The Second International Seminar on Catalysis, Chemical Engineering & Green Chemistry

(CACEG 2025)

May 21–22, 2025
University of El Oued, Algeria

Book of Abstracts

Editors

Dr. Neghmouche Nacer Salah
Pr. Rebiai Abdelkrim

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This volume was prepared with the aim of fostering scientific exchange and advancing research in catalysis, chemical engineering, and green chemistry.

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Acknowledgements

The organizing committee warmly thanks all participants, speakers, and contributors for their valuable role in making the **Second International Seminar on Catalysis, Chemical Engineering & Green Chemistry (CACEG 2025)** a success.

Your engagement and insights have enriched discussions and fostered collaboration across the scientific community.

We sincerely hope that the knowledge shared and the connections made will inspire future research.

"We look forward to seeing you at the next edition of CACEG."

Dr. Neghmouche Nacer Salah

Chair of CACEG 2025

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Conference Program

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09:35–10:10 **Plenary Lecture 2:** *Traitement des échantillons à l'ère de la chimie verte* — Pr. Latifa Latrous

10:10–10:45 **Coffee Break + Poster Session 1 (P001–P120)**

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11:35–11:50 OR003 — Merabet-Khelassi Mounia
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12:05–12:20 OR005 — Hamana Haoua
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Room B — Chairs: Pr. Yousfi Mouhamed, Pr. Amara Mourad

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11:05–11:20 OR009 — Elhassasna Souhir
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11:35–11:50 OR011 — Dahhmouni Said
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12:05–12:20 OR013 — Ouhaibi Abdelhalim
12:20–12:35 OR014 — Miraoui Abdelkader
12:35–12:50 OR015 — Feddal Imene

Room C — Chairs: Dr. Mohamed Taha, Pr. Saidi Mokhtar

10:50–11:05 OR016 — Taib Hana
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14:00 **Lunch**
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08:35–09:10 **Plenary Lecture 4:** *Sustainable Production of Functional Carbon-Based Materials from Biomass Waste for Environmental and Sensing Technologies* — Pr. Claudia Espro
09:10–09:45 **Plenary Lecture 5:** *Toward a Circular Bioeconomy: Valorization of Lignocellulosic Biomass for the Production of Nanocellulose-Based Green Materials* — Pr. Ramzi Khiari
09:45–10:20 **Plenary Lecture 6:** *Cellulose Nanomaterials in Tribology: A Green Frontier for Advanced Surface Engineering* — Dr. Mohamed Taha Abdo
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09:45–10:00 OR028 — Guezane Laakoud Samia
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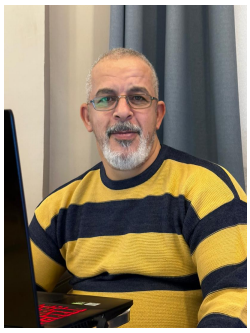
12:35–12:50 OR051 — [To be confirmed]

14:00 **Lunch**

Plenary Presentations



Pr. Yacine Benguerba

[PL001]

Affiliation: University Ferhat Abbas Setif 1, Algeria

Title: *Multiscale Molecular Engineering of Deep Eutectic Solvents: A Strategy for Eco-Extraction, Bioactive Delivery, and Critical Metal Recovery from E-Waste and Iron Ores*

Abstract:

Deep Eutectic Solvents (DESs) have emerged in recent years as a new generation of green solvents offering sustainable alternatives to conventional organic solvents and ionic liquids. Formed by simple mixtures of hydrogen bond donors and acceptors, DESs exhibit unique physicochemical properties such as low volatility, wide electrochemical stability window, tunable polarity, and excellent biodegradability. Their ease of preparation, low cost, and environmental compatibility make them highly attractive for applications in chemistry, materials science, and environmental engineering. In this intervention, we highlight the fundamentals of DESs, their structural features, and their advantages compared to traditional solvents. Particular attention is given to their role in metal extraction, catalysis, drug solubilization, and energy storage systems. The talk also addresses the challenges related to viscosity, toxicity, and large-scale application, as well as future perspectives on the integration of DESs into industrial and academic research. This overview aims to provide students and researchers with a comprehensive understanding of the potential of DESs as versatile, eco-friendly solvents for sustainable technologies.

Pr. Latifa Latrous

[PL002]

Affiliation: Laboratoire de Chimie Minérale Appliquée (LR19ES02), Faculté des Sciences de Tunis, Université de Tunis El Manar, Campus Universitaire Farhat Hached, Tunis, 2092, Tunisie. Institut Préparatoire aux Etudes d'Ingénieurs El Manar, Université de Tunis El Manar, B.P.244 El Manar II, 2092 Tunis, Tunisie.

Title: *Traitements des échantillons à l'ère de la chimie verte*

Abstract:

La préparation d'un échantillon consiste à effectuer les traitements nécessaires pour le rendre apte à subir le processus analytique prévu. Elle constitue l'étape la plus critique d'une analyse, représentant environ 61% du temps total consacré à la procédure. Cette étape est souvent le facteur limitant en chimie analytique, étant à la fois chronophage et susceptible d'introduire des erreurs: par exemple, 30% des erreurs en chromatographie proviennent du traitement de l'échantillon.

Idéalement, l'introduction directe de l'échantillon dans l'instrument serait la solution parfaite, mais elle n'est réalisable que dans des cas très spécifiques.

Dans ce contexte, la chimie verte, telle que définie en 2013, recommande de limiter, voire d'éviter, la préparation des échantillons, car elle mobilise de nombreuses ressources (solvants, réactifs, énergie...). Cela crée une situation paradoxale: d'un côté, la préparation est très consommatrice; de l'autre, elle reste indispensable pour garantir la fiabilité et la précision des analyses.

L'objectif réaliste aujourd'hui est donc de rendre cette étape plus respectueuse de l'environnement, en :

- Miniaturisant les procédures, afin de réduire la consommation de ressources ;
- Utilisant des matériaux renouvelables comme supports ou adsorbants.

Dans cette présentation, l'extraction en phase solide (SPE) sera examinée en priorité, cette méthode étant la plus largement utilisée, avec un accent particulier sur la performance des matériaux biosourcés. L'extraction magnétique sera ensuite présentée, ainsi que la synthèse et la caractérisation de nouveaux adsorbants magnétiques et leurs applications pour l'extraction d'analytes. Enfin, de nouvelles phases adsorbantes innovantes pour la préparation analytique des échantillons seront mises en avant, notamment les cure-dents imprégnés d'octanol et le papier revêtu de poly(éthylène-co-acétate de vinyle).

Key words: Préparation d'échantillons ; Chimie verte ; Extraction en phase solide (SPE) ; Adsorbants biosourcés ; Matériaux renouvelables.

Pr. Claudia Espro

[PL003]

Affiliation: Department of Engineering, University of Messina, Messina, Italy

Title: *Sustainable Production of Functional Carbon-Based Materials from Biomass Waste for Environmental and Sensing Technologies*

Abstract:

The urgent need to reduce waste and promote sustainable technologies based on renewable resources has opened new avenues in research, encouraging the use of dedicated biomass waste as renewable, low-cost, and widely available raw materials. Natural precursors such as plant residues and agro-industrial waste are highly attractive for synthesizing carbonaceous nanomaterials, owing to their abundance, environmental compatibility, and alignment with Green Chemistry principles.

Carbon materials derived from these sources possess advantageous properties, such as high porosity, structural robustness, low background signal, and excellent electrocatalytic behaviour, that render them effective in a wide range of applications with considerable development potential. Biomass-derived carbons can be synthesized through simple and scalable physical or chemical processes and have been extensively applied in environmental remediation and energy storage. While their use as adsorbents of heavy metals and organic pollutants or as electrodes for supercapacitors is well established, their application in higher-value technologies, such as sensing and advanced energy systems, remains underexplored.

Recent scientific efforts have focused on fine-tuning the physicochemical properties of bio-carbons to achieve optimal performance in these fields. Hydrothermal carbonization (HTC), a thermochemical transformation carried out in water under self-generated pressure and at relatively low temperatures (150–300°C), represents a promising technique for converting wet lignocellulosic biomass into valuable products. Unlike traditional thermochemical processes, HTC does not require prior drying of the feedstock, as water acts as the reaction medium.

Through HTC, biomass is transformed into solid hydrochar, liquid bio-oil, and gaseous byproducts. The solid hydrochar obtained from citrus processing residues is rich in oxygen-containing functional groups, making it highly suitable for various applications including pollutant adsorption, soil enhancement, energy conversion, and low-cost electrochemical devices. In addition, the light bio-oil extracted from the aqueous phase contains aldehydes, phenols, ketones, acids, and heterocyclic compounds of significant interest as precursors for fine chemicals or liquid biofuels.

Moreover, we have recently directed our research focus towards the electrochemical (EC) valorization of high-value molecules that remain within biomass. This involves the bottom-up synthesis of CDs through electrochemical methods. Specifically, by utilizing the aqueous solution produced through the hydrothermal carbonization of these agri-food waste materials, we have successfully showcased the feasibility of obtaining CDs with high yields using a straightforward, reproducible, and environmentally friendly electrochemical

bottom-up approach.

Therefore, this presentation will explore the potential of HTC for valorising citrus processing waste, emphasizing key process optimization and scale-up considerations. Moreover, advanced sensing applications of the resulting bio-carbons and CDs, such as conductometric detection of gaseous pollutants at parts-per-billion (ppb) levels and the electrochemical sensing of several molecules of interest, will be discussed.

Keywords: biomass waste; hydrothermal carbonization; carbon dots; sensing and environmental applications.

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C. Espro, A. Satira, F. Mauriello, Z. Anajafi, K. Moulaee, D. Iannazzo, G. Neri, Sens. & Act.: B. Chem. 2021, 341, 130016.

Pr. Ramzi Khiari

[PL005]

Affiliation: 1 CNRS, Grenoble INP, LGP2, Université Grenoble Alpes, F-38000 Grenoble, France
2 Department of Textile, Higher Institute of Technological Studies of Ksar Hellal, Ksar Hellal 5070, Tunisia
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Title: *Toward a Circular Bioeconomy: Valorization of Lignocellulosic Biomass for the Production of Nanocellulose-Based Green Materials*

Abstract:

Cellulose is a biopolymer that is still attracting a lot of interest and offers us enormous possibilities in terms of its use. There is growing interest in the ultimate constituents of cellulose, the nanocelluloses, namely cellulose nanocrystals (CNC) and cellulose nanofibrils (CNF). These nanocelluloses are of great interest for the production of biomaterials. Several research projects have focused on the isolation and characterisation of nanocellulose from plant biomass (agricultural and marine). The challenge was to obtain cellulose nanofibrils and nanocrystals using less energy, thereby reducing the cost of the process, and to determine the intrinsic properties of each residue tested.

My postgraduate work focused on the study of plant biomass with a view to adding value to all its components. I was interested in the isolation of cellulose, lignin and hemicelluloses from various Tunisian lignocellulosic residues. These polymers have also been used for various applications.

Much of my work has focused on the preparation of cellulose nanocrystals and nanofibrils and their use as reinforcement in the development of nanocomposite materials. In fact, many sources of cellulose are available in our country (Tunisia) and in large quantities. These include agricultural waste (such as date palm waste, vine stalks, etc.), marine waste (*Posidonia oceanica*) and waste from annual plants such as alfa. The recovery of these wastes could therefore provide an interesting economic opportunity for the production of new bio-based materials, i.e. made from plant biomass.

The aim of my work is to promote available natural resources by developing a new generation of green materials that respect the environment, for various applications to be identified in different sectors such as food packaging (active), textiles, transport, domestic sector, construction, etc.

Keywords: Lignocellulosic biomass; Biomass valorization; Sustainable materials; Delignification; Environmental sustainability.

References:

R. Khiari, M. Jawaid, M.N. Belgacem, eds., *Annual Plant: Sources of Fibres, Nanocellulose and Cellulosic Derivatives: Processing, Properties and Applications*, Springer Nature, Singapore, 2023.
https://doi.org/10.1007/978-981-99-2473-8

Dr. Mohamed Taha Abdo

[PL006]

Affiliation: Mechanical Engineering Department, College of Engineering and Technology, Arab Academy for Science, Technology and Maritime Transport, Aswan, Egypt

Title: *Cellulose Nanomaterials in Tribology: A Green Frontier for Advanced Surface Engineering*

Abstract:

The urgent global demand for sustainable engineering solutions has positioned cellulose nanomaterials (CNMs) as strategic candidates in modern tribological applications. Derived from the most abundant biopolymer on Earth, these renewable nanostructures offer exceptional mechanical properties combined with biodegradability and biocompatibility, creating unprecedented opportunities for friction and wear management systems.

This keynote examines cutting-edge developments in functionalized cellulose nanocrystals (CNCs) and nanofibrils (CNFs) as boundary lubricants, anti-wear additives, and reinforcement phases in composite materials. We will analyze the nanoscale mechanisms governing CNM performance at sliding interfaces, including their amphiphilic character, self-assembly behavior, and role in tribofilm formation.

The presentation will showcase industrial case studies demonstrating successful implementation of CNM-based tribological solutions in automotive components, biomedical devices, and precision manufacturing, alongside quantitative life-cycle assessments confirming their environmental advantages. By connecting fundamental tribochemistry with practical engineering challenges, this keynote aims to accelerate the translation of laboratory innovations into commercially viable, environmentally responsible tribological technologies.

Oral Presentations

OR001 Valorization of Polyolefin via Catalytic Hydroconversion: A Sustainable Route to Valuable Chemicals

Viviana Bressi[1,*], Antonio Cosimo Pio Trimboli[1], Emilia Paone[1], Francesco Mauriello[1]

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The accumulation of plastic waste, driven by an annual global production exceeding 380 million tonnes, has become a critical environmental issue.[1] Only a small fraction (9%) of plastic waste is recycled, while the majority is incinerated or left to pollute land and marine ecosystems.[2] Plastics nevertheless represent a valuable source of short-chain alkanes within the jet fuel and gasoline range, providing an opportunity to convert waste into resources.[3]

In response, catalytic upcycling of postconsumer plastics has emerged as a sustainable strategy to recover valuable chemicals and fuels. This process, based on thermocatalytic depolymerization, proceeds mainly through hydrocracking and hydrogenolysis, enabling selective conversion of polyolefin waste into light hydrocarbons. A key innovation of our work is the development of mild process conditions, lowering reaction temperature and hydrogen pressure. By combining customized catalytic systems with an H-transfer system for *in-situ* hydrogen supply, we improved depolymerization efficiency, controlled product distribution, and minimized unwanted by-products.

This approach highlights catalytic hydroconversion as a viable pathway to transform polyolefin waste into high-value chemicals, supporting the transition toward a sustainable circular economy.

Keywords: Polyolefin; Catalytic Hydroconversion; Plastic Waste; Circular Economy; Hydrogen Transfer

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OR-L1 A New Horizon to Overcome Traditional Antibiotic Limitations Using Antimicrobial Peptide Derived from Chromogranin A

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Received 20-04-2025, Revised 29-04-2025, Accepted 01-05-2025, Available online 15-09-2025

The global public health is increasingly threatened by the rise of antibiotic-resistant bacteria. Consequently, the effectiveness of traditional antimicrobials is rapidly declining, severely limiting the ability of healthcare providers to manage common infections. Over the past two decades, host defence peptides have emerged as a promising source of novel antimicrobial agents.

In this study, we investigated the antibacterial and molecular characteristics of D-Cateslytin (D-Ctl), a novel epipeptide derived from L-Cateslytin in which all L-amino acids are substituted with D-amino acids. Our findings revealed that D-Ctl is a potent, safe, and stable antimicrobial peptide with undetectable resistance. Using *Escherichia coli* as a model, we demonstrated that D-Ctl targets the bacterial cell wall, leading to membrane permeabilization and subsequent bacterial death.

In summary, D-Ctl presents multiple advantages that make it a promising candidate for the biopharmaceutical development of next-generation antimicrobials, either as a standalone treatment or in combination with conventional drugs. Remarkably, it enhances the activity of several reference antibiotics, including cefotaxime, amoxicillin, and methicillin. These results underscore the potential of D-Cateslytin as a novel therapeutic strategy to overcome the limitations of traditional antibiotics.

Keywords: Host defence peptides; D-Cateslytin; Resistance; Antibiotics

OR003 Dynamic Kinetic Resolution of (±)-trans-2-arylcyclohexanol via Ruthenium(II) / CAL-B Catalysis

Mounia Merabet-Khelassi[1,*]

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Dynamic kinetic resolution (DKR) is among the most efficient approaches for transforming a racemic mixture into a single enantiomer. In this strategy, classical enzymatic kinetic resolution (EKR) of alcohols through acylation is combined with an *in-situ* racemisation of the alcohol catalyzed by a transition metal complex, thereby overcoming the inherent 50% yield limitation of EKR.[1]

In this work, we report the use of the complex $[RuCl_2(p\text{-cymene})]_2$ / hemisalen ligand / TEMPO in association with *Candida antarctica* lipase B (CAL-B) as an efficient chemoenzymatic system for promoting the DKR of two (±)-trans-arylcyclohexanols. This catalytic system had previously shown effectiveness in the DKR of benzylic acetates.[2]

The enzymatic kinetic resolution via acylation, employing CAL-B as biocatalyst and isopropenyl acetate as acyl donor, was achieved with excellent enantioselectivity ($E > 200$). However, conversion rates varied depending on substrate structure (30% and 47%). In contrast, the DKR of both alcohols reached conversions of 80–100%, affording acetates in enantiomeric excesses up to 90%.

These results highlight the efficiency of Ru(II)/CAL-B-based systems in overcoming the limitations of classical EKR and reinforce their potential in asymmetric synthesis.

Keywords: Dynamic kinetic resolution; Ru(II); Hemisalen ligand; Enzymatic kinetic resolution

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OR004 Eco-Friendly Synthesis of CuO Nanoparticles via Green Chemistry: Structural, Optical, and Morphological Insights

Fatima Djeghloul[1,2,*], Youcef Medkour[1,3], Youcef Messai[1], Asma Zahir[1]

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The green synthesis of cupric oxide (CuO) nanoparticles using biological methods has emerged as a promising, eco-friendly, and cost-effective alternative to conventional chemical approaches. In this study, bee pollen (BP) extract was employed for the first time as a simple, one-step, and low-cost route to synthesize CuO nanoparticles at room temperature, without harmful solvents.

The influence of BP concentration on the structural, optical, and morphological properties of CuO nanoparticles was systematically investigated. XRD analysis revealed that samples synthesized with the lowest BP concentration exhibited the smallest crystallite size (19.57 nm), highest dislocation density and microstrain, and greatest crystallinity. FTIR spectra confirmed the formation of Cu–O bonds, mediated by biomolecular functional groups present in the BP extract.

Photoluminescence analysis showed ultraviolet and visible emission peaks, indicating favorable optical properties. Moreover, the optical bandgap decreased from 1.485 eV to 1.408 eV with increasing BP concentration. Morphological studies revealed spherical or pseudo-spherical shapes at low BP levels, whereas higher concentrations induced aggregation and agglomeration. Finally, EDX analysis confirmed the purity of the synthesized CuO nanoparticles.

These results demonstrate the effectiveness of BP extract as a sustainable reducing and stabilizing agent, providing a green route to tune the physicochemical properties of CuO nanoparticles for future applications in optoelectronics and nanotechnology.

Keywords: Copper oxide; Nanoparticles; Bee pollen extract; Green synthesis

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OR005 Integrated Experimental and Theoretical Evaluation of Rhodanine Derivatives: Promising Antioxidant Agents

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Rhodanine is a privileged structural scaffold in medicinal chemistry due to its versatile reactivity and wide range of biological activities. In this work, a series of novel rhodanine derivatives was developed, and the influence of structural modifications on their antioxidant potential was assessed through a combined experimental–theoretical strategy.

Experimentally, the synthesized derivatives were characterized by FTIR and ^{1}H NMR spectroscopy. Their antioxidant activity was examined using two complementary *in vitro* assays: the sodium nitroprusside (SNP) method for nitric oxide (NO•) scavenging and the phenanthroline assay for iron-chelation capacity.

Theoretical studies involved Density Functional Theory (DFT) calculations to evaluate electronic properties, including HOMO–LUMO energies and global reactivity descriptors. Additionally, molecular docking simulations were conducted to predict interactions with oxidative stress-related biological targets.

This integrated approach provides valuable insights into the structure–activity relationships (SAR) of rhodanine derivatives and highlights their promise as efficient antioxidant candidates for pharmaceutical development.

Keywords: Rhodanine; DFT; Molecular Docking; Antioxidant Activity

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OR009 In Silico Evaluation of the Antidiabetic Potential of Flavone, Flavonol, and Isoflavone on Glycogen Phosphorylase B by Molecular Docking

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Diabetes mellitus remains one of the most pressing global health challenges. Glycogen phosphorylase B (GPB), a key enzyme in glycogenolysis, is an attractive therapeutic target for regulating blood glucose levels. Flavonoids such as flavone, flavonol, and isoflavone, abundant in medicinal plants, have attracted considerable interest owing to their diverse biological activities and potential antidiabetic properties.

