricultural BMPs on nitrate losses in the Sebdou Mediterranean catchment in north-west Algeria (North Africa) using the Soil and Water Assessment Tool (SWAT) model in order to identify and recommend the most appropriate BMP. The study was carried out in two parts: first, the SWAT model was calibrated and validated to simulate discharge and nitrate losses at the outlet of the catchment, and second, the calibrated model was used to assess the effects of best management practices (BMPs) on nitrate losses. The hydrological modelling fitted well with the observed data for the calibration and validation periods (NSE between 0.63 and 0.65 and R² between 0.80 and 0.92). Nitrate flux simulation was also satisfactory (NSE= 0.58 and R²= 0.58), with the average nitrate exports at the outlet varying between 136 and 149 t N yr⁻¹. Agricultural tillage practices were the main N input and plant uptake was the main N output. The simulation results of BMP scenarios (contour farming, strip cropping and terracing) showed a significant decrease in nitrate quantity in soil, nitrate yield in surface runoff and nitrate exports. The maximum reduction was observed from the use of parallel terraces, which reduced nitrate in soil by 17 % (41 kg ha⁻¹) and decreased nitrate flux exportation to below 133 t N yr⁻¹ (a reduction of about 11 %). In summary, this study provided useful information for implementation of the most effective agricultural BMPs in the catchment for stakeholders who are interested in soil and water management.

Keywords: Agricultural BMPs, nitrate losses, SWAT model, Mediterranean semi, arid region, North Africa

*Speaker

Development of a wastewater filtration system for agricultural irrigation using nanoparticles from date kernels

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Wastewater desalination for irrigation is crucial in water-scarce areas. Date kernels, the primary agricultural waste, are a promising raw material for creating high-performance adsorbents. Converting this waste into activated carbon and nanoparticles for water purification aligns with circular-economy and green-chemistry principles. This study aims to design and assess an integrated filtration system using activated carbon and nanoparticles derived from date kernels. The focus is on its ability to purify wastewater to meet agricultural irrigation standards. Date kernels were carbonized and chemically activated to produce activated carbon, and nanoparticles were prepared. Their porosity and surface morphology were examined through advanced techniques. A prototype filtration system was then built for testing. Experiments involved passing wastewater-synthetic or real-through the filter to monitor reductions in heavy metals and pollutants. The system exhibits outstanding adsorption capacity because of the high surface area of activated carbon and the effectiveness of nanoparticles in removing contaminants and heavy metals. Results show a notable decline in pollutant levels, confirming that date pit filters are an affordable, eco-friendly, and efficient alternative to conventional wastewater treatment methods.

Keywords: Wastewater, Agricultural irrigation, Filtration system, Nanoparticles, Date stones, Water treatment, Nanotechnology

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Eco-Friendly Core-Shell Nanocomposite through Sustainable Plant-Mediated Synthesis: Highly Efficient Photocatalytic Wastewater Treatment

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This study reports the preparation of an eco-friendly core-shell nanocomposite via a fully sustainable and environmentally benign biosynthetic approach. The material displays high crystallinity, excellent colloidal stability, and appropriate bandgap values that allow highly efficient visible-light-driven photocatalytic activity. The nanocomposite exhibited superior photocatalytic performance, achieving near-complete degradation of the organic dye Rose Bengal and the widely used antibiotic Amoxicillin within a reasonable time under visible-light irradiation. Both pollutants were effectively mineralized to carbon dioxide and water. Kinetic studies confirmed well-defined reaction orders with high statistical reliability. The outstanding activity is ascribed to the efficient generation of reactive oxygen species ($\bullet\text{OH}$ and $\bullet\text{O}$) and enhanced charge separation facilitated by the core-shell heterostructure. This green, high-efficiency nanocomposite offers a promising and sustainable strategy for the photocatalytic removal of Rose Bengal and Amoxicillin from contaminated wastewater, with considerable potential for practical environmental remediation applications.

Keywords: Eco, friendly core shell nanocomposite, sustainable biosynthesis, visible light photocatalysis, Rose Bengal degradation, Amoxicillin removal

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Physics-Based Modeling and Optimization of Water Treatment and Irrigation Systems for Sustainable Agriculture in Arid Regions

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Water scarcity represents one of the most critical challenges to sustainable agriculture in arid and semi-arid regions. Improving water-use efficiency requires a deep understanding of the physical processes governing water treatment, transport, and irrigation systems. This study presents a physics-based approach for modeling and optimizing agricultural water management systems, with a focus on water treatment and irrigation efficiency. The proposed framework integrates principles of fluid mechanics, mass transfer, and hydrodynamics to analyze water flow behavior, treatment performance, and irrigation distribution under varying operational conditions. Mathematical modeling and numerical simulations are employed to evaluate system efficiency, water losses, and optimization strategies aimed at reducing consumption while maintaining crop water requirements. The results demonstrate that physics-based optimization can significantly enhance water-use efficiency, improve system reliability, and contribute to climate-resilient agricultural practices. This work highlights the importance of applying physical modeling tools in the design and management of sustainable water systems, offering practical insights for improving agricultural water management in water-limited environments.

Keywords: Water management, Sustainable agriculture, Physics, based modeling, Irrigation systems, Arid regions.

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Assessment of Irrigation Groundwater Quality in Arid Zones Using the IWQI Index and GIS Zoning: Case of the El-Oued Region (Algerian Sahara)

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Assessing the quality and hydrochemical properties of groundwater is essential for sustainable management in arid environments. This study evaluates the irrigation suitability of phreatic aquifer waters in the El-Oued region (Algerian Sahara) using the Irrigation Water Quality Index (IWQI) and GIS-based zoning. Forty-one water samples were analyzed for major hydrochemical parameters and conventional irrigation indices (EC, SAR, SSP, KR, PI, PS, MAR), then integrated into a locally adapted IWQI. IWQI values ranged from approximately 43 to 127, classifying most samples as "Good," with only three boreholes in the "Excellent" category, several in "Doubtful," and none in "Poor" or "Unsuitable." This indicates overall acceptable quality, tempered by notable saline and sodic constraints. Wilcox and USSL diagrams corroborate these findings, positioning most waters in high salinity zones (C3–C4) but with low to moderate alkalinity (S1–S2), rendering them viable for irrigation provided salt-tolerant crops are selected and soil drainage is optimized. Integrating irrigation parameters (EC, SAR, %Na, KR, PI, PS, MAR) highlights risks of salinization, sodication, and reduced soil permeability, offering a quantitative framework to anticipate issues from current practices. GIS-derived IWQI zoning maps provide clear spatial visualization of irrigation water quality distribution, pinpointing vulnerable areas and serving as a decision-support tool for sustainable groundwater management, crop selection, and irrigation strategies in the El-Oued region.

Keywords: Sustainable Water Management, Groundwater, IWQI, GIS, El Oued Region

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Advanced Water Management and Smart Irrigation Techniques in Algerian Agriculture

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In light of the growing challenges related to water scarcity and the increasing pressure on the agricultural sector, water emerges as a critical element for ensuring food security and sustainable development. Algeria is among the countries endowed with diverse water resources; however, the rational exploitation of these resources, particularly non-conventional ones, has become an urgent necessity. Within this context, the present scientific work highlights the importance of valorizing treated water and adopting modern irrigation and fertilization techniques through an applied field study in tomato production, in line with global trends toward smart and sustainable agriculture.

Keywords: Fertilization. Water treatment. Smart agriculture



*Speaker

ZnCl-Activated Hydro-Biochar Derived from *Melia azedarach* Seeds as a Sustainable Adsorbent for Dye-Contaminated Water

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This research presents an eco-innovative approach to valorize *Melia azedarach* seeds, a locally abundant agricultural residue, as a sustainable raw material for producing hybrid adsorbents for wastewater treatment. A hydro-biochar (HB) was synthesized and activated using zinc chloride (ZnCl), resulting in a material denoted as HB-Zn, designed for the efficient removal of Rhodamine B (RhB) from aqueous solutions. Comprehensive characterization (FTIR, XRD, SEM-EDX, BET) revealed that HB-Zn possesses a high specific surface area (1128 m²/g), favorable mesoporosity (2.62 nm) and surface functionalities rich in oxygen-containing groups. The point of zero charge (pH_{zc}) of 5.8 clarified the influence of pH on surface charge and dye interaction. Adsorption experiments showed rapid kinetics with equilibrium reached within 300 minutes, and maximum adsorption capacities reaching 88 mg/g at 60°C. Removal efficiencies exceeded 99% at initial RhB concentrations < 20 mg/L. The adsorption process followed pseudo-second-order kinetics, indicating a chemisorption mechanism involving electrostatic interactions and coordination bonding. Isotherm analysis confirmed monolayer adsorption behavior following the Langmuir model. HB-Zn showed optimal performance at basic pH (9) but was affected by ionic strength in saline conditions. The optimal adsorbent dose was 1 g/L, balancing high efficiency and material usage. These findings demonstrate the potential of ZnCl-activated hydro-biochar as a sustainable and effective adsorbent for dye-contaminated wastewater. Future work should focus on regeneration performance, applicability to emerging contaminants, and scaling for industrial water treatment.

Keywords: Hydro, biochar, *Melia azedarach*, ZnCl activation, Rhodamine B, Aqueous solution, Adsorption.

*Speaker

Assessment of Groundwater Quality for Irrigation Purposes in the Ouargla Basin (Southeastern Algeria)

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Abstract

The presence of groundwater pollution within the Ouargla basin is currently a significant concern to the community and the government, especially within arid conditions where water resources are under pressure.

The research will try to evaluate the quality of the groundwater by testing nine (9) samples gathered from different locations in the region through the analysis of several chemical components and major elements to determine the possible sources of the contamination based on the results of the testing process.

The pollution level was determined using the Organic Pollution Index. This index enabled the identification of changes in water quality. The study found that there existed highly polluted regions, including Hassi Miloud, N'Goussa, and Hassi Ben Abdellah.

This research works to emphasize the importance of integrated and sustainable water management practices for minimizing risks to the environment and protecting groundwater resources in arid and semi-arid areas.

Keywords: Water pollution, Organic pollution index, Aquifer, Irrigation water, Ouargla.

*Speaker

Purifying polluted water with silica nanoparticles extracted from sand in the El-Oued region.

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The Algerian Sahara contains vast reserves of silica-rich sand dunes, particularly in the El-Oued region ($\text{SiO}_2 > 80\%$). These dunes have numerous industrial applications, notably in the glass, cement, and brick industries, as well as in water treatment in filling basins. This work aims to extract silica nanoparticles from local sand using the sol-gel method, a simple, economical, and environmentally friendly chemical process. The potential use of BBD-enhanced silica as a low-cost adsorbent for removing organic pollutants from water was investigated.

The produced silica was characterized using several analytical techniques, including X-ray fluorescence spectroscopy (XRF), scanning electron microscopy/X-ray energy dispersion spectroscopy (SEM/EDX), X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FTIR), and specific surface area measurement (BET).

The highest silica yield of 87.62% was achieved when the temperature $T = 495.3 \text{ }^\circ\text{C}$, the time $t = 2$ hours, and the SiO_2/NaOH ratio = 7.88. The maximum absorption capacity of methylene blue dye (MB) was 209.23 mg/g at $55 \text{ }^\circ\text{C}$.

Keywords: Purifying, Polluted water, Sand, Silica nanoparticles, Adsorption, Box–Behnken design..

*Speaker

”Sustainable Chitosan–ZnO–Biochar for Methylene Blue Adsorption

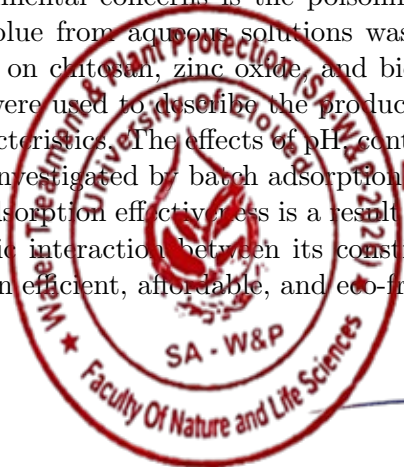
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One of the biggest environmental concerns is the poisoning of water by synthetic colors. The adsorption of methylene blue from aqueous solutions was assessed in this study using a green ternary composite based on chitosan, zinc oxide, and biochar (Chitosan–ZnO–Biochar). FTIR, XRD, and SEM/EDX were used to describe the produced material in order to examine its surface and structural characteristics. The effects of pH, contact time, adsorbent dosage, and initial dye concentration were investigated by batch adsorption tests. The findings showed that the ternary composite’s high adsorption effectiveness is a result of both the availability of active surface sites and the synergistic interaction between its constituent parts. The results verify that the created composite is an efficient, affordable, and eco-friendly adsorbent for wastewater dye removal.



Keywords: Methylene blue – Adsorption – Chitosan – ZnO – Biochar – Water treatment – Green composite

*Speaker

Innovative Use of *Moringa oleifera* for Sustainable Industrial Water Management

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Sustainable water management remains a critical challenge for industrial sectors, particularly in arid and semi-arid regions where water resources are increasingly under pressure. Industrial effluents from the agri-food sector, especially dairy processing industries, are characterized by high turbidity, organic pollution, and elevated mineral content, requiring efficient and environmentally sustainable treatment technologies. In this context, the use of natural coagulants has emerged as a promising alternative to conventional chemical reagents.

This study investigates the application of *Moringa oleifera* seed extract as a natural coagulant for the treatment of industrial dairy wastewater. Due to the high pollution load of the raw effluent, a preliminary dilution step was applied prior to treatment. The coagulation process was optimized using a Box–Behnken response surface methodology, examining the influence of three key operational parameters: coagulant concentration, pH, and initial wastewater characteristics. Treatment efficiency was evaluated based on turbidity removal, chemical oxygen demand (COD) reduction, and changes in conductivity.

The experimental results revealed that *Moringa oleifera* exhibited strong coagulation efficiency under near-neutral pH conditions. Under optimal operating conditions (coagulant dose of 11 g/L and pH of 6.25), a turbidity removal efficiency of 92.78% was achieved, accompanied by a COD reduction exceeding 50%. Additionally, a noticeable decrease in conductivity was observed, indicating partial removal of dissolved ions during the treatment process. Statistical analysis confirmed the significance and robustness of the developed predictive models.

Overall, this study demonstrates that *Moringa oleifera* represents a cost-effective, eco-friendly, and sustainable solution for industrial wastewater treatment, contributing to improved water management strategies in developing and water-stressed regions.

Keywords: *Moringa oleifera*, Industrial wastewater, Coagulation–flocculation, Sustainable water management, Dairy industry

*Speaker

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Study of the adsorption kinetics of the food dye Tartrazine Yellow using a plant-based waste

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Over the past decades, there has been an increasing use of plants and plant-based wastes for the treatment of water contaminated with dyes. The aim of this study is to monitor the batch removal of the food dye Tartrazine Yellow using an agricultural waste. The pseudo-first-order and pseudo-second-order kinetic models, as well as the intraparticle diffusion model, were evaluated. The kinetic study showed that adsorption equilibrium was reached within the first 50 minutes of contact. The obtained results indicate that the adsorption of Tartrazine onto the biomass follows a second-order kinetic model. Regarding intraparticle diffusion, the rate constants increase with increasing initial dye concentration, whereas temperature variation has no significant effect on the rate constant values, which remain nearly constant.

Keywords: adsorption, biomass, Tartrazine Yellow, plants



*Speaker

Synthesis and Environmental Applications of Magnesium Oxide Nanoparticles for Sustainable Agriculture: Wastewater Treatment and Heavy Metal Removal

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This study explores the synthesis and applications of magnesium oxide nanoparticles (MgO NPs) synthesized via the sol-gel method. X-ray diffraction (XRD) analysis confirmed a cubic crystalline structure with an average crystallite size of 22.53 ± 3.42 nm. Optical characterization revealed a direct bandgap of 3.12 eV and a UV absorption peak at 308 nm. Fluorescence spectra exhibited emission peaks at 408, 443, and 478 nm, attributed to oxygen vacancies. The MgO NPs demonstrated exceptional photocatalytic activity degrading 99.82% of Malachite Green dye in 120 minutes under sunlight ($k = 0.02763 \text{ min}^{-1}$). Furthermore, they removed 98.75% of cadmium ions in 120 minutes ($k = 0.01695 \text{ min}^{-1}$). These results underscore the potential of MgO NPs for wastewater treatment and heavy metal removal, showcasing their high efficacy in environmental applications, particularly in the treatment of agricultural wastewater and the removal of contaminants, aligning with the principles of sustainable agriculture and plant protection.

Keywords: Magnesium Oxide Nanoparticles, Sol-Gel Method, Photocatalytic Activity, Wastewater Treatment, Heavy Metal Removal, Malachite Green Dye.

*Speaker

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Impact of irrigation water salinity on water management and durum wheat yield in arid areas : an approach using the AquaCrop model

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Sustainable water management is now a major challenge for agriculture in arid and semi-arid areas, particularly in the context of climate change and the increasing salinisation of water resources. This study addresses this issue and aims to analyse the impact of irrigation water salinity on the water and agronomic behaviour of durum wheat in the El Oued region (Algeria), using the AquaCrop agro-hydrological model as a decision-making tool. The climate analysis carried out over a long period (1978-2018 for the climate and 1996-2018 for the modelling) highlights a high interannual variability in precipitation, characterised by low annual totals and an irregular distribution. Average rainfall remains limited, while maximum and minimum temperatures show an overall upward trend, favouring high reference evapotranspiration (ET), with an annual average close to 1950 mm. These climatic conditions reinforce dependence on irrigation and increase pressure on water resources.

The methodology is based on the simulation of three irrigation water salinity scenarios (0, 2 and 3.5 dS/m), while keeping climatic, soil and crop parameters constant. The results show that salinity significantly influences the components of the water balance and production. Evaporation and transpiration are little affected by moderate salinity (2 dS/m), whereas high salinity (3.5 dS/m) leads to a significant reduction in transpiration, reflecting water and physiological stress on the plant.

The biomass and yield of durum wheat gradually decrease with increasing salinity, particularly during years with water deficits. However, in wet years, particularly 2008-2009, the negative effect of salinity is greatly mitigated by the natural satisfaction of water requirements through rainfall. Water productivity, a key indicator of efficient irrigation management, is also affected by salinity, confirming the importance of adequate irrigation water quality.

In conclusion, this study demonstrates the value of the AquaCrop model as a forward-looking tool for optimising water management and adapting agricultural practices in arid environments, by integrating both the availability and quality of water resources.

Keywords: Water management, AquaCrop, Durum wheat, Irrigation water salinity, Evapotranspiration, Water productivity.

*Speaker

Influence of Physico-Chemical Parameters on Phytoplankton Dynamics and the Ecological Quality of Waters in the Koudiet Medaouar Dam (Batna)

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This study aims to investigate the impact of physico-chemical parameter variations on phytoplankton dynamics and ecological quality in Koudiet Medaouar Dam (Batna Province) from 2017 to 2019. This dam is considered a strategic water resource for drinking purposes and irrigation in a region where climatic constraints are very important.

In this context, a series of seasonal surveys were carried out in three sites with different levels of anthropogenic pressure. The following physico-chemical parameters were studied: temperature, pH, conductivity, salinity, turbidity, sulfates, and nitrogenous (NH, NO, NO) and phosphorous (PO³) nutrients. Phytoplankton samples were collected using a plankton net. Ecological quality assessment is based on species richness, relative abundance, Shannon diversity index, evenness, and Sørensen similarity.

The results showed that physico-chemical parameter variations are influenced by seasonal variations related to climatic and hydrological conditions. Temperature and nitrogenous and phosphorous nutrient inputs seem to be the main controlling factors for phytoplankton dynamics. Phytoplankton communities were mainly dominated by Bacillariophyceae, Chlorophyceae, and Cyanobacteria. The diversity of phytoplankton is higher in spring and summer.

Ecological assessment indicates a trophic status ranging from mesotrophic to slightly eutrophic, reflecting moderate nutrient enrichment. This study confirms the relevance of phytoplankton as an effective bioindicator of water quality and provides essential data to support sustainable management and environmental monitoring of the Koudiet Medaouar Dam.

*Speaker

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Keywords: Phytoplankton, physico, chemical parameters, water quality, trophic status, eutrophication, Koudiet Medaouar Dam.



Green synthesis of metal oxide nanocomposite to improve photocatalytic degradation of bromophenol blue and ortho-toluidine blue under sunlight irradiation and molecular docking

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Dye pollution resulting from the discharge of untreated wastewater has become a major environmental concern. In this study, we propose a green and cost-effective approach for the photocatalytic degradation of dye pollutants using a nanocomposite (NC) of manganese oxide (Mn₃O₄) modified with polyvinylpyrrolidone (PVP). The Mn₃O₄ nanoparticles (NPs) were synthesized through a green method using a biogenic extract of *Pistacia lentiscus* leaves. The resulting Mn₃O₄ NPs were then modified with PVP, a non-ionic polymer, to enhance their stability and catalytic performance. The synthesized Mn₃O₄/PVP NC was characterized using various analytical techniques, including Fourier transform infrared spectroscopy (FTIR), X-ray diffraction (XRD), and scanning electron microscopy (SEM). The findings showed that the Mn₃O₄ NPs and Mn₃O₄/PPV NC exhibit spherical morphology with an average size of 37 nm and 45 nm, respectively. The Mn₃O₄ NPs and Mn₃O₄/PVP NC exhibited optical bandgap energies of 1.8 eV and 1 eV, indicating the effective use of these NPs as photocatalysts. The nanocomposite exhibited exceptional catalytic performance in degrading bromophenol blue (BPB) and ortho-toluidine blue (O-TB), achieving degradation rates of 98% and 95% within 75 minutes. In comparison, Mn₃O₄ NPs showed lower efficiencies with approximately 14% degradation for BPB and 6% for O-TB. This study highlights the potential of Mn₃O₄/PVP nanocomposite as an effective and eco-friendly catalyst for dye pollutant degradation, offering a promising solution for wastewater treatment across industries.

Keywords: Green synthesis, Photocatalytic degradation, Mn₃O₄/PVP, Organic dyes, Nanocomposite, adsorption energy.

*Speaker

Degradation of azo dye (AZO) from wastewater using ZnO/BaMg nanocomposite: a comparative assessment with zinc particles

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In this study, a novel ZnO/BaMg nanocomposite was synthesized using an eco-friendly green synthesis method, where lemon peel extract served as a natural reducing agent. The optical properties of the synthesized material were examined by UV-visible spectroscopy, revealing an absorption peak at approximately 277 nm. Fourier transform infrared (FT-IR) spectroscopy confirmed the presence of characteristic functional groups and chemical bonding within the nanocomposite. X-ray diffraction (XRD) analysis indicated the formation of a hexagonal crystalline structure, while scanning electron microscopy (SEM) revealed irregularly shaped nanoparticles with an average size of about 35.89 nm. The catalytic activity of the ZnO/BaMg nanocomposite was evaluated for the degradation of methyl orange (MO) and rose bengal (RB) dyes under visible and UV irradiation and compared with that of pure ZnO nanoparticles. The ZnO/BaMg nanocomposite exhibited superior performance, achieving decolorization efficiencies of 98.71% for MO and 90.2% for RB within 120 min. In contrast, ZnO nanoparticles showed lower degradation efficiencies of 75.57% for MO and 88.69% for RB.

Keywords: Biosynthesis · Nanocomposite · ZnO/BaMg₂ · Characterizations · Dye degradation

*Speaker

Eco-Friendly Activated Carbon Derived from Pine Cones for the Removal of Organic Dyes from Water

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This work falls within the framework of valorizing plant-based resources and converting them into value-added materials. In this study, activated carbon was prepared from pine cones and used as an adsorbent for the removal of Ethyl Violet dye from aqueous solutions. The activated carbon was obtained through thermal treatment followed by an appropriate activation process, and its physicochemical properties were subsequently characterized.

The adsorption process was investigated by evaluating the effect of several operational parameters, including contact time, initial dye concentration, and solution pH. Adsorption isotherm modeling revealed that the experimental data fitted well with both Langmuir and Freundlich models, indicating the high efficiency of the prepared activated carbon surface. Kinetic studies showed that the adsorption process followed the pseudo-second-order kinetic model, suggesting that chemisorption mechanisms play a dominant role.

A significant maximum adsorption capacity (q) was recorded, confirming the effectiveness of the prepared activated carbon as a low-cost and environmentally friendly material for the treatment of organic dyes in water. These findings highlight the importance of valorizing plant waste in the development of sustainable solutions that support the circular bioeconomy and contribute to the protection of water resources.

Keywords: Activated carbon, Ethyl Violet, Adsorption, Langmuir and Freundlich models, Water treatment.

*Speaker

Multiparametric evaluation of water quality in two lakes (Lac Chott & Chott Diba) in the northeastern Algerian Sahara, El Oued

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This study highlights the environmental health of two Saharan ecosystems, Lac Chott and Chott Diba (El Oued, Algeria), using a multiparametric approach. Research conducted from December 2024 to May 2025 shows significant variations in benthic macroinvertebrate density, peaking at 6800 individuals in Lac Chott. Physicochemical results reveal high organic pollution, with reaching at Chott Diba. Beyond their biological indicators, these sites are vital ecological hubs; Lac Chott hosts over 30 species of migratory birds, including five species listed on the IUCN Red List that use the lake as a wintering stopover. Furthermore, Chott Diba serves essential socio-economic functions, providing water for livestock and crop irrigation. However, these fragile habitats are severely threatened by urban wastewater and anthropogenic pressure. The findings underscore an urgent need for conservation strategies to protect both the biodiversity and the vital water resources used by local communities.

Keywords: Water quality, Benthic macroinvertebrates, Migratory birds, IUCN Red List, Saharan lakes.

*Speaker

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Water governance as a mechanism to enhance climate resilience and achieve sustainable water resource management

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Water governance is a fundamental pillar for achieving sustainable water resource management, especially in light of the rapid climate changes that exacerbate water scarcity and irregular precipitation, particularly in arid and semi-arid regions. This work aims to highlight the role of sound governance in enhancing the climate resilience of water management systems, through the adoption of integrated policies that combine strategic planning, legal frameworks, and sustainable technical practices.

The research focuses on the importance of water reuse, particularly treated wastewater, as a strategic option for adapting to climate changes and ensuring the continuity of water resources for the agricultural sector. It also discusses the role of technological innovation, the effective participation of various stakeholders, and the integration of environmental and economic approaches in improving water use efficiency and reducing pressures on traditional resources.

The results show that enhancing water governance, supported by flexible measures adaptable to climate risks, effectively contributes to achieving water security, supporting sustainable agricultural development, and ensuring resource sustainability for future generations.

Keywords: Water governance – climate resilience – sustainable management – water reuse – water security

*Speaker

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Evaluating Groundwater and Treated Wastewater for Tomato (*Solanum lycopersicum*) Irrigation in Arid Environments: Effects on Growth Performance and Nutritional Quality

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Face à la raréfaction croissante des ressources en eau douce, notamment en zones arides et semi-arides, cette étude vise à évaluer l'impact comparatif de l'irrigation par eaux usées traitées (EUT) et par eaux souterraines sur la culture de la tomate (*Solanum lycopersicum*), en termes de performance agronomique, de qualité nutritionnelle des fruits, de sécurité sanitaire et de durabilité environnementale.

L'expérimentation a été menée en conditions contrôlées en milieu aride. Deux traitements d'irrigation ont été comparés : eaux souterraines (témoin) et eaux usées traitées. Les paramètres mesurés ont été regroupés en trois catégories : (1) agronomiques (croissance végétative, rendement), (2) nutritionnels (teneur en vitamines, sucres, acidité), et (3) sanitaires et environnementaux (présence de contaminants, impact sur les propriétés du sol).

L'irrigation avec les EUT a permis d'obtenir des rendements comparables, voire supérieurs, à ceux obtenus avec les eaux souterraines, sans compromettre la qualité nutritionnelle des fruits. Aucune contamination sanitaire significative n'a été détectée dans les fruits ou le sol irrigués avec les EUT correctement traitées. De plus, cette pratique a réduit la pression sur les nappes phréatiques, tout en maintenant la fertilité du sol grâce à la contribution en nutriments des eaux usées.

L'utilisation des eaux usées traitées pour l'irrigation de la tomate en milieu aride apparaît comme une alternative viable, durable et sécurisée. Elle concilie productivité agricole, préservation des ressources en eau et adaptation au changement climatique, à condition que les normes de traitement et d'usage soient strictement respectées.

Keywords: Irrigation, Eaux usées traitées, Tomate, *Solanum lycopersicum*, Environnement aride, Durabilité.

*Speaker

Groundwater Quality Assessment and Irrigation Suitability in the Leghrous Region, Biskra (Algeria)

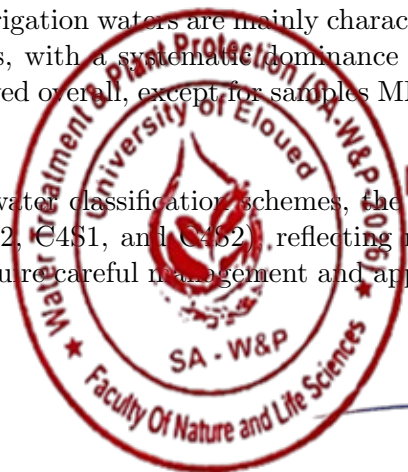
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This study aims to assess the quality of groundwater used for irrigation in the Leghrous region (Biskra, Algeria) through a comprehensive physico-chemical characterization. To this end, ten irrigation water samples were collected and analyzed.

The results indicate that the irrigation waters are mainly characterized by a calcium–magnesium chloride–sulfate chemical facies, with a systematic dominance of sulfate anions in all samples. No dominant cation was observed overall, except for samples MN, CHS, and LI, which exhibited calcium dominance.

Based on standard irrigation water classification schemes, the analyzed samples were grouped into three quality classes (C3S2, C4S1, and C4S2), reflecting moderate to poor water quality. Consequently, these waters require careful management and appropriate precautions when used for agricultural irrigation.



Keywords: irrigation water quality, groundwater, physico, chemical characterization, Leghrous region.

*Speaker

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Assessment of Irrigation Water Quality in the Lioua Region (Biskra, Algeria)

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In this study, we aimed to assess the quality of irrigation water in the Lioua region (Biskra, Algeria). Several physicochemical analyses were carried out, including temperature, pH, electrical conductivity (EC), Ca², Mg², Na, K, HCO, Cl, SO², and NO. The results indicate that the analyzed water samples are classified as saline to highly saline. However, the mean SAR values suggest that the use of these waters does not pose a risk of soil structural degradation. Concentrations of magnesium, potassium, sulfate, and nitrate exceed recommended limits. According to the Piper diagram, the analyzed samples are grouped into two hydrochemical facies: chloride waters with calcium–magnesium sulfate and sodium chloride dominance, and sulfate waters dominated by potassium or sodium. The Fiver/le diagram shows that the water samples fall into five classes: C3–S1, C4–S1, C4–S3, C5–S2, and C5–S3.

Keywords: groundwater, irrigation, quality, SAR.

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Impact of water fluctuations on the survival of Ghouts palm groves in the wilaya of El Oued

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The Ghout System is recognized as a UNESCO world agricultural heritage and is a unique model for which the Souf region is renowned, especially for date palm cultivation. In this innovative approach, palm tree trunks directly contact the water table, allowing them to absorb water naturally without human intervention. However, rising food demand in El Oued has shifted from traditional subsistence farming to intensive agriculture, impacting groundwater availability and rendering the Ghout system unable to meet new demands. This study assesses the current condition of Ghout palm trees through a field survey of 60 Ghouts across all Oued Souf communes. Findings indicate that the system is rapidly approaching extinction, threatened by fluctuating groundwater levels, urban expansion, and competition from modern agriculture. Immediate measures are needed to preserve this valuable heritage.

Keywords: Ghout, Date palm, Investigation, Oued Souf, Water table

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Removal of Contaminants from Seawater Using Waste Mineral Adsorbents

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Seawater treatment technologies. However, conventional treatment methods often involve high energy consumption and elevated operational costs. In this context, the reuse of waste minerals has emerged as a sustainable and eco-friendly alternative for seawater treatment. This approach aims to valorize mineral waste materials by employing them as low-cost adsorbents or reactive media for the removal of dissolved salts, heavy metals, and other contaminants present in seawater. Waste minerals, originating from industrial, mining, or construction activities, exhibit favorable physicochemical properties such as high surface area, porosity, and chemical stability, which make them suitable for water treatment applications. Their use not only enhances seawater purification efficiency but also contributes to waste reduction and environmental protection. This study highlights the potential of waste minerals in seawater treatment processes and demonstrates their effectiveness as a sustainable solution for addressing water scarcity challenges while promoting circular economy principles.

Keywords: Waste minerals. seawater. treatment

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Antibacterial Properties of SnO₂ Thin Films for Water Treatment and Plant Protection

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The development of antimicrobial materials has become increasingly important to address bacterial contamination in aquatic and agricultural environments. Tin dioxide (SnO₂) thin films are promising candidates due to their wide bandgap, optical transparency, chemical stability, and high surface reactivity. These properties position SnO₂ not only for electronic and optoelectronic uses but also for biomedical and environmental disinfection. In this experimental study, the antibacterial activity of SnO₂ thin films was assessed against *Escherichia coli* (ATCC 25922). After 24 hours of aerobic incubation at 37 °C, the films demonstrated significant antibacterial efficacy. These findings highlight the potential application of SnO₂ thin films in water purification systems, the development of antimicrobial surfaces, and other disinfection strategies aimed at protecting crops and mitigating aquatic pathogens.

Keywords: SnO₂, antibacterial activity, *Escherichia coli* ATCC 25922, water treatment, plant protection.



*Speaker

Antibacterial and antioxidant activities of Essential oil of *Balansea glaberrima* (Desf.) Lange growing in Algeria

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Introduction

The medicinal and nutritional properties of the Apiaceae family plants are well established for longtime and many of them are being used as spices and herbal medical preparations. The essential oils comprise secondary metabolites extracted from different parts of aromatic plants with potent antimicrobial and antioxidant properties that are being used as natural remedy in phytotherapy. *Balansea glaberrima* (Desf.) Lange (Apiaceae) is a species found in north of Algeria. In the present study antibacterial and antioxidant activities were investigated.

Methods: Essential oil obtained by hydrodistillation. Their antibacterial activity was evaluated by the disc diffusion method against. Antibacterial activity was evaluated on nine bacterial strains (Gram+ and gram -) *Escherichia coli* ATCC 25922, *Pseudomonas aeruginosa* ATCC 27853, *Staphylococcus aureus* ATCC 25923, *Staphylococcus aureus* résistant à la méticilline (SARM) ATCC 43300, *Bacillus subtilis* ATCC 6633 et *Listeria inocula* CIP 74915. Three bacterial strains have been isolated from human clinical samples: *Escherichia coli*, *Pseudomonas aeruginosa* and *Staphylococcus aureus* multirésistant, the se strains are very often responsible for nosocomial infections. The antioxidant activity was evaluated using the free radical scavenging effect of the DPPH.

Results : The yield of EO from the aerial part of *Balansea glaberrima* is 0,260%. The essential oil has an inhibitory effect against :*E. coli* ATCC 25922, *S. aureus* ATCC 25923 and *B.subtulis* ATCC 6633but is inactive against the other bacterial strains. The IC₅₀ of the EO ans BHT were respectively: 9136,6±0,351 and 41,3 µg/ml

Conclusion: Essential oils from the Apiaceae family contain compounds with antimicrobial effects.

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Keywords: *Balansea glaberrima*, volatile oil, antibacterial activity



Correlation between the physico-chemical properties of irrigation waters and the vegetative and qualitative performance of arboreal fruit crops: case (Khenchela).

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The quality of irrigation water is a major determinant of agricultural productivity and the sustainability of arboreal production systems, particularly in semi-arid areas where water resources are limited. This study conducted a characterization of irrigation water used in arboreal farms in the Khenchela region in order to evaluate the physico-chemical of the waters exploited by the owners of the region and to assess their compliance with the recommended irrigation standards for fruit crops. Our methodological approach combined field sampling and physico-chemical analyses in the laboratory. 35 representative samples of 500 ml, taken from geomembranes and traditional boreholes, were collected according to a rigorous protocol, then packaged and transported to the laboratory for physico-chemical analysis of water (ARAL) in Athens, Greece. These analyses were carried out in collaboration with the laboratory of plant physiology and morphology of the University of Agriculture of Athens, thus guaranteeing the reliability and accuracy of the results obtained. The results obtained reveal that irrigation water has an average pH of 7.5, indicating a neutral to slightly alkaline reaction, favorable to most fruit crops. The electrical conductivity, varying between 1520 and 2200 $\mu\text{S}/\text{cm}$, shows a moderate salt charge however requiring continuous monitoring. The analysis of chemical components revealed the following average contents: nitrates between < 0.5 and 81.86 mg/l, nitrites < 0.02 mg/l, ammonium > 0.02 mg/l, calcium 196.6 mg/l, magnesium 57.4 mg/l, sodium 115.8 mg/l, potassium 2.56 mg/l and boron 0.336 mg/l. The exploitation of these data allowed us to calculate the adsorption ratio of sodium ($\text{SAR} = \text{Na} / ((\text{Ca} + \text{Mg}) / 2)$), a key parameter for assessing the risk of soil sodisation and the suitability of water for irrigation. This calculation is an essential indicator in assessing the degree of compatibility between water quality and tree crop requirements. In conclusion, the results show that the irrigation waters of the study area overall have physico-chemical characteristics compatible with the requirements of fruit arboriculture. Nevertheless, some samples reveal salinity-related constraints that merit special attention and may require the implementation of adapted management practices, such as periodic soil leaching or the choice of salt-tolerant rootstocks. These results constitute a scientific basis for the development of technical recommendations aimed at optimizing the use of water resources in the region and ensuring the sustainability of arboreal systems in semi-arid contexts.