In this work, the *in silico* antidiabetic potential of these flavonoid scaffolds was investigated by targeting glycogen phosphorylase B (PDB ID: 1H5U). Molecular docking simulations were performed using the MOE 2015 platform to explore ligand binding at the GPB active site. Docking protocols were optimized to ensure robust predictions, and binding affinities together with ligand–protein interaction profiles were systematically analyzed.

The results provide mechanistic insights into the interactions between flavonoid scaffolds and GPB, emphasizing their potential as natural lead candidates for the development of novel antidiabetic therapeutics.

Keywords: Diabetes; Flavonoids; Molecular Docking; Glycogen Phosphorylase B

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OR011 LC-MS/MS Bioactive Compound Profiling of *Arthrospira platensis* Extracts

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Arthrospira is a genus of cyanobacteria encompassing about 15 identified species, among which only a few, notably *Arthrospira platensis* and *Arthrospira maxima*, are regarded as safe and suitable for human and animal consumption. These edible species are commercially cultivated on a large scale owing to their remarkable nutritional value and promising therapeutic applications.

This study provides a comprehensive evaluation of the phytochemical composition, fatty acid profiles, and bioactive constituents of *A. platensis* extracts obtained using ethanol (SPE), methanol (SPM), and acetone (SPA). Chemical analysis revealed a high protein content (72.08 %) and moderate lipid levels (6.49 %), with a fatty acid profile rich in polyunsaturated fatty acids. Among the tested extracts, the methanolic extract (SPM) exhibited the strongest antioxidant activity and was thus selected for further LC-MS/MS analysis.

The LC-MS/MS profiling revealed a wide diversity of bioactive compounds, including phenolic acids, flavonoids, carotenoids, chlorophylls, and phycobiliproteins. These findings underscore the nutritional richness and functional potential of *A. platensis*, reinforcing its relevance as a source of nutraceuticals and functional food ingredients.

Keywords: *Arthrospira platensis*; Bioactive profiling; LC-MS/MS analysis; Phytochemical composition

OR012 Study of the Anti-Corrosion Properties of *Scorzonera undulata* Plant Extract in 1M Hydrochloric Acid Media for Carbon Steel (X70)

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This work aims to evaluate the potential of *Scorzonera undulata* extract as a corrosion inhibitor for carbon steel (X70) in 1M hydrochloric acid medium. Electrochemical impedance spectroscopy (EIS) and potentiodynamic polarization techniques were employed to assess the anti-corrosion performance of the acetate extract. Polarization curves revealed that the extract acts as an efficient mixed-type inhibitor, achieving a maximum inhibition efficiency of 83% at 400 mg/L and 298 K.

The investigation was further supported by morphological and surface chemistry analyses using scanning electron microscopy (SEM) and X-ray photoelectron spectroscopy (XPS). These results confirmed the formation of a stable protective layer on the steel surface in the presence of the extract, highlighting its promising potential as a green corrosion inhibitor.

Keywords: *Scorzonera undulata*; EIS; SEM; XPS; corrosion inhibition

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OR013 Synthesis and Characterization of Ni-Doped SnO_2 Nanofilms by Ultrasonic Spray Pyrolysis: PNP Photodegradation Application

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Tin oxide (SnO_2) nanofilms with varying concentrations of nickel (Ni) doping were fabricated on glass substrates via the ultrasonic spray pyrolysis method. Ethanol and tin(IV) chloride dihydrate were used as precursors, with the deposition performed at 450 °C. X-ray diffraction (XRD) analysis confirmed that both pure and Ni-doped SnO_2 nanofilms exhibited a tetragonal crystal structure. Surface morphology studies revealed dense, homogeneous, and continuous layers composed of nanometer-sized grains, with surface roughness strongly dependent on the Ni doping level, as observed through atomic force microscopy (AFM).

Optical characterization using UV–Visible spectroscopy demonstrated high transparency and similar energy bandgap values across all films. Photocatalytic activity was investigated through the degradation of *p*-nitrophenol (PNP) in aqueous solution under UV irradiation. All SnO_2 films exhibited significant photocatalytic efficiency under low UV light energy, with Ni-doped samples showing markedly enhanced photodegradation performance.

Keywords: SnO_2; nanofilms; Ni doping; ultrasonic spray pyrolysis; photocatalysis

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OR014 A Magnetically Retrievable Bentonite-Based Sorbent for Thorium Removal

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This study investigates the performance of sodium bentonite and its magnetically modified counterpart for the removal of thorium (Th^{4+}) from aqueous solutions. The magnetic modification enables rapid and simple recovery of the sorbent using a permanent magnet, eliminating the need for filtration or centrifugation. Batch adsorption experiments were conducted to evaluate the influence of contact time, initial concentration, and pH on sorption efficiency. Thorium concentration was determined spectrophotometrically at 665 nm using Arsenazo III. For analysis, 100 μL of aqueous phase was mixed with 100 μL of Arsenazo III and 2 mL of HCl (9N).

Results showed that magnetic bentonite achieved 58% removal (8.26 $mg{\cdot}g^{-1}$) within 45 minutes, while sodium bentonite reached 89% removal (8.65 $mg{\cdot}g^{-1}$) after 60 minutes. Desorption studies with four acids (0.5 M) revealed complete thorium recovery from magnetic bentonite using sulfuric acid and up to 78% with acetic acid. For sodium bentonite, all acids provided significant desorption efficiencies.

These findings highlight the high efficiency, reusability, and easy retrievability of magnetic bentonite, confirming its potential as a cost-effective sorbent for the treatment of radioactive wastewater.

Keywords: Thorium (IV); Sodium bentonite; Magnetic bentonite; Adsorption

OR016 Different Types of Zeolite as a Catalytic Material

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Zeolites are inorganic microporous crystalline materials that find extensive applications in catalysis, adsorption–separation, and ion exchange. Typically, zeolite synthesis is performed under hydrothermal–solvothermal conditions. In this study, two different types of zeolite were synthesized using distinct aluminate sources as starting materials. The synthesis involved activation of the reactive precursor followed by hydrothermal treatment.

The resulting zeolites were tested in acylation and Biginelli reactions, where they acted as effective catalytic materials. A catalytic yield of up to 75% was achieved, attributed to the presence of Brønsted and Lewis acid sites within the zeolite framework. Structural and surface properties of the synthesized samples were confirmed by X-ray diffraction (XRD), infrared spectroscopy (IR), and scanning electron microscopy (SEM). Additionally, NMR spectroscopy was employed to identify the organic products of the Biginelli reaction, confirming the efficiency of the catalytic system.

These findings underscore the versatility of zeolite catalysts and their importance in organic transformations.

Keywords: Zeolite; Hydrothermal synthesis; Catalysis; Characterization

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OR017 Evaluation of the Antibacterial Activity of Moringa oleifera

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This study aimed to evaluate the antibacterial activity of *Moringa oleifera* seeds in wastewater treatment. Bacterial analyses were conducted on three water types: raw wastewater (RW), cleaned wastewater (CW), and wastewater treated with *M. oleifera* seeds. Fresh seeds were ground and prepared into a liquid solution, then applied to wastewater samples. Pathogenic bacteria were enumerated using the NPP method before and after treatment.

Results indicated that RW contained very high bacterial loads: total bacteria (3.16×10^{12} CFU/mL), fecal coliforms (9.4×10^{8} CFU/mL), and *E. coli* (2.1×10^{8} CFU/mL), along with pathogens such as *Staphylococcus aureus*, *Vibrio* sp., and *Pseudomonas aeruginosa*. In CW, bacterial counts decreased substantially (total: 5.1×10^{6} CFU/mL; fecal coliforms: 6.5×10^{4} CFU/mL), though still exceeding Algerian and WHO standards. Treatment with *M. oleifera* seeds showed remarkable efficacy, reducing bacterial load to 47,133 CFU/mL for total bacteria and 873 CFU/mL for fecal coliforms.

These findings confirm that *M. oleifera* seeds are a highly effective natural bioagent for reducing bacterial contamination in wastewater, offering a sustainable and low-cost solution for water purification.

Keywords: Wastewater; Antibacterial activity; *Moringa oleifera*; Pathogens.

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OR018 High-Performance of a Magnetic Nanocomposite Loaded Agro-Industrial Pomace: A Sustainable Solution for Tannery Effluent Treatment

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Effective management of organic and chemical pollutants remains a major challenge in the leather industry. This work reports the development of a novel magnetic nanocomposite, (AC/Fe_3O_4)PP, synthesized from an agro-industrial byproduct and applied for tannery wastewater treatment. Activated carbon (AC-PP) was prepared from pomace, while the extract served as a reducing and stabilizing agent for Fe_3O_4 nanoparticles (Fe_3O_4@PP-NPs). Their integration produced the (AC/Fe_3O_4)PP nanocomposite, exhibiting high adsorption performance.

The AC component provided a large surface area (>1400 m^2/g), enhancing pollutant adsorption, while the Fe_3O_4 ensured magnetic recoverability. Structural and surface characterizations confirmed successful synthesis of Fe_3O_4@PP-NPs, AC-PP, and the composite. Adsorption studies revealed maximum capacities for AB210 dye of 372.37, 827.60, and 962.31 mg/L for Fe_3O_4@PP-NPs, AC-PP, and (AC/Fe_3O_4)PP, respectively, following the Langmuir isotherm model. Kinetic analysis indicated a dual mechanism involving both external and intraparticle diffusion. Moreover, the composite achieved high removal efficiencies of COD, BOD_5, turbidity, and TDS across multiple treatment stages.

These findings demonstrate the potential of (AC/Fe_3O_4)PP as a cost-effective and sustainable adsorbent for advanced tannery effluent remediation.

Keywords: Adsorption; Iron oxide nanoparticles; Activated carbon; Magnetic nanocomposite.

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OR019 Mesoporous Silica-Based Systems Containing Silver Nanoparticles for Trapping and Immobilizing Iodine from the Gas Phase

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Submicron silica particles with controlled morphology, particle size, and mesoporosity were synthesized under basic conditions using cationic alkyltrimethylammonium surfactants as porogens. Nitrogen adsorption, XRD, and TEM confirmed quasi-spherical, homodispersed MCM-41-type mesoporous objects, where longer hydrophobic tails of the surfactant yielded smaller particles with larger intraparticle pores. Calcination induced aggregation and sintering into clusters containing interparticle voids, as shown by ^{129}Xe NMR and TEM.

Post-synthesis silver loading led to Ag-functionalized silica capable of irreversibly trapping gaseous iodine, predominantly as interfacial AgI. Complementary XRD, SEM/EDX, TGA/DTA, and UV-Vis analyses evidenced the successful incorporation of silver nanoparticles with heterogeneous size and shape. The large-pore silica templated with C18TAB provided the best compromise between textural properties and functionalization efficiency.

The Ag-functionalized mesoporous silica exhibited high retention of iodine, with stability up to 800 K in air, making it a promising candidate for radioactive iodine immobilization in nuclear industry applications.

Keywords: Mesoporous silica; Gaseous iodine entrapment; Silver nanoparticles; ^{129}Xe NMR characterization.

OR020 Study of a Hybrid Adsorption/Heterogeneous Photo-Fenton Process via a Spinel-Type Material for the Decontamination of Colored Water

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Wastewater from the textile industry poses a major environmental concern due to the extensive use of synthetic dyes, which contribute significantly to water pollution and public health risks. In this work, iron oxide (Fe_3O_4) nanoparticles were synthesized via the co-precipitation method and investigated for the removal of methyl orange (MO), an anionic dye, through adsorption and heterogeneous photo-Fenton processes.

The synthesized catalyst was characterized using XRD, BET, FTIR, SEM, and EDX analyses. Adsorption equilibrium studies revealed that the Langmuir isotherm model best described the MO adsorption behavior under optimized conditions in batch mode. Furthermore, catalytic experiments were carried out to evaluate the influence of hydrogen peroxide (H_2O_2) concentration and solution pH on dye degradation efficiency.

The results demonstrated that under UVA irradiation, the hybrid adsorption/photo-Fenton process achieved 96% degradation of MO at acidic conditions (pH = 3) with an optimal H_2O_2 concentration of 5 mM. These findings highlight the potential of spinel-type Fe_3O_4 materials as effective catalysts for wastewater treatment and textile dye removal.

Keywords: Dye; Iron oxide; Adsorption; Heterogeneous photo-Fenton.

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OR021 Use of the Ionic Liquid 1-Ethyl-3-Methylimidazolium Ethylphosphonate in the Desulfuration and Denitrogenation of Fuel

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Ionic liquids (ILs) are the subject of extensive research as greener alternatives to conventional volatile organic solvents. Their unique physicochemical properties, including negligible vapor pressure at room temperature, non-flammability, wide liquid range, and excellent thermal stability, make them highly promising candidates for applications in separation processes, extractive distillation, liquid–liquid extraction, catalysis, synthesis, and electrochemistry. Among them, imidazolium-based ILs have gained particular attention as effective extractants for a wide range of organic and inorganic solutes.

In this study, we focus on the ionic liquid 1-ethyl-3-methylimidazolium ethylphosphonate [EMIM][(EtO)(H)PO_2], evaluating its performance in the desulfuration and denitrogenation of fuels. Activity coefficients at infinite dilution for selected organic solutes were determined using inverse gas chromatography over the temperature range 323.15–363.15 K. Based on these experimental data, the infinite dilution selectivity and capacity of [EMIM][(EtO)(H)PO_2] were calculated.

The results highlight the strong potential of ethylphosphonate-based ionic liquids for efficient fuel purification, offering an environmentally friendly alternative to conventional separation processes.

Keywords: Ethylphosphonate-based ionic liquids; Gas–liquid chromatography; Separation; Selectivity.

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OR023 Extracellular Vesicles in Reaction Engineering: Natural Nanocarriers for Catalytic and Chemical Transformations

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Extracellular vesicles (EVs) are nanosized particles secreted by diverse cell types, containing bioactive molecules such as proteins, lipids, and RNA. They play a central role in intercellular communication and have emerging applications in biotechnology, particularly in reaction engineering. Their lipid bilayer structure enables encapsulation of both hydrophilic and hydrophobic compounds, offering versatility in catalytic and chemical processes.

Due to their stability and biocompatibility, EVs are promising systems for controlled release of enzymes and therapeutic molecules. In cancer therapy, RNA-loaded EVs have demonstrated improved targeting and reduced systemic toxicity. In catalysis, EVs function as natural nanocarriers for enzymes, enhancing biocatalytic efficiency in green chemistry applications such as biofuel production and pharmaceutical synthesis. They also show potential in environmental bioremediation, facilitating the breakdown of pollutants.

Despite these advances, challenges remain in scaling up EV production, maintaining vesicle uniformity, and ensuring long-term stability. Overcoming these limitations is crucial for the industrial deployment of EVs in sustainable catalysis and chemical engineering. Further research is needed to fully exploit their potential in catalytic transformations.

Keywords: Extracellular vesicles; nanocarriers; chemical transformations; catalytic reactions; drug delivery; bioengineering.

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OR024 Photochemistry Process of a Polymer Resin in Digital Light Processing (DLP) 3D Printing

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Vat-photopolymerization is an additive manufacturing (AM) method that involves layer-by-layer solidification of a liquid resin upon exposure to a light source. Among the different vat-photopolymerization techniques, Digital Light Processing (DLP) has emerged as a promising approach due to its high resolution and ability to cure an entire layer in a single projection, thereby reducing printing time. Initially used for producing prototypes from pure photopolymers, DLP has recently been extended to the fabrication of ceramic and metal suspensions.

In this study, a photosensitive resin composed of a urethane acrylate oligomer (synthesized in-house), a reactive diluent, and a photo-initiator was formulated and processed using a DLP 3D printer. Fourier-transform infrared spectroscopy (FTIR) confirmed the presence of acrylate functions in the resin and was employed to evaluate the effect of post-curing on conversion rate (crosslink density). The characteristic absorption peaks of acrylate double bonds (C=C) at 810 cm^{-1} and 1635 cm^{-1} confirmed successful acrylation. Quantitative analysis indicated that post-curing increased the conversion rate of printed parts by 15–20%, demonstrating the effectiveness of the photochemistry process in enhancing the final polymer network.

Keywords: Digital Light Processing; photosensitive resin; photochemistry; 3D printing.

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OR025 Production and Characterization of Oil and Biodiesel from Algerian Castor Seed Kernels

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This study investigates the extraction and characterization of oil and biodiesel from Algerian castor seed kernels, aiming to assess their potential as renewable alternatives to conventional fossil fuels. Castor plants are widely available in southern Algeria (El Oued region) and their seeds contain a high oil content of nearly 50%. Biodiesel was obtained via catalytic transesterification of castor oil with methanol, achieving a conversion yield of about 64%.

Physicochemical properties of the extracted castor oil and the derived biodiesel—including kinematic viscosity, iodine value, cetane number, density, flash point, and FTIR spectral analysis of fatty acid functional groups—were systematically evaluated. The results confirmed that the produced biodiesel complies with essential fuel quality requirements. This work demonstrates that Algerian castor seed kernels can serve as a sustainable and regionally accessible feedstock for oil and biodiesel production, supporting the global transition toward renewable energy.

Keywords: Biodiesel; Castor oil; Transesterification; Physicochemical characterization; Algerian desert plants.

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OR026 Reactivity and Functionalization of Aurones: Pathways and Applications

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Scientific and technological advancements have made organic chemistry increasingly dynamic, with the development of heterocyclic compounds driving innovation in biological and electronic applications. A notable example is the synthesis of 2-[Aryl(hydroxy)methyl]-6-methyl-2H-furo[3,2-c]pyran-3,4-diones via a one-pot reaction using -brominated dehydroacetic acid with benzaldehydes under organobase conditions. Figure 1 illustrates an efficient synthetic pathway leading to oxygen-rich, structurally intricate molecules with heterocyclic scaffolds [**?**].
Aurones and their derivatives are important biological agents, with applications including anticancer[2], antimicrobial[3], antioxidant and anti-inflammatory[4], and antitubercular activities[5]. They also display electronic properties valuable for organic electro-optical (EO) materials, organic semiconductors, and organic photovoltaics[6-8].
In this study, 2-[Aryl(hydroxy)methyl]-2H-furo[3,2-c]pyran-3,4-diones were used in a two-step procedure: (i) opening the molecule to form chalcones; and (ii) using these chalcones as intermediates to synthesize more complex heterocycles, such as 4-hydroxy-6-methyl-3-(3-phenyl-1H-pyrazol-5-yl)-2H-pyran-2-one[6-8]. These modifications aim to enhance both biological and electronic properties, potentially improving therapeutic efficacy and electronic performance.

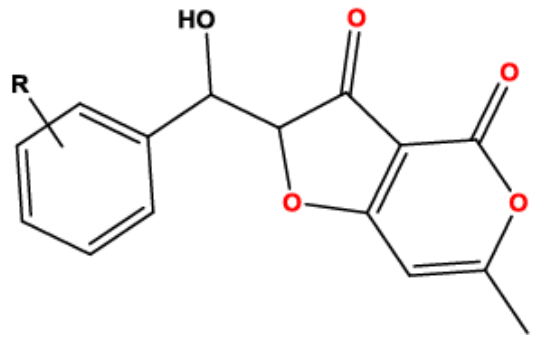

Figure 1: 2-[Aryl(hydroxy)methyl]-6-methyl-2H-furo[3,2-c]pyran-3,4-diones

Keywords: Green synthesis; Heterocyclic compounds; Biological agents; Electronic properties

OR028 Synthesis, DFT Calculations, and Molecular Docking as Antibacterial Activity of Furan α-Acetoxy Methylphosphonate Derivatives

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The growing problem of antibacterial resistance necessitates the development of effective new compounds. Recent research has highlighted -aminophosphonates for their excellent biocompatibility [**?**]. These compounds are structural analogs of -amino acids and have broad applications in medicinal and biochemical chemistry. Several -aminophosphonates have shown remarkable antibacterial activity against drug-resistant bacterial strains [**?**], and they are also valuable as synthetic intermediates with pharmacological potential [**?**]. In this study, novel furan -acetoxy methylphosphonate derivatives were designed and successfully synthesized via a two-step procedure, achieving excellent chemical yields. Their structures were confirmed using NMR spectroscopy (^{1}H, ^{13}C, ^{31}P) and HRMS analyses. The antibacterial activity of these compounds was tested against various Gram-positive and Gram-negative bacteria, showing potent efficacy. Density Functional Theory (DFT) calculations were performed at the CAM-B3LYP/6-31G(d,p) level to investigate compound stability and reactivity through energy gap analysis. Furthermore, molecular docking studies revealed strong interactions between the synthesized molecules and target bacterial proteins, indicating promising antibacterial potential.

Keywords: Furan -aminophosphonate; DFT calculations; Molecular docking; Antibacterial activity

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OR029 Assessment of Nephroprotective Effect of the Methanolic Extract of *Centella asiatica* (Apiaceae)

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Centella asiatica is a perennial herbaceous creeper, faintly aromatic, and a valuable medicinal plant widely used in traditional medicine for treating various human ailments. It contains diverse bioactive compounds such as alkaloids, flavonoids, glycosides, terpenoids, and saponins.

This study aimed to evaluate the anti-nephrotoxic activity of the methanolic extract of *C. asiatica* leaves in vivo. Five groups of six rats each were treated as follows: (1) sodium CMC (control), (2) gentamicin (pathological control), (3) CAMeOH 100 mg/kg p.c., (4) CAMeOH 200 mg/kg p.c., and (5) cyctone 20 mg/kg as reference. Treatments were administered orally 1 h before gentamicin, except for the first group.

The administration of gentamicin significantly reduced urine volume and body weight in the pathological control, indicating nephrotoxicity. In contrast, oral administration of the methanolic extract (100 and 200 mg/kg) and cyctone significantly improved urine output and body weight compared to the pathological control, demonstrating nephroprotective effects.

Keywords: *Centella asiatica*; Anti-nephrotoxic activity; Gentamicin; Methanolic extract

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OR030 Phytochemical Analysis and Biological Activities of Phenolic Compounds from a Species of the Apiaceae Family

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This study investigates the phytochemical composition and biological activities of a species from the Apiaceae family growing in Algeria. Methanolic extraction followed by solvent fractionation of increasing polarity was performed. LC-MS/MS analysis was used to identify phenolic compounds, while biological activities were assessed via antioxidant assays, enzyme inhibition, and anti-inflammatory and anticancer evaluations.
All extracts showed significant antioxidant activity. The butanol fraction exhibited the highest reducing power (IC_{50} = 0.29 µg/mL), surpassing standard antioxidants BHA (IC_{50} = 8.47 µg/mL) and ascorbic acid (IC_{50} = 9.01 µg/mL). In enzyme inhibition assays, all extracts demonstrated Strong Antidiabetic Activity Against α-Amylase, exceeding the efficacy of acarbose (IC_{50} = 3650 µg/mL). Anti-inflammatory testing showed over 75% inhibition in certain fractions. Moderate cytotoxic effects were observed against breast cancer cell lines MCF-7 and MDA-MB-231, with IC_{50} values ranging from 20 to 80 µg/mL. These findings highlight the therapeutic potential of this Apiaceae species, supporting its use in medicinal applications and warranting further detailed studies.

Keywords: Anti-diabetic, Antioxidant, Biological activities, Extracts, LC-MS/MS

OR033 Enhancement of Quinoa (Chenopodium quinoa Willd.) Leaf Bioactivity under Salt Stress: Insights into Tyrosinase Inhibition via In Vitro and In Silico Approaches

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Quinoa is widely recognized for its nutritional and pharmacological value. This study investigates the effect of salt stress, induced by various concentrations of sodium chloride (NaCl), on the biosynthesis of phenolic compounds and associated biological activities in quinoa accessions Q4, Q24, and Q45. Leaf extracts were prepared using water and ethanol, then analyzed for total polyphenols, flavonoids, tannins, and anthocyanins. The aqueous extracts were further characterized using HPLC-DAD-ESI-MS/MS to identify major bioactive compounds.
Biological activities, including antioxidant potential (ABTS and FRAP assays) and anti-tyrosinase effects, were evaluated both in vitro and via in silico modeling. Salt stress significantly increased phenolic content in all accessions, with Q45 exhibiting the strongest response at 200 mM NaCl: polyphenols +65%, flavonoids +144%, anthocyanins +125%, and tannins +89% compared to controls. HPLC-MS/MS confirmed elevated levels of key bioactives under saline conditions. Correspondingly, antioxidant and anti-tyrosinase activities improved, with reduced IC_{50} values. In silico docking further supported strong interactions between major compounds and target enzymes.
These results demonstrate that salt stress enhances both phenolic accumulation and bioactivity in quinoa leaves, highlighting its potential as a functional food and therapeutic crop, particularly under saline and climate-challenged environments.

Keywords: Quinoa; Salt stress; Tyrosinase activity; In vitro study; In silico study

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OR034 Ethnobotanical Survey of Medicinal Plants in the Wilaya of Ain Defla (Southwest Algeria)

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The Wilaya of Ain Defla hosts numerous medicinal plants with therapeutic properties; however, their potential remains underexploited due to limited ethnobotanical documentation. This study, conducted over two years (2019–2021) across 10 municipalities, aimed to identify medicinal plants used by local populations and record their traditional applications. Data were collected via questionnaires targeting demographics, plant species, parts used, preparation methods, and diseases treated. Analyses were performed using species use value (UV), fidelity level (FL), and informant consensus factor (ICF).
Among 180 respondents, 60% were men. The study documented 65 species across 33 families, with Lamiaceae being the most commonly cited. Leaves were the most frequently used plant part, followed by stems, fruits, flowers, and seeds. Infusion was the predominant preparation method. *Thymus munbyanus subsp. coloratus* and *Allium cepa* showed the highest use values (1.07 and 0.69, respectively). *Petroselinum crispum* exhibited a 100% fidelity level for cardiovascular treatments, and *Inula viscosa* had 86% for gastrointestinal diseases. ICF values ranged from 0.75 to 0.96, with gastrointestinal diseases showing the highest consensus (0.96).

Keywords: Ethnobotanical survey; Ain Defla; Medicinal plants; Pathologies

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OR035 Evaluation of the Antioxidant Properties of the Methanolic Extract from the Aerial Parts of *Globularia alypum*

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Medicinal plants are important sources of therapeutic agents due to their diverse secondary metabolites and bioactive compounds. This study investigates the antioxidant and anti-inflammatory activities of the methanolic extract from the aerial parts of *Globularia alypum*. Preliminary phytochemical screening confirmed the presence of flavonoids, polyphenols, flavanols, and other metabolites. Antioxidant activities were evaluated using DPPH and FRAP assays, while anti-inflammatory activity was assessed in vivo. The extract exhibited strong antioxidant activity with IC_{50} values of 0.153, 0.116, and 0.110 µg/mL and significant anti-inflammatory effects. These results support the traditional medicinal use of *Globularia alypum* and encourage further investigations into its therapeutic potential.

Keywords: Antioxidant activity; DPPH assay; FRAP assay; *Globularia alypum*; Phytochemical screening

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OR036 Evaluation of Total Phenols, Essential Oil Yields, and In Vitro Culture of Some Aromatic Plants Used in Algerian Herbal Medicine

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Medicinal plants have broad therapeutic applications due to their bioactive compounds. This study evaluates the chemical composition, essential oil (EO) yield, and total polyphenol content of four medicinal plants collected from the Algerian semiarid region: *Thymus algeriensis* Boiss. & Reut., *Salvia rosmarinus* Spenn, *Mentha pulegium* L., and *Origanum majorana* L. Additionally, in vitro regeneration of *Salvia rosmarinus* and *Thymus algeriensis* was investigated.

Preliminary phytochemical screening revealed that all four species contain saponins, flavonoids, sterols, and tannins. Hydrodistillation indicated that EO content was highest in *Origanum majorana* (1.69%) and *Mentha pulegium* (1.35%), while *Salvia rosmarinus* and *Thymus algeriensis* showed lower yields of 0.73% and 0.53%, respectively. Total phenol quantification via Folin-Ciocalteu method showed that *Thymus algeriensis* and *Salvia rosmarinus* had the highest concentrations (10.8% and 8.1%, respectively), whereas *Origanum majorana* and *Mentha pulegium* exhibited lower contents (2.62% and 0.79%, respectively).

Under greenhouse conditions, *Thymus algeriensis* germination rate was 24%, whereas in vitro germination reached 84%. In vitro microcutting on Murashige and Skoog (MS) medium supplemented with indole-3-acetic acid (IAA) and N-6-furfuryladenine (kinetin) promoted callus and shoot formation in both *Thymus algeriensis* and *Salvia rosmarinus*. These findings highlight in vitro culture as an effective method for propagating overexploited medicinal plants and providing biomass for phytochemical production.

Keywords: Phytochemical composition; In vitro culture; Phytohormone; Essential oils; Herbal medicine

OR037 Exploring the Neuroprotective Effects of an Essential Oil: Phytochemical Characterization and Multi-Method Anti-Alzheimer Evaluation

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This study investigates the extraction and characterization of an essential oil from a medicinal plant and evaluates its potential neuroprotective and anti-Alzheimer activities. The chemical composition of the essential oil was determined using gas chromatography–mass spectrometry (GC/MS). Biological activities were assessed through both in vitro and in vivo experiments to evaluate neuroprotective efficacy. An in silico approach, including molecular docking and molecular dynamics simulations, was employed to investigate interactions with key enzymes implicated in Alzheimer's disease. Furthermore, silver nanoparticles were synthesized using the essential oil, and their physicochemical properties were analyzed. Comparative studies between the essential oil and its silver nanoparticle formulation were conducted to assess differences in bioactivity. The findings highlight the promising therapeutic potential of both the essential oil and its nanoformulations in managing neurodegenerative disorders, offering valuable insights for future pharmacological development.

Keywords: Essential oil; GC/MS analysis; Anti-Alzheimer activity; In silico evaluation; Silver nanoparticles

OR038 Phytochemical and Biological Activity of Pterocarpans Isolated from Psoralea bituminosa

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This study investigates the chemical constituents of *Psoralea bituminosa* L., a Fabaceae species growing in Algeria, known for its diverse natural compounds including biologically active polyphenols. One kilogram of dried plant material was extracted using a hydroalcoholic solution ($MeOH/H_2O$, 8:2), filtered, and concentrated to obtain an aqueous solution. Successive liquid-liquid extraction with solvents of increasing polarity (petroleum ether, ethyl acetate, and n-butanol) produced three organic extracts. Chromatographic analysis revealed the richness of the petroleum ether extract in secondary metabolites, which was further purified using silica gel chromatography (normal and reversed phase) and high-performance liquid chromatography (HPLC). Structural elucidation of the isolated compounds was performed using extensive spectroscopic analyses including 1D and 2D NMR (^1H, ^{13}C, COSY, HMQC, HMBC) and mass spectrometry. Three pterocarpans were identified for the first time in this species, highlighting its phytochemical potential.

Keywords: Fabaceae; Pterocarpans; NMR 1D and 2D; Mass spectrometry

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OR039 Phytochemical Characterization, HPLC-DAD Profiling and Bioactivity Evaluation of *Anacyclus clavatus* Root Fractions

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Anacyclus clavatus is a wild medicinal plant traditionally used to treat digestive disorders. This study aimed to extract, fractionate, identify, and evaluate the biological and pharmacological potential of phenolic compounds from its roots. An ethanolic extract was prepared and fractionated using solvents of increasing polarity. Total phenolic content (TPC) and total flavonoid content (TFC) were quantified spectrophotometrically, and the chemical profile was explored using HPLC-DAD. Antioxidant activity was assessed through DPPH, FRAP, -carotene bleaching, and total antioxidant capacity assays. Additional analyses included in vitro antimicrobial activity, acute toxicity, and in vivo anti-inflammatory activity.

Results showed that the n-butanol fraction had the highest TPC (0.72 g GAE/g) and TFC (0.12 g QE/g), whereas the ethyl acetate fraction exhibited the strongest antioxidant activity (DPPH IC_{50} = 0.26 mg/mL), suggesting a richer antioxidant compound profile. The chloroform fraction displayed the lowest extraction yield and weakest antioxidant activity. HPLC-DAD analysis allowed tentative identification of phenolic compounds including caffeic acid, naringin, quercetin, flavone, and gossypin. The ethanolic extract also showed significant antimicrobial activity against various microbial strains. Acute toxicity tests revealed an LD_{50} of 4303.11 mg/kg, classifying the extract as slightly toxic when administered orally in mice. In vivo anti-inflammatory tests demonstrated a marked, dose-dependent effect (0.5 to 2 g/kg), comparable to a reference drug. These findings confirm the presence of bioactive phenolic compounds and scientifically validate the traditional use of *A. clavatus* as an antioxidant and anti-inflammatory agent.

Keywords: *Anacyclus clavatus*; Antioxidant activity; Anti-inflammatory activity; HPLC-DAD analysis

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OR040 Potential Natural Antioxidant and Antibacterial Activity of *Rubus ulmifolius* Extract: In Vitro Study

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This study explores the antioxidant and antibacterial potential of *Rubus ulmifolius* ethanolic extract to valorize Algerian medicinal plants. Antibacterial activity was assessed using disc diffusion and microdilution methods against nine standard bacterial strains. Antioxidant activity was evaluated through four assays: DPPH, ABTS, Phenanthroline, and FRAP.

The results demonstrated that the ethanolic extract exhibited significant antibacterial activity against most tested strains, notably inhibiting *Staphylococcus aureus* ATCC 25923 and *Escherichia coli* ATCC 25922. Furthermore, the extract showed strong antioxidant capacity across all assays, indicating its potential as a natural antioxidant.

These findings support the traditional use of *R. ulmifolius* in wound healing and bacterial infection prevention. However, further studies against other microorganisms and exploration of additional mechanisms are required to fully evaluate its pharmacological potential.

Keywords: *Rubus ulmifolius*; Antibacterial activity; Antioxidant activity; DPPH; ABTS; FRAP

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OR041 Prediction of Future Budburst and Flowering Dates in Apple Trees to Cope with Global Warming

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Accurate prediction of apple tree phenology under climate change is essential for orchard management. This study aims to select efficient phenological models for forecasting budburst and flowering dates and to parameterize temperature and phenology data for the Golden Delicious variety in northern Algeria. Temperature series from 1980 to 2016 were analyzed in two regions with contrasting climates: Sidi Lakhdar (211 m) and Benchicao (1133 m). Observed phenological data for budburst and flowering were collected from 2000 to 2016.

Phenological modeling was performed using the PMP5.5 platform, comparing single-phase and sequential two-phase models. Single-phase models at the Benchicao site yielded poor predictions, while the Parabolic and Smoothed Utah models showed the best performance. At Sidi Lakhdar, single-phase models were generally inadequate, with the Smoothed Utah model providing acceptable flowering predictions (efficiency = 0.40, RMSE = 5.5 days). Sequential two-phase models at Sidi Lakhdar, particularly the Chuine/Sigmoid model, improved accuracy significantly, yielding an efficiency of 0.80 and RMSE of 2–3 days between observed and predicted dates.

The timing of budburst and flowering is mainly determined by cold unit accumulation at Sidi Lakhdar and by heat unit accumulation at Benchicao. These results highlight the importance of regional climate parameters in modeling apple phenology and provide insights for adapting orchard practices under global warming.

Keywords: Apple tree; Phenology; Budburst; Flowering; Climate change; Modeling

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OR043 Quinoa (*Chenopodium quinoa L.*): A Strategic Nutritional and Therapeutic Resource Against Climate Change Challenges

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Quinoa (*Chenopodium quinoa L.*) is recognized for its exceptional nutritional and therapeutic properties, as well as its resilience to abiotic stresses such as salinity. This study assessed the nutritional composition and bioactive potential of different quinoa accessions cultivated in Tunisia. Analyses revealed considerable genetic variability, with protein content ranging from 7.63–15.85%, total sugars from 38.73–77.09%, fatty acids from 2.33–4.336%, and essential minerals, highlighting quinoa as a strategic crop to combat malnutrition.

Phytochemical investigations on seed and leaf extracts showed that methanol was the most effective solvent for phenolic compound extraction, while acetone yielded higher flavonoid concentrations. Methanolic extracts exhibited strong antioxidant activity. Leaf extracts from accessions Q45 and Q39 demonstrated significant -glucosidase inhibitory effects. Under saline stress (up to 200 mM NaCl), accession Q45 displayed remarkable tolerance, accompanied by increased accumulation of bioactive metabolites. Aqueous leaf extracts also showed potent antioxidant activity and effective inhibition of metabolic enzymes, including amylase, lipase, and tyrosinase.

In silico molecular docking supported these findings, revealing strong binding affinities of compounds such as Hhdp-galloyl glucose and p-coumaroyl hexose to the target enzymes. These results reinforce quinoa's role as a multifunctional crop with significant nutritional and therapeutic potential, particularly in the context of climate change and salinity challenges.

Keywords: Quinoa; Nutritional value; Salinity tolerance; Bioactive compounds; Therapeutic potential; In silico modeling

OR045 Biosensors with Immobilized Enzymes

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In this study, two amperometric glucose enzymatic biosensors were developed using a rapid, simple, and reproducible method for immobilizing glucose oxidase (GOx). Two clay matrices were employed: natural bentonite and cysteine-modified bentonite. The modified bentonite was synthesized and characterized using infrared spectroscopy.

The immobilization of GOx was achieved by combining the bentonite matrices with an electropolymer generated via chronoamperometry, resulting in two biosensor configurations: GOx-bentonite and GOx-bentonite-cysteine. Among these, the cysteine-modified bentonite biosensor exhibited superior performance, showing a linear detection range from 9.9×10^{-7} to 3.3×10^{-3} M glucose, a sensitivity of 3 $mA \cdot M^{-1} \cdot cm^{-2}$, and a detection limit of 9.9×10^{-7} M.

These results demonstrate that cysteine-modified bentonite is an effective immobilization matrix for glucose oxidase and represents a promising electrode material for the development of future enzymatic biosensors.

Keywords: Biosensor; Enzyme; Clay; Glucose; Immobilization

OR047 Valorization of Agricultural Residues for Sustainable Cellulose-Based Materials in Advanced Electrochemical Applications

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This study investigates the valorization of almond shell agricultural residues as a sustainable and cost-effective source for producing biodegradable, functional, and environmentally friendly cellulose-based composites. Cellulose fibers were extracted via sequential chemical processing, including alkaline delignification followed by sodium chlorite bleaching, enhancing fiber purity. A subsequent alkali treatment removed residual hemicelluloses, yielding high-purity cellulose. This method demonstrated efficient cellulose recovery from agro-residues and provides a scalable, eco-conscious platform for advanced material development [1].

To enhance functional performance, zinc oxide (ZnO) nanoparticles were incorporated into the cellulose matrix, forming cellulose/ZnO (AS/ZnO) nanocomposites. Multi-walled carbon nanotubes (MWCNTs) were additionally introduced to improve mechanical strength, electrical conductivity, and thermal stability. This integration resulted in structurally robust, lightweight, and conductive bio-composites suitable for high-performance applications such as sensors, electronics, and biomedical devices [2].

The bio-composite was then drop-cast onto commercial screen-printed carbon electrodes (SPCE), serving as the functional layer of a highly sensitive electrochemical sensor. This sensor was specifically designed for the detection and real-time monitoring of antibiotic residues in food, addressing critical public health concerns associated with contamination.

Keywords: Agricultural residues; Cellulose-based composites; Electrochemical sensor; Antibiotic detection; Biomedical devices

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OR048 Valorization of Date Palm Rachis and *Posidonia oceanica* for Pulp Production and Polymeric Reinforcement Applications

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Large quantities of date palm rachis and *Posidonia oceanica* accumulate annually in Tunisia. The sustainable valorization of these renewable resources aligns with the principles of sustainable development. This study investigates the chemical composition of these two biomass wastes and compares them with conventional wood and non-wood sources. Various chemical components, including extractives in different solvents, ash, lignin, holocellulose, and cellulose, were determined using standard analytical methods. Subsequently, soda–anthraquinone cooking was applied as a delignification process for both residues.

The resulting pulps from *Posidonia oceanica* (40% oven-dry cellulose) and date palm rachis (45% oven-dry cellulose) were characterized in terms of fiber morphology, degree of polymerization (DP), total charge, and chemical composition. Pulps derived from date palm rachis produced paper with very good properties and proved to be an excellent substrate for cellulose derivatives. In contrast, *Posidonia oceanica* particles showed promise as reinforcing fillers in polymeric matrices, particularly low-density polyethylene and biopolymers (Bioplast®).

Keywords: Agricultural waste; *Posidonia oceanica*; Date palm rachis; Delignification; Characterization

OR049 Valorization of Tunisian Vine Stems and *Posidonia oceanica* Residues for the Production of Cellulose Nanocrystals

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In recent decades, the development and rational management of agricultural, natural, and industrial waste has become increasingly important. In Tunisia, agricultural residues such as vine stems, which are available in large quantities, are not yet managed sustainably. Additionally, *Posidonia oceanica* leaves and balls represent widely available marine residues along the Tunisian coast. Valorization of such waste materials presents an attractive economic opportunity for producing bio-based products and biomaterials.

In this study, fibres obtained from Tunisian vine stems and *Posidonia oceanica* (leaves and balls) were first isolated via a delignification–bleaching process. Subsequently, a hydrolysis treatment using sulfuric acid was carried out at 55°C for 40 minutes under mechanical stirring. The resulting cellulose nanocrystals (CNC) were characterized for their morphological and thermal properties using transmission electron microscopy (TEM) and thermogravimetric analysis (TGA), respectively. Different CNC suspensions were extracted and analyzed using various microscopic and spectroscopic techniques. Finally, the CNC obtained from these sources were compared to those typically prepared from wood and annual plants.