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Keywords: khenchela, irrigation water, physico, chemical analysis, SAR, Salinity



Analysis of Nutrient Salts and Rearing Environment Quality: Indicators for Sustainable Management

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A monthly monitoring of water quality was implemented at a floating cage aquaculture site in Beni Ksila, with the objective of supporting management and ensuring the sustainability of aquaculture activities. Five sampling points were established to assess the spatial and temporal evolution of nutrient salts (nitrites, nitrates, ammonium, silicates, and orthophosphates) as well as key physicochemical parameters (temperature, salinity, pH, dissolved oxygen, suspended solids, and turbidity). This monitoring allows for the surveillance of the site's environmental conditions, the prevention of risks associated with nutrient accumulation and water quality degradation, and the optimization of farming practices. The study highlights the importance of regular water quality control as an essential tool to guarantee zootechnical performance, fish health, and the sustainability of floating cage aquaculture systems

Keywords: Floating cage aquaculture · Beni Ksila · Water quality · Nutrients · Physicochemical parameters · Sustainability of aquaculture practices

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In silico characterization of *Bjerkandera adusta* lignin peroxidases for sustainable water treatment: targeting endocrine disrupting chemicals in agricultural water resources

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Lignin peroxidases (LiP; EC 1.11.1.14) are oxidative enzymes secreted by white-rot fungi that play a key role in lignin biodegradation. Due to their broad substrate specificity, these enzymes have attracted increasing interest for environmental applications, including remediation of water contaminated by recalcitrant organic pollutants. However, the three-dimensional structure of LiPs from the white-rot fungus *Bjerkandera adusta* has remained unknown, limiting rational design of enzyme-based water treatment strategies. In sustainable agriculture, access to clean water is critical, particularly in arid regions where water scarcity and contamination by endocrine disrupting chemicals (EDCs) threaten food safety.

In this study, we conducted comprehensive *in silico* characterization of two LiP isoenzymes from *B. adusta* (accessions: 588479560 and 444058) to evaluate their potential for EDC bioremediation in agricultural water systems. Primary structure analysis revealed both enzymes are acidic (pI < 7), thermostable (aliphatic index > 75), and hydrophilic. Homology modeling using lignin peroxidase H8 from *Phanerochaete chrysosporium* (PDB ID: 1b80.1) generated high-quality 3D models, with QMEAN scores of 0.81–0.84 and > 91% of residues in favored regions

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on Ramachandran plots. Conserved domain analysis confirmed the ligninase domain and fungal peroxidase extension region, while COACH analysis identified heme-binding catalytic residues.

Molecular docking simulations were performed against 11 lignin model compounds and 11 EDCs frequently detected in water, including bisphenol A, estrone (E1), atrazine, and nonylphenol. Among lignin compounds, the dimer guaiacyl 4-O-5 guaiacyl exhibited the strongest binding affinity for both LiPs (-7.9 and -6.7 kcal/mol). Notably, EDCs showed higher affinities: estrone (E1) bound most strongly to LiP 588479560 with a Vina score of -9.1 kcal/mol, while bisphenol A exhibited the highest affinity for LiP 444058 at -8.0 kcal/mol, surpassing binding energies of natural lignin substrates.

To assess interaction stability, 300 ns molecular dynamics simulations were conducted using Desmond. RMSD analysis confirmed the LiP-bisphenol A complex remained exceptionally stable throughout, with RMSD values consistently below 2 Å after 100 ns. The LiP-estrone complex also demonstrated good stability with $\text{RMSD} \leq 3$ Å. Radius of gyration analysis revealed bisphenol A induced a more compact enzyme conformation (mean $R_g \sim 3.18$ Å) compared to the substrate. RMSF profiles showed catalytic residues exhibited minimal fluctuations (). These findings demonstrate that *B. adusta* LiPs possess strong and stable binding affinity for priority EDC pollutants, particularly bisphenol A and estrone. By providing the first structural models and dynamic interaction profiles for these enzymes, this study supports their development as biocatalysts for advanced water treatment. Integration of such enzyme-based bioremediation strategies into agricultural water management could contribute to safer irrigation practices and enhanced sustainability of water resources in vulnerable regions.

Keywords: Lignin peroxidases, *Bjerkandera adusta*, molecular dynamics, endocrine disrupting chemicals, water bioremediation



Characterization of the morphological growth dynamics of the fruits of the Deglet Nour palm through the successive phenological stages in the Souf region.

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The Deglet Nour date (*Phoenix dactylifera* L.), often called "the queen of dates" because of its exceptional quality, delicate flavor, and semi-translucent golden appearance, is among the most prized and renowned date palm varieties. It also holds a vital place in Algeria's agricultural heritage. While closely linked to the Biskra region, the Oued Souf area also significantly contributes to its cultivation, thanks to climatic conditions that affect fruit development and quality. Despite its economic and cultural significance, research on how Deglet Nour fruits' morphological traits change throughout their phenological (developmental) stages under Oued Souf's specific environment is limited. This underscores the need to explore this scientific gap and identify which traits are most influenced and at what stages changes are most evident. This study aims to analyze the evolution of these traits across the fruit's growth stages within Oued Souf's climate. A uniform sample of palm trees was chosen, with strict control over environmental variables. During successive stages, measurements of fruit weight, length, width, pulp weight, and stone dimensions were systematically recorded. Results showed a distinct pattern: these indicators increased during the Hababouk and Kimri stages, peaked at Khalal, then gradually declined during Routab and Tamar stages due to water loss and tissue dehydration. These findings demonstrate that monitoring morphological traits is not just descriptive but a vital practical tool to protect the economic value of Deglet Nour, enhance its market competitiveness, and guide more sustainable agricultural practices. Ultimately, understanding the interactions between genetic, environmental, and morphological factors is crucial for preserving and advancing this renowned Algerian cultivar.

Keywords: Datte Deglet Nour (*Phoenix dactylifera* L.), Caractéristiques morphologiques, Stades phénologiques, Région du Souf, Développement du fruit.

*Speaker

ASSESSMENT OF CLIMATE CHANGE IN KONYA CLOSED BASIN WITHIN THE FRAMEWORK OF WATER FLOW OBSERVATION

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One of today's current problems is climate change. Climate change has become the most talked about global problem on a global scale. In the world and in our country, climate change is increasing day by day and is manifesting itself with devastating effects. The duration, frequency and severity of extreme weather events are increasing and have devastating consequences. Excessive rainfall, extreme heat, heat and cold waves lead to drought, severe storms, forest fires, floods and inundations, loss of life and property. It is known that the most fundamental causes of climate change are increasing greenhouse gases and environmental pollution. It is thought that Turkey will be negatively affected by climate change and will have a hotter and drier climate structure in the near future, with a more uncertain climate structure in terms of precipitation amount and intensity. In the study conducted on how the effects of global climate change such as drought, flood and inundation may cause changes on rivers, the changes in the flow rates measured in rivers and streams in the sub-basins of the Konya closed basin were examined and the irregularities in the flow rates were tried to be revealed with statistical averages.

Keywords: Climate change, Drought, Flood, Konya Closed Basin

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THE IMPORTANCE OF USING TREATED WATER IN AGRICULTURE UNDER CHANGING CLIMATE CONDITIONS

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Climate change is intensifying water scarcity, increasing variability in precipitation patterns, and placing unprecedented pressure on agricultural water resources. Under these changing climatic conditions, the use of treated water has emerged as a critical strategy for sustaining agricultural production and enhancing water security. Treated wastewater and alternative water sources offer significant potential to supplement conventional irrigation supplies, particularly in arid and semi-arid regions where freshwater availability is increasingly limited.

This study examines the importance of using treated water in agriculture within the context of climate change adaptation. It evaluates the role of treated water in maintaining crop productivity, improving water-use efficiency, and reducing dependence on overexploited freshwater resources. The study also addresses the potential risks associated with treated water use, including salinity, pathogen transmission, and the accumulation of contaminants, and discusses management practices required to mitigate these challenges.

Drawing on recent scientific evidence and selected case studies, the study highlights that properly treated and well-managed water resources can support resilient agricultural systems while contributing to environmental sustainability. Furthermore, the integration of treated water into agricultural practices is discussed as a key component of climate-resilient farming strategies, particularly when aligned with appropriate regulatory frameworks, monitoring systems, and farmer awareness programs.

The study concludes that expanding the safe and efficient use of treated water in agriculture is essential for adapting to climate change, ensuring long-term food security, and promoting sustainable water management at both local and global scales.

Keywords: Wastewater Reuse in Agriculture, Water Scarcity, Climate, Resilient Farming, Treated Water Reuse

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Effet des Régimes d'Irrigation par Eau Magnétisée sur le Développement Morphologique des Fruits du Palmier Dattier Deglet Nour en Zones Arides

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La rareté des ressources en eau constitue une contrainte majeure pour l'agriculture dans les zones arides et semi-arides. L'irrigation par eau magnétisée représente une technologie à faible coût prometteuse pour améliorer l'efficacité hydrique et atténuer le stress hydrique sur les cultures. Cette étude vise à évaluer l'effet de trois régimes d'irrigation par eau magnétisée sur le développement morphologique des fruits du palmier dattier variété Deglet Nour (*Phoenix dactylifera* L.) à travers cinq stades phénologiques (S1-S5). L'expérimentation a été conduite à la ferme de Daouia, wilaya d'Oued Souf, Algérie, à l'aide du dispositif Delta Water. Trois groupes ont été définis : Groupe 1 (15 h/48 h), Groupe 2 (12,5 h/48 h) et Groupe 3 (10 h/48 h). Sept paramètres morphologiques ont été mesurés et analysés par statistiques descriptives et ANOVA ($p \leq 0,05$). Le Groupe 1 a enregistré les meilleures performances : poids du fruit (8,16 g), longueur (34,20 mm) et poids de la pulpe (7,17 g). Le Groupe 3, malgré une réduction de 33 % des apports en eau, n'a accusé qu'une baisse de 20 % du poids moyen (6,53 g), révélant une meilleure efficacité hydrique liée à la magnétisation. L'ANOVA n'a révélé aucune différence statistiquement significative entre les groupes ($p > 0,05$), avec des écarts plus marqués aux stades S2 et S3. Le régime de 12,5 heures représente le meilleur compromis, réduisant la consommation d'eau de 17 % tout en préservant 90 % de la productivité. Ces résultats confirment le potentiel de l'irrigation par eau magnétisée comme stratégie durable dans les régions phoenicoles arides.

Keywords: Eau magnétisée • Palmier dattier (*Phoenix dactylifera* L.) • Gestion de l'irrigation • Efficacité d'utilisation de l'eau • Zones arides • Morphologie des fruits

*Speaker

Biotechnological Innovations in Agriculture and Food Safety



A Novel Trichoderma-Based Green Formulation for Sustainable and Effective Field Control of Potato Virus Y

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Potato Virus Y (PVY) is one of the most destructive viruses affecting potato worldwide, yet effective antiviral agents remain limited. This study evaluated the potential of Trichoderma culture filtrates (TCFs) as sustainable antiviral agents using biological and computational approaches. PVY and Trichoderma isolates were molecularly characterized, with the PVY isolate deposited as PVY EGY-RIZK24 (PP375808) and Trichoderma isolates identified as *T. asperellum* (T1, T2) and *T. asperelloides* (T4). Foliar application of TCFs significantly suppressed PVY accumulation (68.5–89.8%) and enhanced PR1-b expression, antioxidant enzyme activities (SOD, POD, PPO), and chlorophyll content, with TCF1 and TCF2 showing the strongest antiviral and systemic resistance-inducing effects. GC-MS profiling of TCFs identified 24 metabolites, and molecular docking against PVY coat protein (PDB: 6HXX), using ningnanmycin and ribavirin as controls, highlighted C9, C10, C13, and C19 as top candidates, with molecular dynamics simulations confirming stable interactions, particularly for C19. The most effective filtrate (TCF1) was developed into a garlic oil-based emulsion. Among eight formulations, Formulation No. 6 (C3, 20 mL/L) completely prevented PVY infection in growth chamber trials (100% reduction) and demonstrated strong curative effects (89.92%), while increasing PR1-b expression, phenolic, and flavonoid contents. Field trials confirmed its efficacy, reducing PVY content by 92%, lowering disease incidence and severity by 60.3% and 70.1%, respectively, and enhancing plant growth parameters. This work demonstrates a novel, sustainable Trichoderma-based biocontrol approach against PVY, with the developed product submitted to the Egyptian Patent Office (EG/P/2025/236).

Keywords: PVY, Potato, Trichoderma, Molecular Docking, Molecular Dynamic Simulation, Virucide

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Synthesis, in vitro anti-arthritic, anti-cancer studies of n-ferrocenylmethyl-3-chloroaniline

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Immune-related disorders and cancer are strongly linked to oxidative stress, which drives chronic inflammation, DNA damage, and immune dysregulation (2). Rheumatoid arthritis (RA) is Immune-related disorders and cancer are strongly linked to oxidative stress, which drives chronic inflammation and immune dysregulation (2), as well as DNA damage and genomic instability that contribute to carcinogenesis (10). Rheumatoid arthritis (RA) is a systemic autoimmune disease mediated by pro-inflammatory cytokines and oxidative imbalance (1), and its current treatments are limited by side effects and incomplete remission (3); moreover, chronic inflammation in RA is associated with an increased cancer risk (3).

Ferrocene, a stable redox-active metallocene, has emerged as a promising pharmacophore in medicinal chemistry due to its structural stability and redox properties (5). The incorporation of a ferrocenyl moiety can enhance biological and pharmacokinetic performance (8). Ferrocenyl derivatives exhibit notable anticancer potential mainly through ROS generation and oxidative DNA damage (9), leading to apoptosis and disruption of tumor redox balance, while diverse functionalized ferrocenyl systems have demonstrated encouraging therapeutic prospects (4).

The limitations of current therapies, including severe side effects such as gastrointestinal bleeding and cardiovascular issues, highlight the need for safer, long-lasting agent drugs. This research explores the potential of a novel ferrocene derivative, N-ferrocenylmethyl-n-acetyl-3-chloroaniline as an anti-RA and anti-cancer agent. The compound's synthesis and affinity to bovine serum albumin (BSA) were assessed using a BSA protein denaturation assay, the binding interactions between 3CIA1 and DNA were analyzed by determining the free energy using electron spectroscopy, aiming to identify a safer and more effective therapeutic option.

Keywords: anti, Arthritic activity, anti, cancer activity, Synthesis, ferrocene derivative, bio, organometalique.

*Speaker

From GC–MS to Function: Antioxidant, Antibacterial, and Anti-corrosion Activities of Rosemary Essential Oil With lpha-pinene Pathway Mapping

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Rosemary (*Rosmarinus officinalis* L.) essential oil (REO) is a rich source of bioactive terpenes with promising biological and industrial applications. This study aimed to characterize the chemical composition of REO, map the biosynthetic pathway of its major constituent α -pinene, and evaluate its antioxidant, antibacterial, and anticorrosion activities. Essential oil was obtained by hydrodistillation using a Clevenger apparatus, yielding 1.18 ± 0.45 mL/100 g of plant material. GC–MS analysis revealed a predominance of monoterpenes, particularly oxygenated monoterpenes, with α -pinene and camphor as the main compounds. Antioxidant activity was assessed using DPPH, CUPRA, and FRAP assays, showing strong free-radical scavenging capacity with low EC values. Antibacterial activity was evaluated against *Micrococcus luteus*, *Staphylococcus aureus*, and *Escherichia coli*, demonstrating notable inhibitory effects attributed to the synergistic action of hydrophobic and oxygenated terpenes. The anticorrosion potential of REO was investigated on gray cast iron in 0.5 M HCl using gravimetric methods, revealing significant corrosion inhibition efficiency after 24 h of immersion. Metabolic pathway mapping using KEGG databases confirmed that α -pinene biosynthesis proceeds via the plastidial MEP pathway and C isoprenoid biosynthesis modules. Overall, the results highlight a strong link between the chemical composition of REO, its biosynthetic origin, and its multifunctional biological and anticorrosion properties, supporting its potential as a natural, eco-friendly alternative to synthetic agents.

Keywords: Rosemary essential oil, α -pinene, GC–MS analysis, Antioxidant activity, Corrosion inhibition

*Speaker

Climate-Smart Bioinoculants for Semi-Arid Agriculture: Harnessing Native Rhizobia and Beneficial Bacteria to Improve *Vicia sativa* Growth

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Sustainable agriculture in arid and semi-arid regions is increasingly threatened by water scarcity, recurrent drought, and the overuse of chemical fertilizers. Developing climate-smart biotechnological strategies that enhance crop productivity while preserving natural resources is therefore essential. Beneficial plant-associated microorganisms represent an eco-friendly alternative, offering opportunities to improve nutrient acquisition and stress resilience through biological processes.

This study explores native microbial communities associated with the forage legume *Vicia sativa* cultivated in western Algeria, with the objective of identifying locally adapted bioinoculants for sustainable dryland farming. Bacterial strains were isolated from root nodules and characterized using phenotypic, proteomic, and molecular approaches. Most symbiotic isolates belonged to *Rhizobium* species involved in nodulation and nitrogen fixation, while additional plant growth-promoting rhizobacteria were also detected, highlighting the microbial biodiversity supporting this crop.

Functional screening revealed multiple traits of agronomic interest, including phytohormone production, phosphate solubilization, siderophore release, and tolerance to drought-like conditions. Genomic analyses of selected strains further confirmed their biosafety and uncovered gene repertoires linked to nutrient cycling, abiotic stress adaptation, and symbiotic performance.

Greenhouse experiments demonstrated that seed inoculation, particularly through microbial consortia, significantly improved germination, nodulation, biomass accumulation, and root development compared with uninoculated controls. These results suggest that combining native rhizobia with complementary endophytic or rhizosphere bacteria can generate synergistic effects during early plant establishment.

*Speaker

Overall, this work highlights the potential of microbial biotechnology as a sustainable tool to reduce fertilizer inputs, strengthen forage legume resilience, and support climate-adapted agricultural systems in drought-prone environments.

Keywords: microbial biotechnology, sustainable agriculture, *Vicia sativa*, rhizobia, PGPR, drought resilience, biofertilizers, semi, arid ecosystems



Potential Use of Algerian Steppe Honey as a Natural Antibacterial and Antioxidant Agent against Urinary Tract Infections

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Honey, a natural sweetener produced by *Apis mellifera* through the transformation of floral nectar or tree exudates, has been prized for its medicinal virtues for centuries. Its therapeutic application is supported by proof of strong antioxidant and antibacterial activity. The present work sought to investigate the physicochemical properties, antibacterial activity, and antioxidant activity of two varieties of honey collected from the Algerian steppe.

In order to achieve these objective, the antibacterial activity of four varieties of honey from Algerian steppe was tested against specific strains of bacteria implicated in urinary tract infection (*Escherichia coli* and *Staphylococcus aureus*). Reference strains were tested, *Escherichia coli* ATCC 25922 and *Staphylococcus aureus* ATCC 33862. The plate microdilution technique was employed, through which the MIC values were determined. In addition to this, the antioxidant activity was measured by employing the ferric reducing antioxidant power (FRAP) assay.

All the samples demonstrated the ability to reduce potential, as assessed by the FRAP method. The antibacterial tests showed that the honey samples exhibited significant antibacterial activity against all tested bacterial strains.

Generally, the findings of this study show that Algerian honey possesses intrinsic antibacterial and antioxidant substances that could serve as natural substitutes in the identification of novel therapeutic drugs against pathogenic bacteria-related diseases and oxidative stress.

Keywords: Keywords: Honey, Antioxidant activity, Antibacterial properties, Bioactive compounds.

*Speaker

Comparative Study of the Antioxidant and Antibacterial Activities of Aged and non aged Garlic (*Allium Sativum*) Extracts Against Uropathogenic Bacteria.

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Garlic (*Allium sativum*) is widely cultivated around the globe and has been esteemed for centuries in diverse cultural traditions for its extensive health benefits. Beyond its culinary uses, it is highly regarded as a natural therapeutic agent in preventive healthcare and the management of various diseases, primarily due to its strong antimicrobial, antioxidant, and cardioprotective activities. This study aimed to evaluate and compare the phenolic composition, antioxidant potential, and antibacterial activity of methanolic extracts derived from aged and non-aged garlic. Phenolic compounds were extracted by hydroalcoholic maceration. The total phenolic content was determined by a modified Folin Ciocalteu method. The antioxidant activity of the tested extracts was evaluated using the ferric reducing antioxidant power (FRAP) assay, and the antibacterial activity was assessed using the disc diffusion method against the growth of *Pseudomonas aeruginosa*, *Escherichia coli*, *Staphylococcus aureus*, implicated in urinary tract infection. According to results the extract from the aged garlic had the highest content of polyphenols, with 145.216 ± 0.017 mg gallic acid/g, compared to the non aged garlic extract which had the lowest, polyphenols and flavonoid contents. The results of the antioxidant activity revealed a strong reducing power, with the extract obtained from aged garlic exhibiting the highest antioxidant activity ($EC_{50} = 137.26 \pm 0.02$ mg/mL). The results of the antibacterial effect reveals that the extracts of aged and non garlic possess an antibacterial effect against all tested strains and the extracts of aged garlic exhibited the better antibacterial effect compared to the non aged garlic extracts. The findings of this study suggest that garlic extracts, especially those obtained from aged garlic, contain bioactive compounds with significant antibacterial and antioxidant properties, indicating their potential use as natural therapeutic agents in the development of new treatments for diseases associated with pathogenic bacteria and oxidative stress.

*Speaker

Keywords: Aged garlic, Non aged garlic, Methanolic extract, Antibacterial, Antioxidant activity.



PGPR AS SUSTAINABLE BIOFERTILIZATION FOR POTATO (*SOLANUM TUBEROSUM* L.) GROWTH AND YIELD ENHANCEMENT UNDER REDUCED CHEMICAL INPUTS

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act: The excessive use of chemical fertilizers in potato cultivation raises environmental and economic concerns, necessitating sustainable alternatives. This study investigates the potential of Plant Growth-Promoting Rhizobacteria (PGPR) as biofertilizers to enhance potato growth and productivity while reducing chemical inputs. Potato tubers were surface-sterilized and bacterized by coating with PGPR suspensions following a standardized protocol. The treated tubers were arranged in a randomized block design comprising seven treatments (five bacterial treatments and two non-inoculated controls) with three replicates. Germination tests were conducted under controlled conditions, and weekly measurements of germination percentage and sprout length were recorded until 80% germination was reached. Field trials were carried out on a homogeneous and well-drained experimental plot. The integration of PGPR allowed a reduction in chemical fertilizer inputs up to 25% while maintaining favorable soil and crop conditions. Results revealed a significant ($P < 0.005$) and early germination starting from the first week after inoculation. Moreover, PGPR treatments significantly improved agronomic and physiological parameters, including tuber yield, tuber weight, chlorophyll pigment content, and sugar levels, compared to non-inoculated controls under reduced chemical fertilization. These findings demonstrate that PGPR can effectively substitute part of chemical fertilizers, promoting sustainable biofertilization and enhancing potato growth and yield. The study highlights the promising role of PGPR as eco-friendly bioinoculants for sustainable potato production systems.

Keywords: *Solanum tuberosum*, PGPR, Biofertilization, Reduced chemical inputs, Sustainable agriculture

*Speaker

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Phytochemical profiling and biological potential of *Tribulus terrestris* L.

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This study investigates the phytochemical composition of *Tribulus terrestris* L., a medicinal herb widely used in traditional medicine. The plant materials were extracted using ethanol through Soxhlet extraction. Qualitative screening revealed the presence of steroidal saponins, flavonoids, alkaloids, and tannins. Furthermore, the extracts demonstrated significant antioxidant activity (DPPH assay) and antimicrobial effects against pathogenic bacteria. These findings provide a scientific basis for the therapeutic applications of *T. terrestris* in treating reproductive and metabolic disorders.

Keywords: *Tribulus terrestris*, Phytochemistry, Saponins, Antioxidant



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Exploiting endemic "Trichoderma asperellum" as a biotechnological strategy for sustainable protection of potato crops against bacterial blackleg disease

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Potato (*Solanum tuberosum* L.) is a major food crop worldwide, providing a key source of nutrition and supporting agricultural economies. However, its production is severely threatened by bacterial blackleg disease caused by *Pectobacterium carotovorum*, which leads to substantial yield losses and deterioration of tuber quality. Conventional control strategies primarily rely on chemical inputs, but repeated application contributes to environmental pollution, disrupts soil microbial communities, and promotes the emergence of resistant pathogenic strains, limiting long-term effectiveness.

To address these challenges, biotechnological innovations based on microbial approaches offer sustainable alternatives for crop protection. The use of endemic beneficial microorganisms, such as *Trichoderma asperellum*, provides an eco-friendly strategy for disease management while reducing chemical dependence. This approach aligns with current advances in agricultural biotechnology, which aim to enhance crop resilience and promote sustainable farming practices.

This study investigated the antagonistic potential of thirteen endemic *T. asperellum* strains against four virulent isolates of *P. carotovorum* using certified tubers of the potato cultivar "Spunta." Antibacterial activity was assessed through both in vitro and in vivo assays. In vitro activity was evaluated using the paper disc diffusion method on solid medium, while in vivo efficacy was examined using the potato slice method to assess disease symptom reduction under controlled conditions.

The results revealed substantial variation in antagonistic potential among the tested strains. In vitro, inhibition zones ranged from 0 to 24.8 mm, with strains T12, T13, T2, and T7 showing strong activity against several pathogenic isolates. In vivo, disease incidence was significantly reduced by specific strains, with infection rates dropping from 96–100% in untreated controls to as low as 0–25% in treated samples. Complete inhibition of certain isolates was observed for strains T7 and T13, demonstrating the practical effectiveness of microbial biocontrol under controlled conditions. Statistical analysis using Tukey's test confirmed the significance of these effects.

Overall, the study highlights the promising capacity of microbial biocontrol to mitigate bacterial

*Speaker

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blackleg disease in potatoes. The findings underscore the potential of innovative biotechnological approaches to provide sustainable, targeted, and environmentally friendly alternatives to conventional chemical treatments. Such strategies not only improve crop protection but also contribute to the broader goals of sustainable agriculture, aligning with global efforts to reduce chemical inputs and promote resilient food systems.

These results pave the way for future research into field applications and the integration of microbial biocontrol agents into comprehensive disease management programs, reinforcing the value of biotechnological innovation in modern agriculture.

Keywords: Biocontrol, Blackleg disease, *Pectobacterium carotovorum*, Potato, *Trichoderma asperellum*



Biotechnological Evaluation of *Thymus serpyllum* Essential Oil as a Bio-Insecticide Against *Tribolium castaneum*

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In the pursuit of finding sustainable and environmentally friendly approaches for preserving food products from insects, natural materials, especially essential oils, have been recognized as potential substitutes for chemical insecticides. The paper highlights the biotechnologies developed in the field of agriculture using plant-based bio-insecticides.

The objective of the present study is to assess the bio-insecticidal potential of the essential oil derived from the leaves of the wild aromatic plant *Thymus serpyllum* found in the El Kala region, on the adult forms of *Tribolium castaneum*. These bio-assays were carried out at various concentrations, with controlled temperatures (26 ± 1 °C) and humidity ($70 \pm 5\%$). The insecticidal potential of the essential oil was evaluated on the basis of direct contact, fumigation, and the repellent potential of the essential oil.

Data showed a marked efficacy of *T. serpyllum* essential oil against *T. castaneum*. The lethal doses DL10, DL50, and DL90 were estimated to be 3.34, 12.75, and 22.17, respectively, after an exposure period of 15 minutes. These results clearly indicate that this essential oil has immense potential for use as a bio-insecticide.

The significance of further studies to identify the active ingredients responsible for the insecticidal effect is emphasized, in order to develop new biotechnologies in the field of agriculture.

Keywords: Bio, insecticide, Essential oil, *Thymus serpyllum*, *Tribolium castaneum*, Biotechnological innovation, Sustainable pest management, Stored, product protection

*Speaker

Adapted Composting Practices for Cereal Crops within a Sustainable Agri-Tech Approach

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The sustainability of cereal production systems largely depends on the rational management of organic matter and natural resources. In this context, compost is a widely used agricultural resource whose effectiveness may vary according to its composition, application method, and cultivation conditions. The present work adopts an exploratory approach aimed at adapting composting practices to cereal crop production, considering the current environmental constraints and within the framework of Agri-Tech solutions. The project is based on the development of an optimized compost, in solid and/or liquid form, produced from locally available organic materials and characterized by high biological activity. An experimental protocol is implemented to evaluate the effect of this compost on the morpho-physiological performance of wheat grown under normal conditions and under controlled water deficit. In parallel, complementary analytical approaches are planned to characterize the compost and ensure its quality.

Compost composition plays a key role in shaping plant responses under normal and water-stress conditions by influencing organic matter quality and nutrient balance, which in turn affect root development, water uptake, and physiological adjustment in cereal crops.

The expected outcomes should provide insights into the relevance of adapting composting practices to cereal-based systems, with a view to improving organic matter valorization and enhancing crop resilience to environmental constraints. This work aims to contribute methodologically to the optimization of organic practices within the perspective of sustainable agriculture and the development of Agri-Tech solutions adapted to cereal production systems.

Keywords: Sustainable agriculture, Compost, Cereal crops, Wheat, Morpho, physiological performance, Agri, Tech solutions.

*Speaker

A Sustainable Path to Bioactive Phenols from *Retama raetam* via Subcritical Water Extraction

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Algerian flora is a rich reservoir of endemic species with significant, yet underexplored, phytochemical potential. *Retama raetam*, is a notable example, traditionally used for its medicinal properties, which are largely attributed to its high phenolic content. Conventional extraction methods for these thermolabile compounds often involve organic solvents, raising environmental and health concerns. This study explores Subcritical Water Extraction (SWE) as a green, efficient, and sustainable alternative for the recovery of polyphenols from this valuable plant material. The aerial parts of *Retama raetam* were collected from Elhadjira- Ouargla (Algeria). SWE was performed using a pressurized reactor system. The effects of key process parameters—including temperature (100-180 °C), extraction time (5-20 min), and water-to-solid ratio—on phenolic yield were investigated. The extraction process was optimized using Response Surface Methodology (RSM) to maximize total phenolic content (TPC). The optimized SWE conditions (150 °C, 10 min) resulted in a significantly higher yield of total phenolic compounds compared to conventional hydro-alcoholic extraction. Temperature was identified as the most critical factor, influencing the solubility and stability of target compounds. This work successfully demonstrates the viability of subcritical water as a green and highly effective solvent for the valorization of bioactive flavonoids from an Algerian endemic plant. The optimized SWE process offers a rapid, solvent-free, and environmentally friendly technique to obtain potent antioxidant extracts.

Keywords: Subcritical Water Extraction, Polyphenols, Endemic Plant, Natural Products

*Speaker

Eco-Friendly Galactomannan Films from *Retama raetam* Seeds as Functional Cheese Packaging Materials

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This study investigates the extraction and application of water-soluble polysaccharides from *Retama raetam* seeds collected in the El Oued region for use in edible food packaging. Polysaccharides were extracted using hot water and ethanol precipitation, yielding 7%. Spectroscopic and microscopic analyses confirmed that the extracted polysaccharides were galactomannans. An edible biofilm was prepared using the polysaccharides and glycerol as a plasticizer. The resulting biofilm showed suitable physical properties, including good transparency, low moisture content, complete water solubility, and high surface wettability. When applied to cheese and stored at 25 °C and 4 °C, the biofilm effectively preserved appearance, color, gloss, and odor, with only minor changes in pH, weight, and lipid and protein oxidation. These results demonstrate that *Retama raetam* galactomannan-based biofilms are promising natural materials for edible and biodegradable food packaging applications.

Keywords: *Retama raetam*, galactomannan, edible biofilm, food packaging

*Speaker

Natural Sugar from *Phoenix dactylifera* Dates as an Alternative Sweetener in Chocolate

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This study examined the extraction and use of natural sugars obtained from three Algerian date (*Phoenix dactylifera* L.) cultivars: Deglet Nour, Ghars, and Degla Beida. Water-soluble sugars were extracted and evaluated for yield, chemical composition, and suitability as sweeteners in chocolate production. The sugar yield varied among the cultivars, with Ghars showing the highest extraction yield, followed by Degla Beida and Deglet Nour. Chemical analysis showed that Degla Beida sugar had the highest total sugar and phenolic contents, while Ghars contained more protein. FT-IR and HPLC analyses confirmed the presence of fructose, glucose, and sucrose, with differences in their proportions depending on the cultivar. Degla Beida sugar was also richer in essential minerals, particularly potassium and sodium. Chocolate prepared using the extracted sugars was evaluated sensorially, and the formulation containing Degla Beida sugar showed the best overall acceptance. These findings suggest that sugar extracted from Degla Beida dates can be used as a natural alternative to refined sucrose in chocolate and other food products.

Keywords: *Phoenix dactylifera* L., date sugar, chocolate, natural sweetener, sensory evaluation.

*Speaker

Biotechnological strategies to improve faba bean productivity under saline irrigation conditions.

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The quality of irrigation water currently represents a major environmental challenge for sustainable agriculture, particularly in regions experiencing increasing salinity of water resources. This study aims to evaluate the effect of early application of salicylic acid (SA) during the first 24 hours of germination on root adaptation in two faba bean ecotypes (*Vicia faba* L.) contrasting in their response to salinity, one tolerant and the other sensitive.

Following hormonal treatment, plants were grown and either subjected or not to saline irrigation until the adult stage. Morphometric and biochemical analyses were performed at the root level, the first organ in direct contact with irrigation water. The parameters assessed included root length, fresh and dry weight, water content, as well as proline accumulation and total protein content.

The results show that salinity significantly affects root development, particularly in the sensitive ecotype. However, early application of salicylic acid improves morphometric parameters and promotes better hydric and biochemical regulation, notably through modulation of proline accumulation and maintenance of root protein content. These effects are more pronounced in the sensitive ecotype. This study highlights the potential of salicylic acid as an environmentally friendly biotechnological approach to enhance crop resilience to irrigation water quality degradation, within the framework of sustainable agricultural practices contributing to food security.

Keywords: Saline irrigation water, *Vicia faba* L., Crop resilience, Hormonal treatment, Food security

*Speaker

Antibacterial Evaluation of Novel pyrimidine and purine linked thiazole derivatives

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Pyrimidines, purines, and thiazoles are a noteworthy class of *N*-heterocyclic compounds that have gained considerable attention due to their crucial biological properties. Novel pyrimidine and purine linked thiazole compounds were evaluated for their *in vitro* antibacterial activity against representative strains of gram-negative bacteria (*Escherichia coli* ATCC 25922 and *Pseudomonas aeruginosa* ATCC 27853, and two gram-positive bacteria (*Staphylococcus aureus* ATCC 25932 and *Bacillus subtilis* ATCC 28972) using the well-diffusion method. Gentamicin and Ciprofloxacin were used as a positive control for the antibacterial assay.

Keywords: pyrimidines, purines, thiazoles, Nitrogen heterocycles, antibacterial activity.

*Speaker

Pseudomonas Rhizobacteria: A Strategy to Enhance Forage Nutritional Quality and Resilience

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Trifolium alexandrinum L. is an important forage legume valued for its high palatability, digestibility, and nutritional quality, which are essential for livestock productivity. However, its sensitivity to drought limits its performance in arid and semi-arid regions, where water deficit negatively affects growth, nutrient uptake, biomass accumulation, and forage quality. This study evaluated the effects of three *Pseudomonas* strains on the nutritional composition of *T. alexandrinum* grown under open-field conditions. The experiment was conducted using a randomized design with five replications, including three inoculated treatments (T1, T2, T3) and a non-inoculated control (T0). Forage samples were analyzed for dry matter (DM), crude protein (CP), crude fiber (CF), ash content, acid detergent fiber (ADF), and neutral detergent fiber (NDF). Inoculation with *Pseudomonas* significantly improved forage nutritional quality. Crude protein increased markedly from 20.45% in the control to 24.83% (T1), 23.79% (T2), and 24.08% (T3), indicating enhanced nitrogen assimilation under water shortage conditions. Crude fiber content decreased in inoculated plants, particularly in T1 (16.82%) and T3 (18.29%), compared with the control (20.90%). Ash content increased in all treated plants, reaching 13.91% in T1, compared with 10.99% in the control, reflecting improved mineral accumulation. Fiber quality was also enhanced, as ADF decreased from 27.34% (T0) to 25.80–25.81% (T1 and T3), and NDF declined from 32.38% to 30.18–30.38%, suggesting improved forage digestibility. Among the treatments, T1 exhibited the most pronounced positive effects on protein content, mineral concentration, and fiber quality. Overall, these findings demonstrate that *Pseudomonas* PGPR can act as an effective and sustainable biofertilizer to enhance the nutritional quality and drought resilience of *T. alexandrinum*, supporting environmentally friendly forage production under water-limited field conditions.

Keywords: Drought stress, Nutritional quality, Plant Growth Promoting Rhizobacteria (PGPR), *Pseudomonas* spp., *Trifolium alexandrinum*

*Speaker

Safe preservation of agricultural products by solar drying in desert regions: design and implementation of a sustainable system

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This study aims to develop a sustainable solar drying system for preserving agricultural products in desert regions, ensuring improved quality of dried products without the need for artificial preservatives, while enhancing their nutritional and economic value, extending shelf life, reducing post-harvest losses, increasing energy efficiency, and minimizing reliance on fossil fuels. The system consists of a solar dryer equipped with a cylindrical parabolic concentrator and a dual-axis solar tracking system, designed to maximize solar radiation utilization and improve thermal performance. Experiments were conducted at El-Oued University (Algeria) to evaluate the thermal and drying performance under no-load and full-load conditions. The system was applied to dry 10 kg of apricots, reducing moisture content from 69% to 8% (wet basis), with maximum temperatures reaching 115°C at the receiver and 70°C inside the drying chamber. Results showed that the system preserved the nutritional and sanitary quality of the product by limiting microbial and fungal growth while maintaining essential nutrients. Additionally, it reduced economic losses and extended storage time. The study confirms that the proposed system is an environmentally friendly and effective solution to support sustainable agriculture, enhance food security, and ensure the efficient management of energy and water resources in arid and semi-arid regions.

Keywords: Solar drying, Agricultural products preservation, Desert regions, Sustainable system, Post, harvest loss reduction, Energy efficiency, Dual, axis solar tracker, Food safety.

*Speaker

Enhancing Durum Wheat Growth Using Bacterial Consortia Isolated from *Retama raetam*: A Sustainable Approach for Arid Agriculture

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The search for sustainable bio-solutions to improve cereal resilience in arid regions is a priority. This study investigates the biostimulant potential of indigenous bacterial isolates from the native Saharan plant *Retama raetam* on the growth of Algerian durum wheat (*Triticum durum*). Three distinct bacterial strains, isolated and characterized from *R. raetam* and held in the LP2VM collection, were tested both individually and as formulated tripartite consortia under controlled conditions.

Preliminary results reveal a clear synergistic effect. While individual bacterial applications did not yield statistically significant growth promotion, the application of all three bacterial consortia demonstrated a strong positive impact on wheat seedlings. All consortia treatments consistently increased key growth parameters by over 50% compared to untreated controls. These findings highlight the crucial importance of microbial interactions and suggest that consortia, rather than single-strain inoculants, can unlock significant plant growth-promoting potential. This research, conducted within the LP2VM, provides a promising foundation for developing effective, locally sourced bioinoculants to enhance durum wheat productivity in water-limited environments, aligning with the conference's goals of sustainable plant protection and resilient agri-food systems. Final quantitative data and statistical analyses will be presented at the conference.