Keywords: Agricultural waste; CNC; Delignification; Characterization

OR050 Fibre Cellulose from *Juncus maritimus*: Preparation, Characterization and Application

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Developing sustainable materials that meet evolving technological and environmental demands remains a critical challenge in materials science. In this context, cellulose and its derivatives have attracted considerable interest due to their unique combination of abundance, renewability, and versatile functional properties. As the most abundant organic polymer on Earth, comprising up to 50% of wood biomass and 90% of cotton fibers, cellulose offers a fully renewable feedstock that can be replenished on human time scales. Its robust mechanical durability, inherent biocompatibility, and extensive chemical modifiability underpin applications in packaging, textiles, biomedical devices, and advanced composites.

Despite this potential, many naturally occurring cellulose sources remain underexploited. One such example is *Juncus maritimus*, a halophytic plant thriving in saline-affected coastal regions and riverbanks of Tunisia. Traditionally used in crafts and local construction, *J. maritimus* biomass represents a low-cost, high-availability resource for valorization. By investigating this abundant but overlooked feedstock, this work seeks to expand the portfolio of sustainable cellulose sources and foster circular-economy practices in coastal ecosystems.

The significance of this study lies in demonstrating how regionally abundant biomass residues can be transformed into high-value biopolymer materials without competing with food crops or primary forestry resources. Focusing on a plant adapted to challenging growth environments also highlights the resilience and adaptability of cellulose-based supply chains under changing climatic conditions.

Ultimately, valorizing *J. maritimus* aligns with global efforts to reduce reliance on petrochemical polymers, diminish waste streams, and promote decentralized, community-driven biomass processing. This approach broadens the horizons for renewable material development and supports sustainable livelihoods in rural and coastal communities.

Keywords: Fibre; Cellulose; *Juncus maritimus*; Characterization

OR051 Valorization of *Citrus aurantium* Waste for the Recovery of High-Value Bioproducts

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Tunisia is a major global citrus producer, with an estimated annual production of 380,000 tons in 2024 over approximately 29,000 hectares. Bitter orange (*Citrus aurantium*) trees are widespread across these regions and are valued for their essential oils and medicinal applications. Annual pruning generates 0.5–2.0 tons/ha of wood waste, typically discarded via incineration or soil crushing, creating environmental issues. Valorizing this biomass can provide sustainable and high-value bioproducts [1,2].

This study implements a biorefinery approach combining autohydrolysis and alkaline hydrolysis for the recovery of sugars, lignin, and cellulose. Autohydrolysis, a green pretreatment, solubilized hemicellulose sugars, which were analyzed to determine recovery potential. The solid residue underwent alkaline hydrolysis and bleaching, enabling lignin extraction and cellulose purification. Lignin was precipitated from the alkaline liquor, while purified cellulose shows potential for bio-composites and packaging materials. This strategy demonstrates the use of *C. aurantium* pruning waste as a sustainable feedstock within a circular bioeconomy framework.

Keywords: *Citrus aurantium*; Biorefinery; Cellulose; Autohydrolysis

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Poster Presentations

P001 Zn ZSM-5 Zeolite: A Dual-Function Material for Organic Dye Reduction and Antibacterial Applications

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This study focuses on the preparation of Zn ZSM-5 zeolite and its evaluation for organic dye reduction and antibacterial activity. The catalytic efficiency of Zn ZSM-5 was tested for Congo red degradation in a single system and a binary system with methylene blue. Congo red showed 95% reduction in 30 minutes, while methylene blue degraded 85% in 40 minutes. The optimal catalyst mass was 50 mg, ensuring the best performance. The catalyst exhibited higher affinity for Congo red due to specific interactions between the dye and the zeolite structure [1].

Regarding antibacterial properties, Zn ZSM-5 demonstrated strong activity against different strains. A 99% reduction in *Staphylococcus aureus* (Gram-positive) was observed, while *Escherichia coli* and *Pseudomonas aeruginosa* (Gram-negative) showed 85–90% growth inhibition. The best antibacterial performance was achieved with 0.2 g of Zn ZSM-5, suggesting a synergistic effect between the zeolite's microporosity and zinc properties [2,3].

XRD analysis confirmed the ZSM-5 crystalline structure, with peaks at $2\theta = 7.9°, 8.9°, 23.1°$, and 24.3°. Zinc incorporation slightly reduced peak intensity, indicating minor structural modifications. FTIR analysis revealed characteristic absorption bands at 1100 cm^1, 800 cm^1, and 550 cm^1, which persisted after catalytic and antibacterial applications, confirming material stability.

These findings highlight Zn ZSM-5 as a promising catalyst for dye removal and an effective antibacterial agent, making it a strong candidate for environmental and biomedical applications.

Keywords: Zn ZSM-5; Catalysis; Organic dye reduction; Antibacterial activity

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P003 Synthesis and Biological Activity of a Series of N-Sulfamoylaziridines: Theoretical Study (Molecular Docking, DFT and ADME)

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The combination of sulfonamide and aziridine can produce molecules possessing both antibacterial properties associated with sulfonamides and reactive characteristics typical of aziridines. In this study, new N-sulfamoylaziridine derivatives were designed and successfully synthesized using chlorosulfonylisocyanate, various amines, and dibromoethane as starting materials. The compounds were obtained in good yield, and their chemical structures were determined by ^{1}H NMR and HRMS spectroscopy.

All synthesized derivatives were assessed for antimicrobial activity against bacterial and fungal strains, including *S. aureus*, *E. cloacae*, *Moraxella lacunata*, *P. aeruginosa*, *C. albicans*, *C. krusei*, and *C. lusitaniae*. A theoretical study using DFT and molecular docking was performed to elucidate chemical reactivity and confirm stability within the biological target cavity.

Keywords: Sulfonamide; Aziridine; Molecular docking; DFT study; ADME

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P005 Use of Biomaterials for the Decontamination of Pollutant Substances

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This study focuses on the synthesis of a composite material by intercalating natural organic precursors into two types of bentonite (laboratory-treated sodium bentonite and industrial sodium bentonite) to enhance the physicochemical properties of the resulting material. Various characterization techniques, including infrared spectroscopy, X-ray diffraction, swelling index, and zeta potential analysis, were employed.

The composite exhibits a porous structure and was evaluated for adsorption of an anionic dye onto the solid support's surface. The results indicate that dye adsorption is favorable and strongly influenced by pH and the porous structure of the material.

Keywords: Composite material; Adsorption; Anionic dye; Bentonite

P007 The Biocidal Effect of Hydrogen Peroxide on Water Contaminated with *Escherichia coli* Bacteria

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Water pollution, particularly bacterial contamination, poses significant risks to human health. This study evaluates the biocidal activity of hydrogen peroxide (H_2O_2) against *Escherichia coli* under varying concentrations and exposure times using standard bacteriological methods. Low concentrations (0.847–2.540 ppm) over 900 s showed no measurable effect. At 500 ppm, inactivation efficiency reached 49% after 3 h and 68% after 6 h. Higher concentrations (1000–2500 ppm) produced no further improvement, while 3500 ppm achieved a maximum of 73% inactivation after 6 h.

Keywords: Water; Pollution; Hydrogen peroxide; *Escherichia coli*

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P009 Photocatalytic Water Splitting Using La_2NiO_4 Double Perovskite Synthesized by the Sol-Gel Method

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Hydrogen is a promising clean energy carrier for addressing global energy and environmental challenges. Photocatalysis offers a sustainable approach to hydrogen production using solar energy. In this work, La_2NiO_4, a double perovskite, was synthesized via the sol-gel method and characterized using X-ray diffraction (XRD) for phase purity, scanning electron microscopy (SEM) for morphology, thermogravimetric analysis (TGA) for thermal stability, and X-ray photoelectron spectroscopy (XPS) for surface composition. UV-Vis diffuse reflectance spectroscopy (DRS) provided the optical band gap, while electrochemical techniques, including Mott-Schottky analysis and electrochemical impedance spectroscopy (EIS), evaluated charge transfer properties and flat band potential. The photocatalytic activity of La_2NiO_4 for water splitting under visible light demonstrated promising hydrogen production performance, highlighting its potential as an efficient photocatalyst for solar-driven hydrogen generation.

Keywords: Photocatalysis; Hydrogen production; La_2NiO_4; Renewable energy

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P011 Floristic Diversity of Rare Species Along the Coast in the Tlemcen Region

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The Tlemcen region of Algeria exhibits remarkable coastal flora diversity, including numerous rare and endemic species that require urgent conservation. Cork oak forests in Tlemcen National Park contain 211 taxa across 65 families and 164 genera, with 26 rare taxa, 9 of which are threatened. Regional orchid studies identified 48 taxa in 11 genera, with 27 considered rare or very rare nationally. Surveys conducted from 2006 to 2018 provided detailed distribution and ecological data. Psammophytes in coastal dunes belong to phytosociological classes such as Cakiletea maritimae and Ammophiletea, comprising strictly dune-adapted species often considered rare due to restricted habitats. Juniper groves along the Tlemcen coast also host several rare species. These plant formations are vital for regional biodiversity but face threats from urbanisation and human pressures.

Keywords: Rare plants; Biodiversity; Coastline; Tlemcen

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P012 Multicomponent Biginelli Syntheses in the Presence of Zn- and Zr-Based Catalysts in a Heterogeneous Medium

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The Biginelli reaction is a widely studied multi-component reaction enabling the one-pot synthesis of biologically active 3,4-dihydropyrimidin-2(1H)-one (DHPM) derivatives. While traditional homogeneous conditions involve toxic or flammable solvents, heterogeneous-phase catalysts provide a greener alternative. In this study, CoCuZrO and CoCuZnO catalysts prepared via the sol-gel method were applied under mild, solvent-free conditions. Catalytic tests showed that CoCuZrO exhibited superior performance, achieving an 85% yield of DHPM using 0.01 g of catalyst at 100°C over 3 hours. This approach demonstrates an efficient, eco-friendly route for DHPM synthesis, supporting sustainable chemical processes.

Keywords: Green chemistry; Heterogeneous catalysts; Biginelli reaction; Dihydropyrimidinones

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P013 Agricultural Waste Products as a Valuable Source of Natural Polyphenols with Antimicrobial Potential

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The increasing interest in natural products as alternatives to synthetic drugs motivates the exploration of agro-food waste as a source of bioactive compounds. This study focused on fruit peel wastes from apple, banana, orange, and pomegranate to quantify total phenolic content (TPC) and total flavonoid content (TFC), and evaluate their in vitro antimicrobial activity. Apple peels showed the highest TPC (161.3 mg GAE/100 g) and TFC (113.7 mg CE/100 g). Antimicrobial assays revealed that all tested extracts exhibited notable inhibitory effects against microbial strains. These findings highlight the potential of agro-waste matrices not only as a source of polyphenols and other bioactive molecules but also as a sustainable resource for antimicrobial agents. Valorization of such biowaste supports circular economy strategies by reducing waste while generating health-promoting products.

Keywords: Agricultural waste; Bioactive compounds; Antimicrobial activity; By-products valorization

P014 Synthesis, Solid-State Characterization and DFT Calculation of a Binary Combination of a Drug

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The oral bioavailability of poorly water-soluble drugs is a major challenge in pharmaceuticals, requiring novel strategies to enhance solubility and formulation efficiency. Pharmaceutical co-crystal technology has emerged as an effective approach to improve drug solubility and permeability. This study investigates the co-crystallization of captopril (CAP) with L-proline (PRO) via liquid-assisted grinding. Solid-state characterization was performed using differential scanning calorimetry (DSC), X-ray powder diffraction (PXRD), Fourier-transform infrared spectroscopy (FTIR), and scanning electron microscopy (SEM). DSC revealed distinct melting points for CAP (105.27°C) and PRO (223.07°C), with eutectics observed at x1 = 0.6 (104.81°C) and x1 = 0.9 (91.44°C). A pure CAP-PRO co-crystal formed at x1 = 0.8, melting at 151.74°C. PXRD confirmed a new diffraction pattern corresponding to the co-crystal. FTIR spectra indicated intermolecular interactions, and SEM showed unique crystal morphology relative to the individual components. Density Functional Theory (DFT) calculations, including HOMO/LUMO and molecular electrostatic potential analyses, provided insight into electronic distribution and interaction sites. This study enhances the understanding of CAP co-crystal formation and their potential for improved pharmaceutical properties.

Keywords: Cocrystals; Captopril; DSC; PXRD; Phase diagram; DFT

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P015 Optimization of Sludge Treatment Using Chitosan as a Natural Flocculant

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Sludge treatment is a key step in wastewater management, aiming to reduce water content and improve handling. This study evaluates chitosan, a natural biopolymer, as an eco-friendly alternative to synthetic flocculants. Experiments were conducted on a fixed sludge volume (300 mL) under controlled coagulation–flocculation conditions. Results show that chitosan significantly decreases turbidity after decantation and enhances sludge dryness. At an optimal concentration of 0.5 g/L with a 0.5 mL dosage, turbidity decreased from 1900 NTU to 140 NTU (92.63% removal), while sludge dryness reached 79.52% (compared to 71.41% at 0.2 g/L). The maximum dryness (82.09%) was obtained at 1 g/L chitosan. For comparison, the synthetic polymer AQUAFLOC CP470-H achieved 98.91% turbidity reduction and 84.21% dryness at 0.6 g/L. Despite its slightly lower performance, chitosan offers the advantages of biodegradability and non-toxicity, highlighting its potential as a sustainable sludge treatment option. Future work should optimize process parameters and assess industrial-scale applications.

Keywords: Chitosan; Sludge treatment; Coagulation-Flocculation; Biopolymer

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P017 Characterization and Reactivity of α-Fe_2O_3-rGO Nanocomposite in the Photocatalytic Production of Hydrogen

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A nanocomposite of ferric oxide and reduced graphene oxide (α-Fe_2O_3-rGO) was synthesized via an ultrasonic-assisted sol-gel method and tested for photocatalytic H_2 production from water. Its performance was compared to pure α-Fe_2O_3. TGA indicated a 1.7% rGO content. XRD and Raman analyses confirmed the formation of the hematite α-Fe_2O_3 crystalline phase. BET measurements showed an increased specific surface area for the hybrid, consistent with smaller crystallite size from XRD. UV-Vis analysis revealed a reduced band gap (1.64 eV) compared to pure α-Fe_2O_3 (1.77 eV), enhancing photocatalytic efficiency by reducing electron-hole recombination [1]. Photocatalytic tests under optimized conditions (pH 13, SO_3^{2-} as hole scavenger) showed hydrogen production of 290 µmol for α-Fe_2O_3-rGO versus 196 µmol for pure α-Fe_2O_3. Enhanced performance is attributed to rGO acting as a conductive support facilitating rapid electron transfer [2].

Keywords: rGO; α-Fe_2O_3-rGO nanocomposite; hydrogen; photocatalysis

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P018 Attempt to Produce Biosurfactants by Plant Growth-Promoting Rhizobacteria (PGPR) in a Medium Based on Carob Fruit (Ceratonia siliqua L.)

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Soil contamination by hydrocarbons is a major environmental concern due to their toxicity and bioaccumulation. Bioremediation is an attractive approach due to its low environmental impact. This study investigated the capacity of plant growth-promoting rhizobacteria (PGPR) of the *Bacillus* genus to degrade hydrocarbons and produce biosurfactants. Carob fruit powder (*Ceratonia siliqua*) and glucose-based media were used as carbon sources. *Bacillus sp4* was more efficient in diesel degradation than *Bacillus sp3*. In the carob-based medium, emulsification index, foaming test, and cleaning effect for *Bacillus sp4* were 60%, 37%, and 60%, respectively, compared to 37.14%, 25%, and 44% in the glucose medium. Parafilm tests showed *Bacillus sp4* as the highest surfactant producer (6.5–7 mm diameter). Biosurfactants from the carob-based medium exhibited superior antibacterial activity compared to the glucose medium: inhibition zones on *Staphylococcus aureus* LGA251 were 10.5 ± 0.7 mm and 11 ± 0.7 mm, and on *Escherichia coli* ATCC 25922 were 10.5 ± 0.6 mm and 11.5 ± 0.7 mm.

Keywords: Hydrocarbon-degrading bacteria; biosurfactants; hydrocarbons; antibacterial activity

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P019 The Antioxidant Activity of *Bubonium graveolens* Essential Oil and the In Silico Study of Three Major Derivatives

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This study aimed to valorize Algerian aromatic and medicinal plants by evaluating the antioxidant activity of essential oil from *Bubonium graveolens* (Asteraceae) and performing an in silico study of its major fractions. The essential oil was extracted by hydrodistillation. Antioxidant activity, measured via the DPPH radical scavenging assay, showed significant results compared to reference compounds BHT and ascorbic acid, suggesting the presence of bioactive antioxidant compounds. Three major molecules were selected from HPLC analysis for in silico evaluation. Molecular stability and reactivity were assessed using HOMO-LUMO energies, energy gap, chemical potential (), electronegativity (), hardness (), and softness (S). Molecular docking, ADMET, and pharmacokinetic analyses were performed to evaluate their biological activity and drug-likeness. DFT, molecular docking, and molecular dynamics studies confirmed results consistent with in vitro antioxidant tests, supporting the potential of these molecules for development as natural product-based drugs.

Keywords: *Bubonium graveolens*; essential oil; antioxidant activity; ADME/Toxicity

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P021 Characterization of *Elaeoselinum thapsioides* Extract in 1.0 M HCl Solution as Corrosion Inhibitor on Carbon Steel

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This work investigates the efficacy of *Elaeoselinum thapsioides* extract as a corrosion inhibitor for carbon steel (CS) using electrochemical and weight loss methods. Electrochemical impedance spectroscopy (EIS), potentiodynamic polarization, and gravimetric analysis demonstrated that the extract acts as a mixed-type inhibitor, achieving 82% inhibition efficiency at 900 ppm and 298 K. Inhibition efficiency decreased with increasing temperature. Adsorption of the extract on the CS surface followed the Langmuir model. EIS data also revealed that higher inhibitor concentrations increase charge transfer resistance and decrease double-layer capacitance. The results suggest that *Elaeoselinum thapsioides* extract is a promising natural corrosion inhibitor for acidic media.
Keywords: Corrosion inhibitors; *Elaeoselinum thapsioides*; EIS; Mixed-type inhibitor

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P022 Study of the Inhibitory Efficacy of an Anti-Vomiting Agent Against Corrosion of A9M Steel in 1.0 M H_2SO_4

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This study investigates the use of expired Domperidone (Dpd) as a corrosion inhibitor for A9M mild steel in 1M H2SO4, providing an eco-friendly and sustainable approach. Mass loss measurements were conducted at different times and concentrations to evaluate inhibitory efficacy. The effect of temperature (25–55°C) on inhibition was also studied. The maximum inhibition efficiency of 91% was observed at 1.15×10^{-4} M Dpd. The inhibitor was characterized using FTIR and UV-Visible spectroscopy. Surface analysis by SEM-EDS, optical microscopy, and profilometry confirmed effective protection of the steel surface. Results indicate that Domperidone is an efficient corrosion inhibitor for ordinary steel in acidic medium.

Keywords: Domperidone; A9M steel; H2SO4; corrosion; inhibitor; Weight loss

P023 Use of a Bio-Coagulant for the Reduction of Seawater Turbidity

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The coagulation-flocculation-sedimentation process is widely used to remove suspended solids and reduce water turbidity. Traditional coagulants, such as aluminum sulfate and ferric sulfate, can pose health risks, including links to Alzheimer's disease. This study investigates Aloe vera gel as a natural, cost-effective, biodegradable, and safe coagulant for seawater treatment. Results show that Aloe vera reduced turbidity by 32.82% at acidic pH and 14.06% at neutral pH, whereas ferric chloride achieved only 3.13% reduction. Moreover, Aloe vera did not significantly affect conductivity, TDS, pH, alkalinity, or hardness. The maximum turbidity removal was observed at pH 6. These findings demonstrate that Aloe vera is a promising natural coagulant for sustainable water treatment.

Keywords: Aloe vera; Coagulation; Turbidity

P024 Catalytic Decomposition of Methane for Hydrogen Production over Ni/Beta Catalysts Synthesized via Ethylene Glycol-Assisted Impregnation

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Catalytic decomposition of methane (CDM) is a promising route for clean hydrogen production, enabling H_2 generation without CO or CO_2 emissions. This endothermic reaction converts methane (CH_4) into molecular hydrogen and valuable carbon nanomaterials such as nanotubes and nanofibers. Ni-based catalysts supported on zeolites are effective for CDM [1,2]. In this work, 20 wt% Ni/Beta and Ni/Beta-EG catalysts were synthesized using conventional and ethylene glycol-assisted impregnation methods, respectively. XRD analysis revealed that ethylene glycol-assisted impregnation produced smaller Ni particles. SEM-EDX showed that Ni particles on Ni/Beta were mostly agglomerated, while Ni/Beta-EG displayed better dispersion, consistent with chemisorption measurements. In CDM tests at 620 °C for 2 h, Ni/Beta-EG exhibited superior catalytic performance (66 mol H_2/g.cat) compared to Ni/Beta (57 mol H_2/g.cat), likely due to more accessible Ni^0 active sites. Raman analysis of spent catalysts revealed D and G bands of graphitic carbon, with Ni/Beta showing a lower I_D/I_G ratio and better graphitization.

Keywords: Hydrogen production; Methane decomposition; Ni/Beta catalysts

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P025 Ethnopharmacology of Algerian Medicinal Plants: Bridging Traditional Knowledge and Modern Wound Care

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Algerian traditional medicine encompasses a diverse range of medicinal plants used for wound healing, yet their therapeutic mechanisms remain largely unverified. This study integrates ethnopharmacological knowledge with modern analytical techniques to explore the wound healing efficacy of ten medicinal plants. Selected based on traditional use and literature reports, these plants were extracted using methanolic, ethanolic, and aqueous solvents, as well as essential oil distillation and resin collection. The extracts were evaluated in an animal excision wound model, with wound contraction monitored over 20 days. Histological analysis assessed tissue regeneration and re-epithelialization, while LC-ESIMS/MS and GC-MS profiling identified key bioactive compounds. The findings establish a scientific basis for the wound healing properties of these plants, demonstrating a clear link between their phytochemical composition and therapeutic effects. This study underscores the value of Algerian medicinal plants in bridging traditional remedies with evidence-based modern wound care applications.

Keywords: Wound healing; Medicinal plants; Phytochemical composition; Traditional medicine; Algeria; Excision wound model; Histological analysis; Tissue regeneration; Bioactive compounds

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P026 Production of 3,4-dihydropyrimidinone (DHPM) via Biginelli Multicomponent Reaction Catalyzed by ZnO Sol-Gel Catalyst

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This work focuses on the kinetic study of 3,4-dihydropyrimidinone (DHPM) formation via the multicomponent Biginelli reaction in the presence of ZnO prepared by the sol-gel method. The reaction was carried out using benzaldehyde, ethyl acetoacetate, and urea under solvent-free conditions. The effects of reaction parameters such as catalyst mass, urea amount, reaction time, and temperature on DHPM yield were examined. A reduction in DHPM production was observed due to the in situ decomposition of urea into ammonia, which favors the competing Hantzsch reaction. An increase in catalyst mass also negatively affected DHPM yield due to the same competition. Variation in urea amount had no significant influence on DHPM yield. Under optimized conditions (2 h reaction time, 10 mg catalyst mass, first-order reaction with respect to benzaldehyde and ethyl acetoacetate), the activation energy was calculated as 59.9 kJ·mol^{-1} with a pre-exponential factor of 2.01 × 10^{8} L·mol^{-1}·min^{-1}·g^{-1}.

Keywords: ZnO; Catalyst; 3,4-dihydropyrimidinone; Biginelli reaction.

P027 Sustainable Pollutant Removal Using Natural Zeolite-Polyethylene Composite Membranes for Environmental Remediation

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Zeolites, with their large porous structure and excellent ion retention properties, are crucial in numerous industrial processes such as adsorption, ion exchange, and catalysis. This study aims to assess the potential of natural zeolites, focusing on their micromolecular charge properties for selective ion separation. Natural zeolite samples were extracted from rock deposits in Tinebdar, Bejaia, Algeria, and incorporated into biodegradable polyethylene (PE) at various concentrations to create synthetic membranes. Structural and morphological characterization of the zeolite deposits was performed using X-ray diffraction (XRD), scanning electron microscopy (SEM), Fourier transform infrared spectroscopy (FTIR), and elemental analysis. The synthesized membranes were tested for removal of metal ions (Co^{2}, Ni^{2}, Cu^{2}, Pb^{2}) from aqueous solutions, with filtrates analyzed using atomic absorption spectroscopy (AAS). Results revealed selective ion retention behavior, with PE-Zeolite composite membranes achieving up to 80% ion selectivity. Zeolite concentration was found to significantly enhance the filtration efficiency of the composite material.

Keywords: Natural Zeolites; Synthetic Membranes; Ion Filtration; Metal Ion Retention.

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P030 Sulfonamides: Synthesis, Characterization, and Antibacterial Activity

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Sulfonamides have played a pivotal role in drug development and remain widely used due to their stability, favorable physicochemical properties, and versatile three-dimensional structure. They are employed in treatments for bacterial infections, epilepsy, hypertension, arthritis, and glaucoma. The sulfonamide motif (–NH–SO–) is responsible for the therapeutic effect across various drugs. In this study, a sulfonamide derivative was synthesized from cysteine using the bifunctional reagent chlorosulfonyl isocyanate via carbamoylation and sulfamoylation. The resulting Bocsulfonamide was deprotected to yield the free sulfonamide. Both protected and deprotected compounds were evaluated in vitro for antibacterial activity against bacterial strains.

Keywords: Sulfonamide; Antibacterial activity; Cysteine; Chlorosulfonyl isocyanate.

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P031 Phytochemical Screening and Antimicrobial Activity of Aqueous Leaves Extract of *Balanites aegyptiaca*

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Algeria's diverse climate has led to a rich flora, including many medicinal plants used traditionally in arid regions. *Balanites aegyptiaca*, native to the Algerian desert (Tamanrasset), was investigated for its phytochemical composition and antimicrobial activity. Leaves were collected, dried, ground, and subjected to maceration for 24 h (repeated three times) to obtain the aqueous extract. Phytochemical analysis revealed the presence of saponins, terpenes, steroids, flavonoids, coumarins, cardiac glycosides, alkaloids, and tannins. The antimicrobial activity was evaluated against Gram-positive and Gram-negative bacteria using the broth macro-dilution method to determine MIC, MBC, and MBC/MIC ratios. Results indicated bactericidal activity against *Escherichia coli*, *Staphylococcus aureus*, and *Bacillus subtilis*, whereas *Pseudomonas aeruginosa* exhibited resistance. The aqueous leaves extract of *Balanites aegyptiaca* shows potential as a source of bioactive compounds for drug discovery.

Keywords: *Balanites aegyptiaca*; Folk medicine; Phytochemical screening; Antimicrobial activity; *Escherichia coli*.

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P032 Response Surface Methodology for Optimization of Physico-Chemical Treatment Parameters of Monofloral and Polyfloral Algerian Honeys and Their Impact on Enzymatic Properties and Antimicrobial Activities Against Human Pathogenic Bacteria and Fungi

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The enzymatic properties and antimicrobial activity of honey are crucial indicators of its quality and therapeutic potential, influenced by floral source, geographical origin, and processing conditions. This study investigated the effects of controlled thermal treatment on two Algerian honeys (monofloral and polyfloral) with respect to diastase and invertase activity, as well as antibacterial and antifungal properties. Response surface methodology (RSM) was employed to assess the influence of temperature (40–60°C), heating time (5–15 min), and pH (3–6) on these responses. Statistical analysis demonstrated that all process variables significantly affected enzymatic activities and antimicrobial efficacy, with increases observed with higher temperatures, longer heating times, and elevated pH values. These findings highlight the potential of Algerian honey as an effective antibacterial and antifungal agent in therapeutic applications.

Keywords: Enzymatic properties; Antimicrobial activity; Monofloral honey; Polyfloral honey.

P033 First Quantification of Artemisinin in Three Wild Saharan Artemisia Species from Algeria and Their Antioxidant Potential

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Artemisinin, a sesquiterpene lactone with potent antimalarial properties, has attracted increasing scientific attention. This study reports the first quantification of artemisinin in three wild Algerian Artemisia species—*A. herba-alba* (AH), *A. campestris* subsp. *glutinosa* (AC), and *A. judaica* subsp. *sahariensis* (AJ)—using high-performance liquid chromatography (HPLC). Analysis of hexane extracts revealed artemisinin yields of 0.34%, 0.64%, and 0.04% for AH, AC, and AJ, respectively, with *A. campestris* showing the highest concentration, surpassing previously reported levels in *A. annua* and *A. sieberi*. Methanolic extracts exhibited significant antioxidant activity across all species, with *A. judaica* demonstrating the strongest radical scavenging effect. These results provide new insights into the pharmacological potential of endemic Algerian Artemisia species.

Keywords: Artemisia; artemisinin; antioxidant activity; HPLC.

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P034 Characterization and Selection of Durum Wheat Genotypes in Semi-Arid Regions of Algeria

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In the context of climate change and its impact on agriculture, adopting agro-ecological practices and selecting resilient crops are essential for food security and national sovereignty. This study investigates the effect of water deficit on five durum wheat genotypes (*Oued Zenati*, *Mexicali75*, *ACSAD1361*, *Waha*, and *Langlois*) to identify those best adapted to semi-arid conditions. The genotypes were subjected to three water regimes: 30%, 60%, and 100% field capacity. Phenotypic variation was observed across all traits studied, especially for phenology and yield components. The highest trait values were recorded in *Oued Zenati* and *Mexicali75*, while *Waha* and *Langlois* displayed the lowest. *Oued Zenati* performed best under water deficit, suggesting its potential for improving Algerian durum wheat production under drought conditions. These findings provide valuable insights for targeted genetic improvement programs.

Keywords: Climate change; Food security; Water deficit; Durum wheat.

P035 Evaluation of Trace Elements in Geothermal Waters of El Athmania, Algeria

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Heavy metals can accumulate in water, including geothermal sources, posing potential environmental and health risks. This study investigated trace elements in geothermal waters of El Athmania, M'laa town, Algeria, to assess heavy metal concentrations. Water samples were collected in glass bottles and analyzed using X-ray fluorescence (XRF) spectrometry. Preconcentration was performed using evaporation at 80°C and Amberlite XAD-7 resin, followed by DRX analysis. Concentrations of metals measured included Mg, Al, Si, P, S, Cl, K, Ca, Ti, V, Cr, Mn, Fe, Ni, Cu, Zn, Ga, As, Se, Br, Rb, Sr, Y, Zr, Ba, and Pb. The average abundance order was: Cu » Mn > Zn > Cr > Ni > Fe. Correlation matrices and principal component analysis (PCA) indicate that these metals likely originate from similar sources, consistent with soil erosion processes. Regular monitoring of heavy metals in geothermal waters is recommended to prevent excessive accumulation and potential health risks.

Keywords: Geothermal water; Heavy metals; Amberlite XAD-7; X-Ray Fluorescence (XRF).

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P036 Electrochemical, AFM, and Theoretical Analyses on Asteraceae Extracts as Green Corrosion Inhibitors for Carbon Steel in Acidic Media

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Green inhibitors are eco-friendly substances that prevent metal corrosion while promoting environmental sustainability. This study investigated the anti-corrosion effect of an ethyl acetate extract (EE) from an Asteraceae plant (AP) on carbon steel in hydrochloric acid solution. Potentiodynamic polarization (PDP) and electrochemical impedance spectroscopy (EIS) analyses demonstrated that EE acts as a mixed-type inhibitor, increasing the charge transfer resistance (R_{ct}) and decreasing the double-layer capacitance (C_{dl}) by forming a protective film on the carbon steel surface. Atomic force microscopy (AFM) revealed surface topography changes consistent with corrosion inhibition. The inhibition efficiency (%I.E.) increased with EE concentration, reaching nearly 80% at 400 ppm and 298 K. Complementary density functional theory (DFT) calculations and molecular dynamics simulations further validated the experimental findings. These results highlight the potential of Asteraceae-derived EE as a sustainable and effective corrosion inhibitor in acidic conditions.

Keywords: Corrosion; Green inhibitor; Carbon steel; DFT; Asteraceae extract.

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P037 Influence of a Polyphenol-Rich Asteraceae Extract on the Corrosion Process of API X60 Steel

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Environmental protection is a key challenge for modern science. This study evaluated polyphenol-rich plant extracts from the Asteraceae family as corrosion inhibitors for API X60 carbon steel in 1 M HCl solutions. Three extracts were prepared, and the ethanolic extract was characterized using qualitative phytochemical analysis, quantitative polyphenol assays, and infrared and UV spectroscopy, confirming its high polyphenol content. The inhibitory effect of the ethanolic extract was assessed using weight loss measurements. Results demonstrated significant corrosion resistance, with an inhibition efficiency of 62.14% at 303 K. Thermodynamic adsorption coefficients indicated spontaneous adsorption on the steel surface, following the Langmuir adsorption isotherm. These findings suggest that ethanolic extracts from Asteraceae plants are promising, environmentally friendly corrosion inhibitors.

Keywords: Corrosion; Inhibition; API X60 Steel; Asteraceae; Polyphenols.

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P038 Evaluation of the Effect of 4,4'(5')-[Bis [2-(4-nitrobenzene)ethenyl)]-3,7-dimethyltetrathiafulvalene on Copper Corrosion in Neutral Chloride Medium

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The corrosion inhibition properties of 4,4'(5')- [Bis [2-(4 -nitrobenzene)ethenyl)] 3,7-dimethyltetrathiafulvalene (TTF) were evaluated for copper in a neutral chloride medium (NaCl) using potentiodynamic polarization (PDP) and electrochemical impedance spectroscopy (EIS). The results showed that TTF provided excellent protection, with inhibition efficiency increasing with concentration, reaching 99.98% at 10^{-3} M. Adsorption of TTF on the copper surface followed the Langmuir adsorption isotherm, and polarization studies indicated that TTF acted as a mixed-type inhibitor, with physical adsorption on the X60 surface. Surface morphology studies using scanning electron microscopy coupled with energy-dispersive X-ray spectroscopy (SEM-EDS) and atomic force microscopy (AFM) confirmed the protective film formation on copper, validating the electrochemical findings.

Keywords: Corrosion; PDP; EIS; AFM; 4,4'(5')-[Bis[2-(4-nitrobenzene) ethenyl)] 3,7-dimethyltetrathiafulvalene.

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P039 Encapsulation of Vegetable Oils Using Opuntia (Cactaceae) Polysaccharides as a Core-Shell Material: Formulation, Characterization, and In Vitro Digestion Studies

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Microencapsulation is a cost-effective strategy for protecting sensitive compounds. In this study, vegetable oils were microencapsulated by the coacervation method using Opuntia (Cactaceae) polysaccharides and chitosan as core-shell materials. Polysaccharides were extracted from Opuntia cladodes through a combination of conventional and ultrasound-assisted techniques. The encapsulation efficiency (EE) reached approximately 97%. Morphological analyses confirmed efficient oil entrapment in fine core-shell particles. Thermogravimetric studies revealed enhanced core protection and high thermal stability. In vitro digestion tests indicated that microcapsules remained intact under oral conditions, showed gradual oil release during gastric digestion, and rapid release in the small intestine. These findings highlight the potential of Opuntia-based microcapsules as effective carriers for sensitive oils and functional bioactive compounds.

Keywords: Opuntia; Microencapsulation; Coacervation; In vitro digestion.

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P040 CaO-Driven Photocatalytic Degradation of Methylene Blue under LED and Halogen Irradiation

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Under different calcination temperatures and light sources, this study investigates the photocatalytic activity of calcium oxide (CaO) in the degradation of methylene blue (MB). Structural studies (FTIR, SEM, EDX) confirmed that CaO calcined at 1100 °C exhibits superior crystallinity and more uniform particles than samples processed at 1000 °C. In the absence of light, photocatalytic tests showed minimal (<3%) degradation, confirming that the process is mainly photocatalytic. CaO calcined at 1000 °C under halogen light achieved 60% MB degradation in 40 min, whereas LED light produced 30% degradation. At 1100 °C, halogen illumination gave 80% degradation in 60 min, while LED resulted in 50%. Performance was influenced by pH: LED irradiation at pH 9 (1100 °C) reached 90% degradation, surpassing halogen light (50%), while acidic conditions (pH 2) yielded below 25% degradation. Fifteen milligrams of CaO under halogen illumination at 1100 °C caused complete (100%) degradation. These findings emphasize the role of physicochemical conditions in optimizing CaO-based photocatalysis.

Keywords: Photocatalysis; Methylene Blue; CaO; Pollution.

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P041 Flavonoids from *Eryngium dichotomum*

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Eryngium L. comprises nearly 250 species across Eurasia, North Africa, the Americas, and Australia, and represents the largest and most taxonomically complex genus of Apiaceae. Several species, including *E. foetidum*, *E. maritimum*, *E. planum*, *E. dichotomum*, *E. campestre*, and *E. creticum*, are traditionally used as food or medicine. Others, such as *E. campestre* and *E. kotschyi*, are valued for anti-inflammatory activity, while *E. falcatum* is known for antinociceptive effects. Secondary metabolites from this genus exhibit antitumor, antimicrobial, antifungal, phototoxic, and other bioactivities. Reported constituents include terpenoids, polyacetylenes, saponins, steroids, flavonoids, and coumarins.

Eryngium dichotomum Desf., native to Algeria, Tunisia, Morocco, and parts of southern Europe, typically grows in moist clay pastures. In this study, aerial parts collected in the Batna–Sériana region (Algeria) were subjected to diethyl ether and butanolic extraction. Chemical investigations revealed a diverse metabolite profile, particularly glycosylated flavonoids, whose structures were elucidated by spectroscopic methods including 1D and 2D NMR (RMN^{1}H, ^{13}C, COSY, HSQC, HMBC) and mass spectrometry.

Keywords: Apiaceae; *Eryngium dichotomum*; Polyacetylenes; Flavonoids.

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P043 One-pot Deprotection and Benzoylation of N-Boc-protected Sulfonamides using Preyssler Heteropolyanion as a Catalyst: Synthesis of New Benzamides

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The benzamide moiety is essential in many bioactive molecules due to its wide spectrum of biological and therapeutic properties. Sulfonamide derivatives are also pharmacologically significant, being low-cost, low-toxicity drugs widely used to treat infections. Combining these two bioactive motifs can yield promising lead compounds for drug discovery.

In this study, we report a simple, efficient, one-pot catalytic approach using Preyssler heteropolyacid for the synthesis of benzamides containing a sulfonamide moiety. The method involves deprotection and benzoylation of N-(tert-butoxycarbonyl) sulfonamides in a single step, affording the target compounds in good yields (up to 92%).

Keywords: Benzamide; Sulfonamide; Preyssler heteropolyacid; Catalyst.

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P044 Starch Hydrolysis by the Action of Immobilized Bacterial α-Amylase from *Bacillus subtilis*

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In this study, the hydrolysis kinetics of two sorghum starch substrates extracted by different steeping methods (SO_2 and NaOH solutions) were investigated using free and immobilized α-amylase from *Bacillus subtilis* entrapped in calcium alginate beads. To enhance the carrier properties, alginate was blended with sorghum-derived cereal fibers.

The free enzyme showed optimal activity at 45°C, which increased to 50°C upon immobilization, while the pH optimum remained constant (pH_{opt} = 6.9). The presence of Ba^{2+} and Ca^{2+} enhanced the activity of the immobilized enzyme, whereas Ni^{2+}, Sn^{2+}, Cu^{2+}, and Zn^{2+} acted as inhibitors. Fiber reinforcement eliminated the inhibitory effects of Ni^{2+} and Sn^{2+} and further improved enzyme performance in the presence of Ba^{2+} and Ca^{2+}.

Kinetic studies revealed that both free and immobilized enzyme-catalyzed reactions followed Michaelis–Menten kinetics. The kinetic constants were influenced by both the starch extraction method and the type of immobilization carrier (alginate vs. fiber-reinforced alginate).

Keywords: Alginate; Cereal fibers; Immobilization; Hydrolysis.

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P045 Beyond Vaccines: A Nasal Nano-Formulation and the Realities of COVID-19 Coverage in Tlemcen

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The COVID-19 pandemic has underscored the need for both effective vaccination strategies and accessible prophylactic alternatives, particularly in regions with constrained healthcare resources. This study integrates two complementary approaches: an epidemiological analysis of the COVID-19 vaccination campaign in Tlemcen, Algeria, and a computational evaluation of a novel nasal antiviral formulation combining B-escin with green-synthesized gold and silver nanoparticles.

The vaccination data—analyzed from five brands (Sputnik, AstraZeneca, Sinopharm, Sinovac, and Janssen)—revealed Sinovac as the most administered vaccine with 93,908 doses (91.94% utilization rate), while Sputnik exhibited the lowest wastage, with no expired doses and only 10.35% lost. Age-specific trends showed Sinovac's dominance among individuals aged 50 and above, and Janssen's popularity in the 30–49 age group. Moreover, people with comorbidities showed a stronger response to Sinovac, highlighting the need for more personalized vaccine strategies.