*Speaker

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Keywords: PGPR, *Retama raetam*, *Triticum durum*, consortia



Physicochemical and microbiological characterization of olive pomace from eighteen oil mills (traditional and modern) in six Algerian regions

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This study was initially conducted to evaluate the physicochemical and microbiological composition of olive pomace. Eighteen samples from six regions were analyzed in the laboratory (three per region, obtained from traditional press extraction as well as modern two-phase and three-phase extraction processes). The physicochemical analyses focused on pH, dry matter, ash content, and total nitrogen content while the microbiological analyses involved the enumeration of yeasts and molds.

The physicochemical results revealed average values of 5.44, 66.22%, 3.4%, and 3.47% for pH, dry matter, ash, and total nitrogen, respectively. In addition, the microbiological analysis showed a high load of yeasts and molds, with an average concentration of 2.5×10^6 CFU/mL.

Considering the high microbial load of olive pomace and the biotechnological potential of these microorganisms, particularly due to their enzymatic activity, the study subsequently aimed to identify yeast and mold strains exhibiting relevant biodegradative enzymatic activity. Preliminary results indicate that several microorganisms display notable enzymatic activity, requiring further in-depth characterization in future work. This approach is part of a broader effort to valorize olive pomace as a source of microorganisms producing bioactive metabolites, especially enzymes that could be exploited in the formulation of functional foods. Identifying strains of interest could therefore contribute to the development of new ingredients that enhance the nutritional quality and health benefits of food products.

Keywords: Olive pomace, microorganisms, enzymatic activity

*Speaker

Proteus mirabilis strains isolated from Algerian's North-East avian farms: comparative study between their resistance to 19 antibiotics and their sensitivity to the antimicrobial effect of 03 Algerian essential oils

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Antibiotic resistance has become a growing global concern. Unfortunately, in Algeria, the poultry sector happens to be one of the breeding sectors where the highest rates of antibiotic resistance have been reported, which is why we have thought about the use of essential oils. During our study, we began by determining the state of antibiotic resistance of 50 avian isolates of *Proteus mirabilis* against 19 antibiotic molecules, following which we carried out aromatograms, on these same isolates, and this with regard to 03 local essential oils, namely, the essence of Thyme (*Thymus vulgaris* L.), that of Rosemary (*Rosmarinus officinalis* L.) and that of Coriander seeds (*Coriandrum sativum* L.). All of the isolates tested expressed a general antibiotic resistance profile characterized by a high rate of antibiotic resistance against Sulfonamides (91.61%) and a moderate rate of antibiotic resistance against Quinolones (40.3031%). For the results of aromatograms, they concluded that the essential oil of Thyme was the most active oil (general average of the diameters of the zones of inhibition was estimated at 28.02±0.640mm).

Keywords: *Proteus mirabilis*, antibiotic resistance, Essential oils, Thyme, Rosemary, Coriander seeds.

*Speaker

Pesticide Residues in Open-Field Tomato Crops as Indicators of the Need for Biotechnological and Plant-Based Alternatives in Saharan Agriculture

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Tomato cultivation in Saharan regions relies on intensive production systems and a high dependence on chemical pesticides for pest and disease control, raising growing concerns regarding food safety and environmental protection. This study aimed to assess pesticide residue levels in open-field tomato crops under Saharan conditions and to analyze farmers' pesticide use practices as scientific indicators of the need for more sustainable biotechnological alternatives in crop protection.

Tomato samples were collected from several Saharan production sites and subjected to multi-residue analysis using liquid chromatography coupled with tandem mass spectrometry (LC-MS/MS). In parallel, a field survey was conducted among farmers to evaluate pesticide application patterns, treatment frequency, and compliance with pre-harvest intervals. The results revealed the presence of residues from several fungicides and insecticides in tomato samples, with noticeable variability in residue levels among different locations, closely linked to heterogeneous agricultural practices.

These findings highlight the urgent need to promote alternative and sustainable crop protection strategies for tomato production in Saharan agroecosystems, particularly in view of the potential risks associated with pesticide residue accumulation. In this context, the study discusses the perspectives of integrating biotechnological solutions such as biopesticides, plant-based extracts derived from the valorization of agricultural by-products, and microbial innovations as promising alternatives capable of reducing reliance on synthetic pesticides and enhancing agricultural sustainability. The integration of these approaches within integrated pest management programs is proposed as a key pathway toward sustainable Saharan agriculture.

Keywords: Tomato, Pesticide residues, LC, MS/MS, Saharan agriculture, Biotechnological alternatives.

*Speaker

Endocrine disruption: the molecular interactions of penconazole fungicide with thyroxine-binding globulin and thyroid hormone receptors

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Penconazole is one of the most widely used fungicides for treating and preventing plant diseases caused by fungal pathogens. However, its increased use has led to greater environmental exposure and associated health risks, notably the potential for endocrine disruption. This study aims to evaluate the endocrine-disrupting potential of Penconazole, particularly its effects on thyroid function, within agricultural exposure contexts. To achieve this, molecular docking was performed to explore the interaction of Penconazole with thyroid hormone receptors TR α (PDB ID: 4LNW) and TR β (PDB ID: 1NAX), as well as thyroxine-binding globulin (THBG) (PDB ID: 4x30), using AutoDock Tools, VINA, and Discovery Studio Visualizer. The docking results revealed that Penconazole binds to THBG with a binding affinity of -6.90 kcal/mol, compared to the native ligand thyroxine (-7.7 kcal/mol). Similarly, Penconazole exhibited binding affinities of -7.80 kcal/mol with TR α and -7.60 kcal/mol with TR β , which were weaker than those of their respective native ligands (T3: -9.00 kcal/mol; IH5: -10.20 kcal/mol). Additionally, ADMET profiling via SwissADME and pkCSM indicated a toxicity risk for thyroid dysfunction. These findings support the hypothesis that Penconazole may interfere with hormone activity and signaling, warranting stricter regulation and further in vitro and in vivo investigations.

Keywords: Penconazole, Thyroid Disorders, In Silico, Molecular Docking.

*Speaker

Sustainable Remediation of Polluted Environments: Insights into Microbial Strategies

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Human-induced environmental pollution is an ever-growing threat to human health and ecosystems. In addressing this need, the process of bioremediation is showing as a viable, inexpensive, and green method. Microorganisms are used to break down, convert, or immobilize the pollutants such as heavy metals and agrochemical products in this method. This content is about the main 5 bioremediation techniques, which are biostimulation (increasing the microbial community by adding of nutrients), bioaugmentation (application of specific microbial strains), bioventing (aerobic in situ degradation), biopiles (out-of-place treatment of soils of digged up) and natural attenuation (usage of natural processes to do decontamination). In the article, the focus is on the roles played by the different microbial mechanisms (both of the oxygen and absence of the oxygen ones) in the enzymatic breakdown of the xenobiotics. Intensive research is currently being done to boost these methods, mostly for compounds that are not easily reducible, like plastics and pesticides. Finally, bioremediation has the real potential to become a viable solution for a variety of global pollution challenges by making our planet cleaner and more sustainable.

Keywords: bioremediation, microorganisms, pollution, sustainable decontamination.

*Speaker

Effect of 7% dietary linseed on egg quality and selected biochemical parameters in isa brown hens

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Rising feed costs in poultry production drive the search for alternative feed ingredients that maintain animal health and product quality. Linseed is increasingly incorporated into layer diets because of its richness in omega-3 fatty acids and antioxidant lignans, which can improve the nutritional value of eggs. However, its relatively high phytate content may chelate dietary calcium and potentially impair eggshell mineralization. Therefore, this study evaluated the effects of incorporating 7% dietary linseed, while maintaining iso-nutritional levels of metabolizable energy, crude protein, available phosphorus, and calcium, on serum calcium concentration, hepatic enzyme activities, and eggshell quality parameters in ISA Brown laying hens.

Twenty-four ISABrown hens were allocated to two dietary treatments containing 0% and 7% arranged in three replication groups per treatment. Over eight-week feeding period, blood samples were collected to determine serum calcium concentration and assess liver enzyme activities (ASAT, ALAT) as indicators of hepatic function at the end, and eggs were collected daily and analysed for shell mass and thickness and shell mass relative to whole-egg weight.

Statistical analysis (t-test, $\alpha=0.05$) revealed no significant differences in serum calcium between control and linseed-fed hens, indicating that phytate did not reduce calcium bioavailability under equal dietary supply. Eggshell mass and thickness and Shell-to-egg weight ratio were likewise equivalent, demonstrating unimpaired shell formation. ASAT and ALAT activities remained within normal ranges for both groups, confirming the absence of hepatic stress from linseed inclusion. These findings establish 7 % linseed substitution as safe for maintaining mineral homeostasis, shell integrity and metabolic health in laying hens, supporting its use to enhance egg nutritional value without compromising production performance.

*Speaker

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Keywords: linseed, eggshell quality, serum calcium, ISABrown hens.



Fe-Doped SnO Thin Films as a Unified Solution for Environmental and Agricultural Decontamination

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Thin films of SnO₂ pure and doped with Fe were deposited by a simple and inexpensive spray pyrolysis technique and the films were annealed at temperatures 450 °C. Structural, vibrational, optical and electrochemical properties of the films were analyzed using XRD, FTIR, UV–Visible, fluorescence and four points techniques respectively and their results are discussed in detail. The antimicrobial properties of SnO₂ thin films were investigated and the results confirm the antibacterial activity of SnO₂ against Escherichia coli and Staphylococcus aureus. These findings demonstrate that morphology controlled bandgap engineering in Fe:SnO yields a single-material platform capable of simultaneous water remediation and crop protection, offering a scalable strategy for integrated environmental and agricultural safety.

Keywords: SnO₂ thin films, Environmental, Spray pyrolysis, Antibacterial activity and Agricultural safety.

*Speaker

Biologically based mitigation of pesticide mixture-induced reproductive toxicity: mechanistic insights into *Urtica dioica* modulation

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The extensive use of pesticide mixtures in intensive agriculture necessitates innovative biologically based mitigation strategies to enhance agricultural safety and minimize long-term reproductive health risks. Combined exposures may exert additive or synergistic toxic effects, largely mediated through oxidative stress pathways that disrupt endocrine regulation and spermatogenesis. Elucidating these mechanisms is essential for developing complementary biological interventions within modern agricultural systems. This study investigated the reproductive toxicity induced by chronic co-exposure to two widely used agricultural pesticides, metribuzin and tebuconazole, and evaluated the modulatory potential of an aqueous extract of *Urtica dioica* as a biologically based mitigation strategy. Adult male Wistar rats were exposed for six months to individual and combined pesticide treatments, with or without *Urtica dioica* supplementation. Reproductive endpoints included relative weights of androgen-dependent organs (testes, epididymides, seminal vesicles, prostate), sperm quality parameters (count, motility, morphology), reproductive hormone levels (testosterone, luteinizing hormone, follicle-stimulating hormone), and key oxidative stress biomarkers (malondialdehyde, reduced glutathione, superoxide dismutase, and catalase). Chronic co-exposure to metribuzin and tebuconazole induced pronounced oxidative imbalance, characterized by increased lipid peroxidation and reduced antioxidant defenses. This redox disruption was associated with decreased testosterone levels, compensatory elevation of luteinizing hormone, reduced reproductive organ weights, and significant impairment of sperm parameters. The combined exposure produced more severe alterations than individual treatments, supporting the presence of interactive mixture toxicity. Supplementation with *Urtica dioica* partially attenuated oxidative stress and improved hormonal and sperm alterations in co-exposed animals, suggesting modulation of the redox–endocrine axis. When administered alone, the extract induced only limited changes in selected endpoints and did not reproduce the magnitude of reproductive toxicity observed under pesticide exposure. Overall, these findings highlight oxidative stress as a central mechanistic driver of pesticide mixture-induced reproductive dysfunction and plant-derived bioactive extracts as innovative complementary tools to strengthen pesticide risk mitigation strategies and enhance agricultural safety in intensive farming systems.

*Speaker

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Keywords: Pesticide mixtures, Reproductive toxicity, Oxidative stress, *Urtica dioica*, Agricultural safety.



Enhancing food safety and mitigating pesticide-induced reproductive risks with quercetin

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The objective of this study was to evaluate the neurotoxicity of the pesticide cypermethrin and the therapeutic effect of quercetin in a Wistar rat model. After a 72-day adaptation period, the rats were treated orally with either cypermethrin (1 ml/kg/day) or quercetin (1 ml/kg/day) for 30 days. After sacrifice and brain extraction, we measured metabolic markers (proteins) and oxidative stress parameters (GST, GPx, Catalase, and MDA). The study showed that cypermethrin caused brain toxicity, indicated by a significant increase in protein levels and a decrease in GST. We also observed increased GPx activity, decreased catalase, and increased MDA. Our results also showed that quercetin supplementation improved detoxification balance and reduced the harmful effects of cypermethrin.

Keywords: Cypermethrin, Neurotoxicity, Oxidative stress, Quercetin, Agricultural safety.

*Speaker

Making healthy madeleines by double substituting of commercial oil and table sugar

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This study aimed to develop a healthier bakery product by replacing commercial fat and refined sugar with peanut oil and Degla Beida date powder, respectively. Both raw materials were sourced from the El Oued region (Algeria), processed under controlled conditions, and characterized prior to use. Peanut oil exhibited good physicochemical quality, with low acidity ($0.41 \pm 0.02\%$) and peroxide value (3.9 ± 0.63 meq O₂/kg), and was rich in unsaturated fatty acids (oleic and linoleic acids) and antioxidant compounds. Degla Beida date powder showed high carbohydrate content (73.02 ± 0.05 g/100g) and a valuable mineral profile (Calcium 0.09 ± 0.02 g/100g as the main mineral). Among the tested formulations, the combination of peanut oil and date powder showed the best technological performance, with higher specific volume (12.03 ± 0.15 cm³/g), lower hardness (5.29 ± 0.07 N), and improved crumb structure. Sensory evaluation also indicated better appearance, softness, flavor, and overall acceptability. These findings demonstrate the potential of locally sourced Algerian ingredients to produce a nutritionally enhanced bakery product with improved functional and sensory qualities.

Keywords: Madeleine, peanut oil, Degla Beida powder.

*Speaker

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Neuroprotective Potential of a Medicinal Plant Essential Oil: Chemical Profiling and Integrated In Vitro, In Vivo, and Computational Evaluation Against Alzheimer's Disease

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Alzheimer's disease (AD) remains a major neurodegenerative disorder requiring the development of effective and safer therapeutic alternatives. In this study, an essential oil obtained from a medicinal plant was extracted and chemically characterized, followed by a comprehensive assessment of its neuroprotective potential using complementary experimental and computational approaches. The chemical composition of the essential oil was determined by gas chromatography–mass spectrometry (GC–MS), enabling the identification of its major bioactive constituents.

The biological efficacy of the oil was evaluated through both in vitro and in vivo models to investigate its protective effects against neurodegeneration and cognitive impairment associated with AD. To elucidate the molecular basis of activity, in silico investigations, including molecular docking and molecular dynamics simulations, were performed to examine the interactions of the identified compounds with key enzymatic targets involved in Alzheimer's pathology.

In addition, a green synthesis strategy was employed to prepare silver nanoparticles (AgNPs) using the essential oil as a reducing and stabilizing agent. The resulting nanoformulation was physicochemically characterized and comparatively evaluated alongside the crude essential oil to determine potential improvements in biological performance.

*Speaker

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The integrated results highlight the relevance of combining phytochemical analysis, nanotechnology, biological assays, and computational modeling to explore natural products as multifunctional candidates for neuroprotection. This work provides scientific evidence supporting the potential application of essential oil-based systems in the management of Alzheimer's disease.

Keywords: Essential oil, GC/MS analysis, Anti, Alzheimer activity, In silico evaluation



Effect of salt stress on the germination and growth of some local varieties of durum wheat in the region of Oued Souf and Oued Righ.

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This study aims to evaluate how salt stress affects specific vegetative growth parameters-such as leaf area, leaf number, plant count, stem height, and leaf length-and physiological aspects like chlorophyll content and relative moisture across five durum wheat (*Triticum durum* Desf.) cultivars, which include four local varieties and one introduced one. The experiment was carried out in a semi-controlled greenhouse using a completely randomized block design with three replicates. It involved 20 treatments combining four increasing NaCl concentrations: TO (control), T1 (3 g/L), T2 (6 g/L), and T3 (9 g/L) applied to five cultivars: V1 (Boukhleouf), V2 (Fritissi), V3 (Hedba), V4 (Belyouni), and V5 (Siméto). Results indicated that salt stress negatively impacts germination, vegetative development, and physiological responses, with effects varying based on stress intensity and cultivar. All local cultivars demonstrated better tolerance than the introduced Siméto cultivar. Notably, Hedba and Belyouni showed the highest tolerance, maintaining a 100% germination rate at 9 g/L NaCl while Fritissi was the least tolerant, with an 89% germination rate under the same saline level. In vegetative growth, Belyouni exhibited the highest number of leaves. Physiologically, Hedba preserved the highest chlorophyll levels across all saline concentrations, whereas Fritissi and Boukhleouf displayed good water retention. Conversely, Siméto was adversely affected in all measured parameters, indicating its sensitivity to salt stress. Choosing appropriate cultivars is a key strategy to enhance crop resilience in saline environments.

Keywords: Durum wheat, Salt stress, Local cultivar, Germination, Vegetative growth, Chlorophyll, Relative moisture content (RWC).

*Speaker

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Valorization of Saharan genetic diversity: the case of oasis wheat from Adrar, the Touat and Gourara region

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The Algerian Sahara offers enormous potential in terms of plant genetic resources, providing an alternative means of meeting food security needs, particularly for oasis wheat, which is characterized by great diversity and heterogeneity of forms and types linked by intermediaries.

In

this work, we have attempted to make observations on soft wheat from the Touat and Gourara oases in Adrar, summarizing the results of our own work based on the UPOV description for 7 varieties (Benmabrouk, Bahmoud, Kadoura, Chatar, Sabaga, Hamra and Oumrokba) in order to

identify the varieties with maximum reliability by manipulating the following characteristics: color, shape, dimensions, ear compactness, awn, beard, ridges, number of grains in the ear, weight of 1000 grains, etc. Characterization enabled us to select certain varieties deemed interesting thanks to certain yield components; the Benmabrouk variety has a fairly high number of grains (77 g/epi) and a very high thousand-grain weight (87g) compared with the other varieties.



Keywords: Wheat, oasis, varieties, Touat, Gourara, characters.

*Speaker

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Allelopathic Potential of Essential Oils from *Eucalyptus camaldulensis* and *Salvia officinalis* as Natural Herbicides for Weed Control

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The importance of this research stems from the need to develop environmentally friendly and sustainable solutions for weed control in agricultural fields. The use of essential oils as an alternative to chemical herbicides may help reduce negative impacts on the environment and public health.

In this study, the allelopathic effect of essential oils extracted from *Eucalyptus camaldulensis* and *Salvia officinalis* was tested on the germination of selected weed seeds, including *Portulaca oleracea*, *Hordeum vulgare*, *Medicago sativa*, and *Coriandrum sativum*, all growing in a tomato field (*Solanum lycopersicum* L.). The seeds were treated with known volumes of essential oil (20, 40, and 100 μ l).

The results showed that *Eucalyptus* oil induced complete (100%) inhibition of germination in *Hordeum vulgare*, *Coriandrum sativum*, and *Portulaca oleracea* seeds at all three volumes, while purslane and tomato seeds were less sensitive, particularly at 20 μ l.

Regarding *Salvia officinalis* oil, complete inhibition of germination was observed in *Hordeum vulgare* and *Coriandrum sativum* seeds, whereas *Portulaca oleracea* and *Medicago sativa* seeds were less sensitive. Tomato (*Solanum lycopersicum*) seeds were not significantly affected by *Salvia officinalis* oil, with inhibition reaching only $8.95 \pm 2.59\%$ at the highest volume.

Keywords: Allelopathic effect, Essential oil, *Eucalyptus camaldulensis*, *Salvia officinalis*

*Speaker

Valorization of Plant By-Products



Evaluation of Phytochemical Composition and Bioactivity of *Neurada procumbens* L. from the Oued Souf Region

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This study investigates the phytochemical richness and biological properties of *Neurada procumbens* L.* collected from the Oued Souf region. The work focuses on quantifying total polyphenols, flavonoids, and flavanols, as well as assessing the plant's antioxidant and antibacterial activities. Total phenolic content in the various extracts was determined using the Folin–Ciocalteu method, while flavonoid and flavanol levels were measured spectrophotometrically. Antioxidant activity was evaluated using two complementary methods: total antioxidant capacity (phosphomolybdenum assay) and DPPH radical scavenging. The antibacterial potential was tested using the agar diffusion (disc diffusion) method. Additional analyses-UV-visible spectrophotometry, FT-IR spectroscopy, and HPLC-were employed to characterize the extracts and compare their chemical profiles. The results show that *Neurada procumbens* L.* extracts are rich in polyphenolic compounds and demonstrate strong antioxidant activity. No antibacterial effect was observed against the tested strains.

Keywords: *Neurada procumbens* L., polyphenols, DPPH, antioxidant activity, antibacterial activity.

¹ Speaker

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Total phenol and flavonoid content, and antioxidant, antibacterial activity of ethanol/water extract of *Psidium guajava* L. leaf

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This study aimed to determine the total phenolic and flavonoid content and to evaluate the biological activities of the hydroethanolic extract of *Psidium guajava* L. leaves harvested from the El Oued region of southeastern Algeria. To prepare the extract, the dried leaves were first defatted using petroleum ether, and the active components were then extracted by cold maceration with 50% aqueous ethanol. Subsequently, total phenols were quantified using the Folin-Ciocalteu method, and total flavonoids using the aluminum chloride method. The results showed that the extract contains a high concentration of active compounds, with total phenols registering 268.304 ± 0.659 mg GAE/g and total flavonoids registering 16.959 ± 0.099 mg QE/g. The study also showed that the extract possesses strong antioxidant activity, as demonstrated in the DPPH assay with an IC₅₀ value of 17.239 ± 0.009 μ g/mL, compared to standard ascorbic acid, and also in the phosphomolybdenum assay with 491.949 ± 2.448 mg GAE/g. Furthermore, the extract exhibited anti-hemolytic activity of $43.004 \pm 5.056\%$ at a concentration of 40 mg/mL, but this was lower than that of vitamin E, which recorded $82.945 \pm 2.034\%$ at the same concentration. The extract also exhibited antibacterial activity (against *P. aeruginosa*, *E. coli*, *S. aureus*, and *B. subtilis*) by the agar-well diffusion method, with particularly pronounced efficacy against Gram-positive bacteria. These results underscore the therapeutic value of the extract, linked to its richness in phenolic and flavonoid compounds, thus supporting its use in traditional medicine and opening avenues for pharmaceutical applications aimed at combating oxidative stress.

Keywords: Hydroethanolic extract, phenolic content, flavonoid, Antibacterial activity, Antioxidant activity, *Psidium guajava* leaves.

⁴ Speaker

Matricaria pubescens Essential Oils as Potential Inhibitors of Alzheimer's Disease: An Integrated In Vitro and In Silico Study

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Matricaria pubescens (Desf.) Sch. is an aromatic plant native to the Algerian Sahara and traditionally used for treating various illnesses such as rheumatism, digestive disorders, and joint pain. The present study aimed to evaluate the potential of *M. pubescens* essential oils (MPEOs) as inhibitors of key enzymes associated with Alzheimer's disease through both in vitro and in silico approaches. The essential oils were analyzed by GC-MS, revealing α -pinene (20.5%), β -ocimene (35%), and D-limonene (5.6%) as major constituents. In vitro assays demonstrated significant anticholinesterase activity, with IC₅₀ values of 14.0 μ g/mL for acetylcholinesterase and 20.0 μ g/mL for butyrylcholinesterase, indicating potent inhibitory effects. Complementary molecular docking studies supported these findings by showing strong interactions between the dominant terpenes and the active sites of the target enzymes. These results suggest that *M. pubescens* essential oils may serve as a promising natural source for developing agents against Alzheimer's disease, deserving further investigation to identify and isolate the most active bio-compounds.

Keywords: *Matricaria pubescens*, Essential oils, Alzheimer's disease, Acetylcholinesterase, Butyrylcholinesterase, GC-MS, Molecular docking.

Valorization of *Ephedra alata* By-Products as Natural Anti-Inflammatory Agents: A Carrageenan-Induced Model

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Ephedra alata (Ephedraceae) is a medicinal plant widely used in North African and Middle Eastern traditional medicine for the treatment of inflammatory disorders. In line with the sustainable valorization of plant by-products, the present study aimed to investigate the anti-inflammatory activity of aqueous and ethanolic extracts obtained from the aerial parts of *E. alata* collected in Oued Al Alenda, Algeria. Aqueous and ethanolic extracts were prepared by hot maceration and ethanol maceration, respectively. Phytochemical screening revealed the presence of polyphenols, flavonoids, and alkaloids in both extracts, while saponins were detected exclusively in the aqueous extract. The anti-inflammatory effect was evaluated in vivo using the carrageenan-induced paw edema model in rats, with Diclofenac serving as the reference drug. The ethanolic extract exhibited a higher extraction yield (20.30%) than the aqueous extract (15.09%). A significant inhibition of paw edema was observed with the ethanolic extract, reaching 54% after 4 h, comparable to Diclofenac (50%), whereas the aqueous extract produced a moderate inhibition of 33%. Additionally, both extracts significantly reduced C-reactive protein (CRP) levels, indicating a systemic anti-inflammatory response. Overall, these results demonstrate that *Ephedra alata*, particularly its ethanolic extract, possesses potent anti-inflammatory properties and supports the valorization of its aerial plant by-products as promising natural candidates for the development of anti-inflammatory biotherapeutic agents.

Keywords: *Ephedra alata*, Aqueous extracts, Ethanolic extracts, Anti inflammatory activity, carrageenan, induced edema, phytochemicals.

Phytochemical and biological study of medicinal plant species adapted to desert environments

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The objective of this study is to determine the phytochemical characteristics and therapeutic applications of the medicinal plant spearmint harvested from different regions in Algeria. These regions differ in their geographical location and bioclimatic zone: Tebessa, located in northeastern Algeria and characterized by a semi-arid climate; El Oued, located in southeastern Algeria and characterized by arid climate; and El Tarf, located in the far northeast of Algeria and characterized by a temperate climate. Spearmint, or *Mentha spicata* L., is also called "Naanaa" and belongs to the Lamiaceae family. It is considered a source of essential oils and is used in the treatment of respiratory and digestive diseases. Experimentally, we used aqueous extracts of spearmint to evaluate the content of phenolic compounds and biological activities, namely analgesic activity. The results showed that the aqueous extract of *Mentha spicata* L. harvested from El Oued exhibited the best analgesic activity (IC₅₀ = 41.51%) compared to the extracts from Tebessa (IC₅₀ = 19.48%) and El Tarf (IC₅₀ = 12.97%). Furthermore, the plants harvested from El Oued were characterized by a higher polyphenol content (108.94 ± 16 mg GAE/g DE) compared to the other regions (El Tarf 72.88 ± 5.58 mg GAE/g DE and Tebessa 35.89 ± 2.08 mg GAE/g DE). On the other hand, the results showed that the climatic conditions (temperature) of the El Oued region play an important role in the predominance of phenolic compounds and analgesic activities.

Keywords: Spearmint, analgesic, flavonoids, aqueous extracts

⁷ Speaker

Valorization of Artemisia essential oils: cholinesterase inhibitory activity, GC-MS profiling, and in silico studies

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The valorization of plant by-products provides an opportunity to develop sustainable strategies that transform underutilized botanical resources from the Saharan plant region of Tamanrasset into high-value bioactive products. In this study, essential oils from selected Artemisia species collected in Tamanrasset were evaluated for their potential as cholinesterase inhibitors, integrating experimental assays and computational modeling. Chemical composition of the essential oils was analyzed using gas chromatography-mass spectrometry (GC-MS), identifying key bioactive constituents likely responsible for biological effects. In vitro cholinesterase inhibition assays demonstrated notable activity, highlighting the potential of these plant-derived oils as natural enzyme modulators. Complementary in silico molecular docking studies confirmed the interaction of major compounds with enzyme targets, supporting mechanistic insights into their inhibitory action. This work emphasizes the sustainable use of Artemisia plant materials from the Saharan region, converting otherwise discarded botanical by-products into valuable resources for applications in agriculture, pharmaceuticals, and cosmetics. The findings demonstrate the dual benefits of environmental sustainability and circular bioeconomy, providing a model for eco-friendly valorization of plant-derived materials.

Keywords: Artemisia, essential oil, cholinesterase inhibition, GC, MS, molecular docking.

⁸ Speaker

Chemical composition and Antifungal activity of *Olea europaea* subsp. *Sylvestris* extract against *Candida* Isolates Causing Vulvovaginal Candidiasis in Bechar region southwest of Algeria

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Vulvovaginal candidiasis (VVC) is a common yeast mucosal infection affecting a significant number of women worldwide. *Candida albicans* is the most frequent fungal species responsible for (VVC). This study was aimed to investigate the prevalence of VVC in the Béchar region, identify associated factors, and determine the frequency of the most commonly implicated species. Additionally, Tar extracted from *O. europaea* subsp. *sylvestris* was tested for its antifungal activity against isolated strains. 100 vaginal swab samples were collected, from November 2024 to April 2025 in hospitals in the wilaya of Béchar, utilizing a structured questionnaire to acquire the sociodemographic, clinical factors, and behavioral factors data of the participants. The analysis revealed that about 28% of women suffered from VVC, particularly those aged 20 to 50. The isolates were identified using phenotypic, genotypic and cultural characteristics. Among the analyzed isolates, (77.8%) of the isolates belong to *Candida albicans* being the most frequently implicated species. The main risk factors identified include pregnancy (33.3%), diabetes, and antibiotic use (22.2%). Regarding tar extraction through carbonization, the yield was 4.88% for *Olea europaea*. Physicochemical analyses of the plant tar showed acidic pH levels (3.5 for O.E.), dry matter contents of 63.1% and refractive indices of 1.5065. This tar was analyzed by gas chromatography coupled with mass spectroscopy technique (GC-MS technique) and calculation of Kovats Retention Indices values. Exactly 69 components were recognized that components having the highest percent are as follow: Syringol (6.86%), 2,6-Dihydroxy-4-methoxyacetophenone (5.94%), 2,3-Dimethoxybenzyl alcohol (5.06%), p-Ethylguaiacol (3.68%) Results indicated that all strains were highly sensitive to raw tar, with inhibition zones ranging from 42 to 60 mm. The three fractions demonstrated various effects with inhibition zones measuring between 10 and 20 mm, some isolates (C3, C7) showed resistance to the extracts. Using the liquid medium micro-dilution method, the minimum inhibitory concentrations (MIC) were determined: 0.96 mg/ml for raw tar for all strains (C1 to C9), except C3, which was 1.9 mg/ml. The minimum fungicidal concentrations (MFC) were 0.96 mg/ml for O.E. (C4 to C7, C1, C9) and 1.9 mg/ml for C2, C3, and C8. Consequently, The statement suggests that a plant's tar contains bioactive compounds that show promise as a natural alternative for treating candidiasis and other yeast infections. Keywords: VVC, Characterization, Antifungal activity, Tar, *Olea europaea* subsp. *Sylvestris*, Chemical composition.

Keywords: VVC, Characterization, Antifungal activity, Tar, *Olea europaea* subsp. *Sylvestris*, Chemical composition.

⁹ Speaker

Microwave 'dry' distillation extraction of essential oil from Citrus peels comparison with conventional hydrodistillation

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Microwave Clevenger or microwave accelerated distillation (MAD) is a combination of microwave heating and distillation, performed at atmospheric pressure without added any solvent or water. Isolation and concentration of volatile compounds are performed by a single stage. MAD extraction of orange essential oil was studied using fresh orange peel from Tarocco cultivar oranges as the raw material. MAD has been compared with a conventional technique, which used a Clevenger apparatus with hydro-distillation (HD). MAD and HD were compared in term of extraction time, yields, chemical composition and quality of the essential oil, efficiency and costs of the process. Extraction of essential oils from orange peels with MAD was better in terms of energy saving, extraction time (30 min versus 3 h), oxygenated fraction (1.97% versus 1.34%), product yield (0.17% versus 0.15%) and product quality. Orange peels treated by MAD and HD were observed by scanning electronic microscopy (SEM). Micrographs provide evidence of more rapid opening of essential oil glands treated by MAD, in contrast to conventional hydro-distillation. The oranges used in this study were *Citrus sinensis* L. Osbeck from Tarocco cultivar. All fruits were gathered from the same experimental plantation Institut Technique de l'Arboriculture Fruiti'ere (ITAF), located in the Mitidja region 40 kmsouth of Algiers (Boufarik, Algeria). Oranges were peeled by hand, separating the external part of the orange (flavedo), giving a yield of 20% (w/w) of orange peel with respect to the whole fruit. Fresh plant material was employed in all extractions. The initial moisture content of orange peel was 90%.

Keywords: Clevenger, Microwave, Extraction, Essential oil, Orange peel

¹⁰ Speaker

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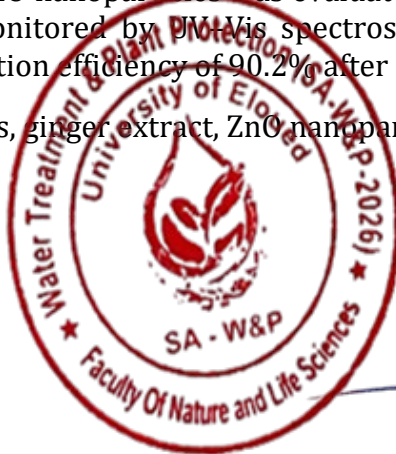
Green Synthesis and Environmental Applications of Metal Oxide Nanocomposites

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Green synthesis of metal oxide nanoparticles using plant extracts represents a promising alternative to conventional physical and chemical methods. In this study, metal oxide nanoparticles were synthesized using ginger extract. Zinc oxide (ZnO) nanoparticles were successfully prepared and characterized. UV-Vis spectroscopy revealed an absorption peak around 320 nm, confirming the formation of ZnO nanoparticles. The chemical bonding and functional groups of ZnO were identified using Fourier-transform infrared (FT-IR) spectroscopy. X-ray diffraction (XRD) analysis confirmed the formation of a hexagonal crystalline structure, while scanning electron microscopy (SEM) was used to examine the surface morphology. The catalytic performance of ZnO nanoparticles was evaluated through the degradation of Rose Bengal (RB) dye, monitored by UV-Vis spectroscopy. The ZnO nanoparticles exhibited a high decolorization efficiency of 90.2% after 120 minutes of reaction time.

Keywords: Green synthesis, ginger extract, ZnO nanoparticles, photocatalysis.



Valorization of poultry by-products for sustainable use as organic fertilizers in green plants in El Oued

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Introduction: Vegetable production in Algeria, particularly in the El-Oued region, has experienced significant expansion in recent years. However, the dominance of sandy soils poses serious challenges to soil fertility management, often leading farmers to rely on chemical fertilizers that are costly and environmentally detrimental. As a sustainable and economical alternative, poultry waste is increasingly being used as an organic fertilizer. This study aims to evaluate the impact of different poultry manure application rates on the growth performance of pumpkin plants, in comparison with an unfertilized control.

Methodology: The experiment was conducted using sandy soil amended with varying proportions of poultry waste. A local pumpkin variety was cultivated under controlled conditions. Physicochemical analyses were performed to assess soil and irrigation water quality, including measurements of pH and electrical conductivity. Plant growth was evaluated using morphological parameters such as mean plant height and number of leaves per plant.

Results: The experimental soil ranged from sandy to sandy-loam texture, characterized by high permeability and noticeable salinity. Irrigation water exhibited an alkaline pH and high electrical conductivity, reflecting elevated mineral content. Plant height showed limited variation among treatments, although a slight improvement was observed at the highest poultry manure rate. Leaf production was influenced by nutrient availability and plant developmental stage; lower amendment levels resulted in reduced leaf numbers, likely due to nutrient immobilization during organic matter decomposition.

Conclusion: The highest poultry manure application rate promoted increased leaf production, indicating a beneficial effect of organic matter on vegetative growth. However, soil and irrigation water salinity may constrain overall plant development. These results highlight the potential of poultry waste valorization as an organic fertilizer while emphasizing the need for careful management in saline sandy soils such as those found in the El-Oued region.

Keywords: El, Oued region, organic fertilizer, poultry waste, pumpkin, sandy soil.

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Effect of extraction solvents on the yield and quantity of bioactive compounds in extracts of a medicinal plant of the genus *Syzygium*

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Natural substances constitute veritable chemical factories from which we must extract the maximum benefit. This work is devoted to the quantitative analysis of extracts from the flower buds of the type species *Syzygium aromaticum* L., known as clove, using distilled water and ethanol as extraction solvents. The active ingredients were extracted from cloves using two different solvents: distilled water and 80% ethanol. The aim of this step was to compare the efficiency of each solvent in extracting biologically active compounds. The results showed that the yield of the aqueous extract was 11.7%, while the yield of the hydroethanolic extract was 25.2%. Quantitative analysis of the extracts showed that clove buds are a rich source of phytochemical compounds of high biological value. The flavonoid content of the aqueous extract at $20.38 \pm 0.03 \mu\text{gQE}/\text{mg}$ of extract, indicating a moderate richness in water-soluble flavonoids. In the case of the hydro-ethanolic extract, the content obtained is $14.14 \pm 0.01 \mu\text{gEQ}/\text{mg}$ of extract, a value lower than that of the aqueous extract. The concentration of flavones and flavonols in the aqueous extract is $50.79 \pm 0.15 \mu\text{g QE}/\text{mg}$ of extract, which indicates a relatively high content of these compounds. The result obtained for the hydroethanolic extract is $44.7 \pm 0.11 \mu\text{g QE}/\text{mg}$ of extract, which is a content slightly lower than that of the aqueous extract. These results reflect the influence of solvent polarity on the extraction efficiency of bioactive compounds.

Keywords: ExtractionYield, Total Flavonoids, solvent, Total flavonols, *Syzygium aromaticum* L.