In parallel, computational modeling of a nasal formulation combining B-escin and metal nanoparticles demonstrated enhanced antiviral efficacy against SARS-CoV-2 variants (Alpha, Beta, Gamma, Delta, Omicron). Through molecular docking, molecular dynamics, and quantum mechanical calculations, the conjugates showed superior binding affinity and target specificity compared to individual components, particularly in the nasal mucosa—an initial site of viral colonization.

This nasal delivery approach offers a non-invasive, scalable, and variant-adaptable prophylactic option. Together, these findings suggest that such a nanobiotechnological intervention could serve as a practical alternative or complement to vaccines in future pandemics, especially where vaccine distribution faces logistical or societal barriers.

Keywords: COVID-19; B-escin; Gold-Silver Nanoparticles; Vaccines.

P046 Ciprofloxacin-Functionalized Copper and Silver Nanoparticles: Advanced Multifunctional Nanotherapeutics with Enhanced Antidiabetic and Antioxidant Potentials

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This study explores two green synthesis approaches for developing multifunctional nanotherapeutics: ciprofloxacin-functionalized copper oxide nanoparticles (CIP@Cu_2O NPs) and ciprofloxacin-loaded silver nanoparticles (CIP@Ag NPs). Both nanocomposites were synthesized using eco-friendly methods—ascorbic acid served as a reducing agent for Cu_2O, while Ag NPs were prepared and subsequently loaded with ciprofloxacin to enhance therapeutic performance. Characterization using FT-IR, UV–Visible spectroscopy, XRD, and SEM confirmed their structural integrity, crystalline nature, and morphological transformations. The CIP@Cu_2O NPs exhibited a morphological shift and increased particle size after ciprofloxacin conjugation, while CIP@Ag NPs showed a reduction in bandgap energy, indicating improved photocatalytic behavior. Both formulations demonstrated strong antioxidant capacity and exhibited significant antidiabetic effects, including inhibition of key enzymes involved in glucose metabolism. These findings highlight the biomedical potential of both nanoparticle systems as sustainable and effective platforms for managing oxidative stress and metabolic dysfunctions. The integration of ciprofloxacin with metal-based nanoparticles not only enhances their therapeutic profile but also supports their application in treating diabetes and related disorders.

Keywords: Ciprofloxacin-loaded nanoparticles; Copper oxide nanoparticles; Silver nanoparticles; Multifunctional therapeutics.

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P047 Electrochemical, isothermal ethyl acetate extract studies of *Hippomarathrum libanotis* on API 5L Gr-B carbon steel in 1M HCl solution

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For scientists, preserving the environment is a difficult undertaking. In the present case, we determine whether ethyl acetate extract from the plant *Hippomarathrum libanotis* acts as a corrosion inhibitor for API 5L Gr-B carbon steel in 1M HCl solution. The electrochemical method is used to monitor the inhibitory mechanism (polarization curves and electrochemical impedance spectroscopy) [**?**]. Thermodynamic and activation parameters were determined. The maximum inhibition efficiency of the inhibitor at 293 K is 78.13% at 800 ppm. On the impedance curve, a characteristic capacitive loop identifies the charge transfer mechanism. The samples were also subjected to in-depth structural and chemical analysis by scanning electron microscopy. The results also showed that the inhibitor works primarily by adhering to the metal surface, leading to the formation of a shield that prevents the steel from corroding [**?**].

Keywords: Plant; API 5L Gr-B; *Hippomarathrum libanotis*.

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P048 Green Synthesis of Copper Oxide Nanoparticles and Their Antibacterial Applications

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In this study, a green synthesis approach was employed to prepare copper oxide nanoparticles using pumpkin pulp juice as both a reducing and oxidizing agent. Various techniques were used to characterize the nanoparticles, including UV–Vis spectroscopy, Fourier-transform infrared spectroscopy (FTIR), and X-ray diffraction (XRD). The UV–Vis spectrum displayed a major absorption peak at 251 nm. FTIR analysis indicated functional groups (C=C, C–C, O–H) and a band at 601 cm^{-1} attributable to Cu–O stretching. XRD confirmed high crystallinity, with an average crystallite size of 6.96 nm.

The antimicrobial activity of the green-synthesized CuO nanoparticles was evaluated against Gram-negative *Escherichia coli* (ATCC 25922), showing a 10 mm inhibition zone, and Gram-positive *Staphylococcus aureus* (ATCC 25932), with a 19 mm inhibition zone. These results support the effectiveness of pumpkin-juice-mediated CuO nanoparticles as antibacterial agents.

Keywords: Nanoparticles; Green synthesis; Copper oxide nanoparticles; Pumpkin pulp juice.

P049 Spatial Variation in the Diversity of Leaf Mycoendophytes of *Calicotome spinosa* Desf

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Microbial diversity helps protect natural or anthropized ecosystems. Endophytic fungi are the best species illustrating the symbiotic association between fungi and plant species, such as *Calicotome spinosa*. The latter is a medicinal plant, pioneer par excellence and regenerator of endangered ecosystems, especially those burned and undergoing recurrent water stress. The objective of this work is to research the presence and diversity of endophytic fungi in the leaves of this species at two sites: Tala n Tazart (site 1) and Tizi-Ghenif (site 2) in the wilaya of Tizi Ouzou, Algeria. The sampling involved several healthy leaves from each of the five subjects chosen subjectively from each site. The leaves underwent treatment on the day of harvest, in order to avoid the development of pathogens. Surface sterilization was performed [**?**], leaves were cultured on PDA medium in 9-cm Petri dishes, and incubated at room temperature for two months. The results showed a high frequency of colonization by endophytic fungi at both sites. Comparison of the results using ANOVAs performed with StatBox software (6.3) showed differences in the abundance of fungal genera between the leaves of the two sites. Fungi are therefore key organisms for the balance and diversity of the ecosystem.

Keywords: Mycoendophytes; diversity; abundance; leaf.

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P050 Study and Characterization of Synergistic Effect of *Agave Americana* and Potassium Iodide as Green Corrosion Inhibitors for Orthodontic Pliers (AISI 410) in 0.5M H_2SO_4

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The synergistic effect of potassium iodide (KI) with plant extract (*Grated Agave Americana* (GAA)) as a corrosion inhibitor for AISI 410 steel in 0.5M H_2SO_4 has been studied. The study employed stationary electrochemical techniques (Potentiodynamic Polarization, PPD), transient methods (Electrochemical Impedance Spectroscopy, EIS), and microscopic observations by SEM-EDX and AFM. The GAA behaved as a mixed inhibitor, with physisorbed adsorption, obeying the Freundlich isotherm, with an efficiency of 93.83% at 10% (v/v) after 2 hours immersion at 25°C.

The synergistic effect of GAA + KI at different concentrations increased the inhibitory efficacy to 99.21% for 7% (v/v) GAA + 10^{-4} M KI at 25°C after 2 hours immersion. Microscopic observations by SEM-EDX and AFM confirmed these results. In conclusion, GAA and its synergy with KI significantly improve the resistance of AISI 410 stainless steel to corrosion in 0.5M H_2SO_4 at 25°C.

Keywords: Corrosion; *Agave Americana*; KI; Synergistic effect.

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P051 Study of Steel Corrosion Behaviour in Presence of Antifreeze COOLELF MDX -26°C

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The present work investigates the corrosion behavior of steel, copper, and aluminum in an aqueous medium in the presence of the antifreeze COOLELF MDX -26°C. The influence of temperature and different antifreeze concentrations on the corrosion of these metals was studied over a period of two months using the polarization method and weight loss measurements. The metal surfaces were examined by optical microscopy to assess their condition. The study aims at protecting metallic contraptions from corrosion.

Keywords: Corrosion and Prevention; Corrosion Inhibitor; Anti-Cooling.

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P052 Extraction of Phenolic Compounds and Evaluation of Antioxidant Activity in Sorghum Panicles (*Sorghum bicolor* L. Moench)

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Sorghum is one of the oldest cultivated plants in the world, grown in arid regions across Africa, Asia, the Americas, Europe, and Australia [**?**, **?**]. This study aimed to evaluate natural food products and their potential as alternative antibiotics by testing the biological activity of phenolic compounds from different extracts under two extraction systems on sorghum plants. The total phenolic content in the acetone/water system ranged from 2.991 to 8.902 mg GAE/g panicles, higher than in the methanol system. Tannin content in the acetone/water (7:3, v/v) system ranged from 0.4 to 3.807 mg GAE/g, while in the methanol system it ranged from 0 to 2.812 mg GAE/g. Antioxidant activity assays of phenolic extracts from sorghum spikes revealed a high capacity against free radicals (DPPH) and lower capacity for iron (III) ions (FRAP).

Keywords: Sorghum; Phenolic Compounds; Antioxidant Activity; DPPH; FRAP.

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P053 Evaluation of the Impact of Agricultural Pollutants: Hydrochemical Study for the Protection of Groundwater in the Bouira Region (Northern Algeria)

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Groundwater is a vital resource for both population needs and agriculture. The Bouira region, characterized by diverse reliefs, faces challenges due to pollution from fertilizers and pesticides, increasing concentrations of nitrates and other harmful substances. This study measured water resources in selected sites of Bouira and quantified mineral pollution. Physicochemical parameters, including temperature, pH, conductivity, and ions (Ca^{2+}, Mg^{2+}, Na^{+}, K^{+}, Mn^{2+}, Zn^{2+}, Cu^{2+}, NH_4^{+}, SO_4^{2-}, NO_3^{-}, NO_2^{-}, Cl^{-}, HCO_3^{-}, PO_4^{3-}) were determined. Hydrochemical diagrams (Piper, Stabler, Schöeller-Berkaloff) revealed water chemical characteristics, quality, and potability, automated via Diagrammes software. Concentrations of nitrates and manganese exceeded WHO standards, indicating the impact of pollutants like heavy metals, dyes, and organic compounds. Statistical analysis using PCA guided new water treatment methods, further validated by molecular modeling (DFT) studies.

Keywords: Groundwater Protection; Hydrochemistry; Agricultural Pollution.

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P054 Ravintsara Essential Oil: Evaluation of Antimicrobial and Antifungal Activities and Comparison to Some Antibiotics

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This study evaluated the antimicrobial effectiveness of Ravintsara Essential Oil obtained by distillation of *Cinnamomum camphora* leaves, aiming to rationalize its use as an alternative to conventional antibiotics amid multi-resistance issues. The essential oil was tested against four Gram-negative bacterial strains, one Gram-positive bacterial strain, and *Candida albicans* as a yeast model. The results demonstrated significant antimicrobial activity against most tested microorganisms, including multi-resistant ESBL-producing strains. These findings suggest that Ravintsara Essential Oil could serve as a valuable alternative in infectious disease management and potentially in pharmaceutical applications.

Keywords: Essential oil; Ravintsara; *Cinnamomum camphora*; Antibiotics; Antimicrobial activity.

P055 Characterization of Anthocyanins in *Hibiscus sabdariffa* L. by High-Performance Liquid Chromatography (HPLC–DAD)

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This study focused on the flower of *Hibiscus sabdariffa* L. (Roselle), aiming to analyze the chemical composition of its anthocyanins. High-performance liquid chromatography coupled with diode-array detection (HPLC/DAD) was used to identify four main types of anthocyanins, with concentrations varying according to the extraction method. The results highlight the potential of innovative and eco-friendly extraction techniques, such as microwave- and ultrasound-assisted processes, to optimize the extraction of Roselle pigments. These findings suggest promising applications in the food, pharmaceutical, and cosmetic industries.

Keywords: *Hibiscus sabdariffa* L. (Roselle); Anthocyanins; HPLC–DAD; Microwave-assisted extraction; Ultrasound-assisted extraction.

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P056 Synthesis of Novel Isoxazolidine Heterocycles by 1,3-Dipolar Cycloaddition between Nitrone and Substituted Chalcones: Experimental and MEDT Investigation of Selectivity and Mechanism

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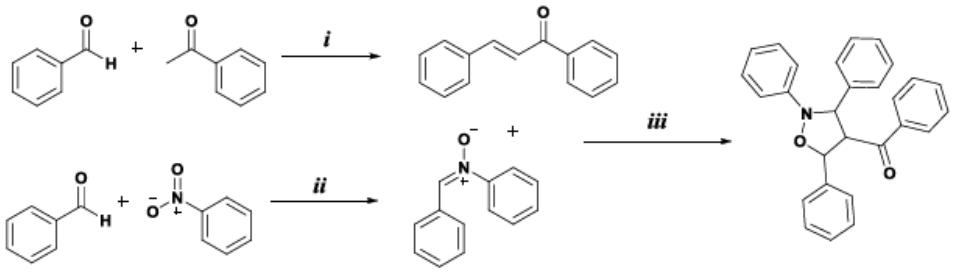
Isoxazolidines are key structural motifs in many drugs and pharmacologically active compounds. In this study, a series of new isoxazolidine cycloadducts were synthesized via 1,3-dipolar cycloaddition of nitrones with various chalcones in toluene under microwave-assisted, catalyst-free conditions. These conditions yielded a single regioisomer in a short reaction period of 30–60 minutes. The molecular mechanism, reactivity, and selectivity of these reactions were investigated using transition state theory and reactivity indices derived from conceptual DFT at the B3LYP/6-31G(d) level. The results indicate that the cycloaddition reactions proceed via a one-step synchronous non-polar mechanism with high activation energies. The theoretical findings are in good agreement with experimental results.

Keywords: Isoxazolidine; Nitrone; 1,3-Dipolar Cycloaddition; DFT; MEDT.



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P057 Complexation and Hydrogenation of Bodipy from Dipyrromethene-Type Molecules

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In this work, the complexation and reduction of dipyrromethenes were performed under simple conditions using water as a solvent and without any catalyst. This procedure led to Bodipy-type structures that possess remarkable fluorescence properties with excellent yields and high purity. All the obtained compounds were characterized by standard techniques, including ^{1}H NMR, ^{13}C NMR, and mass spectrometry. These results demonstrate an efficient, green, and straightforward method for synthesizing fluorescent Bodipy derivatives.

Keywords: Green chemistry; Dipyrromethene; Bodipy; Hydrogenation.

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P058 Virtual Screening Reveals Promising Benzamide Derivatives as Anticancer Agent Candidates for Pancreatic Cancer: A 3D-QSAR and Molecular Docking Study

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Pancreatic cancer is characterized by aggressive progression and poor prognosis, often due to late-stage diagnosis and resistance to conventional therapies. New drug discovery strategies are urgently needed. In this study, virtual screening was employed to identify potential anticancer agents. A 3D-QSAR model was developed on a series of benzamide derivatives, showing strong statistical significance and predictive power ($R^2 = 0.97$, SD = 0.17 for the training set; $Q^2 = 0.88$, RMSE = 0.42 for the test set). The validated model was applied to screen the ZINC database for structurally related compounds. Molecular docking identified key interactions with residues Arg37, Lys128, Thr21, and Thr42 in the receptor active site. In silico ADME evaluation led to five promising hits with favorable pharmacokinetic profiles. Docking analysis confirmed binding interactions similar to known inhibitors, supporting their potential as novel anticancer agents.

Keywords: Anticancer; 3D-QSAR; Molecular Docking; Benzamide Derivatives.

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P060 Efficient Synthesis of New Copper (II) Complex Derivative of Malonamide

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Malonamide derivatives are privileged scaffolds due to their notable biological activities and presence in natural products and pharmaceuticals. They act as effective -optical receptor agonists and have been developed for therapeutic targets including Alzheimer's disease (-secretase inhibitors) and cancer therapy (multi-target kinase inhibitors of c-Met and VEGFR2). In this study, a novel organometallic copper (II) complex was synthesized via complexation of bis(2-hydroxyethyl)malonamide using microwave irradiation. The compound was characterized by IR spectroscopy, UV-Visible spectroscopy, and cyclic voltammetry. Preliminary biological assays revealed promising anti-inflammatory and antimicrobial activities, highlighting its potential for further therapeutic exploration.

Keywords: Malonamide; Copper (II); Complexation; Microwave.

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P061 Adsorption of Dye Mixture

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The global dye industry produces over $7{\cdot}10^5$ tonnes of dyestuffs annually for applications in textiles, cosmetics, food, and paper industries. This results in significant environmental pollution due to the disposal of dye-containing wastewater. Various methods have been developed to remove these toxic dyes, among which adsorption using suitable adsorbents is highly effective. However, the high cost of conventional adsorbents such as activated carbon motivates the exploration of low-cost biosorbents. In this study, the adsorption of a binary dye mixture, Eriochrome Black T (EBT) and Rose Bengal (RB), was investigated using raw potato peels (RPP) as a low-cost biosorbent. The study aims to provide an environmentally friendly and economical method for dye removal from wastewater.

Keywords: Raw potato peels; Adsorption; Eriochrome Black T; Rose Bengal.

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P062 Alginate Biomaterial as Green Efficient Corrosion Inhibitor for Copper in 1 M Nitric Acid

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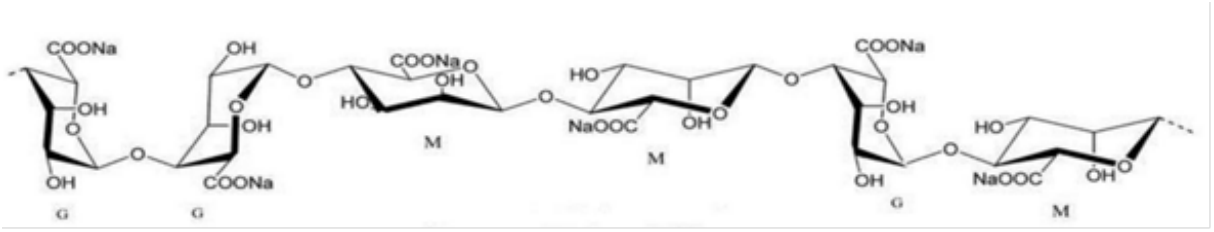
Alginates, linear polysaccharides composed of -L-guluronic acid (G) and -D-mannuronic acid (M), are extracted from brown seaweed. In this study, algae were collected from the rocky area of Ain Achir, Gard Cap, east of the Annaba coast. The anti-corrosion performance of sodium alginate on copper in 1 M nitric acid was evaluated using weight loss and electrochemical methods. Corrosion rates and inhibition efficiencies were calculated. Results indicate that inhibition efficiency increases with alginate concentration, exceeding 80% at 0.1 mg L^{-1}. The corrosion inhibition follows an adsorption mechanism and obeys the Langmuir isotherm. Monte Carlo simulations further demonstrated the correlation between alginate molecular structure and its inhibition performance.



Keywords: Ain Achir alginates; Corrosion; Inhibition; Nitric acid.

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P063 Anti-Lithiasis Activity of Tannins Extract of *Cucurbita moschata* Fruit on Struvite Crystals

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The genus *Cucurbita* is widely distributed in Algeria and belongs to the Cucurbitaceae family. Traditional medicine has used various parts of *Cucurbita moschata* to treat diseases such as urinary stones. Struvite stones, composed of magnesium ammonium phosphate hexahydrate, account for 10–20% of kidney stones and are considered "infection stones." The present study evaluates the in vitro antilithiasis activity of fruit tannins of *Cucurbita moschata* using a turbidimetric model. Hydrolyzable tannins were quantified by the potassium iodate spectrophotometric method and expressed as Tannic Acid Equivalent (TAE, mg/g dry extract). The inhibition of struvite formation was assessed at various concentrations of the extract. Results show inhibition percentages of 39.45, 42.78, and 46.11%, corresponding to 0%, 50%, and 100% inhibitor concentrations, respectively, with the positive control contributing 13.88%. These findings demonstrate that *Cucurbita moschata* fruits possess significant anti-lithiasis potential and can be considered a natural remedy.

Keywords: *Cucurbita moschata*; Struvite; Tannins; Turbidimetry.

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P064 Antioxidant Activity and In-Depth Characterization by LC–MS of Butanolic Extract of *Brassica fruticulosa* subsp. *numidica* (Coss.) Maire

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Brassica fruticulosa subsp. *numidica*, a lesser-known species of the Brassicaceae family, presents considerable opportunities for identifying bioactive compounds. This study aimed to characterize the phytochemical composition using liquid chromatography–mass spectrometry (LC–MS) and to assess the antioxidant activity of its butanolic extract. The extract was rich in phenolic compounds, particularly phenolic acids (Cinnamic acid 42.39% and Coumaric acid 19.48%) and flavonoids (Riboflavin 15.51% and Rutin 10.56%). The total antioxidant activity was measured using the Vitamin C Equivalent Antioxidant Capacity (VCEAC) through the ABTS [2,2'-azino-bis(3-ethylbenzothiazoline-6-sulfonic)] radical scavenging assay. The determined antioxidant capacity was 283.13 ± 8.26 mg VCE per 100 g of dry weight. These results suggest that *Brassica fruticulosa* subsp. *numidica* is a promising natural source of antioxidants and warrant further investigation for bioactive compound isolation and in vivo validation.

Keywords: *Brassica fruticulosa* subsp. *numidica*; Antioxidant activity; LC–MS; Butanolic extraction; ABTS.

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P065 Bioinspired Design of Chitosan-Opuntia Mucilage Coacervates: A Smart Platform for Functional Encapsulation

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This study investigates the complex coacervation between chitosan (Chi) and cactus mucilage (CM) extracted from *Opuntia ficus-indica* cladodes, focusing on the effects of pH and the Chi/CM ratio. Physicochemical characteristics of mucilage samples and the resulting microcapsules were assessed. Mucilaginous polysaccharides were extracted at pH levels of 2, 4, and 12 using hot water and purified with ethanol. Microstructural analysis revealed amorphous, porous features enhancing moisture retention. Monomer composition varied and included arabinose, galactose, glucose, xylose, and uronic acid fractions. X-ray diffraction (XRD) analysis identified primarily calcium salts. Encapsulation produced microcapsules with diameters ranging from 4 to 12 m and high encapsulation efficiency (83%–95%). Data integration indicated successful encapsulation of sunflower oil via complex coacervation, with cactus extract serving as an effective carrier. This bioinspired approach suggests potential applications in protecting bioactive compounds from oxidation and in drug delivery systems.

Keywords: Mucilaginous polysaccharides; Microcapsule; Complex coacervation.

P066 Biosynthesis of ZnO NPs using Polymer and Its Applications in Photocatalysis

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Chitosan was used as a capping agent in the synthesis of zinc oxide nanoparticles (ZnO NPs) to control their size, shape, and photocatalytic performance. Chitosan derived from shrimp shells was employed for the preparation of ZnO NPs. The photocatalytic efficiency was evaluated using methylene blue (MB) photodegradation tests for various ZnO NPs. The particle size of ZnO NPs was found to be 20 nm. MB dye removal by ZnO NPs synthesized with shrimp shell chitosan reached 60% after 60 minutes of contact at a low initial MB concentration of 7×10^{-5} M.

Keywords: Chitosan; ZnO nanoparticles; Nanotechnology; Photocatalytic activity.

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P067 Characterization of Phenolic Compounds from Inula viscosa Aqueous Extract by UHPLC-DAD-ESI-MSn

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This study focused on the green extraction and characterization of phenolic compounds from the aqueous extract of *Inula viscosa*. Extraction was performed by decoction using water as a solvent. Analysis was carried out using UHPLC-DAD-ESI-MSn, enabling precise identification and quantification of 22 phenolic compounds, including hydroxycinnamic acids, flavonols, and flavanone derivatives. Among these, nine caffeoylhexaric acid derivatives and eight caffeoylquinic acid isomers were identified. 1,5-dicaffeoylquinic acid was the most abundant compound. Quantification was performed using calibration curves with reference standards. These compounds are known for their antioxidant, antiradical, and anti-inflammatory activities, highlighting the therapeutic potential of *Inula viscosa*.

Keywords: Phenolic composition; Inula viscosa; UHPLC-DAD-ESI/MS; Aqueous extract.

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P068 Characterization, Electrochemical Performance Studies and Surface Analysis of a New Schiff Base

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This study investigates the efficiency of a new Schiff base as a corrosion inhibitor for aluminum in sulfuric acid. SEM, XRD, and XPS analyses were used to characterize the aluminum surface and confirm the strong adsorption of the inhibitor. The compound's purity was verified by FTIR and Raman spectroscopy, while UV and ^{1}H NMR confirmed its structure. A mechanism for inhibition on aluminum in acidic media is proposed for the first time, highlighting the superior performance of Schiff bases over corresponding amines and aldehydes.

Keywords: Inhibition; Schiff base; Electrochemical performance; Surface characterization.

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P069 Comparison of the Antifungal Activity of Aqueous and Methanolic Extracts of Artemisia herba alba and Marrubium vulgare

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The antifungal potential of two medicinal plants, *Artemisia herba alba* and *Marrubium vulgare*, collected from northeastern Algeria, was evaluated using aqueous and methanolic extracts. The aqueous extracts exhibited higher yields (14.39% for *A. herba alba* and 9.09% for *M. vulgare*) compared to methanolic extracts (7.81% and 6.93%, respectively). Phytochemical analysis revealed richness in flavonoids and saponins in the aqueous extracts, while methanolic extracts contained tannins. Quantification of total polyphenols and flavonoids showed higher content in aqueous extracts. Antifungal tests demonstrated that methanolic extracts had significant activity against *Alternaria sp.*, *Penicillium sp.*, and *Candida albicans*, with inhibition zones and MIC values of 18–30 mm and 50 mg/mL, respectively. The aqueous extract of *A. herba alba* was active against *Alternaria sp.* with a MIC of 200 mg/mL. Overall, *A. herba alba* exhibited fungicidal activity, while *M. vulgare* showed fungistatic effects.

Keywords: Antifungal activity; *Artemisia herba alba*; *Marrubium vulgare*.

P070 Mesoporous Silica (SBA-15) as a Functional Filler in UV Light-Curing 3D Printing Resin

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Mesoporous silica SBA-15 was synthesized via hydrolysis-condensation of tetraethoxysilane (TEOS) with Pluronic P123 under acidic conditions, followed by hydrothermal treatment. For the first time, SBA-15 was incorporated as a filler into a UV light-curing 3D printing acrylic resin. FTIR analysis confirmed SBA-15 formation and an increase in cross-linking density with 0.125 and 0.25 wt% addition. TGA demonstrated improved thermal stability, while SEM showed well-dispersed nanoparticles and enhanced structural integrity of the nanocomposites. The silanol (Si–OH) groups of SBA-15 contributed to improved resin performance, suggesting its potential as an effective additive for advancing 3D printing resin properties across various applications.

Keywords: Mesoporous Silica; Photosensitive resin; Structural properties; 3D printing.

P071 Development and Characterization of Nanocomposites Derived from Phosphate Waste

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This study investigates the synthesis and multifunctional applications of $Ca_5(PO_4)_3F@Ca_5P_8$ nanocomposites derived from phosphate waste from Djebel Onk, Algeria. FTIR analysis confirmed key functional groups including C–H, P–H, P–O, and F–Ca, while XRD revealed crystalline hexagonal ($Ca_5(PO_4)_3F$) and monoclinic (Ca_5P_8) phases with an average crystallite size of 22.45 ± 1.18 nm. SEM and EDS showed spherical nanoparticles (24 nm) with elemental composition of Ca, P, O, and F. Optical characterization indicated peak absorption at 391 nm, direct and indirect band gaps of 1.62 eV and 2.98 eV, respectively, and an Urbach energy of 0.435 eV. The nanocomposite exhibited near 100% hydrogen peroxide scavenging efficiency and degraded 99.2% of Evans Blue dye in 140 minutes (rate constant: 0.01334 min^{-1}). These results highlight the potential of $Ca_5(PO_4)_3F@Ca_5P_8$ nanocomposites for sustainable water treatment and photocatalytic applications.

Keywords: Djebel Onk; $Ca_5(PO_4)_3F@Ca_5P_8$ nanocomposites; photocatalysis.

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P072 Efficient One-Step Synthesis of a New Tetrahydro-4H-chromene via a Three-Component Reaction under Mild Conditions

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Chromene derivatives represent an important class of compounds used in cosmetics, pigments, and potentially biodegradable agrochemicals. Polyfunctionalized 4H-chromenes also constitute structural units of many natural products with pharmacological activities including antiallergic, antitumor, and antibacterial effects. Herein, we report an efficient, eco-friendly one-pot, three-component cyclocondensation reaction for synthesizing novel 2-amino-5-oxo-5,6,7,8-tetrahydro-4H-chromene derivatives. Nickel(II) nitrate hexahydrate was used as a green catalyst under mild conditions. Two new compounds, 2-amino-6,6-dimethyl-5-oxo-4-(4-methoxyphenyl)-5,6,7,8-tetrahydro-4H-benzopyran-3-carbonitrile and 2-amino-6,6-dimethyl-5-oxo-4-phenyl-5,6,7,8-tetrahydro-4H-benzopyran-3-carbonitrile, were obtained in good yields. Structures were elucidated via IR, UV-Vis, and NMR spectroscopy, and the crystalline structure of compound 1 was confirmed by single-crystal XRD. The methodology provides high yield, operational simplicity, and environmental compatibility, representing a valuable strategy in heterocyclic framework design.

Keywords: Tetrahydro-4H-chromene; Green catalysis; One-pot synthesis; Nickel(II) nitrate.

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P073 Quantitative study of polyphenol content in Anacyclus clavatus root extracts and evaluation of their antioxidant properties

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Anacyclus clavatus (Desf.) is widely used in traditional herbal medicine for treating stomach discomfort, gastric ulcers, and as an intestinal antiseptic. This study aimed to evaluate total polyphenol and flavonoid contents in methanolic extracts of A. clavatus roots and assess antioxidant activities using DPPH radical scavenging, total antioxidant capacity (TAC), and reducing power assays. Five extraction methods were compared: mechanical agitation (MA), Soxhlet, microwave heating (MW), Soxhlet combined with microwave heating (SAMW), and agitation with reflux heating (AHR). The SAMW method provided the highest extraction yield (12.06%) and superior antioxidant activity (DPPH IC = 69.95 ± 2.32 µg/mL; reducing power EC = 672.36 ± 39.00 µg/mL). TAC was highest with AHR (21.79 ± 1.61 mg EAA/g). Soxhlet extraction yielded the greatest total polyphenol (24.92 ± 1.90 mg GAE/g) and flavonoid (8.89 ± 0.99 mg QE/g) contents. These results indicate that extraction method significantly affects the phytochemical profile and bioactivity, confirming A. clavatus root extracts as promising sources of bioactive compounds.

Keywords: Anacyclus clavatus; antioxidant activity; polyphenol content; medicinal plant.

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P074 Study of effects of green wormwood inhibitors on corrosion of XC60 steels in acidic media

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Corrosion is a major industrial problem causing equipment malfunction. Green inhibitors, which are environmentally friendly and non-toxic, are promising solutions. This study evaluates the corrosion inhibition effect of Wormwood extracts on XC60 steel in 1N HCl using gravimetric and electrochemical methods. Increasing the concentration of flavonoid extracts at low temperatures improved the inhibition efficiency, reaching a maximum of 98.7% at 500 ppm, a critical concentration for optimal performance. Adsorption of the extracts on XC60 steel followed the Langmuir model, and thermodynamic analysis indicated physisorption. Potentiodynamic polarization measurements confirmed that all extracts act as mixed-type inhibitors. These findings demonstrate the effectiveness of green wormwood extracts for corrosion protection in acidic media.

Keywords: corrosion; green inhibitor; polarization; XC60 steel.

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P075 Mint Essential Oil as a Green Corrosion Inhibitor: Phytochemical, Spectroscopic, and DFT-Based Electrochemical Evaluation

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This study investigates the corrosion inhibition potential of mint essential oil (MEO) on metals using a multidisciplinary approach. Phytochemical screening identified key bioactive compounds including menthol, menthone, and carvone, which possess electron-donating and adsorption properties. Spectroscopic analyses (FT-IR and UV-Vis) confirmed strong interactions between MEO functional groups and the metal surface, indicating the formation of a protective film. Density Functional Theory (DFT) calculations further confirmed the adsorption ability and reactivity of MEO constituents through HOMO-LUMO analysis, molecular electrostatic potential (MEP), and adsorption energy evaluations. Electrochemical measurements, including potentiodynamic polarization (PDP) and electrochemical impedance spectroscopy (EIS), demonstrated inhibition efficiencies exceeding 85%, confirming MEO as a mixed-type corrosion inhibitor. These results highlight mint essential oil as a green and sustainable alternative for corrosion protection in engineering applications.

Keywords: Green corrosion inhibitor; Mint essential oil; Electrochemical impedance spectroscopy; Sustainable materials.

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P076 Synthesis of Novel Isoxazolidine Heterocycles via 1,3-Dipolar Cycloaddition of Nitrone and Substituted Imines: Experimental and MEDT Investigation of Selectivity and Mechanism

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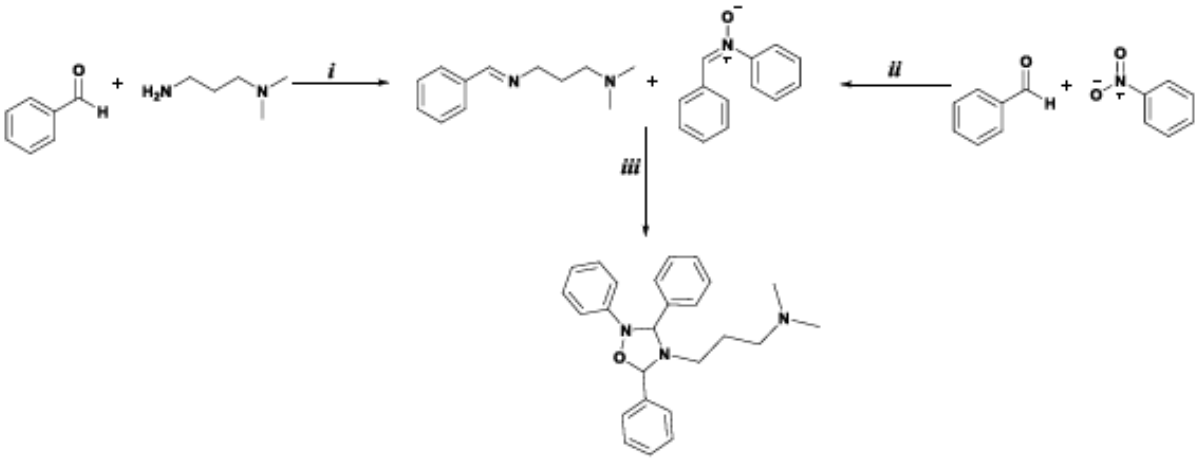
A series of novel oxadiazolidine cycloadducts were synthesized via 1,3-dipolar cycloaddition (13DC) between nitrones and substituted imines in toluene under microwave-assisted, catalyst-free conditions. These conditions allowed the formation of a single regioisomer in significantly reduced reaction times (30–60 min). The mechanism, reactivity, and selectivity were investigated using conceptual DFT and transition state theory at the B3LYP/6-31G(d) level. Theoretical calculations indicated that the 13DC reactions proceed through a one-step, synchronous, non-polar pathway with high activation energies, consistent with experimental observations. These findings provide insight into the chemo- and regioselectivity of isoxazolidine formation.



Keywords: Isoxazolidine; Nitrone; Cycloaddition; DFT; MEDT.

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P077 Optimization of Methyl Violet Extraction Using an Extractant Mixture

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The removal of the cationic dye methyl violet (MV) from aqueous solutions was investigated using the emulsified liquid membrane (ELM) technique. The effects and interactions of various operating parameters were first screened using a Plackett–Burman design to identify the most influential factors. Subsequently, a Box–Behnken design optimized three key parameters: mass percentage of the TBP–TEA extractant mixture, mass percentage of Span80 surfactant, and concentration of the internal aqueous phase. Optimization using MINITAB 20 revealed the best extraction conditions: internal phase [H_2SO_4] = 0.1 M, Span80 = 6% w/w, TBP = 4% w/w, TEA = 1% w/w. Under these conditions, an experimental extraction yield of 99.23% for MV was achieved. The study also evaluated the effects of real water matrices, transition metals, and driving force on extraction efficiency. These results confirm that the ELM process is highly effective for the treatment of dye-contaminated wastewater.

Keywords: Methyl Violet; Emulsified liquid membrane; Plackett-Burman; Box-Behnken; Dye extraction.

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P079 Implementation of a Plant Waste for the Optimization of Its Adsorption Performance of Recalcitrant Organic Materials in Aqueous Media

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This study investigates the adsorption performance of a local plant-based material for the removal of the synthetic dye Gentian Violet from aqueous solutions. Experiments were conducted to examine the influence of key parameters on adsorption capacity. Results indicate that the adsorption kinetics follow a pseudo-second-order model, and the adsorption isotherms are well described by the Langmuir model, with a maximum adsorption capacity of approximately 500 mg/g. Ionic strength, evaluated through salt addition, did not significantly affect the dye removal efficiency. Thermodynamic analysis revealed that the adsorption process is spontaneous and exothermic. These findings highlight the potential of this plant material as a low-cost and effective adsorbent for wastewater treatment applications.

Keywords: Adsorbent; Gentian Violet; Plant material; Exothermic; Wastewater treatment.

P080 Predicting Vapor Pressure of Pesticides Using Chemometric Techniques

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Pesticides pose significant environmental risks due to their persistence, bioaccumulation, and adverse effects on human health and ecosystems. Predicting their vapor pressure (Vp) is essential to evaluate environmental mobility and bioavailability. In this study, molecular descriptors of 77 pesticides were calculated using HyperChem and Dragon software, then optimized to develop QSPR models with QSARINS. Multiple linear regression (MLR) combined with genetic algorithm-based variable subset selection (GA-VSS) was employed. The dataset was divided into a training set (53 compounds) and a test set (22 compounds) for external validation. The resulting model demonstrated high robustness and predictive reliability: $R^2 = 0.8164$, $Q^2 = 0.7510$, low standard errors, and a minimal difference ($< 10\%$) between R^2 and Q^2. The applicability domain was validated using Williams plots. These findings confirm that chemometric QSPR approaches provide reliable prediction of pesticide vapor pressures, supporting environmental risk assessment and regulatory decision-making.

Keywords: QSPR; Pesticides; Vapor Pressure; Multiple Linear Regression; Molecular Descriptors.

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P081 Raw Pinecones as a Sustainable Adsorbent for the Removal of Malachite Green Dye from Aqueous Solution Using the Batch Experiment Method

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Industrial wastewater often contains synthetic dyes that threaten the environment and human health. Malachite Green (MG) is widely used in textile, paper, and aquaculture industries but is toxic, mutagenic, and potentially carcinogenic. This study investigates raw pinecones as a low-cost, sustainable biosorbent for MG removal. The material was characterized using FTIR, SEM, EDX, XRD, TGA, and point of zero charge (pH_{pzc}). The effects of adsorbent dosage, initial dye concentration, solution pH, and contact time were studied. Adsorption isotherms were analyzed with Freundlich, Langmuir, and Temkin models, while kinetics were studied using pseudo-first-order and pseudo-second-order models. Thermodynamic analysis indicated a spontaneous and feasible adsorption process. Results demonstrated high adsorption efficiency, highlighting the potential of raw pinecones as an eco-friendly material for industrial wastewater treatment.

Keywords: Adsorption; Malachite Green; Pinecones; Isotherms; Batch Experiment.

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P082 Structural Modulation of Rhodanine Derivatives: Insights into Antioxidant Efficiency via Dual in Vitro Assessment

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The rhodanine scaffold continues to attract attention due to its structural versatility and broad biological potential. In this study, two newly synthesized rhodanine-based compounds with distinct substituents were designed to explore the impact of structural modifications on antioxidant performance. The derivatives were obtained via conventional synthesis and characterized by FT-IR and ^{1}H NMR techniques. Antioxidant properties were evaluated through a dual in vitro approach: the SNP assay determined NO• scavenging activity, while the phenanthroline method assessed iron-chelating capacity and hydroxyl radical (•OH) inhibition. Results revealed that structural variations significantly affected antioxidant behavior: one compound showed superior NO scavenging, whereas the other exhibited stronger metal chelation. These findings highlight the role of electronic and steric factors and provide insight into enhancing antioxidant potential through targeted rhodanine modifications, relevant for therapeutic applications in oxidative stress-related conditions.

Keywords: Rhodanine; Antioxidant activity; Structural modification; Free radical scavenging.

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P083 Ozonized Olive Oil: A Natural Antimicrobial Agent with Broad-Spectrum Activity on Bacteria and Fungi

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This study evaluates the antimicrobial potential of ozonized olive oil (*Olea europaea* L.) against a diverse range of microorganisms, including eight bacterial strains, two yeasts, and five filamentous fungi. Ozonized olive oil was prepared by bubbling medical-grade ozone through olive oil for 24 and 96 hours. Antimicrobial activity was assessed using the agar diffusion method, while minimum inhibitory concentrations (MIC), minimum bactericidal concentrations (MBC), and minimum fungistatic/fungicidal concentrations (MFC) were determined.

Results demonstrated broad-spectrum activity: *Proteus mirabilis* exhibited the highest bacterial sensitivity (inhibition zone 18.33±0.47mm, MIC 0.794mg/mL), while *Fusarium solani* was the most susceptible fungus (inhibition zone 36.66±4.71mm, MFC 0.38mg/mL). Notably, the antifungal effect against *Candida albicans* was exceptionally strong, with MFC values 13 times lower than previously reported. Chemical analyses indicated that antimicrobial activity arises from ozonides, peroxides, aldehydes, and polyperoxides formed during ozonation. These findings suggest that ozonized olive oil acts primarily through oxidative stress mechanisms and represents a promising natural antimicrobial agent, relevant for addressing antimicrobial resistance and emerging infectious diseases.

Keywords: Ozonized olive oil; Antibacterial activity; Biodiversity; Fungal inhibition.