Valorization of Pistacia lentiscus L. Oil as a circular bioeconomy solution for the sustainable control of avian coccidiosis in Algeria

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Avian coccidiosis, caused by protozoan parasites of the genus *Eimeria*, remains one of the main health and economic constraints weighing on poultry production in Algeria. According to recent economic modelling, the disease causes annual losses of around £86.66 million, or nearly £0.30 per chicken. Nearly 75% of these losses are due to morbidity, mainly due to reduced weight gain and deterioration in feed conversion efficiency. These losses are compounded by the heavy use of anticoccidials and ionophores, which increase production costs, promote drug resistance and raise growing concerns about the presence of chemical residues in poultry products. In this context, we studied a circular bioeconomy approach based on the valorization of *Pistacia lentiscus* L. vegetable oil, a product of Mediterranean plant origin obtained by cold pressing, thus preserving its bioactive constituents. In vitro assays demonstrated a net dose-dependent anticoccidial activity against *Eimeria* oocysts, evidenced by a reduction in oocyst viability and a concomitant increase in absorbance at 273 nm, reflecting the release of nucleotides and aromatic amino acids following parasite lysis. This biological activity is probably due to the synergistic action of unsaturated fatty acids (C18:1, C18:2), polyphenols, tocopherols and terpenes, which disrupt the integrity of the parasitic membrane, modify transmembrane ion gradients and alter ATP synthesis. In vivo experiments conducted on experimentally infected broilers confirmed a significant reduction in intestinal parasite burden and clinical severity, accompanied by significant improvements in zootechnical performance. The treated poultry showed an increase in weight gain (up to 33%) and improved feed conversion efficiency, reflecting enhanced gut integrity, reduced oxidative stress and more efficient nutrient absorption. Overall, these results support the integration of *Pistacia lentiscus* oil into coccidiosis control programs as a plant-based and environmentally friendly alternative that combines the valorization of plant by-products, green biotechnology, and economic sustainability, while helping to reduce dependence on chemicals and improve the resilience of the Algerian poultry sector.

Keywords: Avian coccidiosis, *Pistacia lentiscus*, natural anticoccidials, plant by, product valorization, circular bioeconomy

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Mathematical Experimental Study and Simulation of Stem Surface Area of the Sunflower Plant (*Helianthus annuus* L.)

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The growth and development of the sunflower (*Helianthus annuus* L.) are closely linked to the structural dynamics of its stem, which serves as the central organ for nutrient transport, mechanical support, and photosynthetic efficiency. This study presents a mathematical and experimental investigation of the stem surface area of the sunflower plant, integrating empirical measurements with computational modeling to quantify and simulate its evolution throughout the growth cycle. The primary objective is to establish a predictive mathematical relationship between stem surface area and key biophysical growth parameters, including stem diameter, height, and age of the plant. Experimentally, sunflower plants were cultivated under controlled conditions, and stem dimensions were recorded at different developmental stages using digital calipers and graduated scales. The stem surface area was calculated using cylindrical geometric approximations, expressed as $S = \pi DL$, where D represents stem diameter and L the plant height. Corrections for tapering and irregular growth patterns were incorporated through regression-based adjustment factors derived from the observed data. The mathematical modelling phase employed algebraic and non-linear growth models (Gompertz, Logistic, and Richards equations) to simulate surface area expansion over time. The best-fit model was determined using statistical criteria such as the coefficient of determination (R^2) and root mean square error (RMSE). The simulation results revealed that the Gompertz model provided the most accurate description of stem surface area growth, capturing the asymptotic nature of sunflower development with high precision. This integrated approach demonstrates the potential of combining experimental data with mathematical modelling to predict the morphological evolution of plant structures. The findings contribute to a deeper understanding of plant biomechanics and growth optimization, offering valuable insights for agronomic modelling, crop yield estimation, and precision agriculture. The study also highlights the importance of computational simulations in evaluating environmental effects such as light intensity and nutrient availability on plant growth parameters. Ultimately, this work underscores the relevance of mathematical and experimental methods in advancing the quantitative analysis of sunflower physiology and broader plant growth studies.

Keywords: Sunflower (*Helianthus annuus* L.), Stem surface area, Mathematical modelling, Growth simulation, Gompertz model, Experimental study.

A natural ointment based on the *Hypericum perforatum* plant against inflammations and burns

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This study aimed to evaluate the effectiveness of *Hypericum perforatum* (St. John's Wort) extract, rich in bioactive compounds, in inhibiting the cyclooxygenase-2 (COX-2) enzyme to reduce the formation of prostaglandins, key mediators in the development of fever and inflammatory responses. Following the preparation of the plant extract and its dissolution in water, ultraviolet-visible (UV-Vis) spectroscopy was used to study its spectral characteristics, providing valuable insights into the nature and concentration of its chemical components. The anti-inflammatory activity of the extract was evaluated through an *in vitro* assay examining the inhibition of bovine serum albumin (BSA) denaturation using UV-Vis spectroscopy, and via molecular docking simulations with the COX-2 enzyme. Additionally, a range of other activities were investigated, antioxidant, antibacterial, and phagocytic activities. The study also involved the preparation of a topical ointment formulation using the prepared plant extract. The extract rich in active compounds, was incorporated into a suitable ointment base, considering diffusion and stability properties to ensure the effectiveness of the final product. The results showed that the extracts possess very potent anti-inflammatory activity, evidenced by their IC₅₀ and ΔG values. The negative ΔG values also indicated a good binding affinity to the biological target, and the molecular docking results corroborated the *in vitro* findings. The IC₅₀ value demonstrated highly significant inhibitory activity compared to standard drugs. Furthermore, in simulations of the enzyme extract interaction, the physicochemical properties, pharmacokinetics, and toxicity of selected extracts were predicted using the swissADME and Protox servers. In conclusion, our findings confirm the effectiveness of this *Hypericum perforatum* extract as an anti-inflammatory agent and open avenues for the development of topical formulations from it, making it a promising candidate for future topical anti-inflammatory drugs

Keywords: Docking, SwissADME, Cyclooxygenase, 2 (COX, 2), *Hypericum perforatum*, Anti, inflammatory ointment, phagocytic activity.

In vitro anticoccidial activity of hexane extract from *Opuntia ficus-indica* seed cake and GC–MS profiling

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Opuntia ficus-indica is a drought-tolerant cactus widely distributed in arid and semi-arid regions and represents a valuable agro-biological resource whose valorization can support sustainable agricultural systems. Among its by-products, the seed cake obtained after oil extraction is often underutilized despite its richness in bioactive compounds with potential biological activities. Avian coccidiosis, caused by protozoan parasites of the genus *Eimeria*, remains one of the most economically significant parasitic diseases in poultry production worldwide. The extensive use of synthetic anticoccidial drugs has led to increasing concerns regarding drug resistance and residue accumulation, highlighting the urgent need for alternative, natural control strategies. In this study, a hexane extract from *O. ficus-indica* seed cake (OFI-SC) was prepared, and its chemical composition was characterized by gas chromatography–mass spectrometry (GC–MS). The *in vitro* anticoccidial activity of the extract was then evaluated against sporulated oocysts of *Eimeria* spp. Oocysts were exposed to increasing concentrations of the extract (2–64 mg/mL) in Hank's balanced salt solution, while toltrazuril was used as a positive control. Anticoccidial efficacy was assessed by microscopic enumeration of viable oocysts and by evaluating membrane integrity through the release of UV-absorbing substances at 273 nm. The results demonstrated a clear dose-dependent reduction in oocyst viability, accompanied by a significant increase in membrane permeability. The calculated LC₅₀ value of the hexane extract was 50.09 mg/mL, indicating a marked anticoccidial effect comparable to that of toltrazuril. Gas chromatography–mass spectrometry (GC–MS) analysis revealed a fatty acid-rich profile, dominated by oleic acid (44.20%), followed by palmitic acid (19.02%) and stearic acid (10.15%). These findings suggest that the hexane extract of *O. ficus-indica* seed cake exhibits promising *in vitro* anticoccidial activity, likely associated with its fatty acid composition, and support the potential valorization of this agro-industrial by-product as a natural alternative for coccidiosis control.

Keywords: *Opuntia ficus, indica*, seed cake, anticoccidial activity, *Eimeria*, GC–MS.

Comparison of Cold Pressing, Hydrodistillation and Microwave 'dry' distillation extraction for the determination of Citrus oils produced in Algeria

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Traditional hydro-distillation (HD), cold pressing (CP), and Microwave Clevenger or microwave accelerated distillation (MAD) methods have been compared and evaluated for their effectiveness in the isolation of essential oil from fresh *Citrus* peels. Essential oils from peel of four varieties of Algerian sweet orange (*C.sinensis*), Lemons (*C. limon*), Citrons (*C.medica*), sour orange (*C.aurantium*), grapefruits (*C.paradisi*) and tangelos (*C. deliciosa* Ten *C. tangerina* Hort. ex Tan.) x (*C. paradisi* Macf.) were analyzed by gas chromatography coupled to mass spectrometry (GC-MS). The oil constituents were identified according to their mass spectra and Kováts retention indices determined on both polar and non-polar stationary phase capillary columns. While Citrus peel oils contained from 86.69 to 99.31% of monoterpenes (C10 H16), limonene as a major component and from 0.72 to 6.06% of oxygenated compounds. The principal Components analysis (PCA) and the canonical Discriminant analysis (CDA) on the one hand for the statistical survey of the composition of the 30 essential oils obtained and on the other hand to be able to differentiate the three techniques of extraction MAD, HD and CP.

Keywords: Clevenger, Extraction, Essential oil, Hydro, distillation, Microwave, Orange peel.

Microbial approaches that can increase plant resistance mechanisms under drought stress conditions: Algae

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Increasing water use efficiency in plants, especially in agricultural activities carried out in arid and semi-arid regions, has become a necessity today to find new approaches that increase the resistance mechanisms of plants experiencing water scarcity. This study focuses on algae, whose applications have recently begun to spread due to their positive effects on increasing plant resistance and improving plant growth. Seaweed or, in other words, algal products, improve the germination of plant seeds and seedling development. They help plants develop tolerance to environmental stress conditions. Algae contain vitamins A, B1, B12, C, D, riboflavin, niacin, pantothenic and folic acid, as well as trace amounts of various plant nutrients and plant growth regulators. Due to the presence of metabolites that affect plant growth, these substances have recently begun to be produced as biofertilizers that support plant growth. Commercial preparations are marketed in liquid and solid fertilizer form. These products can be obtained from seaweed, or produced in some countries by organizing various algae production systems or facilities. Depending on the type of algae, the mechanisms of action may differ depending on the plants. In stressed plants, the plants can increase antioxidant enzyme activity and provide protection against peroxidases, making plants more resistant to water scarcity conditions. Today, the increasing problem of drought due to climate change is a significant issue in terms of production, yield, product quality, and food security. Plants develop various mechanisms called abiotic stress under water deficiency conditions. As a result of these mechanisms, photosynthetic activity decreases, and consequently, the harvest index decreases. For this purpose, it has been determined that algae, which are recommended for foliar application, contribute to the development of resistance mechanisms in plants against the negative effects of drought that they have effects on processes such as photosynthesis, respiration, and assimilation; and that they increase the activity of various low-antioxidant defense compounds and various antioxidant defense enzymes. This study have been investigated the mechanisms of action of different algal species for different plant species. The study have been concluded that the mechanisms of action differed depending on the algal species, there was a general decrease in antioxidant enzyme activities, and plant growth parameters were positively affected depending on the application doses, which could be reflected in yield. This study has been investigated the mechanisms of action of different algal species for different plant species. The study has been concluded that the mechanisms of action differed depending on the algal species, with a general decrease in antioxidant enzyme activity. However, it is believed that further studies are needed to investigate the effectiveness of algae under drought stress conditions, focusing on different plants in field conditions, identifying algae suitable for regional conditions, and researching their effectiveness. In this study, it has also been suggested that, given Algeria's status as a coastal country, the establishment of a seaweed industry is necessary. Given the country's potential for producing commercial products containing various algae, the study aims to draw attention to the effectiveness of algae in agricultural activities, particularly in plant cultivation in arid and semi-arid regions.

Keywords: Plant resistance mechanism, drought stress, algae, biofertilizer, seaweed

²³ Speaker

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Phytochemical Screening and Quantification of Total Polyphenols and Flavonoids in Pomegranate (*Punica granatum* L.) and Cactus pear (*Opuntia ficus indica*) Peels: Two Potentials Agro-Industrial By-Products

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Pomegranate and cactus pear peels are traditionally consumed in several countries worldwide, primarily in dried, powdered, or extract forms, owing to their high dietary fiber content and their richness in bioactive compounds. They have also been widely utilized in many traditional medicine systems for centuries due to their therapeutic properties. However, these peels, often discarded as an agro-industrial waste, remain underexploited despite being valuable sources of bioactive compounds. The valorization of pomegranate and cactus pear peel as a reservoir of polyphenols and flavonoids could contribute to reducing ecological pollution and promoting sustainable development while offering promising pharmaceutical and nutraceutical applications. Phytochemical screening of the two studied fruit peels was carried out using standard qualitative methods to identify the major secondary metabolites. The total phenolic content (TFC) was determined by the Folin–Ciocalteu method and expressed as microgram of gallic acid equivalents per milliliter ($\mu\text{g GAE/mL}$). The total flavonoid content (TFC) was quantified by the aluminum chloride (AlCl_3) colorimetric method and expressed as $\mu\text{g QE/mL}$. Phytochemical analysis revealed that both pomegranate and cactus pear peels contain reducing sugars, glucosides, and terpenoids. However, anthocyanins and quinones were exclusive to pomegranate peels. Quantitative assays showed that pomegranate and cactus pear peels contained $196.74 \pm 1.69 \mu\text{g GAE/mL}$ and $21.94 \pm 2.83 \mu\text{g GAE/mL}$ of total polyphenols, respectively, and $91.87 \pm 0.58 \mu\text{g QE/mL}$ and $18.47 \pm 0.14 \mu\text{g QE/mL}$ of flavonoids, respectively. These findings confirm their richness in antioxidant compounds, with higher levels observed in pomegranate peels. Pomegranate and cactus pear peels, traditionally considered a waste material, demonstrate significant potential as a valuable source of bioactive compounds with antioxidant properties. Their valorization may reduce the ecological burden of agro-industrial by-products and promote their application in pharmaceutical, nutraceutical, and food industries. This study highlights the importance of revalorizing plant residues not only for environmental sustainability but also for enhancing human health through natural bioactive compounds.

Keywords: Agro, industrial by, product, Cactus pear peel, flavonoids, polyphenols, Pomegranate peel, phytochemical screening.

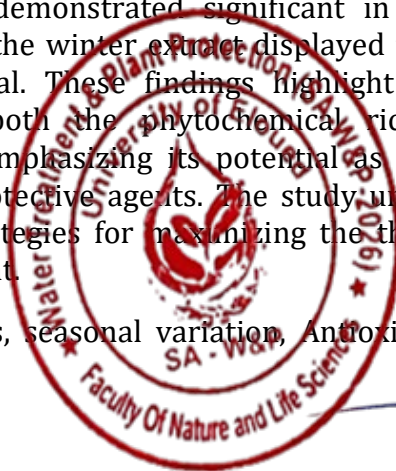
Impact of Seasonal Variation on Antioxidant and Anti-Inflammatory Potentials of *Cistus creticus* Extracts

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This study investigates the impact of seasonal variation on the phytochemical composition and biological potential of *Cistus creticus* extracts collected during spring, summer, autumn, and winter. Extracts were analyzed for their phenolic and flavonoid contents and evaluated for antioxidant, anti-inflammatory, analgesic, and photoprotective properties. Distinct seasonal differences were observed. Extracts obtained in spring and summer, characterized by higher concentrations of bioactive compounds, exhibited the strongest biological performance, including pronounced antioxidant and anti-inflammatory effects as well as notable photoprotective capacity. The spring extract also demonstrated significant *in vivo* anti-inflammatory and analgesic activities, while the winter extract displayed the most pronounced *in vitro* anti-inflammatory potential. These findings highlight the crucial role of harvest season in determining both the phytochemical richness and pharmacological efficiency of *C. creticus*, emphasizing its potential as a valuable natural source of antioxidants and photoprotective agents. The study underscores the importance of seasonal optimization strategies for maximizing the therapeutic and cosmeceutical applications medicinal plant.

Keywords: *Cistus creticus*, seasonal variation, Antioxidant and Anti, Inflammatory activity.



Valorization of Spent Coffee Grounds: A Sustainable Source of Bioactive Additives for Cosmetic Innovation

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2

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Spent coffee grounds (SCG) are abundant urban residues in Laghouat, Algeria, offering both environmental challenges and valorization opportunities. This study explores SCG as a renewable source for a natural biosurfactant in eco-friendly cosmetics. SCG oils exhibited antimicrobial activity against *S. aureus*, *E. coli*, and *M. luteus*, and antioxidant activity (DPPH: 2.16%, CUPRAC: 26.36%, FRAP: 8.21%), supporting skin protection against oxidative stress and microbial damage. Valorizing SCG reduces urban waste, promotes circular economy principles, and opens possibilities for other industrial applications, including cleaning products and pharmaceuticals. Overall, SCG represent a sustainable raw material linking waste management, green chemistry, and innovative cosmetic development offering environmental and economic benefits.

Keywords: Spent coffee grounds (SCG), antimicrobial activity, antioxidant activity, circular economy, waste valorization, sustainable raw materials



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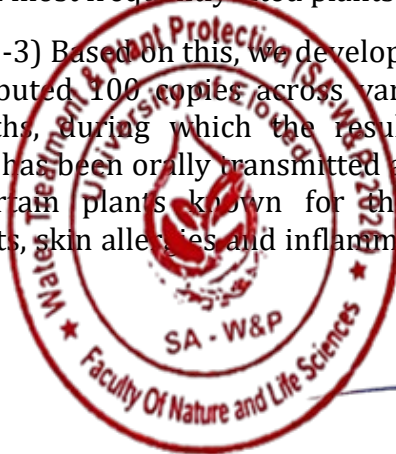
Ethnobotanical Study Of medicinal plant *Urtica dioica* L. (nettle).

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Our study aims to document local knowledge related to the use of medicinal plants in the treatment of skin inflammations and allergies in the El Oued region, in light of the lack of sufficient scientific studies on the effectiveness of these plants and their methods of use. The study sought to identify the most commonly used plant species, the parts of the plants employed, and the common methods of preparation and application among the local population (1). From this study, we identified a wide range of medicinal plants used by people in the region to treat skin allergies and inflammations. We selected most frequently cited plants:

- *Urtica dioica* L. (nettle)(2-3) Based on this, we developed a questionnaire on the use of these plants and distributed 100 copies across various population groups. The study spanned two months, during which the results revealed a rich body of traditional knowledge that has been orally transmitted across generations, along with a strong reliance on certain plants known for their traditional effectiveness. **Keywords:** Medicinal plants, skin allergies and inflammations, herbs, El Oued , *Urtica dioica* L. (nettle)



Valorization of Agricultural Waste and Biopolymers for the Preparation of Functional Materials for Dye-Contaminated Water Treatment

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Abstract

The contamination of water resources by industrial dyes represents a major environmental challenge due to their chemical stability and resistance to biodegradation. In this context, the present work adopts a green chemistry and circular economy approach, aiming to valorize agricultural waste in the form of peanut shells as a sustainable source for cellulose extraction, combined with biopolymers for the development of an efficient material for water remediation applications. A modified bio-based material was synthesized by integrating extracted cellulose with chitosan, followed by chemical functionalization through a condensation reaction to form Schiff base linkages using benzoin as the carbonyl precursor. This strategy enabled the introduction of active imine ($-C=N-$) functionalities onto the material surface. Furthermore, magnetic iron oxide nanoparticles (Fe_3O_4) were incorporated to obtain a magnetically recoverable biocomposite, facilitating post-treatment separation and reuse. Comprehensive physicochemical characterization confirmed the successful formation of the functionalized structure and the development of a heterogeneous surface favorable for adsorption processes. The synthesized material exhibited high efficiency in the removal of Reactive Blue 19 dye from aqueous solutions, driven by the synergistic contribution of multiple adsorption mechanisms, including electrostatic interactions, hydrogen bonding, and $\pi-\pi$ stacking interactions. The findings demonstrate the strong potential of chemically modified bio-based materials as sustainable, low-cost, and effective adsorbents for industrial wastewater treatment, while highlighting the significance of agricultural waste valorization in the development of advanced environmental remediation technologies.

Keywords: Keywords Peanut shells, Cellulose, Schiff bases, Magnetic biocomposites, Dye adsorption, Water treatment.

Therapeutic Potential of *Calligonum comosum* in Mitigating Pregabalin-Induced Toxicity: A Combined Chemical, In Vivo, and In Silico Study

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This study investigates the hepatoprotective potential of *Calligonum comosum* extract against pregabalin (PGB)-induced hepatic toxicity, combining *in vivo* biochemical assessments with *in silico* molecular dynamics simulations. Pregabalin administration caused significant liver dysfunction, evidenced by elevated serum markers (AST, ALT, LDH) and histopathological lesions, including hepatocellular necrosis, inflammation, and vascular congestion. Treatment with *C. comosum* extract markedly restored liver function, reducing AST, ALT, and LDH levels by 18.5%, 25.2%, and 13.7%, respectively, while improving hepatic architecture and reducing inflammatory infiltration. Complementary *in silico* investigations revealed strong binding affinities of key *C. comosum* phytochemicals—particularly quercetin, caffeic acid, and chlorogenic acid—to oxidative stress-related proteins such as LXR- α and GLUT-1, with docking energies ranging from -8.1 to -9.2 kcal/mol. Molecular dynamics simulations confirmed the stability of these ligand-protein complexes throughout 100 ns trajectories, suggesting robust interactions that may underlie the observed hepatoprotective effects. Overall, the integration of *in vivo* biochemical outcomes and *in silico* molecular modeling supports *Calligonum comosum* as a promising natural therapeutic candidate for mitigating pregabalin-induced liver injury and highlights molecular dynamics as a valuable biotechnological approach for mechanistic toxicology and phytopharmacology studies.

Keywords: *Calligonum comosum*, Pregabalin, Hepatotoxicity, Molecular docking, Molecular dynamics, Oxidative stress

Valorization of aromatic plant biomass produced on contaminated agricultural soil

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To cope with the soil trace element (TE) pollution, phytomanagement (a combination between the phytoremediation and the valorization of the plant biomass produced on contaminated soils) was suggested as an eco-friendly and feasible approach. Among the eco-innovative channels intended for the non-food valorisation of the produced biomass, the culture of aromatic and medicinal plants (AMP) to produce essential oils (EO), high-added value biosourced products, has been proposed within the framework of PhytEO and DEPHYTOP projects. Their aims were to evaluate the relevance of a phytomanagement approach based on clary sage, angelica and coriander cultures, combined or not with a mycorrhizal inoculum, on *in situ* experimental plots polluted or not with TE. Clary sage, angelica and coriander have shown a good ability to grow and to produce high amounts of biomass, despite the presence of high TE concentrations in the soil. Addition of an amendment based on arbuscular mycorrhizal fungi enhanced the mycorrhizal colonisation rates of both coriander and clary sage roots. However, no significant improvement was observed in terms of plants' growth, EO amounts, and quality. Moreover, mycorrhizal inoculation allowed TE immobilisation in soils, in particular Pb, and reduced TE (Cd and Pb) transfers in aerial parts of clary sage. Besides, the EO distilled from clary sage in lorescences, angelica seeds and coriander (aerial parts or seeds) grown on TE polluted soils, displayed a highly satisfactory quality, regarding the absence of contamination by TE or pesticide residues (trace amounts). Their chemical compositions were not altered by both TE pollution and mycorrhizal inoculation and were characterized by several active principles, such as linalool, linalyl acetate, germacrene, α -pinene, α -terpinene, 2-decenal, decanal and 2-dodecenal. Furthermore, several biological properties with potential applications in non-food fields such as crop protection (antifungal, antigerminative and herbicidal) or human healthcare (antioxidant and anti-inflammatory) have been brought forward. Moreover, the soil revegetation with clary sage displayed a clear shaping of the microbial communities, in both the rhizospheric soil and clary sage roots. Altogether, our results combined with the economic feasibility assessment of the channel "AMP/EO" have emphasised clary sage as a good candidate for the phytomanagement of TE-polluted soils.

Keywords: aromatic and medicinal plants, essential oils, Soil pollution - trace elements - phytomanagement

Enhanced immune activation and organ protection by vitamin b-rich extract of *Chamaeleo chamaeleon* in rats

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The immunomodulatory and protective effects of a vitamin B-rich (Multi B) extract of *Chamaeleo chamaeleon* were evaluated in rats subjected to ink-induced immune stress. The Multi B extract significantly increased phagocytic index (1.603 ± 0.455 ; $p < 0.001$ vs. control) and lymphocyte ($64.67 \pm 2.6\%$) and monocyte ($41.67 \pm 1.2\%$) counts, indicating broad enhancement of innate and adaptive immune responses. Organ weight indices showed slight, non-significant increases in spleen ($0.29 \pm 0.02\%$) and thymus ($0.23 \pm 0.01\%$), suggesting maintenance of lymphoid organ function. Biochemical markers revealed significant reductions in fasting blood sugar (0.74 ± 0.02 g/L) and alanine aminotransferase (70.67 ± 2.1 U/L), along with decreased C-reactive protein (2.2 ± 0.11 mg/L), highlighting anti-inflammatory and hepatoprotective effects. Histological assessment confirmed improved splenic architecture with densely populated lymphoid follicles, moderate thymic lymphocyte distribution, and increased leukocyte activity in bone marrow. Collectively, these results indicate that the Multi B extract subtly enhances immune cell activity while mitigating inflammatory and metabolic disturbances, supporting its potential as a multifunctional immunoprotective agent.

Keywords: *Chamaeleo chamaeleon*, immunostimulation, lymphocytes, monocytes, anti, inflammatory.

Bioactive potential of *Chamaeleo chamaeleon* extracts: antioxidant, anti-inflammatory, and antibacterial assessment *in vitro*

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This study investigated the *in vitro* biological activities of aqueous, methanolic, and hexane extracts of *Chamaeleo chamaeleon*, focusing on antioxidant, anti-inflammatory, hemolytic, and antibacterial properties. Antioxidant assays revealed that the extracts exhibited weak reducing power and DPPH radical scavenging activity compared to ascorbic acid and gallic acid; however, they demonstrated notable superoxide radical ($O_2^{\bullet-}$) scavenging activity, particularly the aqueous extract ($IC_{50} = 0.218 \pm 0.011$ mg/mL). Hemolysis assays indicated that the extracts were generally non-toxic to red blood cells, with the hexane extract showing slight hemolytic activity at higher concentrations, unlike SDS which caused significant hemolysis. Anti-inflammatory activity was significant for methanolic (75.79% inhibition at 0.8 mg/mL) and hexane extracts (68.21%), while the aqueous extract showed moderate activity (38.20%) compared to acetylsalicylic acid (89.45%). All extracts displayed antibacterial effects against Gram-positive and Gram-negative bacteria, with *Pseudomonas aeruginosa* being the most susceptible. Hexane and methanol extracts showed higher efficacy than the aqueous extract. Although the extracts' antibacterial activity was lower than standard antibiotics, the results indicate a broad spectrum of bioactivity. Overall, *C. chamaeleon* extracts possess promising antioxidant, anti-inflammatory, and antibacterial properties, highlighting their potential for pharmacological applications.

Keywords: *Chamaeleo chamaeleon*, antioxidant activity, anti-inflammatory, hemolysis, antibacterial activity.

Clinical Potential of Essential Oils from Aromatic Plants in the Management of Dyspepsia and Gastrointestinal Bloating

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Gastrointestinal disorders such as dyspepsia, abdominal bloating, and excessive gas production are highly prevalent and are often associated with poor digestion and postprandial discomfort. In this context, the present study aims to clinically valorize essential oils extracted from selected aromatic plants, mint (*Mentha* sp.), caraway (*Carum carvi*), and asafoetida (*Ferula* sp.) with the ultimate objective of developing a natural functional beverage intended to alleviate digestive discomfort. Essential oils were obtained by hydrodistillation using a Clevenger apparatus, yielding 0.892% for mint, 1.6531% for caraway, and 5.12461% for asafoetida, indicating a satisfactory extraction efficiency suitable for practical formulation purposes. Physicochemical parameters, including pH, density, and refractive index, were assessed and found to comply with AFNOR quality standards, ensuring suitability for potential therapeutic and dietary use. The biological activities relevant to digestive health were evaluated through antioxidant and antibacterial assays. Antioxidant capacity, determined using the DPPH radical scavenging method, revealed significant activity with IC₅₀ values of 0.42 mg/mL for mint oil, 0.57 mg/mL for caraway oil, and 0.59 mg/mL for asafoetida oil, suggesting a potential role in reducing oxidative stress associated with gastrointestinal inflammation. In addition, antibacterial activity was tested against clinically relevant bacterial strains involved in digestive disorders (*Escherichia coli*, *Pseudomonas aeruginosa*, *Staphylococcus aureus*, and *Bacillus subtilis*). The essential oils exhibited notable inhibitory effects, with inhibition zone diameters ranging from 7 to 21 mm. These findings support the clinical relevance of these essential oils as bioactive ingredients for the formulation of a natural anti-bloating and anti-flatulence beverage. Their combined antioxidant and antibacterial properties highlight their potential use as complementary therapeutic agents for the management of dyspeptic disorders and digestive discomfort

Keywords: Dyspepsia, Gastrointestinal bloating, Flatulence, Essential oils, Aromatic plants, Functional beverage

³⁵ Speaker

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Antioxidant profile of *Smyrniun olusatrum* L. Essential oil

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Phytotherapy has been a particularly popular discipline since the 20th century, when humans began to turn regularly to alternative medicine. However, Algerian flora contains a significant number of aromatic and medicinal plants that are very rich in secondary metabolites capable of curing many diseases. In order to promote this flora and develop phytomedicines, we conducted a phytochemical and biological study on a wild plant with therapeutic properties belonging to the Apiaceae family, which is very common in the Mediterranean basin and commonly known as HAIYAR in Algeria, maceron, *Smyrniun olusatrum* L. Phytochemical analysis showed the presence of several secondary metabolites, namely tannins, flavonoids, coumarins, and saponosides. The essential oil yield of this plant around 0.42%. Analysis of the chemical composition by GC-MS revealed the presence of several chemical compounds, in the following proportions: furanodiene (21.3%), isofuranogermacrene (16.6%), B-phellandrene (12.6%) and myrcene (6.1%) . Evaluation of the antioxidant activity of the essential oil using the iron reduction (FRAP) and DPPH methods revealed its powerful antioxidant capacity with IC50 values of 0.068 and 0.027 mg/ml, respectively, while ascorbic acid had an IC50 value of 0.0249 mg/ml.

Keywords: *Smyrniun olusatrum*, phytochemical analysis, antioxidant activity, IC50, GC, MS.

Evaluation of the biological and insecticidal activities of extracts and essential oil of *Eucalyptus globulus*

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This study aims to evaluate certain biological activities of methanolic extracts of *Eucalyptus globulus* leaves, obtained by maceration, Soxhlet extraction and ultrasound, as well as essential oil from leaves harvested in Miliana (Ain Defla). The highest extraction yield was obtained by the Soxhlet method (40.19%), while the essential oil, extracted by hydrodistillation, had a yield of 0.18%. The methanolic extract obtained by Soxhlet showed a very high antioxidant activity (CI₅₀ = 0.000696 mg/mL), higher than that of the reference standards. Evaluation of antimicrobial activity by the disc diffusion method revealed a high efficacy of the essential oil against *Staphylococcus aureus* (65.33 mm) and *Pseudomonas aeruginosa* (64.67 mm), in contrast to methanolic extracts, which showed moderate activity. The highest anti-inflammatory activity was observed for aqueous extract (91.05%) and ultrasonic extract (89.49%), with effects comparable to those of diclofenac. The essential oil demonstrated remarkable insecticidal activity against *Tribolium castaneum*, with a mortality rate of 100% and a repellent effect greater than 93.33%. These results confirm the potential of *Eucalyptus globulus* as a natural source of bioactive compounds of therapeutic and agricultural interest.

Keywords: *E. globulus*, antioxidant, antimicrobial, anti, inflammatory, insecticidal activity, *Tribolium castaneum*

³⁸ Speaker

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Evaluation of the Mineral Composition and Nutritional Value of *Matricaria chamomilla* L. Wild-Growing in Northern Algeria Using INAA and ICP- OES Techniques

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Matricaria chamomilla L. (German chamomile) is an aromatic and medicinal plant widely used in food, cosmetics, and traditional medicine for its numerous therapeutic properties, including gastrointestinal relief, anti-inflammatory, and antidiabetic effects. Owing to its increasing incorporation into herbal teas, nutraceuticals, and functional foods, understanding its elemental composition is essential for ensuring both nutritional quality and consumer safety. The present study aimed to evaluate the mineral content of *M. chamomilla* wild-growing in northern Algeria using Instrumental Neutron Activation Analysis (INAA) and Inductively Coupled Plasma–Optical Emission Spectrometry (ICP-OES). Dried and homogenized samples, along with reference standards, were irradiated in a research reactor and analyzed through γ -ray spectrometry using an HPGe detector. Complementary analyses were performed after acid mineralization using ICP-OES to quantify macro- and microelements. A total of twenty-one elements were identified-seventeen by INAA (Ba, Br, Cl, Co, Cs, Eu, K, Mn, Mo, Na, Rb, Sb, Sc, Sr, Th, U, Zn) and four by ICP-OES (Ca, Cr, Fe, Mg). The plant exhibited high levels of Ca, K, Na, and Fe, while potentially toxic elements such as As, Br, and Sb remained below WHO/FAO safety limits. The combined use of INAA and ICP-OES provided complementary, precise, and reliable data on the elemental composition of *M. chamomilla*. These findings highlight its nutritional and functional potential as a safe natural source for food, dietary, and phytopharmaceutical applications.

Keywords: *Matricaria chamomilla* L., INAA, ICP, OES, trace elements, food safety, nutrition, medicinal plants.

⁴⁰ Speaker

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Valorization of flax fibers sourced from metal-polluted soils: a transcriptomic study of molecular tolerance mechanisms and the role of mycorrhizal inoculation

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Soil pollution by trace elements (TEs) represents a major environmental challenge, with long-term impacts on agricultural productivity and ecosystem health. Phytoremediation constitutes an environmentally friendly and sustainable alternative to conventional physico-chemical remediation methods, relying on the use of plants capable of tolerating and accumulating or stabilizing TEs in contaminated soils. Cultivated flax (*Linum usitatissimum* L.) emerges as a particularly promising species, combining potential tolerance to TEs, substantial biomass production, and potential for post-remediation valorization, particularly through the utilization of its fibers in bio-based composite reinforcements, and eco-friendly building materials. To enhance flax tolerance to metal pollution and promote its growth, one strategy described in the literature involves the use of mycorrhizal inoculation. Indeed, arbuscular mycorrhizal fungi (AMF) are well known for improving water and mineral nutrition of the host plant, thereby enhancing plant growth and tolerance to biotic and abiotic stresses such as pollution. However, the underlying molecular mechanisms involved in these beneficial interactions under polluted conditions remain poorly documented, particularly in flax. Thus, the present study aims to investigate the ability of flax plants to (i) grow on TE-polluted soil, (ii) stabilize or accumulate TEs, and (iii) tolerate TEs by characterizing their molecular bases and elucidating the role of mycorrhization in modulating stress-induced transcriptomic responses. Inoculated and non-inoculated flax plants were exposed to different metal treatments (Cd, Pb, Zn, applied individually or in combination) under controlled experimental conditions. Plant physiological responses, mycorrhizal colonization, metal accumulation, and gene expression profiles (using transcriptomic approaches, RNA-seq) were analyzed. Although metal pollution induced a slight reduction in shoot height, flax is able to successfully develop on highly TEs-contaminated soils. In addition, low TEs accumulation was detected in the aerial parts, indicating a limited translocation of metals from the soil to roots to shoots and preserving the quality of aboveground biomass. Transcriptomic analyses further highlight a major effect of mycorrhization on the transcriptomic reprogramming of flax roots under metal stress conditions. Exposure to TEs induced significant changes in the expression of genes involved in several key metabolic pathways, notably ion transport, stress responses, and signaling pathways. These findings reveal a close interaction between mycorrhization and metal pollution, underscoring the central role of AMF in the molecular adaptation of flax to polluted soils. This study opens new perspectives for the optimization of phytoremediation strategies based on the integration of plant-microorganism interactions and the valorization of the biomass.

Keywords: Phytoremediation, *Linum usitatissimum*, Trace elements, Arbuscular mycorrhization, Transcriptomics

⁴² Speaker

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Valorization Potential of the Invasive Plant *Leucaena leucocephala* in Arid Algerian Ecosystems: Phytochemical Composition, Potent Antioxidant, Antibacterial, and Photoprotective Activities

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Leucaena leucocephala, a known invasive species, possesses significant but underexplored phytochemical potential. This study investigated how its chemical composition aids adaptation in arid environments and offers opportunities for valorization. Methanolic extracts from the plant's roots, leaves, pods, seeds, and flowers, collected in Algeria, were assessed for their phenolic, flavonoid, and tannin content, alongside their antioxidant, anti-inflammatory, antibacterial, and photoprotective activities. Seeds exhibited the highest phenolic content ($197.26 \pm 1.90 \mu\text{g GAE/mg}$), while roots were richest in tannins and flavonoids. Notably, strong antioxidant activity was recorded in seeds and leaves (IC_{50} : 3.54 ± 0.05 and $3.61 \pm 0.05 \mu\text{g/mL}$). Roots displayed a high SPF value of 26.40, and both seed and flower extracts showed significant antibacterial effects against *E. coli* and *S. aureus*. Correlation analyses highlighted a strong positive relationship between tannins and SPF ($R^2 = 0.92$) and a negative correlation between phenolics and DPPH activity ($R^2 = -0.84$). LC-MS analysis identified 13 key polyphenols, with pods and leaves being particularly rich in compounds like vanillin and gallic acid. These findings underscore *L. leucocephala*'s potential for sustainable use in health and cosmetic industries.

Keywords: *Leucaena leucocephala* (Lam.), phenolics, antioxidant, anti-inflammatory, antibacterial, LC, MS analysis.

Green Nanotechnology as a Therapeutic Approach Against the Adverse Health Effects of Pesticides

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This study aims to explore the potential of green-synthesized metallic nanoparticles in mitigating the harmful health effects caused by pesticide exposure. Through an extensive review of scientific literature and recent experimental findings, the research investigates the toxic impacts of pesticides on human health and the environment, and highlights the therapeutic potential of eco-friendly nanoparticles synthesized using plant extracts or other green methods. Examples such as silver nanoparticles (AgNPs) and zinc oxide nanoparticles (ZnO-NPs) have shown promising antioxidant, anti-inflammatory, and detoxifying properties that can counteract pesticide-induced toxicity. These findings underscore the value of green nanotechnology as a sustainable and innovative approach to reducing the risks associated with pesticide contamination and protecting public health.

Keywords: Health Effects, Green Nanotechnology, Pesticide and Toxicity.



Study of the antioxidant activity of phenolic extracts from two medicinal plants of the northern Sahara

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Azadirachta indica (Neem) and *Bunium bulbocastanum* (Targhouda) are medicinal plants widely used to treat various health problems due to their numerous medicinal properties. The objective of this study was to estimate the total polyphenol, flavonoid, and tannin content of phenolic extracts of *Azadirachta indica* and *Bunium bulbocastanum*. The phenols, flavonoids, total and condensed tannins of 80% hydro-methanolic extracts were determined using colorimetric spectrophotometric methods. Antioxidant activity was assessed using three assays: phosphomolybdate, DPPH, and ABTS. The Targhouda extracts were the richest in flavonoids (83.13 mg QRE/g DW) and exhibited the highest overall antioxidant activity (270 mg eq ACE/g DW). Those obtained from Neem exhibited an important amount of total phenols (138.98 mg eq GAE/g W) and the lowest total antioxidant activity (159 mg ACE/g W). The high IC₅₀ values of Neem (DPPH=1.79 mg/mL; ABTS=0.78 mg/mL) indicate relatively weak free radical scavenging activity compared to ascorbic acid (0.04 mg/mL). These results confirm the pharmacological value of medicinal plants as a natural source of potent bioactive antioxidant compounds.

Keywords: *Azadirachta indica*, *Bunium bulbocastanum*, phenolic compounds, antioxidant activity.

valorization of cereal by products for bioethanol production

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Plants serve as renewable sources of a diverse array of molecules with various properties and activities. Their lignocellulosic components-such as forest residues, agricultural waste, and dedicated crops-are the most plentiful biomass on Earth, cost-effective, and do not compete with food supplies. They open new avenues in renewable energy and materials by offering innovative solutions to ecological challenges, lowering greenhouse gas emissions, and minimizing pollution. This makes them highly promising for future biofuel development. Currently, converting lignocellulosic biomass into second-generation bioethanol is a major research focus. The process involves anaerobic fermentation using *Saccharomyces cerevisiae* (baker's yeast) after pre-treatment steps. This fermentation typically takes around 72 hours in a bioreactor submerged in a water bath maintained at 30 ± 2 °C. The yield is approximately 556 mL of bioethanol per kilogram, with a concentration of 90°.

Keywords: Lignocellulosic biomass, bioethanol, anaerobic fermentation, *Saccharomyces cerevisiae*



Evaluation of Phytotoxicity and Valorization of Two Biofertilizers for Soil Restoration and Enhancement of Plant Growth

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Sustainable agriculture increasingly relies on innovative and eco-friendly strategies capable of transforming organic substrates into valuable resources that improve soil fertility and support plant development. This study investigates two complementary biological conversion processes-anaerobic bio-conversion and aerobic composting-applied to mixtures composed of kitchen-derived materials, poultry residues, and coffee grounds. The objective was to assess their efficiency in generating agronomically valuable amendments while ensuring environmental safety and enhancing plant growth. Four mixtures with different compositions were prepared and processed under controlled laboratory conditions. During the anaerobic conversion phase, gas production was monitored at regular intervals, while pH, temperature, and electrical conductivity were measured to evaluate system stability. Results showed that mixtures enriched with nitrogen rich components produced the highest gas output, whereas coffee-based mixtures generated more moderate but stable levels. Statistical analyses (ANOVA) revealed significant differences among mixtures, confirming the strong influence of substrate composition on the efficiency of biological conversion. In parallel, composting produced stabilized organic amendments with improved structural characteristics, reduced salinity, and enriched nutrient profiles. Physicochemical analyses of the final products (digestates and composts) revealed substantial variations in total carbon, nitrogen concentration, and C/N ratio. Digestates generally contained higher nitrogen levels and lower C/N ratios, promoting rapid mineralization and immediate plant availability. Conversely, composts exhibited higher C/N ratios, indicating slower decomposition and long-term soil enrichment potential. To evaluate the agronomic suitability of these products, phytotoxicity assays were conducted using cress (*Lepidium sativum* L.) as a bioindicator species. Seed germination rate, root elongation, and shoot growth were examined at different amendment concentrations. Results demonstrated that coffee-based substrates stimulated seedling development, while mixtures rich in poultry residues required dilution to avoid inhibitory effects associated with nutrient excess or elevated salinity. These findings highlight the importance of balanced formulations combining carbon- and nitrogen-rich materials to ensure safe and effective amendments. Overall, this research underscores the potential of organic substrate valorization through biological conversion and composting as a strategic approach for improving soil health, enhancing plant growth, and supporting sustainable agricultural systems. It further emphasizes the relevance of circular bioeconomy practices in Mediterranean agro-ecosystems.

Keywords: Organic substrates, Bioconversion, Composting, Soil quality

Optical and spectral properties of bioplastics extracted from sweet potato waste starch : ftir and uv-vis spectroscopic analysis

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The study of the optical and spectral properties of bioplastics derived from sweetpotato starch waste is a key and advanced research focus of this study, which stems from a comprehensive vision to address the global environmental challenge of accumulating conventional plastic waste. Beyond simply seeking to replace these non-biodegradable materials, this work aims to move beyond the concept of a "bio-alternative" to develop a "smart biomaterial" with specialized functional properties that rival or even surpass those of conventional plastics in specific applications. Within this framework, the use of advanced spectroscopic techniques, particularly Fourier transform infrared (FTIR) spectroscopy and UV-Vis spectroscopy, is a crucial and indispensable scientific tool. The application of FTIR analysis aims to elucidate the molecular structure of the manufactured bioplastic, identifying its unique chemical fingerprint. It not only confirms the successful conversion of starch into a moldable polymer but also analyzes the nature of the resulting chemical bonds and examines the impact of processing methods, such as gelatinization and plasticization, on the final structure. This precise understanding of the structure is the foundation upon which all other properties are built. In contrast, UV-Vis analysis illuminates the material's optical and electronic behavior. It studies how the material interacts with a broad spectrum of light, from high-energy ultraviolet to the visible spectrum. This analysis not only measures transparency or opacity but can also reveal the material's ability to absorb specific types of radiation—a vital property in fields such as packaging for light-sensitive foods or materials requiring protection from UV-damaging radiation. Thus, this integrated analytical component is not merely a routine characterization step but an exploration of the new material's "identity." It answers fundamental questions: What is the nature of this biopolymer at the molecular level? And how does this structure translate into usable optical behavior? By combining the FTIR results, which reveal the structure, with the UV-Vis results, which reveal the optical function, an integrated structure-function model can be constructed. This approach not only demonstrates the viability of using renewable resources such as sweet potato starch but also opens the door to "engineering" the properties of these biomaterials by modifying their composition or processing them. The goal is to design products that meet precise specifications for modern industrial applications, thereby increasing their economic and practical value and making them genuine competitors in the advanced materials market, rather than simply being environmentally friendly alternatives.

Keywords: Bioplastic, Sweet potato starch, FTIR & UV, Vis analysis, Optical properties, Sustainable packaging.

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Adaptation of a medicinal plant to Abiotic Stress: Organic Osmolyte Profiling and Phytochemical Characterization in the Algerian Sahara

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Global warming and intensifying abiotic stresses present critical threats to medicinal plant biodiversity and the traditional knowledge systems that rely on them. Climate-driven perturbations alter the accessibility, quality, and secondary metabolite profiles of plants, jeopardizing the future of natural medicine. Central to plant adaptation under such environmental constraints is the accumulation of organic osmolytes, such as Glycine betaine and Proline, which facilitate osmotic adjustment and cellular protection. While Algeria possesses a rich flora of 3,139 species, data regarding the stress-induced accumulation of bioactive compounds in endemic taxa remain scarce. This study investigates *Pituranthos scoparius*, a medicinal genus specific to North Africa, to evaluate its adaptation strategies within the arid conditions of the Algerian Sahara (Adrar region). We characterize the major organic osmolytes accumulated as a response to desert environmental changes and perform comprehensive phytochemical profiling using LC-MS/MS and GC-MS. Furthermore, the study explores the pharmacological potential of the plant's bioactive molecules, specifically targeting antioxidant. These findings aim to bridge the gap between environmental stress response and the optimization of medicinal resources for pharmaceutical applications.

Keywords: Pituranthos scoparius, Abiotic stress, Organic osmolytes, Algerian Sahara, Phytochemical analysis, Pharmacological activity

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Phytochemical Profiling and In Vitro Biological Activities of the Aqueous Extract of *Bassia muricata* (L.) Asch.

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This study investigates the phytochemical composition and evaluates the in vitro biological activities of the aqueous extract of *Bassia muricata* (L.) Asch. Total phenolic and flavonoid contents were quantified spectrophotometrically, while LC-MS/MS analysis identified the major phenolic compounds, with vanillic acid being the most abundant. Antioxidant activity was assessed using DPPH radical scavenging, reducing power, total antioxidant capacity (TAC), and anti-hemolysis assays. Additional *in vitro* evaluations included sun protection factor (SPF), cytotoxicity against MCF-7 and A549 cell lines, α -amylase inhibition, and antibacterial activity. The extract exhibited moderate levels of total phenols ($47.739 \pm 2.987 \mu\text{g GAE/mg}$) and flavonoids ($16.064 \pm 0.120 \mu\text{g QE/mg}$), potent antioxidant activity, significant SPF (33.80 ± 0.16), and cytotoxic effects against MCF-7 ($\text{IC}_{50} = 0.265 \pm 0.03 \text{ mg/mL}$) and A549 ($\text{IC}_{50} = 0.585 \pm 0.02 \text{ mg/mL}$) cell lines. It also inhibited α -amylase ($\text{IC}_{50} = 23.63 \pm 2.88 \text{ mg/mL}$) and demonstrated moderate antibacterial activity. These results highlight the potential of *B. muricata* aqueous extract as a source of bioactive compounds with antioxidant, cytotoxic, antimicrobial, and enzyme-inhibitory properties.

Keywords: *Bassia muricata*, aqueous extract, phytochemicals, antioxidant activity, cytotoxicity, α , amylase inhibition, antimicrobial activity, LC, MS/MS

Green Synthesis of Magnesium and Silver-Based Nanoparticles: A Sustainable Approach to Enhanced Targeted Biomedicine and Antimicrobial Therapy

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Nanotechnology has emerged as a transformative frontier in biomedicine, offering unique physicochemical properties through particles sized between 1 and 100 nanometers. These nanoparticles (NPs) possess high surface area-to-volume ratios and improved reactivity, enabling them to overcome the limitations of conventional drug administration, such as poor bioavailability and systemic toxicity. By facilitating targeted delivery, NPs enhance therapeutic efficacy while minimizing adverse effects—a critical requirement for complex pathologies like oncology and chronic infection. This study explores the transition toward “green synthesis” methods, utilizing eco-friendly, non-toxic plant extracts to reduce metal salts into biocompatible nanoparticles. This sustainable approach significantly reduces environmental impact and biological toxicity compared to traditional chemical synthesis. Specifically, the research focuses on the integration of Magnesium (Mg) and Silver (Ag) oxides. While Magnesium is vital for biochemical homeostasis, protein synthesis, and bone integrity, Silver NPs provide potent antibacterial properties essential for wound healing and infection control. The synergy of green-synthesized Mg and Ag nanoparticles represents a promising strategy for developing next-generation biomaterials with enhanced healing capabilities and superior biocompatibility for diverse physiological applications.

Keywords: Nanotechnology, Green Synthesis, Magnesium Oxide NPs, Silver Nanoparticles, Targeted Drug Delivery, Biocompatibility.

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An Integrated In Vitro, In Vivo and In Silico Evaluation of the Anti-Inflammatory Potential of Essential Oils and Plant Extracts from Selected Medicinal Species

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This study investigates the anti-inflammatory potential of essential oils and crude extracts obtained from two selected medicinal plant species traditionally used in local ethnomedicine in the El Oued region (Algeria). A comprehensive experimental strategy was adopted, integrating phytochemical characterization, in vitro and in vivo biological assays, and in silico modeling approaches. Essential oils were extracted via hydrodistillation and chemically characterized using gas chromatography–mass spectrometry (GC–MS), revealing a rich profile of bioactive monoterpenoids and phenolic compounds, with selected oxygenated monoterpenes and terpenes identified as major constituents. The in vitro anti-inflammatory activity was assessed through inhibition of bovine serum albumin (BSA) denaturation, where both oils exhibited significant activity comparable to that of diclofenac, used as a reference non-steroidal anti-inflammatory drug. For in vivo evaluation, inflammation was induced in white mice by intraperitoneal administration of an inflammatory agent. A seven-day treatment with the tested oils resulted in a marked attenuation of inflammation, evidenced by reduced body weight loss, decreased inflammatory biomarkers, and improved histopathological architecture compared to untreated controls. Pharmacokinetic and toxicity-related properties of the principal compounds were predicted using SwissADME, admetSAR, and ProTox platforms, confirming favorable absorption, distribution, metabolism, excretion, and toxicity (ADMET) profiles in accordance with drug-likeness criteria. Molecular docking analyses further demonstrated stable binding interactions between the major compounds and cyclooxygenase enzymes (COX-1 and COX-2), with binding energies ranging from –6.54 to –4.77 kcal/mol, suggesting a plausible mechanism involving cyclooxygenase inhibition. Overall, these findings provide experimental and computational evidence supporting the anti-inflammatory potential of essential oils derived from selected medicinal plants and highlight their relevance as promising candidates for the development of safe and effective natural anti-inflammatory agents.

Keywords: Anti, inflammatory activity, Essential oils, Medicinal plant extracts, In vitro assays, In vivo models, ADMET prediction, Molecular docking

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In Silico Evaluation of the Antipyretic Potential of Mentha pulegium Compounds Targeting COX-2

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In the pursuit of natural alternatives to synthetic antipyretic drugs, an in silico molecular docking study was conducted to evaluate the potential antipyretic activity of selected bioactive compounds from *Mentha pulegium* (1). The study employed MOE 2019 software to target the enzyme Cyclooxygenase-2 (COX-2) (2), a key player in inflammation and fever pathways. The crystal structure of COX-2 was retrieved from the Protein Data Bank under the PDB ID: 5JVY. Several phytochemicals were tested for their binding affinity to the COX-2 active site. Among the compounds analyzed, rosmarinic acid exhibited the most favorable docking results, characterized by the lowest binding energy and strong interactions with key residues of the active site. To complement the docking results, an ADME (3) (Absorption, Distribution, Metabolism, and Excretion) analysis was carried out, demonstrating acceptable pharmacokinetic properties for all tested compounds. Notably, rosmarinic acid complied with Lipinski's Rule of Five, suggesting good oral bioavailability and drug-likeness. These findings highlight rosmarinic acid as a promising natural compound with potential antipyretic effects, warranting further experimental and clinical investigation.

Keywords: Mentha pulegium, Rosmarinic acid, Molecular docking, COX, 2, MOE 2019, Antipyretic, PDB ID: 5JV, ADME



Molecular Docking Study of Antifungal Compounds from *Cymbopogon schoenanthus* Against the 2KCN Enzyme

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The present study aimed to evaluate the antifungal potential of bioactive compounds found in the leaves and roots of *Cymbopogon schoenanthus* (1) using molecular docking (2) analysis with MOE 2019 software. Four ligands were selected: two isolated from the leaves and two from the roots of the plant. The fungal enzyme 2KCN (3) was chosen as the biological target, and docking simulations were carried out to assess the interaction energies and stability of the resulting complexes. The results revealed that all tested compounds exhibit moderate antifungal potential, with complexation energies around -3.20 kcal/mol, suggesting stable ligand–enzyme interactions. Among the four ligands studied, cis-p-menth-2-en-1-ol, found in the leaves, showed the best binding affinity, indicating that it may act as a potent natural antifungal inhibitor. Overall, *Cymbopogon schoenanthus* appears to be a rich source of natural antifungal agents, supporting its potential for further pharmacological investigation.

Keywords: *Cymbopogon schoenanthus*, Antifungal activity, Molecular docking, MOE 2019, 2KCN, cis, p, menth, 2, en, 1, ol – Plant based inhibitors, In silico analysis.



Quantitative Evaluation of Leaf and Stem Fiber in Three Native Algerian Plant Species

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The escalating need for environmentally sustainable materials has catalyzed extensive research into natural fibers as viable substitutes for synthetic counterparts across various industrial sectors. This investigation focuses on the biometric evaluation of stem and leaf fibers from three native Algerian plant species: *Eucalyptus globulus*, *Argania spinosa* L., and *Ricinus communis* L., with the aim of assessing their structural properties and potential for sustainable exploitation in eco-friendly applications. The fiber extraction was conducted using an equal-volume mixture of acetic acid and hydrogen peroxide at 60°C for a duration of 72 hours. Fiber lengths from both stem and leaf samples of all species were measured precisely using a micrometer, with values ranging from 0.21 to 2 mm. To assess the morphological differences between species and tissue types, Student's t-test was employed to compare the mean fiber lengths. The results indicated that the calculated t-values exceeded the critical t-value, demonstrating statistically significant differences in fiber length between tissues within each species. Stem-derived fibers from *A. spinosa* and *E. globulus* were identified as long fibers, with lengths ranging from 0.79 to 2.00 mm. In contrast, leaf fibers from *E. globulus* and *R. communis* were categorized as medium-length fibers, measuring between 0.65 and 1.83 mm. Conversely, the stem fibers of *R. communis* and the leaf fibers of *A. spinosa* were classified as short fibers, with a length range of 0.21 to 0.87 mm. This suggests that stem and leaf fibers possess distinct morphological characteristics (tapered, bifurcated, rounded, and flattened forms), which may influence their mechanical properties and suitability for specific industrial applications. Two-way ANOVA revealed highly significant effects of species and organ on fiber length ($F = 17.315$; $F = 27.730$ respectively), with a dominant species \times organ interaction ($F = 148.587$). This interaction, accounting for the largest explained variance, underscores organ-specific genetic regulation of fiber elongation and cell wall deposition, precluding generalized species-level fiber length characterization. Understanding this variation is essential for optimizing the selection and processing of fibers for papermaking, composites and textile.

Keywords: *Argania spinosa* L., *Eucalyptus globulus*, morphology, natural fibers, *Ricinus communis* L.

Essential oils of Algerian medicinal plants (Thyme and Rosemary): Extraction, chemical composition and comparative study of their antimicrobial activities against multiresistant strains of E.coli isolated from broiler turkey breeding

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Problem: in order to be able to find a solution to the problem of antibiotics resistance in broiler turkey breeding, we have researched, *in vitro*, the possible antibacterial activity of 02 essential oils (EO) extracted from Algerian medical plants (thyme and Rosemary) against multi-resistant *E.coli* strains isolated from turkey farms. **Material and Methods:** We started by extracting, using hydrodistillation, the two EO, following which, the chemical composition of these EO was determined by Gas Chromatography coupled to Mass Spectrometry (GC-MS). Finally, the antibacterial activity was evaluated by carrying out aromagrams. **Main results:** The extractions allowed us to have an EO of Thyme characterized by a brown color with a strong spicy odor. For Rosemary EO, the color was pale yellow with a camphorated smell. Concerning the yields, the EO of Thyme was the EO which presented the highest one ($10.22 \pm 0.26\%$). Regarding the GC-MS analysis, the most identified components were represented by Carvacrol (73.3%) for Thyme EO and 1,8 Cineole (39.75%) for Rosemary. *In vitro*, the aromagrams concluded that the EO of Thyme was the most active essence against *E.coli* isolates (general average of the diameters of the zones of inhibition was estimated at $26.79 \pm 0.439\text{mm}$). **Conclusion and prospects:** These results seem to be very promising in the case where we think about the replacement of antibiotics by EO, *in vivo* studies would be very interesting to confirm or invalidate this hypothesis.

Keywords: Essential oils, Thyme, Rosemary, E.coli, Antibiotic resistance, Broiler turkey breeding.

Organ-Specific Bioactive Potential of Retama Species: A Sustainable Biorefinery Approach for Valorizing Algerian Semi-Arid Shrubs

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The sustainable utilization of plant biomass is a major challenge in semi-arid agricultural systems. This study explores a zero-waste biorefinery strategy for two Algerian semi-arid shrubs, *Retama raetam* and *Retama monosperma*, with a focus on stems as valuable bioresources. Aqueous extracts of stems and flowers were analyzed for extraction yield, antioxidant activity, and phytochemical content. Stems demonstrated superior extraction yields (620 mg/g DW for *R. raetam*) and strong antioxidant activity, as measured by the DPPH radical scavenging assay ($IC_{50} = 0.584$ mg/mL for *R. monosperma* stems). In contrast, flowers contained higher flavonoid levels (up to 2.38 mg catechin equivalents/g DW), highlighting an organ-specific distribution of bioactive compounds. Phytochemical screening also identified alkaloids and saponins, providing additional industrial relevance. These results indicate that stems, often considered agricultural residues, can be valorized as low-cost, effective nutraceutical ingredients, contributing to the sustainable management of semi-arid biomass. This approach supports a circular bioeconomy, where all plant fractions are utilized efficiently, minimizing waste and promoting environmental sustainability. By integrating underutilized plant parts into nutraceutical and industrial applications, this study demonstrates a model for sustainable agricultural practices in arid ecosystems. Overall, *Retama* species provide organ-specific bioactive compounds suitable for functional foods, nutraceuticals, and industrial products, illustrating the potential of integrated biorefinery strategies to enhance resource efficiency and sustainability in agriculture.

Keywords: Sustainable agriculture, Bioactive compounds, Stem valorization, Circular bioeconomy, *Retama* species

⁶⁴ Speaker

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Development of Functional Cookies Enriched with Blida (*Cucurbita pepo* L.), Seed Flour: Nutritional, Rheological, and Sensory Optimization

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Local pumpkin seeds (*Cucurbita pepo* L.), cultivated in the Blida region (Algeria), are rich in proteins, fibers, and minerals, offering significant potential for nutritional enhancement of bakery products. Composite flours were formulated by partially replacing soft wheat flour with pumpkin seed flour (PSF) at levels of 0%, 10%, 15%, and 20% to improve the bioactive, nutritional, and sensory properties of cookies. Rheological properties of composite flours containing PSF were evaluated, demonstrating a positive influence on dough texture due to high contents of proteins (39.8% DM), fibers (4.6% DM), lipids (34.67% DM), and Magnesium (310 mg/100 g). Cookies produced from these flours exhibited enhanced physicochemical characteristics: increased total and soluble fiber levels, protein and mineral enrichment (particularly Magnesium), improved friability, and optimized spread ratio. PSF substitution elevated phenolic compound contents and antioxidant capacity. Sensory evaluation, conducted with a consumer panel, revealed a marked preference for the 15% PSF formulation over the control cookie (100% wheat flour), with high scores for aroma (7.8/9), taste (7.5/9), and overall appreciation (7.6/9). Incorporating 15% PSF significantly boosted protein, fiber, and magnesium levels without compromising hardness or color. The use of PSF, abundant in bioactive compounds, improved dough rheology and the nutritional, physicochemical, and sensory qualities of cookies. The 15% PSF formulation provides a functional alternative for the food industry, promoting the valorization of local pumpkin seeds and the development of nutrient-enriched cookies tailored to modern nutritional needs. This approach contributes novel composite flours to the literature, supporting functional food innovation.

Keywords: cookies, pumpkin seeds, composite flour, nutritional enrichment, sensory properties.

⁶⁶ Speaker

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Valorization of Wheat Bran for Sustainable Succinic Acid Production by *Aspergillus* sp.

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Succinic acid has been identified by the U.S. Department of Energy as one of twelve key platform molecules. Produced from lignocellulosic biomass, it is a valuable molecular platform, which can be transformed into a wide range of industrial products used in agriculture, pharmaceuticals, agri-food, cosmetics and healthcare. As a result, succinic acid represents a sustainable alternative to petroleum-derived chemicals. This study aimed to optimize the production of succinic acid from a strain of *Aspergillus* sp., using wheat bran as a substrate, using classical optimization methods and fractional factorial designs. Wheat bran is an abundant and inexpensive agro-industrial by-product, widely available in Algeria. The results demonstrated the ability of the *Aspergillus* strain to produce succinic acid by fermentation in a solid medium. The maximum production level of approximately 0.422 g/mL was obtained under optimal conditions: 7 days of incubation, a temperature of 30 C and an inoculum volume of 1.5 mL. Fractional factorial design analysis revealed that inoculum volume was the most important factor for succinic acid production. Comparative analysis of the chemical composition of fungal extracts obtained by solid state fermentation (SSF) and submerged fermentation (SMF) revealed a higher production of secondary metabolites in FMS than in FMS. Succinic acid was identified as the predominant compound, accounting for 42% and 48% of the total FMS and FMS metabolites, respectively. Succinic acid, its main constituent, is well known for its antifungal, antibacterial, and antioxidant properties. Overall, this study offers an in-depth understanding of optimizing succinic acid production. The systematic evaluation of key operational parameters provided valuable information to improve production efficiency and yield, as well as to establish reliable experimental protocols for sustainable organic acid production.◦

Keywords: Succinic acid, *Aspergillus* sp., Solid, state fermentation (SSF), Optimization, Fractional factorial design, Wheat bran, GC/MS.

Phenolic and Lipid Composition of Oilseeds from Southeastern Algeria: Nutritional and Biological Insights

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Oilseeds are considered strategic agricultural resources because of their richness in lipids, proteins, and bioactive phenolic compounds that play a vital role in human nutrition and health. Beyond their economic importance, they are increasingly valued for their potential functional and therapeutic properties. In the present study, oilseeds collected from different sites in southeastern Algeria were investigated with a particular focus on their lipid and phenolic composition. The extracted oils exhibited yields ranging between 30% and 45%, indicating a high potential for industrial exploitation. Comprehensive physicochemical analyses were performed to determine their quality parameters, with special emphasis on fatty acid composition, which revealed a predominance of unsaturated fatty acids of nutritional relevance. Moreover, the seeds were found to contain appreciable amounts of phenolic compounds, with the total phenolic content estimated at approximately 10%. Both quantitative and qualitative analyses of phenolic subclasses, including flavonoids, were carried out. The diversity and relative abundance of these bioactive molecules suggest a strong antioxidant potential and possible applications in food, pharmaceutical, and nutraceutical industries. Overall, the findings highlight the dual importance of these oilseeds as sources of both high-quality edible oils and natural phenolic antioxidants, providing new insights into their nutritional value and possible health-promoting effects.

Keywords: Oilseeds, antioxidant . polyphenol . fatty acids.

⁶⁹ Speaker

From Traditional Knowledge to Scientific Rationale: Ethnopharmacological Insights into Medicinal Plants with Potential Gastroprotective Properties

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Traditional medicine represents a valuable source of knowledge regarding the use of medicinal plants for the prevention and treatment of various diseases, particularly gastrointestinal disorders. This study aims to highlight the importance of the ethnopharmacological approach in bridging traditional uses with scientifically recognized biological properties of medicinal plants. Based on ethnopharmacological surveys and traditional knowledge sources, two medicinal plants were selected from a list of 35 species commonly used in folk medicine: *Punica granatum* L. (fruit peels) and *Juniperus phoenicea* L. (leaves). Aqueous extracts of these plants were prepared by decoction, and their antioxidant potential was evaluated through multiple in vitro assays, including DPPH, FRAP, TAC and β -carotene bleaching methods, yielding highly satisfactory results. The selection of these plants was guided by their widespread traditional use in alleviating stomach pain, acidity, and gastric ulcer-related symptoms. The observed antioxidant activity of the extracts provides a scientific rationale supporting their potential gastroprotective effects, complementing the ethnopharmacological evidence. Overall, this contribution emphasizes the value of integrating traditional knowledge with laboratory-based biological evaluation to identify medicinal plants with genuine therapeutic potential, offering promising avenues for the development of natural and safe gastroprotective agents.

Keywords: Traditional Knowledge, *Juniperus phoenicea*, *Punica granatum*, Antioxidant, Gastroprotective properties.

Biosynthesized CuO/Cu₂O Nanoparticles with Enhanced Antioxidant and Photocatalytic Properties

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Copper oxide nanoparticles were biosynthesized using an eco-friendly green method based on *Phoenix dactylifera* L. The synthesized CuO/Cu₂O nanoparticles were characterized by UV-Vis, FT-IR, SEM, and XRD analyses, confirming mixed crystalline phases with sizes between 15.7 and 35.4 nm. The nanoparticles exhibited notable antioxidant activity, as demonstrated by TAC, FRAP, and DPPH assays. Their photocatalytic performance was evaluated using methylene blue as a model dye under light irradiation, showing efficient degradation due to their nanoscale size and synergistic CuO/Cu₂O phases. These results highlight the potential of green-synthesized copper oxide nanoparticles for antioxidant applications and photocatalytic wastewater treatment.

Keywords: Copper oxide, eco-friendly, antioxidant activity, photocatalytic



In vitro Antioxidant, Antidiabetic and Photoprotective Properties of Artemisia judaica Aqueous Extract

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Artemisia judaica is aromatic plant belongs to Asteraceae family, it is commonly used by the population of Tassili N'Ajjer region to treat various diseases such as gastrointestinal illness, diabetes, fever, wounds. This study investigate the aqueous extract of *artemisia judaica* collected from DJANET in 2024, focusing on its phytochemical screening, and biological effects. Antioxidant capacity was determined through the inhibition of DPPH and ABTS radicals, while, antidiabetic potential was assessed in vitro by inhibition of alpha amylase. The sun protector factor SPF was also measured. Phytochemical screening revealed the presence of phenolic acids, flavonoids, tannins, coumarins, and other bioactive classes. *Artemisia judaica* exhibited a notable inhibition of alpha amylase with $IC_{50}=120\pm 5, 15\mu g/ml$, suggesting significant antidiabetic activity. The extract showed moderate antioxidant capacity compared to standard used, and moderate photoprotective activity with $SPF=14, 98\pm 0.02$. Overall, these results underscore *artemisia judaica* as a rich source of natural antioxidant, antidiabetic agents, and supports its use in the development of phytopharmaceutical formulations

Keywords: *Artemisia judaica*, Antioxidant activity, α Amylase inhibition, Sun protector factor.



Valorization of citrus by-products and the antifungal activity of bioactive compounds against *Aspergillus niger*

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The sustainable management of fungal plant diseases represents a major challenge for global food security. Among phytopathogenic fungi, *Aspergillus niger* is responsible for significant post-harvest losses and the deterioration of various agricultural products. In this context, the valorization of plant-based by-products emerges as an innovative and sustainable strategy for developing alternatives to synthetic fungicides, whose extensive use is associated with resistance development, chemical residues, and environmental concerns. This study focuses on the valorization of citrus by-products, particularly the peels of *Citrus sinensis* (sweet orange), considered agro-industrial residues with high added-value potential. The main objective was to characterize the physicochemical properties of the essential oil extracted from fresh peels by hydrodistillation and to evaluate its *in vitro* antifungal activity against *Aspergillus niger* using the direct contact method on PDA medium. The results revealed an average essential oil yield of 0.66%, characterized by a pale yellow color, a fresh aroma, acidic pH, an acid value of 2.80 and a refractive index of 1.474. GC-MS analysis showed that limonene and linalool were the predominant compounds, both known for their antifungal properties. Biological assays demonstrated a significant inhibitory effect of the essential oil against *Aspergillus niger*, as evidenced by a marked reduction in mycelial growth compared to the control. These findings highlight the potential of citrus plant by-products as a valuable source of bioactive compounds with antifungal activity. The present study supports the development of natural biopesticides and contributes to sustainable agricultural practices through the effective valorization of plant-derived residues.

Keywords: Essential oil, *Citrus sinensis*, oil characteristics, antifungal activity, phytopathogenic fungi

Development And Evaluation Of a Polyherbal Cream For Skin Burn Treatment

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This study focuses on the formulation and evaluation of a polyherbal cream intended for the treatment of minor skin burns, incorporating natural ingredients such as *Moringa oleifera* extract, *Teucrium polium* extract, peppermint oil, lavender oil, and honey. Each component was selected based on its well-documented medicinal properties: *Moringa oleifera* for its strong anti-inflammatory and antioxidant activities and its role in promoting wound healing; *Teucrium polium*, a desert medicinal plant, for its rich phenolic content and notable antimicrobial and anti-inflammatory effects; peppermint oil for its soothing and cooling action on the skin; lavender oil for its analgesic properties and ability to enhance skin regeneration; and honey for its antibacterial and moisturizing benefits. The ingredients were homogeneously incorporated into a cream base and subjected to physicochemical evaluation, including pH, viscosity, spreadability, and stability studies. The formulated polyherbal cream was further evaluated for its efficacy in the treatment of minor thermal burns using *in vitro* and *ex vivo* models. The results demonstrated significant wound healing activity, reduced inflammation, and enhanced epithelial regeneration compared to the control. The synergistic interaction between the plant extracts and essential oils contributed to the overall therapeutic efficacy, indicating that this polyherbal formulation represents a promising natural alternative for the management of mild to moderate skin burn injuries. Further clinical investigations are recommended to confirm its safety and effectiveness in human subjects.

Keywords: burns, wound healing, antioxidants, antimicrobial activity

Contribution to the study of water-soluble polysaccharides of *Citrullus colocynthis* L. collected in the El-Oued region (Algerian Sahara): biological activities

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The aim of the present study is to evaluate the antioxidant, anticoagulant and gastro-protective activity of the water-soluble polysaccharide extract of the seeds and stems of *Citrullus colocynthis* of the Cucurbitaceae family, a spontaneous plant of medicinal nature collected in the eastern Algerian northern sahara of the El Oued region. After analyzing the two water-soluble polysaccharide samples PGCC and PTCC, the mass yield of the polysaccharide extracts are 3.5% for PGCC, 5.9% for PTCC. The study of the chemical composition of the isolated polysaccharide extracts consists of 37.55% (PTCC) and 3.88% (PGCC) of total bones, 22.22% and 5.69% for PTCC and PGCC respectively of neutral bones, 0.9% for PTCC and 0.65% for PGCC of polyphenols and proteins represent the lowest contents, 0.33% (PTCC) and 0.12% (PGCC). The study of the antioxidant power of water-soluble polysaccharides was carried out by the DPPH method, the extract of two samples of *Citrullus colocynthis* L. has a very low antioxidant activity with $IC_{50} = 0.736$ mg/ml and $IC_{50} = 1.602$ for PTCC; PGCC mg/ml respectively compared to the BHA control ($IC_{50} = 0.013$ mg/ml). The gastro-protective activity of water-soluble polysaccharides extracted from the seeds of this plant, PGCC, on male rats of the *Wistar albinos* breed. Doses of 50 and 75mg/kg showed significant results of protection percentages of 50%, 70%, respectively. These results show a gastroprotective effect of PGCC, which seems to be due to its capacity to reduce the formation of lesions and to induce protective mechanisms of the gastric mucosa.

Keywords: Water, soluble polysaccharides, *Citrullus colocynthis* L, Antioxidant activity, Gastroprotective activity, El Oued.

⁷⁵ Speaker

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Sustainable transformation of a plant by-product: integration of *Moringa oleifera* seed hull into a food application

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The seed husk of *Moringa oleifera* Lam., an underexploited agro-industrial by-product, is a rich source of dietary fibre and bioactive compounds. Its incorporation into bakery products offers a valuable opportunity for sustainable functional innovation, meeting the growing demand for nutritious foods with reduced environmental impact. This study aimed to valorize this by-product by incorporating its powder into muffin mixes in order to develop a nutritionally enriched and sustainable bakery product. The husk of the dried seed was crushed and characterized for its nutritional composition, bioactive compound content and antioxidant activity by DPPH, ABTS and FRAP tests. The powder was then incorporated into a standard muffin mix at different rates (2.5 to 10%), and the resulting products were evaluated for nutritional and technological properties. Ingredient characterization revealed a remarkably high dietary fiber content (approximately 71%), low fat content (less than 2%), and strong antioxidant activity (DPPH > 80%, ABTS > 90%), highlighting its potential as a functional ingredient. Fortification of muffins resulted in a significant increase in dietary fibre (up to approximately 5.6% for a 10% incorporation rate) and ash content, accompanied by a gradual reduction in fat content from 26.8% in the control to approximately 21% for the highest substitution rate. Technologically, the incorporation of seed coat powder led to a reduction in the volume (from 119.8 cm to about 73 cm) and height of the muffins, while their density increased in proportion to the rate of incorporation. Moderate variations in water content and water activity were observed, reflecting the expected structural and water retention changes. Overall, the inclusion of *Moringa oleifera* seed coat significantly improved the nutritional profile of muffins while enriching them with bioactive compounds, confirming its potential as a promising functional ingredient. This work demonstrates the sustainable valorization of an agro-industrial by-product and proposes a practical approach for the development of innovative, healthy and technologically optimized bakery products.³³

Keywords: *Moringa oleifera* seed hull, Agro, industrial by, product valorization, Dietary fiber enrichment, Functional bakery product, Antioxidant activity

Theoretical investigation of bioactive molecule (properties, molecular docking and inclusion complexes)

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In this work, we have investigated theoretically, the properties and the spectroscopic features of jaceosidin (molecule extracted from *plantago albicans L plant*) using DFT approach with B3LYP method. We have chosen three different basis 6-31G (d,p), 6-311G(d,p) and ccpvdz. The spectroscopic results (UV/VIS and ¹H, ¹³C NMR) depict a good agreement with the experimental data. Complete bond analysis NBO, FMOs and molecular electrostatic potential (MEP) surface were executed to explain the electronic behavior of jaceosidin on the target to investigate different reactive sites such as hydroxyl groups and aromatic rings. We have calculated BDE (bond dissociation energy) of hydroxyl to evaluate the antioxidant reactivity of the molecule. Then, jaceosidin undergoes in silico screening via pharmacokinetics and physicochemical analysis to evaluate its ability to inhibit MMP9 enzymes. The drug-likeness properties were evaluated based on Lipinski rules. The obtained results respect successfully the rules such as (MW, PSA, HBA, HBD). Thus, jaceosidin is suitable to be bioavailable and can be considered as oral drugs. ADME simulation provides more information about pharmacological features of jaceosidin. In fact, the molecule presents a high GI absorption but it is not a BBB permeable. Then, the prediction of metabolism effect, unfortunately, jaceosidin is predicted to be an inhibitor to CYP except CYP1A2 will be a substrate.

Keywords: flavonoid, beta, cyclodextrine, inclusion complexes, DFT, molecular docking.

⁷⁸ Speaker

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Sustainable Packaging Development through Valorisation of Potato Peels Wastes

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Vigitable rank among the most extensively cultivated and consumed crops worldwide, and their industrial processing produces a significant quantity of by-products, with potato peel (PP) contributing to a substantial portion of these wastes. The accumulation of these wastes in nature causes serious problems regarding environmental sustainability, public health, and economic losses. Considering this, the review aims to provide a comprehensive overview of the potential valorization pathways of PP for the development of eco-friendly films and packaging materials. This review discusses the chemical composition of potato peels, emphasizing their richness in cellulose, hemicellulose, starch, and bioactive compounds, which collectively represent a versatile resource for biodegradable and functional packaging applications. The incorporation of potato peel-derived biopolymers into polymer matrices, as well as their reinforcement with nanocellulose, has also been highlighted as a promising strategy to improve mechanical performance, thermal stability, and barrier properties of bio-based films and coatings. In addition, the review highlights the potential integration of antimicrobial and antioxidant compounds from PP into packaging systems to extend food shelf-life and reduce synthetic additives use. The significant outcome of this review confirms that the valorization of PP not only contributes to reducing environmental problems associated with potato waste management but also supports circular economy principles by replacing petroleum-based plastics with renewable, biodegradable alternatives.

Keywords: waste, potato peel, eco, friendly packaging, Valorization

Antimicrobial effects of *Artemisia judaica* to control foodborne pathogens –a review

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Artemisia judaica L. is a perennial aromatic shrub that has long been utilized for its therapeutic benefits as a vermifuge, analgesic, sedative, and skin healer; it is commonly used in ethnomedicine to treat gastrointestinal problems. Numerous scientific studies reported the antimicrobial activity of *Artemisia judaica* against foodborne microbes. Essential oils and extracts from *A. judaica* demonstrate potent antibacterial effects on various pathogenic bacteria frequently implicated in foodborne illnesses, including *Staphylococcus aureus*, *Escherichia coli*, *Klebsiella pneumoniae*, and *Salmonella species*. These extracts are rich in bioactive compounds such as sesquiterpene lactones, phenolics, and flavonoids, which exert their antibacterial effect by disrupting the cell membranes, thereby inhibiting growth or causing bacterial death. For instance, methanolic extracts have exhibited inhibition zones of 30 mm against *S. aureus*. However, hydroethanolic extract showed minimum inhibitory concentrations (MIC) of 125 µg/mL against *K. pneumoniae*. Furthermore, *A. judaica* extracts demonstrated time-dependent bacterial killing effects similar to some antibiotics. These results highlight *A. judaica* as a promising source of natural antimicrobial agent for food preservation, prevention of foodborne infections, and serving as an alternative to synthetic preservatives and antibiotics.

Keywords: *Artemisia judaica*, antimicrobial, *Staphylococcus aureus*, *Klebsiella pneumoniae*, foodborne pathogens

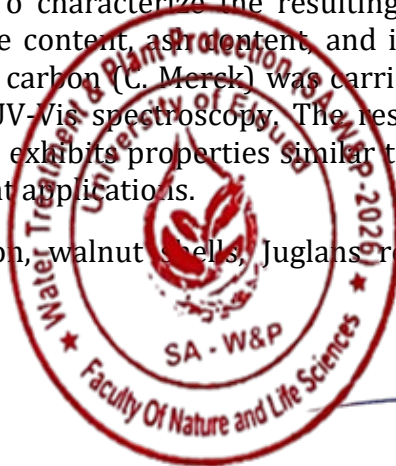
The conversion of Walnut shells (*Juglans regia*) biomass into activated carbon

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The disposal of organic waste poses a major environmental challenge (1) Activated carbon, which possesses highly developed pore structure, is widely used as adsorbents, catalysts and catalyst supports for the removal of pollutant (2). Walnut shells (*Juglans regia*) are an agricultural waste rich in carbon, making them a suitable raw material for the production of activated carbon. In an effort to valorize natural resources and reduce pollution, these shells were used to prepare activated carbon. The preparation method involved chemical activation using phosphoric acid followed by a carbonization step. To characterize the resulting material, several properties were studied: pH, moisture content, ash content, and iodine number. A comparison with commercial activated carbon (C. Merck) was carried out regarding the removal of methylene blue using UV-Vis spectroscopy. The results showed that the carbon derived from walnut shells exhibits properties similar to industrial carbon, making it suitable for water treatment applications.

Keywords: ctivated carbon, walnut shells, *Juglans regia*, carbonization, chemical activation, adsorption



Valorisation of Plant By-Products from Algerian Traditional Pharmacopoeia: Veterinary Use and Antibacterial Activity of *Pistacia lentiscus* Essential Oil

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The valorisation of plant by-products derived from traditional pharmacopoeia represents a promising approach for the development of sustainable and environmentally friendly therapeutic alternatives, particularly in veterinary medicine. Algeria, characterized by a rich and diverse flora, constitutes an important reservoir of medicinal plants that remains insufficiently explored and scientifically validated. This study aimed to assess the use of medicinal plants in veterinary practice in Eastern Algeria and to valorise plant by-products of *Pistacia lentiscus* through the evaluation of their antibacterial activity. An ethnoveterinary survey was conducted among 256 animal health professionals in the Wilaya of Souk-Ahras to investigate their practices, perceptions, and criteria regarding phytotherapy. The survey revealed that 53% of practitioners reported using medicinal plants in their professional activities. Leaves were the most commonly used plant part (69%), mainly administered as decoctions and macerations. The main therapeutic indications concerned infectious diseases, particularly bacterial and viral infections, as well as digestive disorders. The experimental phase focused on the extraction of essential oil from *Pistacia lentiscus* leaves by hydrodistillation, with a yield of 0.07%. The antibacterial activity of the essential oil was evaluated using the agar disc diffusion method against four reference bacterial strains. The results demonstrated antibacterial activity against three of the tested strains, with greater sensitivity observed in Gram-positive bacteria. *Staphylococcus aureus* showed the highest susceptibility, with an inhibition zone reaching 19.5 mm, while no inhibitory effect was observed against *Klebsiella pneumoniae*. Although the antibacterial activity was lower than that of conventional antibiotics, these findings confirm the bioactive potential of *Pistacia lentiscus* essential oil. Overall, this work highlights the relevance of valorising plant by-products from Algerian medicinal flora as a complementary strategy to conventional treatments and supports their potential integration into sustainable veterinary health management systems.

Keywords: Plant by, products, Valorisation, *Pistacia lentiscus*, Veterinary phytotherapy, Antibacterial activity

Emerging technologies in plant protection

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In the current context of global food security, farmers face increasing phytosanitary threats due to climate change and intensive agricultural practices. Traditional pest control methods are proving inadequate, necessitating the adoption of emerging technologies. This review explores the potential of drones and artificial intelligence (AI) to enhance crop management and protection. Based on case studies from various agricultural farms, this research examines the integration of drones for real-time crop monitoring over a six-month period, as detailed by Gonzalez et al. (2019). Simultaneously, AI algorithms were utilized to optimize the detection of diseases and pest infestations, as reported by Ko et al. (2021). Additionally, integrated pest management methods combining biopesticides and mechanical techniques were adopted to compare effectiveness on several farms, following the research of Khan et al. (2020). The findings indicate a 30% reduction in crop losses on plots utilizing drones for preventive monitoring (Zhang et al., 2020). Furthermore, AI applications have increased treatment efficiency by 25%, leading to a decrease in required inputs (Li and Zhang, 2022). Farmers adopting these technologies experienced yields up to 20% higher, averaging 8 tons per hectare for treated crops compared to 6.5 tons for those using traditional methods. These results emphasize the critical role of an integrated approach that improves productivity while promoting the sustainability of agricultural ecosystems. The integration of emerging technologies in plant protection signifies a vital advancement toward sustainable agriculture. Targeted education and training for farmers on these innovations are essential to maximize their benefits and ensure long-term food security, particularly in climate-affected areas.

Keywords: Emerging Technologies, Drones, Artificial Intelligence, Crop Protection, Sustainable Agriculture

⁸⁵ Speaker

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Valorisation of date palm pollen as a sustainable plant by-product in semen extenders: experimental evidence from chilled epididymal ram sperm

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One important tactic for developing sustainable and circular agricultural systems is the valorisation of agricultural plant byproducts. Rich in natural antioxidants and bioactive chemicals, date palm pollen (DPP), a plentiful but underutilised by-product of date palm agriculture in arid locations, is a promising natural additive for use in agricultural biotechnologies. The potential use of DPP as a natural addition in semen extenders to preserve epididymal ram sperm during refrigerated storage was assessed in this experimental study. Samples of epididymal sperm were taken from the testes of healthy rams as soon as they were slaughtered at a nearby slaughterhouse. Epididymal flushing was used to recover the spermatozoa, which were then diluted in an extender supplemented with date palm pollen extract at certain concentrations, along with a control one. Sperm quality was evaluated at pre-arranged intervals, while diluted samples were kept in chilling settings (4–5 °C). During the chilling period, standard microscopic techniques were used to assess sperm motility and viability, which were chosen as important functional indications of sperm preservation. The findings showed that, in comparison to the control group, extenders enriched with date palm pollen sustained noticeably higher sperm motility and viability over time. Specifically, samples with intermediate DPP concentrations showed a shorter reduction in sperm quality during chilling, indicating enhanced resilience to stress caused by the cold. The antioxidant and protective qualities of DPP bioactive components, which may stabilise sperm cell membranes and sustain metabolic function during storage, are probably responsible for these benefits. From a sustainability perspective, the use of date palm pollen encourages the value-adding of a locally accessible plant by-product, while the use of epididymal sperm recovered from killed animals adds to the effective use of animal genetic resources. This integrated approach to plant and animal biotechnology supports ecologically conscious livestock reproduction methods and is consistent with the ideas of the circular economy. In conclusion, date palm pollen shows great promise as a plant-based, sustainable supplement in semen extenders for chilled epididymal ram sperm. Its use may increase the effectiveness of sperm preservation while lowering reliance on artificial additives, supporting more environmentally friendly agricultural and reproductive biotechnology systems. To optimise concentrations and assess fertility results in field settings, more research is advised.

Keywords: Date palm pollen, plant by, product valorisation, epididymal sperm, semen extender, chilling preservation

⁸⁷ Speaker

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Green synthesis of eco-friendly fluorescent carbon dots from *Solanum melongena* L. Calyx for enhanced antioxidant activity.

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The escalating threat of oxidative stress has heightened the need for innovative, eco-friendly antioxidants. C-dots, with their distinctive physical and chemical attributes alongside straightforward surface modification, stand out as viable options in nanomedicine. This research explores the eco-conscious production of C-dots from the calyx of *Solanum melongena* fruits -an overlooked plant part- via an uncomplicated, economical pyrolysis process. The resulting C-dots displayed intense blue-green luminescence when exposed to UV radiation, excellent solubility in water, and a notable quantum efficiency. Their antioxidant capacity was evaluated through multiple assays and contrasted with that of the raw aqueous extract. In summary, these plant-derived C-dots from *Solanum melongena* calyx reveal strong potential as versatile nanomaterials for antioxidant purposes and wider biomedical roles, supporting green nanotechnology practices.

Keywords: C, dots, Green synthesis, *Solanum melongena* calyx, Antioxidant activity, Nanotechnology.



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Phytochemical characterization and multi-assay antioxidant capacity of *Mentha rotundifolia* L. from Constantine, Algeria: implications for sustainable agricultural applications

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The exploration and valorization of indigenous medicinal plants represent a sustainable and economically viable approach to developing natural antioxidants for agricultural and agro-industrial applications. *Mentha rotundifolia* L. (Apple Mint), a perennial aromatic herb from the Lamiaceae family, is widely distributed across the Constantine region of Algeria and has been traditionally used for its therapeutic and culinary properties. This study aimed to comprehensively investigate the phytochemical profile, total phenolic content (TPC), total flavonoid content (TFC), and multi-assay antioxidant capacity of organic extracts obtained from *M. rotundifolia* aerial parts collected from Constantine Province, Algeria. Plant materials were subjected to sequential extraction using solvents of increasing polarity (n-hexane, chloroform, ethyl acetate, and n-butanol) following initial maceration in 70% ethanol. Phytochemical quantification employed the Folin-Ciocalteu method for TPC determination and aluminum chloride colorimetric method for TFC assessment. Antioxidant activities were evaluated using four complementary and standardized assays: 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging, ferric reducing antioxidant power (FRAP), cupric ion reducing antioxidant capacity (CUPRAC), and phosphomolybdenum-based total antioxidant capacity (TAC). Results revealed that *M. rotundifolia* exhibited remarkably high total phenolic content, with the n-butanol extract showing the highest concentration (139.45 ± 9.01 mg gallic acid equivalents per gram extract). The chloroform extract demonstrated the highest flavonoid content (37.26 ± 0.27 mg quercetin equivalents per gram extract). Among all tested extracts, the ethyl acetate fraction displayed superior and consistent antioxidant capacity across all assays (TAC: 919.55 ± 3.86 mg ascorbic acid equivalents/g; FRAP: 919.55 mg Trolox equivalents/g; CUPRAC: 2.448 ± 0.19 absorbance units at $400 \mu\text{g/ml}$; DPPH: $95.82 \pm 0.07\%$ inhibition at $100 \mu\text{g/ml}$). Strong positive correlations were observed between total phenolic content and antioxidant capacity, particularly in polar extracts, suggesting that phenolic compounds are the primary contributors to the observed bioactivity. These findings highlight the exceptional potential of *M. rotundifolia* from Constantine as a sustainable and abundant source of natural antioxidants for diverse applications including crop protection formulations, food preservation systems, development of bio-based agricultural products, and integration into environmentally friendly agricultural practices that support both ecological sustainability and economic viability.

Keywords: *Mentha rotundifolia*, Phytochemical analysis, Antioxidant capacity, Sequential extraction, Sustainable agriculture

Ethnobotanical survey of medicinal plants used during the COVID-19 epidemic in the Sahara of Algeria

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The aim of this investigation is to identify the medicinal plants that the people of Touggourt province use to prevent and treat COVID-19. Using a questionnaire that includes a section on personal information, a second piece on COVID disease, and a final section on herbal medicines. Among interviewed people, 31% of reported persons use of phytotherapy alone and 64% reported using it in combination with medical treatment. More than 30 therapeutic plants from various botanical groups were found to be utilised by the respondents; the most commonly mentioned ones were from the Lamiaceae, Asteraceae, and Zingiberaceae families, including *Thymus vulgaris*, *Artemisia herba-alba*, and *Zyzygium aromaticum*. The most often utilised portions are the leaves and stems (36% and 35%, respectively), with the roots coming in second (17%). The estimated 97% happiness rating for using plants is much higher than the 3% discontent rate.

Keywords: Medicinal plant, Covid19, ethnobotanical study, Touggourt

Innovative Bioactive Formulation from *Artemisia campestris*: A Natural Multi-Functional Product for Antioxidant, Anti-Inflammatory, and Metabolic Health Applications

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Medicinal plants have been a major resource in traditional medicine, serving as a basis for modern therapeutics (Gurib-Fakim, 2006). *A. campestris*, a member of the Polygonaceae family, has received a lot of attention for its various pharmacological effects and capacity to withstand harsh weather conditions, this family contains 50 genera and approximately 1200 species of flowering weeds. The rich phytochemical profile of *A. campestris* highlights its traditional uses and emphasizes its untapped potential as a source of therapeutic agents, with its diverse flavonoids, phenolic acids, and coumarin derivatives, *A. campestris* holds promise as a natural remedy for a wide range of diseases, including inflammatory, metabolic, and infectious conditions. The plant's antioxidant, anti-inflammatory, antimicrobial, and anticancer properties position it as a candidate for developing novel therapeutic agents. Further research into its chemical composition and biological activities is warranted to fully exploit the therapeutic potential of *A. campestris* in modern medicine (Llauradó Maury et al. 2020). *Artemisia campestris* L. is a medicinal plant widely recognized for its rich phytochemical composition and broad pharmacological activities. Numerous studies have demonstrated its potent antioxidant, anti-inflammatory, hepatoprotective, nephroprotective, neuroprotective, antihyperlipidemic, antidiabetic, antihypertensive, and antimicrobial effects, largely attributed to its high content of flavonoids, phenolic acids, essential oils, and other bioactive molecules. This diverse therapeutic profile supports its value in both traditional and modern medicine. This study aims to develop an innovative natural bioactive product from *Artemisia campestris* L. and evaluate its potential health benefits by assessing its antioxidant, anti-inflammatory, and metabolic enzyme-modulating activities, while identifying and characterizing its principal bioactive compounds using UPLC and GC-MS to explore its potential as a safe, multifunctional natural health product.

Keywords: *Artemisia campestris*, Antioxidant, Anti, Inflammatory, Metabolic Health Applications

⁹³ Speaker

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Phenolic Profile and Cytotoxic Activity of the Aqueous Tuber Extract of *Arisarum vulgare* Against HT29 and HepG2 Cell Lines

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Arisarum vulgare tubers are widely used in Algerian folk medicine for the treatment of dermatological disorders, including eczema, burns, scars, and wounds, as well as for inflammatory and tumor-like conditions. Despite these traditional applications, information regarding their phytochemical composition and biological activity remains limited. The present study aimed to characterize the phenolic profile of the aqueous extract of *A. vulgare* tubers prepared by traditional maceration and to evaluate its in vitro cytotoxic potential against selected human cancer cell lines. The phenolic composition of the extract was analyzed using LC-ESI-MS/MS, while cytotoxic activity was assessed by the MTT assay against HT29 (human colorectal carcinoma) and HepG2 (human hepatocellular carcinoma) cell lines following 24 and 48 h of exposure at concentrations ranging from 1.56 to 100 $\mu\text{g}/\text{mL}$. Chemical profiling revealed that the extract was predominantly rich in phenolic acids, with coumarin (96.026 $\mu\text{g}/\text{g}$ extract), 4-hydroxybenzoic acid (94.974 $\mu\text{g}/\text{g}$ extract), ferulic acid (76.021 $\mu\text{g}/\text{g}$ extract), vanillic acid (32.823 $\mu\text{g}/\text{g}$ extract), and sinapic acid (23.275 $\mu\text{g}/\text{g}$ extract) as the major constituents. Flavonoid compounds such as epicatechin, quercetin, and rutin were not detected under the applied analytical conditions. The aqueous extract exhibited a concentration- and time-dependent reduction in cell viability in both cancer cell lines, with pronounced antiproliferative effects observed at higher concentrations (50 and 100 $\mu\text{g}/\text{mL}$), particularly after 48 h of treatment. IC_{50} values indicated that HepG2 cells were more sensitive to the extract than HT29 cells, suggesting cell-type-dependent cytotoxic activity. Overall, the findings demonstrate that the phenolic acid-rich aqueous extract of *A. vulgare* tubers possesses notable in vitro antiproliferative activity, providing scientific support for its traditional medicinal use. Further studies are required to elucidate the underlying mechanisms of action and to confirm these effects through in vivo investigations.

Keywords: *Arisarum vulgare*, aqueous extract, LC, MS/MS, phenolic compounds, cytotoxicity, HT29, HepG2

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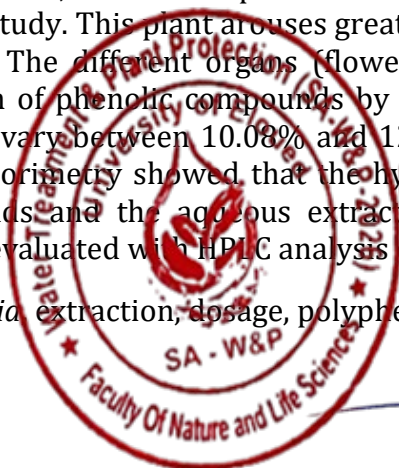
Dosage and identification of polyphenols and flavonoids in different extracts of *Deverra scoparia* Coss & Dur (Apiaceae)

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The Algerian flora contains a great diversity of medicinal plants, which today represent an essential source for the discovery of new biomolecules highly effective against many diseases. This work aims to contribute to the valorization of a plant endemic to the Algerian Sahara, *Deverra scoparia* Coss & Dur (Apiaceae), through the first stage of an analytical study. This plant arouses great interest in folk medicine due to its abundant local use. The different organs (flowers, stems) of the plant were subjected to the extraction of phenolic compounds by water and 70% ethanol. The extraction yields obtained vary between 10.08% and 12.84%. The semi-quantitative analysis carried out by colorimetry showed that the hydro-ethanolic extract is very rich in phenolic compounds and the aqueous extract has the highest content of flavonoids, this study was evaluated with HPLC analysis of both extracts.

Keywords: *Deverra scoparia*, extraction, dosage, polyphenols, flavonoids, HPLC.



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Preparation of a nutritional supplement based on nanoparticles from moringa leaf extract for liver disease

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This research focused on the green synthesis of zinc oxide (ZnO), selenium (Se), and zinc oxide-grafted selenium nanoparticles using Moringa leaf extract. This environmentally friendly approach reduces the use of toxic chemicals, aligning with sustainable practices. The synthesized nanoparticles were precisely characterized using various techniques, including UV-Vis spectroscopy for optical properties, Fourier transform infrared spectroscopy for chemical bonds, X-ray diffraction for crystal structure, and scanning electron microscopy for morphological analysis. A key aspect of the study was investigating the antioxidant, anti-inflammatory, and antimicrobial properties of the nanoparticles. These properties are crucial in the treatment of liver diseases, where oxidative stress and inflammation play a significant role in their pathogenesis. In vitro and animal experiments were conducted to evaluate the potential therapeutic effects of the nanoparticles. Biochemical and hematological analyses, as well as liver histological studies, were conducted to assess the safety and efficacy of the nanoparticles in vivo. The results of this comprehensive study demonstrate the promising potential of Moringa oleifera-derived nanoparticles as a natural treatment for liver diseases. These nanoparticles exhibited significant antioxidant and anti-inflammatory activity, indicating their ability to mitigate liver damage and promote healing. However, further research is still needed to fully understand their mechanisms of action and to optimize dosage and administration for clinical applications. This research contributes to the growing body of knowledge about the therapeutic potential of Moringa oleifera and paves the way for the development of new natural treatments for liver diseases.

Keywords: Moringa oleifera, nanoparticles, liver disease, dietary supplement

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Protective Role of Herbal Treatments Against Oxidative Stress–Induced Renal Damage in Experimental Animals

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The present study evaluated the protective and therapeutic effects of selected medicinal plants against chemically induced nephrotoxicity in Wistar rats. Renal injury was experimentally induced using two environmental toxicants, benzene and lead acetate. In the first experiment, male rats were exposed to benzene (100 mg/kg body weight) in drinking water for 15 weeks and treated with an aqueous extract of *Atriplex halimus* either preventively throughout the exposure period or curatively during the last 30 days. In the second experiment, female rats received lead acetate (100 mg/kg body weight) in drinking water for 75 days and were treated during the final 15 days with *Aristolochia longa* rhizome powder and/or *Aquilaria malaccensis* heartwood powder (1% w/w of diet). Exposure to benzene and lead produced significant renal dysfunction, evidenced by elevated serum urea, creatinine, uric acid, and blood glucose levels. Lipid peroxidation was markedly increased, as indicated by higher malondialdehyde levels, while antioxidant defenses were impaired, with decreased glutathione content and reduced activities of catalase and glutathione-S-transferase. Histopathological examination revealed severe glomerular and tubular alterations in the kidneys of intoxicated animals. Treatment with the investigated plants improved biochemical parameters, restored antioxidant status, and attenuated renal histological damage. Preventive administration of *Atriplex halimus* demonstrated stronger protective effects than curative treatment, while *Aristolochia longa* and *Aquilaria malaccensis*, administered individually or in combination, partially restored renal structure and function in lead-exposed rats. These findings suggest that the studied medicinal plants exert significant nephroprotective effects, likely mediated through their antioxidant properties, and may represent promising natural agents for protecting against environmental pollutant-induced kidney injury.

Keywords: Antioxidants, Experimental animals, Medicinal plants, Nephroprotection, Oxidative stress, Renal toxicity

Ethnobotanical Survey of Wild Medicinal Plants for Irritable Bowel Syndrome Treatment in Oued Souf , Algeria

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The local community in Oued Souf Governorate, Algeria, boasts a rich heritage in utilizing wild medicinal plants for treating gastrointestinal disorders, particularly irritable bowel syndrome (IBS). Despite pharmaceutical advancements, many patients rely on traditional remedies, yet local ethnobotanical knowledge remains underexplored. This study investigates the most common wild medicinal plants used for IBS, alongside community perceptions of their efficacy. A descriptive field study employed a structured questionnaire with 214 participants across varied ages, education levels, and genders, capturing socio-demographic data, plant species, parts used, preparation methods, and perceived effectiveness. Results identified significant plant diversity, with *Artemisia herba-alba* (65.1%), *Mentha pulegium* (4.2%), and *Thymus vulgaris* (3.7%) as the most frequently cited. Other important plants were also counted. Leaves predominated (55%), and the method (infusion 45%, decoction 51%) was deemed most effective. These findings highlight traditional plant medicine's role in IBS management and underscore the need for experimental validation of efficacy and safety. This work bridges a key ethnobotanical knowledge gap in Oued Souf, laying groundwork for phytopharmaceutical research.

Keywords: Ethnobotany, Oued Souf, wild medicinal plants, IBS, questionnaire.

Extraction, HPLC Characterization, and Antioxidant Activities Of Hydro-Methanolic Extract From Date Palm Seeds (*Phoenix Dactylifera L.*); Ghars Variety

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Date palm seeds (*Phoenix dactylifera L.*) represent an underutilized agricultural by-product rich in bioactive compounds. This study investigated hydro-methanolic extraction and biological activities of Ghars variety date seeds from Oued Souf, Algeria. Defatted seeds were extracted with methanol-water (70:30, v/v) at 80°C for 4 hours, yielding 12.5% extraction efficiency. Phytochemical analysis revealed total phenolic content of 59.0 mg GAE/g, total flavonoids of 85.94 mg QE/100g, and tannins of 22.89%. HPLC-DAD identified seventeen phenolic compounds with procyanidin B1 (8.45 mg/g), catechin (7.32 mg/g), epicatechin (6.12 mg/g), and gallic acid (4.89 mg/g) as major components. Two compounds, naringenin (0.87 mg/g) and rutin (0.74 mg/g), were identified in date seeds for the first time. Antioxidant assays demonstrated potent activities: DPPH scavenging IC₅₀ 42.3 µg/mL, ABTS IC₅₀ 38.7 µg/mL, FRAP 627.4 µmol Fe²⁺/g, and hydroxyl radical scavenging 79.2%. Antimicrobial activity against *S. aureus*, *S. epidermidis*, *E. coli*, and *P. aeruginosa* showed inhibition zones of 12-18 mm. Enzyme inhibition assays revealed α-glucosidase IC₅₀ 156 µg/mL and α-amylase IC₅₀ 178 µg/mL, indicating antidiabetic potential. These findings demonstrate that hydro-methanolic extraction yields a bioactive-rich extract with significant antioxidant, antimicrobial, and enzyme inhibitory properties, positioning date seed waste as a valuable source for pharmaceutical and nutraceutical applications in sustainable valorization strategies.

Keywords: Date seeds, Hydro, methanolic extraction, HPLC analysis, Phenolic compounds, Antioxidant activity

Phytochemical Analysis And Biological Activity Evaluation Of The Hydromethanolic Extract Of Fenugreek (*Trigonella Foenum-Graecum L.*) Seeds Locally Cultivated In El-Oued Region, Algeria

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Fenugreek (*Trigonella foenum-graecum* L.) seeds represent a valuable medicinal resource widely used in traditional North African medicine. This study investigated the phytochemical composition and biological activities of hydromethanolic extract (75:25, v/v) from fenugreek seeds cultivated in El-Oued, Algeria. Seeds were macerated at room temperature for 48 hours, yielding 13.38% extraction efficiency. Phytochemical analysis revealed total phenolics of 47.33 mg GAE/g, flavonoids of 88.57 mg QE/g, condensed tannins of 13.62 mg CE/g, and hydrolysable tannins of 4.05 mg TAE/g. HPLC-DAD identified six major compounds: protocatechuic acid, vanillic acid, luteolin, epigallocatechin gallate, apigenin, and rutin. HPLC-MS analysis confirmed twenty-seven flavonoid glycosides including vicenin-2, vicenin-1, schaftoside, isoorientin, orientin, isovitexin, vitexin, and quercetin 3-O-rhamnoside. Antioxidant assays demonstrated DPPH IC₅₀ of 31.53 mg/L, FRAP EC₅₀ of 1.32 g/L (21.49 mg AAE/g), and TAC of 74.53 mg AAE/g. The extract showed significant α -amylase inhibition (IC₅₀ = 63.52 μ g/mL), superior to acarbose (IC₅₀ = 60.93 μ g/mL). Molecular docking revealed strong flavonoid binding to α -amylase with schaftoside and quercetin 3-rhamnoside showing -8.7 and -8.6 Kcal/mol binding scores. These findings demonstrate that hydromethanolic extraction of fenugreek seeds from El-Oued yields a bioactive-rich extract with potent antioxidant and antidiabetic properties, positioning this cultivar as a valuable source for pharmaceutical and nutraceutical applications in Algeria

Keywords: Fenugreek seeds, Hydromethanolic extraction, HPLC analysis, Antioxidant activity, Antidiabetic potential

A Literature Review on the Antiproliferative and Antiviral Effects of Essential Oils of *Artemisia* and *Lamiaceae* Families from Algerian Flora

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The flora of Algeria, forming a critical transition zone between the Mediterranean climate in the north and the extreme conditions of the Sahara Desert in the south, holds strategic importance for medicinal plants due to its high rate of endemism and phytochemical diversity. This review aims to investigate the phytochemical profiles and the molecular bases of biological activities of species belonging to the *Asteraceae* and *Lamiaceae* families, which stand out with the morphological and physiological adaptations they have developed against the harsh ecological conditions of the region. Essential oils, synthesized as a defense strategy to survive under drought and high-temperature stress, lie at the center of the pharmacological potential of these plant groups. Analyses performed using Gas Chromatography-Mass Spectrometry (GC-MS), one of the leading modern analytical methods, reveal that representatives of both families contain a chemical matrix quite rich in monoterpenes such as 1,8-cineole, camphor, thujone, borneol, and alpha-pinene. The high lipophilic character of these detected terpenoids endows them with the ability to interact with biological membranes and disrupt the integrity of cellular and viral structures. When evaluated in terms of antiproliferative activity, it is observed that these volatile components pass through cancer cell membranes, suppress intracellular signaling pathways, and trigger apoptosis; furthermore, providing selective cytotoxicity by showing minimal toxic effects on healthy cells offers a critical advantage regarding therapeutic reliability. A similar mechanism is observed in antiviral activity, where the entry and proliferation of viruses into the host cell are prevented by the disintegration of lipid-structured viral envelopes and the inhibition of viral replication enzymes. However, findings in the literature emphasize that this potent biological response stems from the synergistic interaction formed by the major and minor components within the essential oil, rather than a single molecule. Consequently, essential oils from the Algerian *Asteraceae* and *Lamiaceae* families, thanks to their multi-targeted mechanisms of action, represent powerful natural resources that should be evaluated as new-generation drug candidates in both cancer treatment and the control of viral infections.

Keywords: Asteraceae, Lamiaceae, Essential oils, Selective cytotoxicity, Antiviral activity

¹⁰⁵ Speaker

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A Literature Review on the Evaluation of Phenolic Compounds Obtained by Recycling Agricultural Wastes Within the Scope of Sustainable Agriculture as Antiviral Agents

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Production activities intensifying to meet the food and industrial product demand of the rapidly increasing world population cause millions of tons of agricultural industrial waste to be released on a global scale every year. These organic wastes, which are mostly left to the environment, burned, or left to rot in landfills considering they have no economic value, constitute a serious source of environmental pollution and also mean the loss of potential biomass energy. Simultaneously, the spread of viral pathogens posing a threat to both agricultural production and public health is increasing; however, problems such as the high cost, toxic side effects, and resistance development of existing antiviral agents and synthetic chemical drugs make the struggle difficult. In this context, within the framework of sustainable agriculture and circular economy principles, evaluating agricultural wastes not just as trash to be disposed of, but as a cheap and abundant raw material source for the recovery of high value-added bioactive molecules has become a strategic necessity. This review study examines the potential use, chemical profiles, and mechanisms of action of phenolic compounds obtained by recycling agricultural by-products as broad-spectrum antiviral agents in the light of literature. Performed phytochemical characterization studies show that citrus peels, pomegranate wastes, grape pomace, and olive industry by-products, in particular, are rich reservoirs in terms of phenolic structures such as hydroxytyrosol, hesperanol, hesperidin, punicalagin, and quercetin. The antiviral efficacy of these phenolic extracts occurs through a general biochemical mechanism independent of the virus type. Findings in the literature explain this mechanism on three basic axes. First, the virucidal effect is the disruption of virion integrity by phenolic compounds physically interacting with the protein coat or lipid envelope forming the outer structure of the virus, rendering the virus unable to cause infection. Second, adsorption inhibition is the prevention of the virus from binding to host cell receptors and entering the cell by blocking the attachment proteins on the virus surface. Third, Replication Inhibition is the stopping of viral proliferation by inhibiting critical enzymes such as polymerase and protease used by viruses that succeed in entering the cell to copy their genetic material. The use of these natural extracts obtained from agricultural wastes as antiviral agents offers a much lower cost and safer alternative compared to synthetic chemicals. Furthermore, this approach reduces the carbon footprint by decreasing the waste load and adds an integrated economic value to agricultural production. As a result, waste-derived phenolic compounds have great potential as eco-friendly and sustainable natural bioactive substances that should be evaluated in future biomedical and agricultural applications.

Keywords: Sustainable Agriculture, Agricultural Waste Recycling, Phenolic Compounds, Antiviral Activity, Circular Economy

¹⁰⁷ Speaker

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A Literature Review on the Antiviral Potential and Mechanisms of Action of Essential Oils in Combating Plant Viruses Within the Scope of Sustainable Agriculture

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One of the biggest problems encountered in agricultural production is the diseases caused by plant viruses and the serious yield losses caused by these diseases. Today, synthetic chemical pesticides are used intensively to combat these viruses and the insects that carry them. However, the unconscious use of these chemicals leads to pollution in soil and water resources, threatens human health, and causes harmful organisms to gain resistance against these drugs over time. These negativities have made it mandatory to develop safer, environmentally compatible, and sustainable new control methods in agriculture. This review study examines the use potential and mechanisms of action of essential oils, produced by plants as a natural defense mechanism against viruses that damage agricultural products. Performed chemical analyses show that essential oils are quite rich in terms of terpenes and phenolic compounds. The most important feature of these components is their high ability to dissolve in oil. Thanks to this feature, essential oils easily overcome biological barriers and show effect against viruses in three different ways. The first is directly targeting the structure of the virus; oil components prevent the virus from proliferating by fragmenting the outer coat of the virus or disrupting its genetic material. The second is the prevention of carriers; by showing a repellent effect against harmful insects such as aphids and whiteflies that carry viruses from plant to plant, the spread of the virus is stopped from the very beginning. The third and most remarkable one is the stimulation of the plant's own immune system. When essential oils are applied to the plant, the plant activates defense mechanisms as if there is an attack and becomes resistant to the virus. The biggest obstacle in transferring these successful results obtained in laboratory studies to the field is that volatile oils evaporate quickly in the open air. However, the use of methods such as nano-encapsulation with developing technology can ensure that these oils maintain their effect for a long time. As a result, essential oils are a much safer option compared to harmful chemicals and should be evaluated as a promising natural resource for the control of plant viruses in agriculture in the future process.

Keywords: Sustainable Agriculture, Essential Oils, Plant Viruses, Biological Control, Antiviral Activity

¹⁰⁹ Speaker

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Assessment of climate change in konya closed basin within the framework of water flow observation

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One of today's current problems is climate change. Climate change has become the most talked about global problem on a global scale. In the world and in our country, climate change is increasing day by day and is manifesting itself with devastating effects. The duration, frequency and severity of extreme weather events are increasing and have devastating consequences. Excessive rainfall, extreme heat, heat and cold waves lead to drought, severe storms, forest fires, floods and inundations, loss of life and property. It is known that the most fundamental causes of climate change are increasing greenhouse gases and environmental pollution. It is thought that Turkey will be negatively affected by climate change and will have a hotter and drier climate structure in the near future, with a more uncertain climate structure in terms of precipitation amount and intensity. In the study conducted on how the effects of global climate change such as drought, flood and inundation may cause changes on rivers, the changes in the flow rates measured in rivers and streams in the sub-basins of the Konya closed basin were examined and the irregularities in the flow rates were tried to be revealed with statistical averages

Keywords: Climate change, Drought, Flood, Konya Closed Basin

¹¹¹ Speaker

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The importance of using treated water in agriculture under changing climate conditions

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Climate change is intensifying water scarcity, increasing variability in precipitation patterns, and placing unprecedented pressure on agricultural water resources. Under these changing climatic conditions, the use of treated water has emerged as a critical strategy for sustaining agricultural production and enhancing water security. Treated wastewater and alternative water sources offer significant potential to supplement conventional irrigation supplies, particularly in arid and semi-arid regions where freshwater availability is increasingly limited. This study examines the importance of using treated water in agriculture within the context of climate change adaptation. It evaluates the role of treated water in maintaining crop productivity, improving water-use efficiency, and reducing dependence on overexploited freshwater resources. The study also addresses the potential risks associated with treated water use, including salinity, pathogen transmission, and the accumulation of contaminants, and discusses management practices required to mitigate these challenges. Drawing on recent scientific evidence and selected case studies, the study highlights that properly treated and well-managed water resources can support resilient agricultural systems while contributing to environmental sustainability. Furthermore, the integration of treated water into agricultural practices is discussed as a key component of climate-resilient farming strategies, particularly when aligned with appropriate regulatory frameworks, monitoring systems, and farmer awareness programs. The study concludes that expanding the safe and efficient use of treated water in agriculture is essential for adapting to climate change, ensuring long-term food security, and promoting sustainable water management at both local and global scales.

Keywords: Wastewater Reuse in Agriculture, Water Scarcity, Climate, Resilient Farming, Treated Water Reuse

¹¹³ Speaker

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Pimpinella anisum Essential Oil as a Potential Therapeutic Agent Against pesticide induced Kidney Injury in Wistar rats

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Exposure to pesticides represents a significant environmental health problem, with nephrotoxic effects increasingly acknowledged in workplaces and communities. This study investigated the protective role of *Pimpinella anisum* essential oil (PAEO) against imidacloprid (IMI) and lufenuron (LUF) induced kidney damage in Wistar rats. Male Wistar rats were randomly allocated into multiple experimental groups receiving IMI, LUF, PAEO, or combinations thereof over an extended treatment period. Both IMI and LUF significantly elevated serum creatinine, urea, and uric acid compared to controls, with combined treatment producing the most dramatic increases in these biomarkers. Oxidative stress analysis revealed substantial elevation in malondialdehyde (MDA) levels with combined treatment, alongside significant depletion of antioxidant enzyme activities. Histopathology showed distinct patterns: imidacloprid caused acute tubular necrosis with severe epithelial degeneration and vacuolization, while lufenuron produced chronic interstitial nephritis with tubular atrophy. Combined exposure resulted in synergistic nephrotoxic lesions including glomerular sclerosis and fibrosis. Co-treatment with PAEO appeared to ameliorate these alterations, with potential reductions in creatinine levels and possible restoration of antioxidant enzyme activities. This research suggests that PAEO may exhibit nephroprotective effects against IMI and LUF induced kidney injury, possibly through antioxidant related mechanisms. These preliminary findings could provide insights for developing therapeutic interventions for pesticide-exposed populations, though further investigation is warranted to confirm these observations.

Keywords: Nephrotoxicity, Imidaclopride, lufenuron, oxidative stress biomarkers, pimpinella anisum

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Effect of enrichment with bioactive substances from *Berberis vulgaris* on the antioxidant and antibacterial profiles of *Opuntia ficus-indica* vinegar

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This study aims to valorize natural products with bioactive potential, specifically prickly pear vinegar (*Opuntia ficus-indica*). The research focused on enriching this vinegar with bioactive compounds derived from *Berberis vulgaris*, a plant renowned for its high berberine and phenolic content. Phytochemical analysis was conducted to estimate total phenolic and flavonoid contents. The results demonstrated a significant increase in secondary metabolite concentrations following enrichment, confirming the efficiency of the process. Antimicrobial assays revealed that the antibacterial activity of the enriched vinegar was significantly enhanced, although some resistance was observed in certain strains, particularly *Escherichia coli*. In conclusion, enriching *Opuntia ficus-indica* vinegar with *Berberis vulgaris* extracts represents an effective strategy for formulating a natural product with potent antioxidant and improved antimicrobial properties.

Keywords: *Opuntia ficus-indica* vinegar, *Berberis vulgaris*, Bioactive compounds, Phenolic content, Antioxidant activity, Antibacterial properties, Enrichment, Functional food.

¹¹⁷ Speaker

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Green Innovations for the Valorization of Palm Grove Waste in the Service of Sustainable Agriculture

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Each year, palm groves generate significant quantities of agricultural waste, contributing to resource depletion and environmental degradation. This research explores green innovations for waste valorization in support of sustainable agriculture, specifically the production of compost and biochar from palm grove waste using a mixture containing 80% plant waste and 20% animal waste. Biochar was produced through pyrolysis at temperatures above 300 °C. The composting process consisted of alternating layers of these materials, forming a pile approximately one meter high. Temperature, moisture and pH were measured daily using a portable thermometer. The pile was regularly turned and watered to maintain adequate aeration and ensure optimal decomposition. Once mature, the compost and biochar were analyzed in the laboratory to determine their physicochemical characteristics, including pH, electrical conductivity (EC), organic matter content, carbon (C), nitrogen (N), phosphorus (P), potassium (K), magnesium (Mg) and calcium (Ca). The carbon-to-nitrogen (C/N) ratio was also calculated. The quality and physicochemical properties of the compost and biochar contribute significantly to the improvement of degraded soils by enhancing water retention capacity, supplying essential nutrients (N, P, and K), stimulating microbial activity, and improving soil structure. By promoting these green innovations, the valorization of palm grove waste emerges as a major lever for the transition toward sustainable and resilient agriculture. It contributes to responsible resource management, the reduction of greenhouse gas emissions, and the strengthening of agricultural systems in oasis areas

Keywords: Compost, Biochar, the Valorization, Green Innovations, Sustainable Agriculture

Ethnobotanical Survey of Complementary Plants for Lung Cancer Chemotherapy in El-Oued, Algeria

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Lung cancer remains a leading cause of death worldwide, and chemotherapy often causes serious side effects that lead patients to seek complementary therapies. Although there is extensive traditional knowledge of plants in regions of Algeria, such as the Oued Righ and Oued Souf, there is a significant lack of information regarding the use of plants in conjunction with chemotherapy, and documentation of what patients and physicians actually do is limited. This study addresses the problem of the undocumented traditional use of plants to alleviate chemotherapy-related symptoms in lung cancer patients in Algeria. The main objective is to identify common plants, their preparation methods, and patterns of use through an ethnobotanical survey. A cross-sectional field study was conducted using a structured questionnaire distributed to lung cancer patients and oncologists in local hospitals in Cac El-Oued (target sample: 120 participants). Data included demographic information, plant species, parts used, preparation methods, routes of administration, and expected efficacy/side effects. The results indicated that *Artemisia herba-alba* was the most commonly used complementary plant for lung cancer treatment (61% of cases), followed by *Ephedra alata* (25%). Males comprised 70% of patients, the majority of whom had stage IV disease (47%), and smoking was the leading cause (84%). *Ephedra alata* also exhibited higher polyphenol content (2,200 vs. 0.200 mg quercetin equivalent/g dry weight), higher flavonoid levels (0.6 vs. 0.5 mg quercetin equivalent/g dry weight), and greater antioxidant/antibacterial activity compared to *Artemisia herba-alba*. These findings warrant further clinical studies to investigate the efficacy of these plants.

Keywords: Ethnobotanical, Lung cancer, Ephedra spp, Artemisia spp, activity.

Effect of seeding dates on vegetative growth and yield components of three varieties of pearl millet (*Pennisetum glaucum* (L.) R. Br.)

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This study evaluates how sowing date influences vegetative growth and yield in three pearl millet (*Pennisetum glaucum* (L.) R. Br.) varieties during the 2024 season in Naâma, an arid region with limited water resources. Pearl millet is vital for food, feed, and fodder due to its resilience to harsh climates and poor soils. The experiment used a split-plot block design with two sowing dates-June 2 and July 2-and three millet varieties. It assessed vegetative growth, biomass, dry matter, and green fodder yields to determine the optimal sowing date for each variety under local conditions. Results showed significant effects of sowing date and genotype on agronomic performance. Sowing on June 2 yielded better vegetative growth, biomass, and yields than July 2. The V1 (Adrar) and V2 (Tunisia3) varieties exhibited high biomass and adaptability to semi-arid conditions, making them suitable for forage. Conversely, the V3 (Tunisia1) variety had lower biomass, indicating a grain-focused trait. This research underscores the importance of selecting appropriate sowing dates and varieties to enhance productivity and sustainability in dryland agriculture.

Keywords: pearl millet (*Pennisetum glaucum*), sowing date, efficiency, biomass, arid zones, fodder.



Study of the phytochemical, mineral and antioxidant activity of the medicinal plant *Launaea glomerata* in Algeria

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The plant *Launaea glomerata* is used in traditional medicine in some regions of North Africa to treat digestive disorders such as stomach pain and indigestion. It is sometimes considered a mild laxative and diuretic, and is also used to relieve minor inflammations. Some laboratory studies indicate that it contains antioxidant compounds such as flavonoids and phenolic compounds. In this study, the total content of phenols and flavonoids was studied, as well as the antioxidant activity by three methods (DPPH, ABTS, CAT) and the qualitative and quantitative estimation of some minerals.

Keywords: Methanolic extract, antioxidant activity, DPPH, ABTS, CAT.



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Phytochemical Profiling and Antioxidant Potential of the Halophytic Plant *Suaeda vera*

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Halophytic plants are increasingly recognized as valuable reservoirs of bioactive secondary metabolites due to their adaptation to saline and oxidative stress conditions. In this context, the present study aimed to characterize the phytochemical composition and evaluate the antioxidant capacity of an aqueous extract of *Suaeda vera*. Preliminary qualitative screening revealed the presence of major classes of secondary metabolites, including phenolic compounds, flavonoids, tannins, and saponins. Quantitative analyses were performed to determine total phenolic content (TPC) and total flavonoid content (TEC), providing insight into the bioactive richness of the extract. The antioxidant potential was assessed in vitro using DPPH radical scavenging and Ferric Reducing Antioxidant Power (FRAP) assays. The aqueous extract demonstrated a concentration-dependent free radical scavenging activity and significant ferric reducing capacity. The antioxidant performance observed is strongly associated with the abundance of phenolic constituents, known for their redox properties and ability to act as hydrogen or electron donors. Overall, the findings suggest that *Suaeda vera* represents a promising natural source of antioxidant compounds. The study contributes to the growing interest in halophytic plants as sustainable resources for the development of phytotherapeutic and nutraceutical applications.

Keywords: Halophytic plant, Phytochemical profiling, Total phenolic content, DPPH assay, FRAP assay.

¹²⁴ Speaker

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Integrated Phytochemical and Pharmacological Investigation of the Anti-Inflammatory Potential of *Cucurbita maxima* Leaf Aqueous Extract

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Inflammation is a key pathological process involved in numerous chronic disorders, and the search for safer multi-target therapeutic agents from natural sources remains an important research priority. In this context, the present study aimed to comprehensively evaluate the anti-inflammatory potential of an aqueous extract obtained from the leaves of *Cucurbita maxima* through a multidisciplinary strategy combining phytochemical profiling with biological and computational investigations. The chemical composition of the extract was characterized using UPLC–ESI–MS/MS analysis, which revealed a polyphenol-rich profile dominated by caffeic acid, along with significant amounts of rutin, ferulic acid, and myricetin derivatives. The anti-inflammatory activity was assessed *in vitro* using a protein denaturation inhibition assay and *in vivo* using a benzylthiourea-induced inflammation model in Wistar rats. Treatment with the extract significantly attenuated systemic inflammation, as evidenced by normalization of white blood cell counts, reduction of C-reactive protein levels, and marked protection of hepatic and renal tissues confirmed by biochemical and histopathological analyses. Molecular docking studies demonstrated strong binding affinities of several major phytoconstituents toward cyclooxygenase-1 and cyclooxygenase-2, suggesting a plausible mechanism involving modulation of key inflammatory enzymes. In addition, ADMET predictions indicated favourable pharmacokinetic characteristics, low acute toxicity, and absence of major safety concerns for most compounds. Overall, the findings provide scientific support for the traditional use of *Cucurbita maxima* leaves and highlight their potential as a natural source of bioactive molecules with multi-target anti-inflammatory and organ-protective effects. Further studies focusing on the isolation of active constituents and clinical validation are warranted to advance their therapeutic development.

Keywords: Aqueous leaf extract, Anti, inflammatory activity, Polyphenols, UPLC–ESI–MS/MS, COX, 1, COX, 2, *In vitro* and *in vivo* evaluation.

¹²⁶ Speaker

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Phytochemical Composition and In Vitro Assessment of the Anti-Inflammatory Activity of *Capparis spinosa* L. Extract

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Inflammation is a fundamental biological response implicated in the pathogenesis of numerous chronic disorders, including metabolic and cardiovascular diseases. Medicinal plants have gained considerable attention as potential sources of safer anti-inflammatory agents. This study aimed to evaluate the phytochemical profile and in vitro anti-inflammatory activity of *Capparis spinosa* L. extract. Ethanolic extraction was performed, followed by phytochemical screening to identify bioactive constituents such as flavonoids, phenolics, and tannins. The anti-inflammatory potential was assessed using protein denaturation inhibition and cyclooxygenase (COX) inhibition assays. The extract demonstrated a significant and dose-dependent reduction in inflammatory markers compared to the control group. The biological activity observed may be attributed to the presence of phenolic compounds known for their capacity to modulate inflammatory pathways and oxidative stress. These findings suggest that *Capparis spinosa* L. extract possesses promising anti-inflammatory properties and may serve as a potential natural therapeutic agent. Further pharmacological and mechanistic studies are recommended to elucidate its mode of action and clinical applicability.

Keywords: *Capparis spinosa* L., anti-inflammatory activity, protein denaturation assay, COX inhibition, medicinal plants.

¹²⁸ Speaker

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Phytochemical Characterization and In Vitro Evaluation of the Antidiabetic Potential of *Capparis spinosa* L. Extract

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Diabetes mellitus is a major global health concern characterized by persistent hyperglycemia and metabolic dysregulation. Natural products represent a promising source of safer therapeutic alternatives for glycemic control. The present study aimed to investigate the phytochemical composition and in vitro antidiabetic activity of *Capparis spinosa* L. extract. The plant material was subjected to ethanolic extraction, followed by qualitative phytochemical screening to identify major bioactive constituents, including phenolic compounds, flavonoids, alkaloids, and tannins. The antidiabetic potential was evaluated through inhibitory assays targeting α -amylase and α -glucosidase, two key enzymes involved in carbohydrate digestion and postprandial glucose regulation. The extract exhibited significant, concentration-dependent inhibition of both enzymes, suggesting its ability to delay carbohydrate hydrolysis and reduce glucose absorption. The observed activity is likely attributed to its rich phenolic and flavonoid content. These findings highlight *Capparis spinosa* L. as a promising natural candidate for the management of postprandial hyperglycemia. Further in vivo investigations and toxicological assessments are required to confirm its therapeutic efficacy and safety profile.

Keywords: *Capparis spinosa* L, antidiabetic activity, α , amylase inhibition, α , glucosidase inhibition, phytochemicals

¹³⁰ Speaker

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Chemical Composition and Molecular Docking Analysis of *Artemisia herba-alba* Asso Essential Oil

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Essential oils derived from medicinal plants are recognized as valuable sources of bioactive compounds with diverse pharmacological properties. This study aimed to investigate the chemical composition of the essential oil extracted from *Artemisia herba-alba* Asso and to evaluate the potential biological activity of its major constituents using molecular docking analysis. The essential oil was obtained from the aerial parts of the plant by hydrodistillation, and its chemical profile was characterized using gas chromatography coupled with mass spectrometry (GC–MS). The analysis revealed that the essential oil is rich in monoterpenes and sesquiterpenes, with major constituents including camphor, 1,8-cineole, α -thujone, and β -thujone. To gain insight into the possible molecular mechanisms underlying its biological activity, molecular docking studies were performed to assess the binding affinity of the main identified compounds toward selected target proteins involved in inflammation and oxidative stress pathways. The docking results demonstrated favorable binding energies and stable ligand–protein interactions for several constituents, suggesting a strong affinity toward the active sites of the selected targets. These interactions were mainly driven by hydrogen bonding and hydrophobic interactions, indicating potential inhibitory effects at the molecular level. The combined GC–MS and molecular docking results highlight the pharmacological potential of *Artemisia herba-alba* essential oil and support its traditional use in herbal medicine. Further in vitro and in vivo studies are recommended to validate these computational findings and to explore its possible therapeutic applications.

Keywords: *Artemisia herba*, *alba* Asso, essential oil, GC–MS, molecular docking, bioactive compounds.

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Olive leaves (*Olea europaea* L.) as a bioactive source: evaluating the therapeutic potential of polyphenolic and alkaloid extracts

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Olive leaves (*Olea europaea* L.) represent a significant byproduct of the olive oil industry, characterized by a complex chemical profile rich in bioactive secondary metabolites, particularly polyphenols and alkaloids. These compounds have garnered substantial interest due to their diverse pharmacological properties, ranging from neuroprotection to antimicrobial activity. This study aims to explore the biological efficacy of these extracts and investigate the impact of innovative formulation strategies on their therapeutic potential. The research focuses on the multi-target activity of crude and purified extracts in the context of age-related disorders and microbial resistance. Specifically, the study evaluates the anticholinesterase activity against acetylcholinesterase (AChE) and butyrylcholinesterase (BChE), key enzymes in the pathophysiology of Alzheimer's disease. Furthermore, the metabolic potential was assessed by inhibiting DPP-4, a critical enzyme in glycemic regulation. The antioxidant capacity was rigorously evaluated using the DPPH and FRAP assays to determine how different extraction and formulation methods affect free radical scavenging and reducing power. In addition to enzymatic inhibition, the study examines the antibiofilm properties of the extracts against clinically relevant pathogens, including *Staphylococcus aureus*, *Pseudomonas aeruginosa*, and *Escherichia coli*. This assessment is crucial for addressing the growing challenge of antibiotic resistance. Finally, the safety profile of the developed formulations was validated through acute toxicity studies in murine models to ensure biological compatibility. By analyzing the synergy between traditional phytochemistry and modern formulation techniques, this research confirms the promising potential of olive leaf derivatives as innovative candidates for the prevention of neurodegenerative diseases, metabolic syndromes, and persistent microbial infections, providing a foundation for future clinical applications.

Keywords: *Olea europaea* L, Polyphenols, Alkaloids, Enzyme Inhibition, Acute Toxicity.

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Chemical profiling of latex of *Euphorbia guyoniana* and *Launaea fragilis* at Oued Souf region

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This work focuses on the bioactive potential of latex from *Euphorbia guyoniana* and *Launaea fragilis*, two desert-adapted species known in ethnomedicine. The objective was to evaluate their phytochemical content and biological activities, particularly their antimicrobial and insecticidal effects. Latex was analyzed for secondary metabolites such as total phenols, flavonoids, and tannins. Biological activity was assessed through: antibacterial tests on reference strains (*E. coli*, *S. aureus*), and insecticidal assays measuring DL50 values on key agricultural pests. *Euphorbia guyoniana* showed moderate cytotoxicity and weak antibacterial activity (inhibition zones < 9 mm). Its insecticidal performance was measurable, with a DL50 of 44.81%, indicating moderate activity. *Launaea fragilis* latex exhibited a DL50 of 35.00%, reflecting slightly lower but comparable insecticidal capacity. However, its performance was less consistent across tests. Phytochemical analysis indicated that *Euphorbia guyoniana* contained higher levels of total phenols, which may explain its relatively greater biological activity. In comparison, although both species demonstrated moderate insecticidal potential, *Euphorbia guyoniana* appeared somewhat stronger in bioactivity, whereas *Launaea fragilis* showed greater variability, possibly due to lower concentrations of active phytochemicals. While *Euphorbia guyoniana* and *Launaea fragilis* latexes possess some bioactive properties, their effectiveness is less pronounced.

Keywords: *Euphorbia guyoniana*, *Launaea fragilis*, latex, phytochemical composition, biological activities, Oued Souf region .

¹³⁶ Speaker

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ANTIOXIDANT EFFECTS OF WATER-SOLUBLE POLYSACCHARIDES FROM *Plantago albicans* L. (PLANTAGINACEAE)

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The objective of this work was to extract and evaluate the antioxidant potential of water-soluble polysaccharides from the leaves of *Plantago albicans* L. (Plantaginaceae), a wild medicinal plant harvested in the northern Sahara of eastern Algeria, in the El Oued region. The main structural characteristics of the PA extract were determined by colorimetric assays and Fourier transform infrared spectroscopy. Antioxidant activities were evaluated using three in vitro methods. A crude polysaccharide extract, named PA, was obtained by hot water extraction followed by precipitation with cold ethanol (96%) at a mass yield of 4.31%. The chemical composition showed levels of 99.46% total sugars, 32.40% neutral sugars, and low levels of protein (10%) and phenolic compounds (5.16%). IR spectroscopy analysis allows for the determination of the presence of chemical functional groups characteristic of polysaccharides, such as hydroxyl groups (OH), carboxyl groups (COO⁻), and CH bonds. The antioxidant activities of the PA polysaccharide extract show an IC₅₀ of 242.63 $\mu\text{g/ml}$ as determined by the DPPH free radical scavenging assay. According to the ferric reduction assay (FRAP), the PA fraction exhibits an EC₅₀ of 4237 $\mu\text{g/ml}$. Furthermore, the PA fraction is capable of protecting 50% of erythrocytes at a concentration of 236.51 $\mu\text{g/ml}$. Overall, the results demonstrate that the water-soluble polysaccharides from *Plantago albicans* leaves possess measurable antioxidant and cytoprotective activities, highlighting their potential as natural bioactive compounds of pharmacological interest. Future studies should focus on detailed structural elucidation, purification of active fractions, and in vivo investigations to better understand their mechanisms of action and possible applications in nutraceutical or therapeutic formulations.

Keywords: Polysaccharides, *Plantago albicans* L., Antioxidant activity, El Oued region.

¹³⁸ Speaker

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Synthesis, characterization and nanoparticles prepared from date seeds of date palms with ant diabetic activity (Phoenix dactylifera L.)

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This study aims to valorize the by-products of the date palm (*Phoenix dactylifera* L.), specifically the date seeds of the Ghars variety from the El Oued region, through the green synthesis of zinc oxide nanoparticles and zinc oxide nanoparticles doped with magnesium and silver at 0.5% for each using an aqueous extract of the studied date seeds. The main objective is to evaluate the biological activities of these nanoparticles and reduce the toxicity of the metals used in their synthesis both in vitro and in vivo, exploring their therapeutic potential against the physiological and biochemical disorders associated with type 2 diabetes in Wistar rats. To achieve this, an aqueous extract of date seeds was prepared via decoction, followed by qualitative and quantitative analyses to detect some secondary metabolites and to identify and quantify phenolic compounds using HPLC. The ZnO NPs and ZnO doped Mg-Ag NPs were biosynthesized from the aqueous date seeds extract, and their properties were characterized using UV-Vis spectroscopy, Fourier-transform infrared spectroscopy (FTIR), scanning electron microscopy (SEM), energy-dispersive X-ray analysis (EDAX), and X-ray diffraction (XRD). The biological activities were evaluated in vitro, including antioxidant activities (DPPH, FRAP, β -carotene, anti-hemolytic, and photocatalytic assays), antidiabetic (inhibition activities of α -glucosidase and α -amylase enzymes, and glucose absorption assays), anticoagulant properties, and antibacterial effects. For the in vivo study, 25 male Wistar rats were divided into five groups of five rats each: a healthy control group, an untreated diabetic group, and three diabetic treatment groups (treated with Metformin, ZnO NPs, or ZnO doped Mg-Ag NPs). Diabetes was induced by a single intraperitoneal injection of alloxan (150 mg/kg body weight). Treatments (5 mg/kg) were administered orally for 21 days to assess the nanoparticles efficacy in glucose reduction and their therapeutic effect against type 2 diabetes. Biochemical, hematological, hormonal, pancreatic, hepatic, and renal parameters were measured, along with histological analyses of the liver and pancreas to determine structural changes in the studied tissues.

Keywords: *Phoenix dactylifera* L., date seeds, green synthesis, zinc oxide nanoparticles, zinc oxide doped magnesium and silver nanoparticles, diabetes type 2.

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Molecular Docking and ADME Prediction in the Virtual Screening of Plant Phytochemicals: An Evidence-Based Review

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Traditionally, the identification of the biological activities of plant-derived bioactive compounds has relied on extensive laboratory experimentation. Currently, computational modeling techniques are broadly employed to screen phytochemicals for their pharmacological potential. This review outlines recent advances in the use of molecular docking and in silico ADME (Absorption, Distribution, Metabolism, and Excretion) prediction to assess the biological activity and pharmacokinetic characteristics of secondary metabolites. Publications from 2021 to 2025 were analyzed to identify studies utilizing tools such as AutoDock Vina, SwissADME, and pkCSM. In particular, thymol and carvacrol from *Thymus vulgaris* and *Origanum vulgare* demonstrated significant antimicrobial activity. When used alongside antibiotics, these compounds lowered the minimum inhibitory concentration (MIC) against bacterial strains, indicating synergistic interactions. Docking analyses and experimental investigations of *Centaurea lycanica* showed that apigenin and myristoleic acid exhibited considerable binding affinities toward α -amylase and α -glucosidase. Extracts of this plant also displayed strong antioxidant capacity and notable FRAP activity. Furthermore, in silico ADME assessments indicated promising drug-likeness and absorption properties for several compounds. The integration of molecular docking with AI-driven computational approaches such as molecular dynamics simulations and QSAR modeling provides a fast and cost-efficient strategy for screening numerous phytochemicals, thereby facilitating drug discovery. Nevertheless, experimental validation remains indispensable.

Keywords: Phytochemicals, Molecular Docking, Drug Discovery, Antioxidant

¹⁴² Speaker

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Valorization of Cereal By-Products for Bioethanol Production

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Plants constitute renewable reservoirs of a wide range of bioactive and functional molecules. Their lignocellulosic fraction (forest residues, agricultural residues, and dedicated energy crops) represents the most abundant biomass on Earth. This resource is relatively low-cost and does not compete with human food supplies. Lignocellulosic biomass offers innovative strategies in renewable energy and materials, providing an alternative to environmental risks by reducing greenhouse gas emissions and environmental pollution. It is considered a promising feedstock for producing future biofuels. The conversion of lignocellulosic biomass into second-generation bioethanol is currently a widely investigated research topic. Bioethanol production is achieved through anaerobic fermentation using baker's yeast, *Saccharomyces cerevisiae*, following appropriate pretreatment steps. The fermentation process is conducted over approximately 72 hours in a bioreactor immersed in a water bath, with the temperature maintained at 30 ± 2 °C. The bioethanol yield obtained reaches approximately 556 mL/kg at 90% (v/v) concentration.

Keywords: Lignocellulosic biomass, bioethanol, anaerobic fermentation, *Saccharomyces cerevisiae*.



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Isolation of *Aspergillus niger* from Wheat for Industrial Bioethanol Production in Southwestern Algeria

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This study highlights the importance of isolating the filamentous fungus *Aspergillus niger* from wheat for its application in industrial bioethanol production. A wheat sample was selected, and appropriate laboratory techniques were applied to isolate and purify fungal strains, which were subsequently identified based on their morphological characteristics. For bioethanol production, dried palm fronds were subjected to anaerobic alcoholic fermentation using *Aspergillus niger* at different inoculum concentrations: C1 (10^6 spores/mL), C2 (10^4 spores/mL), and C3 (10^2 spores/mL). Among the five isolates obtained, three fungal genera were identified, namely *Aspergillus*, *Penicillium*, and *Fusarium*. The results demonstrated that optimal bioethanol production was achieved at concentration C3 (10^2 spores/mL), with a remarkable yield of 145.27%. The bioethanol produced exhibited physicochemical characteristics such as flammability, volatility, and a transparent appearance, closely resembling those of commercial ethanol. This study underscores the potential of *Aspergillus niger* in the bioconversion of plant biomass into bioethanol, thereby offering promising perspectives for the development of sustainable biofuels.

Keywords: Fungi, *Aspergillus niger*, alcoholic fermentation, bioethanol.



¹⁴⁶ Speaker

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A Literature Review on the Antiproliferative and Antiviral Effects of Essential Oils of *Artemisia* and *Lamiaceae* Families from Algerian Flora

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The flora of Algeria, forming a critical transition zone between the Mediterranean climate in the north and the extreme conditions of the Sahara Desert in the south, holds strategic importance for medicinal plants due to its high rate of endemism and phytochemical diversity. This review aims to investigate the phytochemical profiles and the molecular bases of biological activities of species belonging to the *Asteraceae* and *Lamiaceae* families, which stand out with the morphological and physiological adaptations they have developed against the harsh ecological conditions of the region. Essential oils, synthesized as a defense strategy to survive under drought and high-temperature stress, lie at the center of the pharmacological potential of these plant groups. Analyses performed using Gas Chromatography-Mass Spectrometry (GC-MS), one of the leading modern analytical methods, reveal that representatives of both families contain a chemical matrix quite rich in monoterpenes such as 1,8-cineole, camphor, thujone, borneol, and alpha-pinene. The high lipophilic character of these detected terpenoids endows them with the ability to interact with biological membranes and disrupt the integrity of cellular and viral structures. When evaluated in terms of antiproliferative activity, it is observed that these volatile components pass through cancer cell membranes, suppress intracellular signaling pathways, and trigger apoptosis; furthermore, providing selective cytotoxicity by showing minimal toxic effects on healthy cells offers a critical advantage regarding therapeutic reliability. A similar mechanism is observed in antiviral activity, where the entry and proliferation of viruses into the host cell are prevented by the disintegration of lipid-structured viral envelopes and the inhibition of viral replication enzymes. However, findings in the literature emphasize that this potent biological response stems from the synergistic interaction formed by the major and minor components within the essential oil, rather than a single molecule. Consequently, essential oils from the Algerian *Asteraceae* and *Lamiaceae* families, thanks to their multi-targeted mechanisms of action, represent powerful natural resources that should be evaluated as new-generation drug candidates in both cancer treatment and the control of viral infections.

Keywords: Asteraceae, Lamiaceae, Essential oils, Selective cytotoxicity, Antiviral activity

¹⁴⁸ Speaker

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BIOTECHNOLOGICAL POTENTIAL OF MENTHA PIPERITA L. EXTRACT-DERIVED BIOMOLECULES IN ENHANCING THE NUTRITIONAL AND PHYSICOCHEMICAL QUALITY OF POSTHARVEST TOMATO

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Natural plant extracts have emerged as sustainable alternatives to synthetic preservatives for maintaining fruit quality after harvest. In this study, the antioxidant, antimicrobial, and preservative properties of an aqueous extract of *Mentha piperita* were assessed in the postharvest treatment of *Solanum lycopersicum* (tomato). The ment extract exhibited a strong antioxidant activity ($IC_{50} = 2$ mg/mL) and was rich in total polyphenols (432 mg GAE/mL) and flavonoids (45 mg QE/mL), confirming its high bioactive potential. Antimicrobial analyses revealed significant antifungal effects, while no inhibitory activity was observed against bacterial strains. When applied to tomato fruits, the extract effectively maintained essential physicochemical parameters including pH, titratable acidity, firmness, and weight throughout the storage period. These results indicate that bioactive compounds derived from basil not only provide antioxidant and antifungal protection but also contribute to preserving the nutritional and physical quality of tomatoes after harvest, underscoring their promise as natural agents for food preservation and health promotion.

Keywords: Mentha piperita, postharvest tomato quality, physicochemical attributes

¹⁵⁰ Speaker

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Evaluation of the Biological Activity of a Medicinal Plant Extract Obtained by Ultrasound-Assisted Extraction

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This study aims to evaluate the biological activity of a medicinal plant extract obtained using ultrasound-assisted extraction, with ethanol as the solvent. This method is recognized for its efficiency in extracting bioactive compounds, yielding high extraction yields and high-quality extracts. The results showed that the ethanolic extract of the plant exhibited considerable biological activity, indicating its richness in bioactive constituents. Biological assays revealed notable antioxidant activity in the extract, showing a positive response compared with vitamin C as the reference compound. In addition, an *in silico* molecular docking study was performed to evaluate the interactions of the bioactive compounds with a selected enzyme involved in oxidative processes. The docking results demonstrated favorable binding interactions, supporting the experimental findings. These findings highlight the promising therapeutic potential of this medicinal plant, support its traditional use, and emphasize its possible applications in pharmaceutical and biological fields. Moreover, this study underlines the importance of combining experimental and computational approaches, as well as modern extraction techniques, in the valorization of natural plant resources.

Keywords: medicinal plant, antioxidants, ultrasound, assisted extraction, free radicals.

¹⁵² Speaker

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Extraction of Curcumin and Study of Its Association with Natural Antibiotics

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Over the past decade, the significant increase in bacterial infections and the emergence of antibiotic resistance have become major global problems. The search for new solutions to overcome this resistance has become an absolute necessity. For thousands of years, natural products of plant origin have been an important source of therapeutic agents. Currently, about 25–30% of all available drugs used to treat diseases are derived from natural products (plants, animals, bacteria, and fungi). The World Health Organization (WHO) has reported that medicinal plants represent the best source for obtaining a wide variety of effective and less harmful medicines. This renewed interest in medicinal plants has become a reliable alternative in response to the decreasing effectiveness of synthetic drugs and antibiotics, as well as their concerning side effects. A single plant can act both as an antibiotic and as an antioxidant capable of reducing oxidative stress. Curcumin, an active compound of turmeric, possesses antibacterial, anti-inflammatory, and antioxidant properties. When combined with natural antibiotics, curcumin can enhance their effectiveness. In this study, the investigated extracts were obtained by microwave-assisted extraction using different solvents, in order to evaluate the antibacterial effect of curcumin in combination with a natural antibiotic (royal jelly) and two synthetic antibiotics (amoxicillin and Orapen). The results showed that the tested bacterial strains (*Staphylococcus aureus* and *Escherichia coli*) exhibited greater sensitivity compared to the effect of the reference antibiotics. Therefore, the association of curcumin with natural antibiotics as potential antibacterial agents could help in combating the problem of antibiotic resistance.

Keywords: Extraction, antibacterial effect, natural antibiotic, curcumin, antibiotic resistance.

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Preparation of Novel Nanoparticles from Date Seeds Extract and Their Biological Activities

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This study aims to synthesize selenium nanoparticles and evaluate their biological activities. Using date seed extract (Ghars variety) at three different percentages, the nanoparticles are characterized by UV-Visible spectrophotometry, Fourier transform infrared (FTIR), and X-ray diffraction (XRD) to confirm their formation. The optical study shows that the appearance of the UV-Vis peak (380 nm) in the absorption spectrum confirms the possibility of the formation of ZnSeNPs. FTIR spectra showed the bonds, and the decrease in peak intensity can be confirmed by the reduction of ZnSeNPs. This study was carried out using XRD, where the results confirmed the synthesis of selenium nanoparticles and the production of two compounds: zinc oxide (OZn) and zinc selenate (O3SeZn). The results of the biological activities showed that the antioxidant activities of the three nanoparticles were 0.28%, 1.97%, and 3.57% for Zn-SeNPs (0.5%), Zn-SeNPs (2%), and Zn-SeNPs (1%), respectively, at a concentration of 1 mg/ml. For β -Carotene bleaching, Zn-SeNPs (2%) gave the highest percentage at 74.53%, followed by Zn-SeNPs (1%) and Zn-SeNPs (0.5%), with levels of 62.96% and 52.38%. The anti-inflammatory activity of Zn-SeNPs (0.5%) reached a rate of 31.5% compared to 11.11% and 18.51% for Zn-SeNPs (1%) and Zn-SeNPs (2%), at the same concentration of 20 mg/ml. The antimicrobial test of the 0.5%, 1%, and 2% selenium nanoparticles showed little effect on the microbial strains *Escherichia coli*, *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Klebsiella pneumoniae*, and *Candida albicans*. In photocatalytic testing, Zn-SeNPs (0.5%) exhibited the highest activity compared to the other nanoparticles. The anticoagulant activity showed coagulation times of 92.7 s for Zn-SeNPs (2%), 28 s for Zn-SeNPs (1%), and 24.1 s for Zn-SeNPs (0.5%). The hemolysis inhibition effect of NaCl in all nanoparticles was high, reaching 95.53% for Zn-SeNPs (0.5%), 88.73% for Zn-SeNPs (1%), and 81.22% for Zn-SeNPs (2%). For H₂O₂, the hemolysis-inhibiting effect was variable, with the following ratios: 82.25% for Zn-SeNPs (0.5%), 97.97% for Zn-SeNPs (1%), and the lowest, 25.25%, for Zn-SeNPs (2%). This study demonstrates that date seeds possess remarkable antihemolytic activity

Keywords: Date seeds (Ghars variety), Biological activity, Nanoparticle

Effets anti-inflammatoires des extraits de *Thapsia garganica* : approche expérimentale

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Thapsia garganica est une plante traditionnellement utilisée pour ses propriétés médicinales, notamment pour soulager les douleurs articulaires et les inflammations. Cette étude s'est concentrée sur l'évaluation de l'activité anti-inflammatoire des extraits éthanoliques des racines et des fruits de la plante, à travers des modèles *in vitro* et *in vivo*. *In vitro*, l'inhibition de l'hémolyse érythrocytaire a montré une efficacité supérieure pour l'extrait de racines ($IC_{50} = 10,35 \pm 1,23$ mg/mL) par rapport à l'extrait de fruits ($IC_{50} = 15,96 \pm 0,24$ mg/mL), indiquant une meilleure stabilisation des membranes cellulaires. Les évaluations *in vivo*, réalisées sur un modèle d'inflammation aiguë induite par la carraghénine, ont révélé que l'extrait de racines réduisait de manière dose-dépendante l'œdème et l'infiltration inflammatoire, tout en protégeant le cartilage et l'os. En revanche, l'extrait de fruits n'a fourni qu'une protection partielle. Les résultats suggèrent que les racines de *Thapsia garganica* sont particulièrement riches en composés bioactifs capables de moduler efficacement la réponse inflammatoire. Cette étude met en évidence le potentiel thérapeutique des extraits de racines pour le développement de nouveaux agents anti-inflammatoires d'origine naturelle.

Keywords: Mots clés : *Thapsia garganica*, Activité Anti, inflammatoire, Dénaturation protéique, Activité *in vivo* / *in vitro*.

¹⁵⁷ Speaker

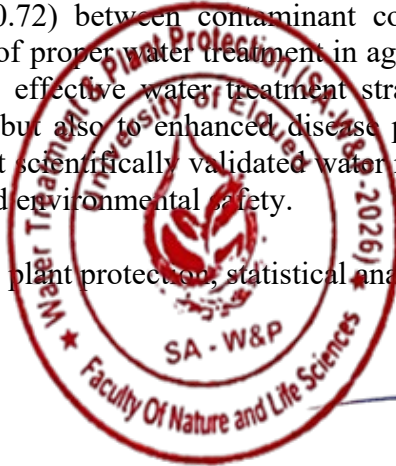
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Impact of Water Treatment Methods on Plant Protection and Agricultural Productivity

Biki Abdelmalek

Water quality plays a critical role in sustainable agriculture and plant health. This study explores the relationship between water treatment methods and plant protection efficiency, focusing on both biological and chemical impacts. Various water treatment techniques, including filtration, chlorination, and advanced oxidation processes, were evaluated for their effectiveness in reducing contaminants that negatively affect plant growth. A statistical analysis was conducted to assess the impact of treated versus untreated water on plant health indicators, including growth rate, leaf chlorophyll content, and disease incidence. The results showed a significant improvement ($p < 0.05$) in plant growth and resistance to pathogens when treated water was used. For instance, plants irrigated with treated water exhibited an average increase in growth of 18–25% compared to those receiving untreated water. Moreover, correlation and regression analyses revealed a strong negative correlation ($r = -0.72$) between contaminant concentration and plant vitality, highlighting the importance of proper water treatment in agricultural systems. The findings demonstrate that integrating effective water treatment strategies contributes not only to improved crop productivity but also to enhanced disease protection in plants. This study emphasizes the need to adopt scientifically validated water management practices to ensure agricultural sustainability and environmental safety.

Keywords: Water treatment, plant protection, statistical analysis, agriculture, water quality, crop productivity



Assessment of Surface Water Quality of Lake Echatt (El Oued, Algeria)

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Lake Echatt (El Oued, Algeria), a wetland located near urban areas, is increasingly exposed to anthropogenic pressures that may affect its water quality and sustainable use. This study, conducted from November 2023 to April 2024, aims to assess the physicochemical quality of the lake's surface waters. The study analyzed eight key physicochemical parameters: temperature, pH, electrical conductivity, suspended solids (SS), dissolved oxygen (DO), total dissolved solids (TDS), salinity, and biochemical oxygen demand (BOD₅) over five days. These parameters were assessed at 10 sampling stations across the lake. The results of the analysis indicated poor water quality with high turbidity, elevated salinity, an alkaline pH, and high conductivity, suggesting significant mineralization and environmental stress. The average temperature ranged from 16.82°C to 18.52°C. These findings highlight the need for regular monitoring of water quality to effectively manage the lake's environmental conditions. Such monitoring is crucial for preserving the health of the wetland, especially in areas facing urban development and environmental pressures.

Keywords: Water quality, Physico-chemical analysis, Lake Echatt, Environmental monitoring, Water management

Spatio-temporal variability of floristic diversity in arid and semi-arid areas Case of the M'sila region (Algeria)

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The Hodna Mountains are part of the Algerian mountain range, located in the south, oriented west-north-west/east and south-east, connecting the Tellian Atlas and the Saharan Atlas, and dominating the Chott el Hodna. Hodna has a Mediterranean climate; this being more or less attenuated by Saharan influence. Within the region, vegetation is distributed along highly complex boundaries with overlaps and even enclaves. These limits correspond, in the first place, to climatic differences that lead to the confrontation of two main types of plant formation: a steppe formation on the plains and slopes of the djebels, up to the depressions, and a forest and pre forest formation at high altitudes. This study examines the spatiotemporal variability in the floristic diversity of the Hodna Mountains using remote sensing. In this context, vegetation was analyzed by calculating the Normalized Difference Vegetation Index (NDVI) from Landsat satellite images between 1987 and 2022. The results show that, over the years, the diachronic study of vegetation productivity (NDVI) varies across vegetation formations, with maximum values in the forest formation. This is due to changes in biotic and abiotic factors that influence plants' physiological processes over time and space.

Keywords: floristic diversity, remote sensing, NDVI, vegetation, Hodna Mountains

Study of the floristic diversity of Djebel Messâad Boussâada M'sila

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The national forest of Djebel Messâad Canton Triba has significant floristic diversity, with 59 taxa across 24 botanical families. The most-represented families are Asteraceae, followed by Poaceae. The study area has very high floristic potential, with an estimated rate of 1.29% of the Algerian North African flora (Quezel and Santa 1962). The results obtained will make it possible to propose the rational use of these biological resources in the context of treatments with medicinal plants and phytotherapy, with 25 species inventoried, with the aim of carrying out the sustainable development policy for all the forest cantons of the national forest

Keywords: Dj Messâad, Triba, flora, floristic diversity, medicinal species



Risk of groundwater contamination by pollutants of agricultural origin in arid regions (Oued Souf)

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Intensive agriculture in irrigated areas is a major source of water pollution in southern Algeria. In the Oued Souf region, this type of agriculture contributes to groundwater pollution. In fact, excessive inputs of agrochemicals and manure are the direct causes of this type of pollution. In this context, a study was conducted in this region to establish a diagnosis of groundwater pollution. Thus, representative water withdrawals have been made from irrigation water in the four largest agricultural activity areas in the region: Debila, Robbah, Reguiba, and Oumes. The analyses focused on physicochemical parameters (pH, EC, SO₄-2, Cl⁻, Ca⁺⁺, Mg⁺⁺, Na⁺, K⁺, NO₃⁻, NO₂⁻, NH₄⁺, PO₄-3) and bacteriological analyses (total coliforms, fecal coliforms, fecal streptococci, sulfite-reducing anaerobes). The results show that the most important indicators of water pollution differ significantly both by site (agricultural vs. non-agricultural) and by withdrawal period. It should be noted that the nitrate and pathogenic germ levels of the water studied exceed the national drinking water standard. These results show the importance of preserving water resources against the risk of pollution from agricultural sources, which requires adequate management and control of agrochemical use in this region.

Keywords: pollution, groundwater, nitrates, fecal contamination, agriculture.

Diversity of arthropods associated with olive trees in Oued Souf: Biodiversity and potential pests in agricultural systems.

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Abstract

This study aims to characterize the diversity of arthropods associated with olive trees in the Oued Souf region. Arthropod sampling was carried out in three different olive groves located in the localities of Miha-Salah, Djedaida, and Ghamra, within the municipality of Guemar. We used two sampling methods, Barber traps and colored traps, from October 2018 to March 2019. We inventoried 95 arthropod species, distributed across two classes, Arachnida and Insecta, 11 orders, and 65 families. The family with the most species was Tenebrionidae, with 6 species, followed by Achididae and Aphididae, each with 4 species. The highest total species richness was recorded in Miha-Salah, with 68 species and an average species richness of 16.85. In terms of abundance, insects are the most abundant class in all three olive groves, with a minimum of 95.29% recorded in the Miha-Salah olive grove and a maximum of 97.48% recorded in the Djedaida olive grove. In the Miha-Salah and Djedaida olive groves, Diptera are the most prevalent, with abundance rates of 45.62% and 38.57%, respectively. Shannon-Weaver diversity index (H') values range from 1.43 to 1.81 bits. Maximum diversity (H'_{max}) ranges from 2.54 to 2.77 bits. *Ceratitis capitata*, *Dosophila sp.*, and other Diptera species were identified as potential pests of the olive tree.

Keywords: Arthropods, Diversity, Olive tree, Oued Souf, Potential pests.

Monitoring Antibiotic Residues in Wastewater in Arid Regions: Case Study of Ouargla and Ghardaïa

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Abstract

The extensive use of antibiotics in human and veterinary medicine has led to their persistent release into the environment, raising concerns about public health and ecological safety. Wastewater serves as a significant conduit for these contaminants, especially in arid regions where water scarcity intensifies pollution's impact. This study aims to monitor antibiotic residues in wastewater from Ouargla and Ghardaïa, two key urban centers in southern Algeria. Wastewater samples were systematically collected from major treatment plants and analyzed using High-Performance Liquid Chromatography (HPLC) to detect and quantify commonly used antibiotics, including doxycycline, amoxicillin, cefazoline and cefadroxil. The results reveal the occurrence, concentration levels, and spatial distribution of antibiotic residues in these arid environments, providing critical insights into potential ecological and human health risks. This research emphasizes the need to implement efficient wastewater management and monitoring strategies to mitigate the spread of antibiotics and combat the growing threat of antimicrobial resistance (AMR) in vulnerable desert regions. Furthermore, the study highlights the relevance of HPLC as a sensitive and reliable analytical technique for environmental surveillance of emerging contaminants.

Keywords: Antibiotics, Wastewater, Arid regions, Ouargla, Ghardaïa, High-Performance Liquid Chromatography (HPLC), Emerging contaminants, Antimicrobial resistance (AMR).

Agri-Tourism as a Nexus for Sustainable Development: Integrating Water-Smart Agriculture, Biodiversity Conservation, and Eco-Tourism Marketing in Arid and Semi-Arid Regions

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In the context of escalating environmental pressures and growing demand for sustainable tourism experiences, the intersection of agriculture and hospitality management offers a promising, yet underexplored, frontier for holistic territorial development. This paper proposes an integrated conceptual framework that bridges sustainable agricultural practices with tourism marketing strategies, drawing upon the four thematic axes of the SA-W&P International Conference. Specifically, biodiversity conservation, water management innovations, valorization of plant by-products, and biotechnological innovations are examined through the lens of agri-tourism product development, destination branding, gastronomy tourism, and scientific tourism circuit design. By repositioning sustainable agriculture as a driver of tourism competitiveness and hospitality differentiation, this contribution advocates for transdisciplinary policies that align rural development, environmental stewardship, and tourism marketing within a coherent territorial strategy.

Keywords: Agri-tourism · Sustainable destination marketing · Water management · Biodiversity · Gastronomy tourism · Biotechnology · Hospitality · Rural development · Algeria

Chemical composition and mosquitocidal activity of *Syzygium aromaticum* essential Oil against *Culex pipiens* (Linnaeus)

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This study assessed the larvicidal activity of *Syzygium aromaticum* essential oil against fourth-instar larvae of the common house mosquito, *Culex pipiens* (Linnaeus) (Diptera: Culicidae). The essential oil, obtained by hydro-distillation from dried cloves, yielded 0.79% (w/w) and was chemically characterized using gas chromatography-mass spectrometry (GC-MS). Analysis revealed 18 different compounds, with phenol, 2-methoxy-3-(2-propenyl) (61.95%) and phenol, 2-methoxy-4-(2-propenyl)-, acetate (16.08%) as the major components. Lethal concentrations (LC₂₅, LC₅₀ and LC₉₀) of *S. aromaticum* essential oil with their confidence limits were determined from dose-response curves. After 24 hr of exposure, LC₂₅, LC₅₀ and LC₉₀ values were 1.67, 6.51, and 97.85 ppm, respectively. Treated larvae exhibited restless movement and convulsions followed by death, whereas control larvae showed normal behavior. The results demonstrated that *S. aromaticum* essential oil possesses significant larvicidal activity. Therefore, the constituents of *S. aromaticum* essential oil may be considered promising natural pesticides for the control of mosquito vectors.

Key words: *Syzygium aromaticum*, *Culex pipiens*, larvicidal activity, LC₂₅, LC₅₀ and LC₉₀, mosquito, toxicity, essential oil, phytochemical, chemical control, biological control, disease vectors.

Ethnobotanical Assessment of Medicinal Plants Used in the Traditional Care of Hypercholesterolemia-Related Cardiovascular Diseases in the Setif Region, Algeria

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Algerian society has historically relied heavily on traditional herbal therapy, especially for the treatment of hypercholesterolemia, a significant cardiovascular disease risk factor. The purpose of this study was to identify and describe the medicinal plants utilized in the conventional pharmacopoeia to manage excessive cholesterol levels within communities in the Setif region of northeastern Algeria. An ethnobotanical survey was conducted between July and September 2025 using a structured questionnaire among 174 adult participants (122 men and 52 women) aged 18 years and older. A total of 73 medicinal plant species belonging to 35 botanical families were recognized for the control of hypercholesterolemia. The most represented families were Labiaceae (12 species) and Asteraceae (8 species). The most frequently cited plants were *Echinops spinosissimus* (20.11%), *Olea europaea* (20.11%) and *Linum usitatissimum* (13.22%), followed by *Zingiber officinale* (12.64%) and *Crataegus azarolus* L. (8.05%). The main recorded preparation methods were infusion (42.0%), decoction (20.8%), direct consumption (15.3%) and powdered form (10.3%). The primary plant parts used were leaves and seeds (29%), fruits (11.9%) and aerial parts (10.6%). Treatment durations ranged mostly from one week to six months, with many users continuing until full recovery. In summary, the findings highlight a rich traditional knowledge of medicinal plants employed for the therapy of hypercholesterolemia in the region of Setif. However, the medicinal properties of these plants should be empirically substantiated to effectively integrate indigenous knowledge with contemporary medicine.

Keywords: Ethnobotanical survey, Medicinal plants, Hypercholesterolemia, Cardiovascular diseases, Setif, Algeria.

GC–MS Characterization and In Vitro Bioactivities of *Pelargonium graveolens* Essential Oil: Cytotoxic, Antidiabetic, and Anti-Inflammatory Potential

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Pelargonium graveolens essential oil (PGEO) is widely used in traditional medicine and the fragrance industry, yet its biological potential depends strongly on its volatile composition. This study aimed to characterize PGEO by GC–MS and evaluate its cytotoxic, antidiabetic-related, and anti-inflammatory activities *in vitro*. GC–MS analysis identified 86 volatile constituents, with a profile dominated by oxygenated monoterpenes. The main compounds ($\geq 1\%$) were citronellol (19.26%), menthone (10.72%), linalool (8.87%), eucalyptol (8.05%), geraniol (7.37%), citronellyl formate (6.65%), and α -terpineol (2.31%), indicating a citronellol-rich chemotype. Cytotoxicity was assessed using the *Artemia salina* lethality assay (5–50% oil, 24 h monitoring). PGEO induced a clear dose- and time- dependent toxicity, with complete mortality at 50% within 180 min and total mortality at all tested concentrations after 24 h. Antidiabetic-related activity was evaluated via α -amylase inhibition (31.25–1000 $\mu\text{g/mL}$), showing moderate inhibition (6.03–36.33%) with a maximum effect at 62.5 $\mu\text{g/mL}$. Anti-inflammatory potential was assessed using BSA heat-induced protein denaturation, with inhibition ranging from 16.12% to 52.01% (maximum at 50 mg/mL), while aspirin remained more active. Overall, PGEO combines a bioactive, monoterpene-rich composition with measurable *in vitro* enzyme inhibition and protein-stabilizing activity, alongside strong *Artemia* toxicity, supporting potential larvicidal applications and warranting careful dose-safety evaluation for therapeutic use.

Keywords: *Pelargonium graveolens*, essential oil, GC–MS, *Artemia salina*, α -amylase inhibition, protein denaturation, monoterpenes.

Phytochemical Characterization and In Vitro Evaluation of the Antidiabetic Potential of Capparis spinosa L. Extract

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Diabetes mellitus is a major global health concern characterized by persistent hyperglycemia and metabolic dysregulation. Natural products represent a promising source of safer therapeutic alternatives for glycemic control. The present study aimed to investigate the phytochemical composition and in vitro antidiabetic activity of Capparis spinosa L. extract. The plant material was subjected to ethanolic extraction, followed by qualitative phytochemical screening to identify major bioactive constituents, including phenolic compounds, flavonoids, alkaloids, and tannins. The antidiabetic potential was evaluated through inhibitory assays targeting α -amylase and α -glucosidase, two key enzymes involved in carbohydrate digestion and postprandial glucose regulation. The extract exhibited significant concentration-dependent inhibition of both enzymes, suggesting its ability to delay carbohydrate hydrolysis and reduce glucose absorption. The observed activity is likely attributed to its rich phenolic and flavonoid content. These findings highlight Capparis spinosa L. as a promising natural candidate for managing postprandial hyperglycemia. Further in vivo investigations and toxicological assessments are required to confirm its therapeutic efficacy and safety profile.

Keywords: Capparis spinosa L., antidiabetic activity, α -amylase inhibition, α -glucosidase inhibition, phytochemicals.

Phytochemical Composition and In Vitro Assessment of the Anti-Inflammatory Activity of Capparis spinosa L. Extract

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Inflammation is a fundamental biological response implicated in the pathogenesis of numerous chronic disorders, including metabolic and cardiovascular diseases. Medicinal plants have gained considerable attention as potential sources of safer anti-inflammatory agents. This study aimed to evaluate the phytochemical profile and in vitro anti-inflammatory activity of Capparis spinosa L. extract. Ethanolic extraction was performed, followed by phytochemical screening to identify bioactive constituents, including flavonoids, phenolics, and tannins. The anti-inflammatory potential was assessed using protein denaturation inhibition and cyclooxygenase (COX) inhibition assays. The extract demonstrated a significant, dose-dependent reduction in inflammatory markers compared with the control group. The observed biological activity may be attributed to the presence of phenolic compounds, known for their capacity to modulate inflammatory pathways and oxidative stress. These findings suggest that Capparis spinosa L. extract possesses promising anti-inflammatory properties and may serve as a potential natural therapeutic agent. Further pharmacological and mechanistic studies are recommended to elucidate its mode of action and clinical applicability.

Keywords: Capparis spinosa L., anti-inflammatory activity, protein denaturation assay, COX inhibition, medicinal plants.

Chemical Composition and Molecular Docking Analysis of Artemisia herba-alba Asso Essential Oil

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Essential oils derived from medicinal plants are recognized as valuable sources of bioactive compounds with diverse pharmacological properties. This study aimed to investigate the chemical composition of the essential oil extracted from Artemisia herba-alba Asso and to evaluate the potential biological activity of its major constituents using molecular docking analysis. The essential oil was obtained from the aerial parts of the plant by hydrodistillation, and its chemical profile was characterized using gas chromatography coupled with mass spectrometry (GC–MS). The analysis revealed that the essential oil is rich in monoterpenes and sesquiterpenes, with major constituents including camphor, 1,8-cineole, α -thujone, and β -thujone. To gain insight into the possible molecular mechanisms underlying its biological activity, molecular docking studies were performed to assess the binding affinity of the main identified compounds toward selected target proteins involved in inflammation and oxidative stress pathways. The docking results demonstrated favorable binding energies and stable ligand–protein interactions for several constituents, suggesting a strong affinity toward the active sites of the selected targets. These interactions were mainly driven by hydrogen bonding and hydrophobic interactions, indicating potential inhibitory effects at the molecular level. The combined GC–MS and molecular docking results highlight the pharmacological potential of Artemisia herba-alba essential oil and support its traditional use in herbal medicine. Further in vitro and in vivo studies are recommended to validate these computational findings and to explore its possible therapeutic applications.

Keywords: Artemisia herba-alba Asso, essential oil, GC–MS, molecular docking, bioactive compounds.

Integrated In Vivo and In Silico Evaluation of the Antidiabetic Potential of Pelargonium graveolens Essential Oil: Glycemic Control, Hepatoprotection, ADMET, Docking, MD, and MM-PBSA

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The present work investigated the antidiabetic potential of Pelargonium graveolens essential oil (PGEO) using an integrated experimental and computational approach. In vivo activity was assessed in alloxan-induced diabetic rats by measuring fasting blood glucose, glycated hemoglobin (HbA1c), and hepatic enzymes (ALT, AST). PGEO treatment produced a marked antihyperglycemic effect, with fasting glucose reduced to levels comparable to those in the reference drug group, and improved long-term glycemic status, as reflected by decreased HbA1c. PGEO also showed a pronounced hepatoprotective effect, significantly lowering ALT and AST compared with untreated diabetic animals, consistent with the mitigation of diabetes-associated liver injury. To explore pharmacokinetic suitability and mechanistic plausibility, major GC-MS constituents were subjected to in silico ADMET and target-based modeling. Citronellol, geraniol, linalool, eucalyptol, and menthone displayed favorable drug-likeness (Lipinski/Veber compliance), high predicted gastrointestinal absorption, no CYP3A4 inhibition, and low predicted acute toxicity ($LD_{50} \approx 2000 - 5000$ mg/kg). Molecular docking against α -amylase (1HNY) and α -glucosidase (3TOP) revealed moderate affinities ($\Delta G \approx -5.9$ to -6.85 kcal/mol), with citronellol and geraniol among the best-ranked ligands. MD simulations (100 ns) supported stable complex formation (RMSD ≤ 0.5 nm), and MM-PBSA estimated favorable binding energies (≈ -56 to -65 kJ/mol), dominated by van der Waals contributions. Collectively, these findings suggest that PGEO exerts antidiabetic and hepatoprotective effects through multi-target mechanisms, including modulation of oxidative stress and cumulative, moderate inhibition of carbohydrate-hydrolyzing enzymes by abundant monoterpenes.

Keywords: alloxan diabetes, hepatoprotection, ADMET, molecular docking, molecular dynamics, MM-PBSA, α -amylase, α -glucosidase, monoterpenes

Phytochemical Content of Different Parts of Argan Tree, *Argania spinosa* L. in Algerian Populations

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This study provides a comprehensive comparative analysis of five distinct Algerian populations of *Argania spinosa* L. (Mostaganem, Timimoune, Adrar, Alger, and Tindouf), a species of paramount ecological and socio-economic importance. To evaluate their potential, we performed a multi-component assessment focusing total phenolic (TPC) and flavonoid (TFC) contents, and antioxidant capacities (via DPPH and FRAP assays) across three fruit compartments: shell, kernel, and seeds. Our results reveal significant intra-specific variability influenced by geographical origin. Notably, the Mostaganem population exhibited the highest accumulation of bioactive compounds, while Tindouf showed distinct physical adaptations. Across all populations, the shell emerged as the richest source of phenolic and flavonoid compounds compared to the kernel and seeds, highlighting the high value of argan by-products. Furthermore, antioxidant activity was strongly correlated with phytochemical distribution, with the pulp and shell exhibiting superior radical-scavenging potential. These findings underscore the chemical and morphological plasticity of Algerian argan trees and provide a scientific basis for their valorization in the functional food, pharmaceutical, and cosmeceutical industries. Altogether, this study offers valuable insights into the selection of optimal cultivars and the conservation of Algerian argan genetic resources for high-quality oil production and the development of bioactive extracts.

Study and Application of *Moringa oleifera*: Development of an Oil Extract and Evaluation of Its Effectiveness in Skin Wound Healing

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This study aims to evaluate the biological and therapeutic efficacy of oil extracted from *Moringa oleifera* seeds, with a specific focus on its role in accelerating wound healing when applied topically. The selection of this plant was motivated by its abundance of biologically active compounds, including flavonoids, phenolics, and fatty acids, as well as its widespread use in traditional medicine as an antimicrobial, anti-inflammatory, and tissue-regenerating agent. The antioxidant capacity was assessed using the FRAP (Ferric Reducing Antioxidant Power) assay. The results demonstrated high efficacy in reducing ferric ions, comparable to that of the standard antioxidant (ascorbic acid), as confirmed by statistical analysis of EC₅₀ values: EC₅₀ (extract): 0.873 ± 0.030 vs. EC₅₀ (ascorbic acid), 0.5243 ± 1.10 , indicating a strong free radical-scavenging potential. The UV-protective effect of the oil was also evaluated by measuring the Sun Protection Factor (SPF), yielding a value of 73.25, highlighting its potential as a natural photoprotective agent. At the microbial level, the antibacterial activity was assessed through the determination of Minimum Inhibitory Concentration (MIC) and Minimum Bactericidal Concentration (MBC) against selected (Gram+ and Gram-) bacterial strains. The MIC values ranged from 25% for *E. coli*, *P. aeruginosa*, and *B. subtilis* to 50% for *P. aureus*, confirming the oil's antimicrobial properties. In addition, the oil demonstrated the ability to inhibit biofilm formation and protease activity, both of which are crucial for reducing inflammation and protecting structural proteins such as collagen and elastin, which are especially relevant in wound-healing processes. In the in vivo application phase, the oil was applied topically to experimentally induced skin wounds in rats. The animals were divided into three groups: a control group, a group treated with a commercial wound-healing ointment (Mebo), and a group treated with *Moringa* seed oil. Treatments were administered every other day for a total of 20 days. The results revealed that the *Moringa* oil-treated group achieved faster wound closure by day 12, compared to day 15 for the Mebo-treated group and after day 20 for the control group.

Key words: *Moringa oleifera* seed extract oil, Antioxidant activity, FRAP assay, Antibacterial activity, Biofilm inhibition, Wound healing, Sun Protection Factor (SPF)


THE EFFECTS OF ENVIRONMENTAL FACTORS ON THE COMPOUNDS OF TWO VARIETIES OF TOMATO (*LYCOPERSICON ESCULENTUM* MILL) GROWING IN GREEN HOUSE AND FIELD.

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Tomato (*Lycopersicon esculentum* Mill.) is one of the most widely consumed vegetables worldwide, with a global production exceeding 162 million tonnes. During growth and development, tomato plants are exposed to various environmental stresses, including drought, heat, ultraviolet radiation, air pollution and pathogen attacks. Exposure to temperatures above or below the optimal range can cause significant physiological and biochemical disturbances, affecting both yield and fruit quality. The aim of this study was to evaluate the effects of different environmental conditions on the quantitative and qualitative production of tomato grown under greenhouse and open-field conditions. Two tomato varieties were used: Riogrande (industrial variety) and Marmande (fresh consumption variety). Seeds were germinated under greenhouse conditions, and seedlings at the five-leaf stage were transplanted into an experimental greenhouse and open field. Post-harvest analyses included agronomic parameters (number of fruits per plant, fruit weight, plant height, and number of diseased plants) and biochemical analyses (total polyphenols, total sugars, lycopene, and β -carotene contents, total acidity). The results revealed significant differences between greenhouse and field-grown tomatoes. Temperature, humidity and plant diseases were higher in the greenhouse cropping system, affecting physiological and biochemical traits as well as genotype response. Marmande variety was significantly the most productive variety in the open-field cropping system, while Riogrande variety was the most productive variety under greenhouse conditions. Generally, Riogrande variety showed the best performance in the greenhouse due to its high sugar content and in the open field for its nutritional value with high polyphenol and lycopene contents. This study highlights the importance

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of environmental conditions in determining tomato productivity and nutritional quality and provides insights for optimizing cultivation practices to improve yield and fruit composition.

Keywords: *Lycopersicon esculentum* Mill, greenhouse, open field, productivity, quality.



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Partnership for Research and Innovation in the Mediterranean Area (PRIMA)

The PRIMA Programme (Partnership for Research and Innovation in the Mediterranean Area) is a European partnership established under Article 185 of the Treaty on the Functioning of the European Union (TFEU). It represents one of the most significant scientific cooperation initiatives between the European Union and the countries of the Southern and Eastern Mediterranean. The programme aims to strengthen research and innovation in agriculture, food security, and water management by developing sustainable solutions aligned with the principles of the European Green Deal. PRIMA serves as an effective tool of science diplomacy, combining scientific, developmental, and geopolitical dimensions to promote stability and prosperity in the Mediterranean region.



University of El Oued, Algeria

The University of El Oued, established in 2001 in Algeria, is a public institution offering a wide range of programs across natural sciences, humanities, economics, and law. It annually hosts around 25,000 to 26,000 students. Located in the southeastern part of the country, the university plays a crucial role in the Saharan region by facilitating access to higher education. It offers bachelor's, master's, and doctoral programs while promoting research, particularly in renewable energy and desert technologies.



Biology, Environment, and Health Laboratory, Algeria

The work of the Biology, Environment, and Health Laboratory revolves around the following objectives: • Exploiting biological resources to meet human needs in various fields (nutrition, treatment, transportation, etc.). • Studying natural products, especially plant-based ones prevalent in desert regions. • Studying mechanisms to improve the economic, agricultural, and environmental efficiency of desert agrarian systems. • Studying and understanding the stresses caused by factors affecting the environment and human health. • Working on protecting and valorizing plant species, especially wild ones, in the field of health. • Conducting environmental research and studies aimed at solving various environmental problems



Laboratory for Biodiversity and Application of Biotechnology in Agriculture Field, Algeria

The Laboratory for Biodiversity and Application of Biotechnology in Agriculture Field (In French: Laboratoire de Biodiversité et l'Application de la Biotechnologie dans le Domaine Agricole, BABDA) is a scientific research laboratory located at the Faculty of Natural and Life Sciences at Echahid Hamma Lakhdar University in El Oued, southeast of Algeria. It was established according to the ministerial decision N°: 148 of 29 April 2020, and given the urgent need for scientific support for the development of the agricultural sector in our region, the laboratory contributes to the development of agricultural products in terms of quantity and quality by: • Leading the biotransformation and use in the agrifood or medical fields. • Providing a favorable place for graduate students, teachers, and researchers to carry out their scientific research. • Activating participation in national and international research projects. • Creation of fruitful relationships with socioeconomic partners. • Establishing cooperation relationships with relevant scientific and research bodies at the national and international levels.



Laboratory for the Exploitation and Valorization of Saharan Energy Resources (LEVRES), Algeria

The Laboratory for the Exploitation and Valorization of Saharan Energy Resources (LEVRES) is a specialized, independent research unit established in April 2013, headquartered at the Faculty of Exact Sciences at the University of Eloued. Its fundamental mission is to research solutions for the sustainability of energy sources and to develop methods for their exploitation and valorization within the Saharan environment. The laboratory is divided into four integrated research teams, comprising academic staff at various ranks (Professors, Lecturers, and Assistant Professors), ensuring complementary expertise and specializations. The laboratory supports its activities with physical resources, infrastructure, and specialized equipment tailored for its research objectives. Furthermore, LEVRES is distinguished by extensive cooperation with national and international research laboratories, as well as by establishing strategic partnerships with the industrial sector, to ensure the application of research findings and the transfer of technology.



Agence Thématique de Recherche en Sciences et Technologies, Algeria

The ATRST stands for the Agence Thématique de Recherche en Sciences et Technologies (Thematic Research Agency for Sciences and Technology), serving as a crucial operational body under the DGRSDT in Algeria. Its primary mission is to manage and promote scientific research across the hard sciences and technological domains, including engineering, computer science, materials science, and physics. The agency is responsible for coordinating national research programs (PNRs), allocating funding, and supervising the execution of projects related to strategic technological development. Furthermore, the ATRST plays a vital role in evaluating research outcomes and in facilitating the valorization and transfer of technology from academic laboratories to industrial and socio-economic applications.



Direction Générale de la Recherche Scientifique et du Développement Technologique, Algeria

The DGRSDT (Direction Générale de la Recherche Scientifique et du Développement Technologique), which translates to the General Directorate for Scientific Research and Technological Development, is the central administrative body under Algeria's Ministry of Higher Education and Scientific Research. Its primary and vital role is to act as the chief executor and coordinator of the national policy for Scientific Research and Technological Development. The DGRSDT is responsible for planning and prioritizing the country's research agenda, managing and allocating funds to research programs across universities and centers, and ensuring the evaluation and valorization of research outcomes. Essentially, it serves as the strategic link ensuring that academic knowledge and innovation are effectively transferred to the socio-economic sectors to drive national development.



Matrouh University (MAU), Egypt

Matrouh University (MAU), Egypt, is an academic organization under the supervision of the Egyptian Supreme Councils of Universities, Ministry of High Education and Scientific Research, created under the terms of the Ministerial law No. 1715 for the year 2018 and dedicated to the study for obtaining Bachelor's Degrees, Post Graduate Degrees as well as Community services and Environmental Development. The principal's mission and objectives are:

- Education and Training: Offers educational programs and training to build capacity in the management of Sciences, Life Sciences, Literatures, and Humanities.
- Postgraduate studies and Research: Conducts research on the sustainability, arid area, and coastal regions in different sciences.
- Community services, Environmental and Sustainable Development: emphasizes the promotion of sustainable development strategies that increase the community's resistance to environmental deterioration and climate change.



Alexandria University, Egypt

Alexandria University has been one of the oldest and most prominent universities in Egypt since 1942. It comprises 24 faculties and institutes covering most disciplines. AU has around 120,000 students and almost 30,000 employees and staff members. AU is an essential partner in EU-funded projects from FP7 and Tempus to H2020 and Erasmus+, and the university has around 450 international agreements with other universities, institutes, and entities. AU Vision: Alexandria University aspires to restore its historic status and achieve a comprehensive qualitative leap across various fields of knowledge within a framework of noble human values, enabling it to take a leading position in its national, Arab, African, Mediterranean, and global environments. AU Mission: The University of Alexandria is a national institution for education, research, and development, integrated into the production and dissemination of knowledge. Also, emphasize the building of a modern human being and the cultural rehabilitation of society. In addition, be able to assume leadership positions in all sectors.



Faculty of Sciences of Sfax (FSS), Tunisia

The Faculty of Sciences of Sfax (FSS) has continued to develop and advance in terms of pedagogy and scientific research since its creation in 1987. The Faculty of Sciences of Sfax offers you a range of fundamental and applied training. The faculty comprises six departments and a doctoral school, all of which contribute to achieving its objectives. With more than 3000 students, 450 teachers, and 170 administrative staff, technicians, and workers, the Faculty of Sciences of Sfax represents the largest institution of the University of Sfax. The Faculty of Sciences of Sfax offers its students training in the fields of fundamental and technological sciences to obtain diplomas in: Unified License (Bac + 3); Research or professional master's degree (Bac + 5); Doctorate (Bac + 8) The Faculty of Sciences also offers training in preparation for entrance exams to engineering schools in addition to an integrated preparatory cycle in computer sciences. Holders of a basic or applied license will be able to continue their studies in a Master's, research, or professional program. Research master's degrees are generally linked to the doctoral school, and professional master's degrees are related to internship management. In addition to university trainers, these training courses are often led by external experts and professionals, reflecting our institution's openness to the socio-economic world. Scientific research at the Faculty of Sciences of Sfax is conducted by 32 research structures, including 30 laboratories, two units, and 4 standard service units. The Faculty of Sciences of Sfax is establishing several international collaborations with countries in the Maghreb, Europe, the USA, and Asia. These cooperations cover both the educational field and scientific research. The internship management ensures the opening of the Faculty of

Sciences of Sfax to the socio-economic world. The Faculty of Sciences of Sfax organizes, or participates in organizing, several scientific events each year in the fields of scientific research and pedagogy.



Selçuk University, Turkey

Selçuk University was transformed into a general university in 1975, following the establishment of its core faculties in 1908. The university, which has been in a constant state of development since its early years, has grown into a major institution with 24 faculties, 7 institutes, 5 colleges, 1 conservatory, 23 vocational schools, and 53 research centers. Selçuk University is among the largest and most established educational institutions in Türkiye, with over 70,000 students and over 7,000 personnel.



The University of Coimbra (UC), Portugal

The University of Coimbra (UC) is a public higher education institution founded in 1290. The mission of UC comprises three pillars: Education, Research, and Knowledge Transfer. UC was designated a World Heritage Site by UNESCO in 2013, and it holds several UNESCO chairs. UC offers 46 undergraduate degrees, 127 master's degrees, and 77 doctorates. In 2021/2022, 200 PhD theses were concluded. UC comprises 12 research and education units and 38 centres of pure and applied research, responsible for producing knowledge across several scientific fields, bringing together around 2100 researchers. A number of these centres are leaders in their areas, regularly evaluated by international panels. There are also units supporting cultural, training, and education activities. Regarding knowledge transfer, UC deepens its innovation policy through INOV.C, an Innovation Ecosystem comprising more than 500 partners. As a result of these dynamics, in 2022 the UC managed a total of 475 project grants (368 national and 107 international), amounting to 86.42M€ in contracted funding to support education, research, innovation, and other institutional projects. The Pharmacy Faculty of the University of Coimbra has all the required equipment and competencies to develop the proposed project.



Usak University, Turkey

With its 18 years of history, young, dynamic, nationally and internationally successful academic staff, and student-centered management approach, Usak University is the shining star of the region; Based on this aim, U?ak University, with its institutional structure embracing the slogan "In the Light of Mind and Science, a New Generation University," is among the pioneering universities working for the development of the country with all its units. The principal's mission and objectives are : • Research: Conducts research on the challenges and opportunities associated with various fields including Agriculture, Education, Finance etc. Our university has set a basic goal of contributing to the training of qualified human resources for scientific research. • Education and Training: This campus houses the Graduate School of Education, Faculty of Engineering and Natural Sciences, Faculty of Humanities and Social Sciences, Faculty of Fine Arts, Faculty of Economics and Administrative Sciences, Faculty of Architecture and Design, Faculty of Communication, Faculty of Islamic Sciences, Faculty of Sports Sciences, Faculty of Agriculture, Faculty of Medicine, Faculty of Health Sciences, Faculty of Applied Sciences, School of Foreign Languages, and Distance Education Vocational School. • Sustainable Development: Established in 2006, our university has become a pilot university in the fields of leather, textile, and ceramics as part of the program announced by our President, Recep Tayyip Erdo?an, "Regional Differentiation and Specialization of Universities". With this program, our university aims to integrate primarily with our city and region, deepen its studies to develop economic, social, and human capital in the fields of leather, textile, and ceramics, move away from uniformity in the relevant areas, and focus its strong aspects on the development of these sectors by specializing its infrastructure within the mission.



EGAS - Egyptian Agricultural For Seed Production, Egypt

Egaseed, an Egyptian firm founded in 1981, specializes in producing high-quality agricultural seeds. The company aims to enhance crop productivity and combat pests and diseases. They boost agricultural output by optimizing seeds for the Egyptian environment and supplying a variety of field and vegetable crops. The Egaseed team has distinct divisions for production, marketing, research, and legal issues, ensuring a holistic approach to seed creation and distribution. Key personnel include a general manager and directors overseeing seed production, screening, marketing, and research. Egaseed has been present in many Egyptian governorates with screening stations and farms, contributing to the national economy and boosting local farmers' revenue through improved crop quality and productivity.



Université du Littoral Côte d'Opale, France

The Environmental Chemistry and Life Interactions Unit (UCEIV) is a multidisciplinary unit

that develops fundamental and applied research in the fields of the environment, sustainable development, and energy. Its research themes concern the detection and characterization of air and soil contaminants, the evaluation of their effects on the environment and living organisms, the proposal of remediation methods, and the valorization of bio-resources. These contributions are part of the three research themes of the UCEIV: • Effects of pollutants on living organisms • Biological and chemical Remediation • Valorization of biomass UCEIV gathers researchers from several scientific disciplines: Chemistry, Toxicology, Biochemistry, and Plant Biology. The Unit is organized into four main research teams. The IPCR team's research activities, which will participate in the Project, are based on its expertise in mycology, particularly the interactions between plants and fungi (both phytopathogenic and symbiotic fungi), and in physiology, cytology, biochemistry, molecular biology, and microbial ecology.



Delta Water for Magnetic Water Treatment, Egypt

Delta Water Co. for Magnetic Water Treatment is an Egyptian Company specializing in the design, development, and manufacture of water treatment devices using magnetic technology, with Japanese technology and materials, to eliminate the problems of water well salinity and soil salinity, and to improve overall water quality... Delta Water Company is the only magnetic water treatment company in the Middle East to hold the ISO 9001:2008 certificate from the German Accreditation Organization (DAKKS).



CPH Hydraulic, Algeria

CPH Hydraulic is an Algerian company specializing in solutions for the hydraulic and water sectors. This company focuses on solutions for: • Fittings and Connections (raccordements) • Fluid Control (contrôles de fluides) • Sanitation (assainissements) • Water Treatment (traitement des eaux) The group has over 40 years of experience in this field, allowing them to offer products and solutions that meet the technical and market standards of Algeria with the best Quality/Price ratio. CPH Hydraulique supports its clients throughout their projects by providing: • Optimal and continuous training on products and solutions. • A quality guarantee. • After-sales service.



The Saharan Natural Resources Laboratory, Algeria

The Saharan Natural Resources Laboratory aims to enrich data and information on natural resources in Saharan regions, with a focus on their importance to social and economic development. The laboratory seeks to achieve several key objectives:

1. Data Collection: Work on gathering and analyzing data related to natural resources, contributing to a better understanding of the possibilities in Saharan areas.
2. Economic Development: Investigate the potential roles of natural resources in enhancing economic and social development, which could lead to improved living standards in benefiting regions.
3. Development of Clean Technologies: Pursue the development of sustainable and clean technologies suited to the desert environment, enabling responsible resource exploitation without harming the ecosystem.
4. Enhancement of Scientific Research: Support and strengthen research capabilities in the field of Natural and Life Sciences, contributing to the formation of trained students and researchers who can tackle environmental challenges.

This laboratory aspires to be a center for innovation and research, enhancing its ability to contribute to sustainable development in Saharan regions.