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P084 Synthesis and In Vitro Antifungal Activity of α-Acetoxy Methylphosphonates: DFT Calculations and Molecular Docking Studies

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Opportunistic fungi such as *Candida albicans* and *Saccharomyces cerevisiae* pose significant health threats, particularly to immunocompromised individuals. In this study, novel α-acetoxy methylphosphonate derivatives were synthesized in two steps using α-hydroxyphosphonates as intermediates, achieving excellent yields of up to 80%. The structures of the synthesized compounds were confirmed by IR, UV-Vis, NMR (^{1}H, ^{13}C, ^{31}P), and HRMS analyses.

Antifungal activity was evaluated against *C. albicans* and *S. cerevisiae*, showing high efficacy for all tested compounds. Density functional theory (DFT) calculations at the CAM-B3LYP/6-31G(d,p) level were performed to investigate molecular stability and reactivity through HOMO–LUMO energy analysis. Molecular docking studies revealed strong binding affinities with fungal target proteins, ranging from –7.1 to –9.4 kcal/mol. Overall, α-acetoxy methylphosphonates exhibit promising potential as antifungal drug candidates.

Keywords: α-Acetoxy methylphosphonate; DFT; Molecular docking; Antifungal activity.

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P086 Study of the Phytochemical, Mineral, and Antioxidant Activity of the Medicinal Plant *Ephedra alata* in Algeria

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Ephedra alata is a medicinal plant widely recognized for its therapeutic properties, including treatment of allergies, bronchial asthma, colds, coughs, fever, flu, and headaches. In addition to its antimicrobial and anticancer activities, this species is a rich source of alkaloids such as ephedrine and pseudoephedrine, and contains significant amounts of phenolic compounds contributing to its high antioxidant potential. This study investigated the total phenolic and flavonoid contents, and evaluated antioxidant activity using DPPH, ABTS, and CAT assays. Furthermore, qualitative and quantitative analysis of some minerals present in the plant was performed. The results provide insight into the bioactive potential of *E. alata* and support its traditional medicinal use in Algeria.

Keywords: Methanolic extract; Antioxidant activity; DPPH; ABTS; CAT.

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P087 Recent Advances in Biodiesel Purification: Towards More Efficient and Eco-Friendly Processes

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The purification of biodiesel is a critical step to ensure compliance with international quality standards (EN 14214, ASTM D6751). While water washing remains the most common method, advanced approaches are increasingly being adopted to enhance process efficiency and minimize environmental impact. This review summarizes recent developments (2020–2024) in purifying fatty acid methyl esters (FAMEs) from vegetable oils, including solvent-aided crystallization using green solvents, functionalized adsorbents (modified zeolites and silicas), membrane separation technologies, and process intensification techniques such as microwave- or ultrasound-assisted purification. These methods have demonstrated superior performance in removing impurities (glycerol, soaps, residual methanol) and improving biodiesel properties, particularly oxidation stability and cold-flow behavior. The synthesis highlights a shift towards more sustainable, energy-efficient, and scalable purification methods, supporting optimization of biodiesel production.

Keywords: Purification; Methyl Esters; Biodiesel; Transesterification.

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P088 Enzymatic Interesterified Apricot Kernel Oil Crystallization Behavior Study Using Pulsed Nuclear Magnetic Resonance (p-NMR)

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Physical and/or chemical modifications of fats and oils can be performed via interesterification, a catalytic reaction that changes fatty acid positions on the glycerol backbone, affecting melt-crystallization characteristics. In this study, structured fats were prepared using enzymatic interesterification (EIE) with Lipase B (CALB) on blends of bleached, refined, deodorized apricot kernel oil (AKO) and hydrogenated coconut oil (HCNO) at different ratios. Pulsed-NMR (p-NMR) was used to analyze melting profiles (solid fat content, SFC) and isothermal SFC over time at 0, 10, and 25 °C, fitted with the Avrami model.

SFC curves showed varying melting profiles for the three blends, with complete melting at 40 °C and maximum SFC (SFC_{max}) at 0 °C of (68.32 ± 0.12)%, (42.96 ± 0.10)%, and (15.07 ± 0.35)% for EIE AKO/HCNO (25:75), (50:50), and (75:25), respectively. At 25 °C, SFC values were very low, corresponding to low rate constants (k_n) from the Avrami fit. A slight increase in k_n for the 75% AKO blend indicates slower crystallization kinetics. A sudden change in the Avrami exponent (n) with 75% AKO suggests a nucleation and growth mechanism shift from non-defined to instantaneous nucleation or rod-like morphology.

Keywords: Apricot Kernel Oil; Enzymatic Interesterification; Crystallization; p-NMR.

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P089 Phytochemical Characterization and Antioxidant Properties of Polyphenols Extracted from the Leaves of *Thymus algeriensis* Boiss. et Reut.

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The increasing interest in phytomedicines has led to restrictions on synthetic drugs. This study aimed to identify the main secondary metabolites in the leaves of *Thymus algeriensis* using phytochemical screening and to evaluate the antioxidant activity of polyphenol extracts obtained by maceration in methanol, ethanol, and ethyl acetate via DPPH® free radical scavenging assay.

Phytochemical screening revealed polyphenolic compounds (anthocyanins, leucoanthocyanins, gallotannins, catechins, quinones, coumarins, flavonoids) and saponins, with no senosides or carbohydrates detected. In vitro antioxidant evaluation showed strong DPPH® radical scavenging activity, with IC_{50} values of 0.011 mg/mL (methanol), 0.013 mg/mL (ethanol), and 0.02 mg/mL (ethyl acetate). Reference antioxidants BHT, BHA, and ascorbic acid exhibited IC_{50} values of 0.01, 0.02, and 0.045 mg/mL, respectively. These results indicate that *T. algeriensis* extracts possess significant antioxidant potential, likely due to polyphenols, making the plant a promising natural antioxidant source.

Keywords: *Thymus algeriensis* Boiss. et Reut.; Phytochemical characterization; Polyphenols; Antioxidant properties.

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P090 Molecular Modeling of Anticancer Flavonoids from *Scutellaria baicalensis* and Their Interaction with the Cb1a Protein

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This study employs molecular modeling through molecular docking using the MOE software to investigate specific flavonoids extracted from *Scutellaria baicalensis*, known for their anticancer properties. The interaction of these flavonoids with the Cb1a protein was analyzed, revealing tight binding and significant interactions at a specific site of the protein. These results suggest potential modulation of the protein's activity, highlighting the relevance of these flavonoids in developing novel therapeutic strategies for inflammatory diseases.

Keywords: Anticancer; *Scutellaria baicalensis*; MOE; Cb1a.

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P091 Circumpyrene Synthesis by Alkyne Benzannulation of Brominated Dibenzo-Ovalene

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A transition metal-catalyzed benzannulation reaction enabled the synthesis of circumpyrene from 3,11-dibromo-6,14-dimesityldibenzo-ovalene (DBDBOV). The structure of circumpyrene was confirmed using NMR, mass spectrometry, and single-crystal X-ray diffraction, revealing a multiple-edge zigzag topology. The formation of two new C=C bonds significantly altered the electronic structure, increasing both optical and electrochemical energy gaps. These results are consistent with an increase in Clar sextets and a decrease in -electrons along the conjugation path, as shown by induced current density anisotropy calculations. This method provides a novel route for the preparation of nanographenes with multiple zigzag edges and offers insights into their electronic properties.

Keywords: Circumpyrene; Nanographenes; Single-crystal; X-ray diffraction analysis.

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P092 Quantification of Total Polyphenols and Total Flavonoids of Medicinal Plant *Asphodelus tenuifolius* Cav.

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Medicinal plants have long been used to treat various diseases and constitute a natural source of secondary metabolites, representing a wide variety of organic compounds. In this study, the aerial parts of *Asphodelus tenuifolius* Cav., a member of the Liliaceae family growing in the arid zone of El Oued (Algeria), were harvested and extracted using hydroethanol (ethanol/distilled water, 80/20 v/v). Sequential fractionation with polar and apolar solvents yielded chloroform ($CHCl_3$), ethyl acetate (EtOAc), and n-butanol (n-BuOH) extracts. Quantification of total polyphenols and flavonoids revealed that the $CHCl_3$ extract contained the highest levels of polyphenols (366.708 ± 0.049 mg GAE/g) and flavonoids (334.898 ± 0.010 mg RE/g), followed by EtOAc (polyphenols: 190.453 ± 0.006 mg GAE/g; flavonoids: 128.862 ± 0.042 mg RE/g) and n-BuOH (polyphenols: 125.120 ± 0.044 mg GAE/g; flavonoids: 68.230 ± 0.003 mg RE/g).

Keywords: Total polyphenols; Total flavonoids; Polar; Apolar; *Asphodelus tenuifolius* Cav.; Extraction.

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P093 The Effect of the Hormone Kinetin on Irrigation with Salt Water Levels in Quinoa Plants (*Chenopodium quinoa*)

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This study aimed to investigate the resistance of quinoa plants to salinity and their response to the growth regulator kinetin. Two quinoa varieties (yellow and red) were grown in 48 pots and irrigated with different concentrations of sodium chloride (NaCl: 200, 400, 600 mmol/L) or distilled water (control). Two kinetin treatments (200 ppm) were applied: seed soaking before planting and foliar spraying twice during the vegetative phase. Measurements during the vegetative phase included stem length, number of branches, number of leaves, leaf area, chlorophyll a and b, relative water content, wet weight, and dry weight. Results indicated that both quinoa varieties responded differently to salinity; high salinity negatively affected growth, whereas low salinity had positive effects. Kinetin treatment mitigated the negative impact of salinity to varying degrees between the two cultivars, likely due to physiological and genetic differences.

Keywords: Salt water; Growth regulator kinetin; *Chenopodium quinoa*.

P094 Influence of Nanostructuring of Titanium Alloy Surfaces on Their Antimicrobial Properties and Resistance

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Titanium and its alloys are widely used biomaterials due to their corrosion resistance, low modulus of elasticity, and biocompatibility. However, limitations such as low wear resistance can prevent them from fully meeting clinical requirements. This study investigates strategies to improve mechanical properties and bioactivity of titanium alloys, focusing on antimicrobial properties and corrosion resistance of nanostructured surfaces. Experimental results showed that nanoscale surfaces significantly inhibit bacterial growth. Electrochemical tests simulating physiological environments revealed that nanostructuring promotes a protective passivating layer, reducing the corrosion rate. Sample microstructure was characterized using scanning electron microscopy (SEM) and X-ray diffraction (XRD), and hardness tests were performed after high-pressure treatment (HPT).

Keywords: Passivating layer; Microstructure; Scanning electron microscopy; X-ray diffraction; High-pressure treatment.

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P095 Inventory of Post-Harvest Wheat Pest Insects

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Insects are responsible for significant losses of stored food grains. Effective management of stored-product insects requires precise detection and estimation protocols that provide accurate assessments of insect populations in space and time, relying on robust sampling methods. This study aimed to evaluate the frequency and diversity of insects in concrete silos using standardized sampling and evaluation criteria. Inventories were conducted at two storage sites: the Cooperative Cereal Storage Center (CCLS) of Khemis-Miliana and Ténès. Samples were collected monthly over six months (January to June) through the silo discharge hatch, with collections every 30 minutes to ensure representativeness across all levels. After sieving through a 2 mm mesh, insects were quantified and classified according to their frequency. Seven species were identified across both sites, mostly Coleoptera. In Khemis-Miliana, six species were found: five Coleoptera (Trogoderma granarium L., Rhyzopertha dominica, Sitophilus granarius) and one Lepidoptera (Ephestia kuehniella). In Ténès, the same Coleoptera species were identified, with the Lepidoptera represented by Plodia interpunctella.

Keywords: Inventory; Wheat; Insects; Coleoptera; Storage.

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P096 LC-MS Profiling of Chamomile Infusion, with Its Hyperglycemic and Antioxidant Capacities

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Matricaria chamomilla L., commonly known as chamomile, is widely used in Algeria for its medicinal properties. It is primarily employed for its anti-inflammatory, analgesic, and sedative effects, making it popular for treating digestive disorders, anxiety, and sleep disturbances. The phenolic profile of the ethanol extract of aerial parts of *M. chamomilla* was investigated by UHPLC-UV. HRMS analysis in both negative and positive ion modes indicated higher sensitivity in negative ion mode, detecting twenty-nine (29) major peaks. Identified compounds included hydroxyl-cinnamic acids and flavonoids. The extract exhibited significant antioxidant activity against DPPH radicals (EC_{50} = 10.49 µg/mL), correlated with phenolic and chlorogenic acid derivatives. Additionally, anti-glycemic properties were demonstrated through -amylase inhibition (IC_{50} = 0.82 mg/mL). These findings highlight chamomile as a functional food capable of contributing to disease prevention.

Keywords: *Matricaria chamomilla*; UHPLC-UV analysis; antioxidant activity; hyperglycemic properties.

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P097 Clean Technology for Water Recycling: Amino Acid Recovery from Wheat Washing Water

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This research focuses on applying clean technologies for water conservation, recycling, and valorization of organic pollutants. The study investigates the separation of free amino acids from wheat washing water using ion exchange chromatography. The process involves three main steps: (i) separation of amino acids using an ion exchange resin based on their ionic charges, (ii) elution of amino acids according to their acidity to achieve chemical separation, and (iii) detection and quantification of recovered amino acids to evaluate method efficiency and valorization potential. This approach reduces the environmental impact of wastewater and recovers high-value biomolecules suitable for industrial reuse, providing a sustainable solution aligned with circular economy principles and environmental preservation.

Keywords: Clean technology; ion exchange chromatography; amino acids; washing water.

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P098 Lightweight AlMgZn Alloy by High-Frequency Fusion: An Ecological Innovation

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This study reports the development of a lightweight AlMgZn alloy through high-frequency fusion, an innovative and environmentally friendly method that generates heat directly within the material without combustion or pollutant emissions. Microstructural characterization by X-ray diffraction and electron microscopy confirmed the formation of intermetallic phases contributing to enhanced mechanical strength. The proposed clean and energy-efficient process aligns with green chemistry principles and offers promising applications in renewable energy, biomass thermal conversion, recycling, and pollution control via toxic metal capture.

Keywords: AlMgZn alloy; high-frequency fusion; green chemistry; pollution treatment.

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P099 Molecular Docking of Polyphenols from *Myrtus communis* L. and *Arbutus unedo* L. as Natural Tyrosinase Inhibitors for Cosmetic Applications

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Tyrosinase is a key enzyme in melanogenesis and an important therapeutic target for the treatment of hyperpigmentation disorders. The search for natural, safe, and effective tyrosinase inhibitors is gaining momentum in cosmetic science, driven by the rising demand for clean beauty and plant-based actives. This study investigates the tyrosinase inhibitory potential of polyphenols derived from two Algerian medicinal plants: *Myrtus communis* and *Arbutus unedo*. Ten polyphenolic compounds—including flavonoids, phenolic acids, anthocyanins, and glycosylated derivatives—were selected for in silico molecular docking against the crystal structure of tyrosinase (PDB: 3NQ1), with kojic acid as a reference inhibitor. Docking results showed that flavonoids such as myricetin, quercetin, and kaempferol exhibited strong binding affinities (-8.3, -8.1, and -8.0 kcal/mol, respectively), significantly higher than kojic acid (-5.5 kcal/mol). These interactions involved copper ion chelation, hydrogen bonding, and π–π stacking within the active site, crucial for effective enzyme inhibition. The findings highlight the potential of polyphenol-rich extracts from native Algerian plants as natural alternatives to synthetic tyrosinase inhibitors in depigmentation and antioxidant cosmetic formulations. This work emphasizes the value of Algerian plant biodiversity and demonstrates the utility of molecular docking as a predictive tool in discovering bioactive compounds for sustainable cosmetics.

Keywords: Algerian medicinal plants; tyrosinase inhibition; molecular docking; sustainable cosmetics.

P100 The Use of Essential Oils in Poultry Farms: Preliminary Study Validating the Antibiotic Action of Two Algerian Essential Oils on Multi-Resistant Avian Enterobacteria

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The overuse and misuse of antimicrobials has critically undermined their therapeutic efficacy. In response, this study explores the potential of essential oils as natural antibacterial alternatives that avoid the emergence of new resistant strains. A total of 69 multi-resistant strains of avian Enterobacteria were isolated, including *Escherichia coli*, *Proteus vulgaris*, and *Proteus mirabilis*, and their resistance profiles were determined against 21 antibiotics. The strains were subsequently exposed to two Algerian essential oils—*Rosmarinus officinalis* (rosemary) and *Thymus vulgaris* (thyme)—using aromatogram assays. Gas chromatography–mass spectrometry (GC–MS) analysis identified 1,8-cineole (39.75%) as the major compound in rosemary oil and carvacrol (73.03%) as the main constituent in thyme oil. Aromatograms confirmed that thyme oil exhibited stronger antibacterial activity (mean inhibition zone: 29.06 ± 0.33 mm) than rosemary oil (11.42 ± 0.26 mm), with *P. vulgaris* showing the highest sensitivity (32.47 ± 0.25 mm). These in vitro results suggest that essential oils, particularly thyme, hold significant promise as alternatives to conventional antibiotics in poultry farming.

Keywords: Antibiotic resistance; avian Enterobacteria; rosemary essential oil; thyme essential oil.

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P102 Green Synthesis of Silver Oxide Nanoparticles Using *Ficus carica* L. Leaves Extract and Their Antibacterial Activity

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In this work, silver oxide nanoparticles (AgO-NPs) were synthesized via a green method using *Ficus carica* L. leaves extract. The obtained nanoparticles were characterized by UV–Vis spectroscopy, Fourier-transform infrared spectroscopy (FTIR), and X-ray diffraction (XRD). Their potential applications were investigated in methylene blue dye degradation and antimicrobial activity. The biosynthesized AgO-NPs displayed spherical morphology with an average particle size of 70.88 nm. They exhibited significant antibacterial activity against different bacterial strains, with inhibition zones ranging from 15.5 to 19 mm at a concentration of 20 mg/mL. Furthermore, the AgO-NPs demonstrated anti-candidiasis activity against *Candida albicans*. These results highlight that *Ficus carica*-mediated AgO-NPs are promising candidates for eco-friendly antibacterial agents.

Keywords: Green synthesis; *Ficus carica*; AgO-NPs; Antibacterial activity.

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P103 Extraction Optimization and In Vitro Anti-Inflammatory and Antidiabetic Assessment of Propolis Extracts

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In this study, the extraction efficiency, phytochemical content, and biological activity of Algerian propolis extracts obtained through different methods—maceration (ME), Soxhlet extraction (SE), ultrasound-assisted extraction (UAE), and their combinations with maceration—were evaluated. The yields ranged from 19.58% to 28%, with UAE-M (24 h) giving the highest yield. Qualitative analysis confirmed the presence of flavonoids and polyphenols, while cyclic voltammetry highlighted their redox-active properties. Quantitative assays using spectrophotometry and voltammetry revealed that UAE-M 24 h extract contained the highest levels of total phenolics (148.1 mg GAE/g) and flavonoids (270.3 mg QE/g). Biological assays validated the therapeutic potential of the extracts. The UAE-M 24 h extract exhibited strong anti-inflammatory activity with IC_{50} of 0.187 mg/mL (comparable to diclofenac at 0.190 mg/mL) in BSA denaturation inhibition, and potent antidiabetic activity with α-amylase inhibition (IC_{50} = 0.227 mg/mL vs. acarbose at 0.221 mg/mL). These findings highlight the promise of propolis extracts as natural candidates for the treatment of metabolic and inflammatory diseases.

Keywords: Propolis; Anti-inflammatory activity; Antidiabetic activity; Molecular docking.

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P104 Synthesis and Characterization of Al-Cu-Nb-B Intermetallics via Mechanical Milling

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In recent years, nanomaterials, particularly those based on aluminum, have attracted increasing attention for their potential in environmental applications, especially wastewater treatment. Their unique properties—such as high surface area, enhanced reactivity, and mechanical strength—make them excellent candidates for removing persistent pollutants including dyes, heavy metals, and organic compounds from industrial effluents. Among the most promising forms are nanophotocatalysts, nanomembranes, and nanosorbents, which offer innovative and efficient solutions for water purification. In this context, the present study focuses on the synthesis of Al-based intermetallic compounds containing copper (Cu), niobium (Nb), and boron (B) using high-energy ball milling (HEBM), a technique that promotes fine powder formation and solid-state reactions. The effects of milling parameters on phase formation, microstructure evolution, surface area, and mechanical properties were systematically investigated.

Keywords: Nanomaterial compounds; Al-alloys; Mechanical milling.

P105 Electrochemical Degradation of Ortho-Methyl Phenol through Anodic Oxidation

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Ortho-methyl phenol (o-cresol) is widely used in the synthesis of resins, pesticides, polymerization inhibitors, pharmaceuticals, and dyes. Due to its persistence and toxicity, its removal from wastewater is of significant environmental concern. In this study, o-cresol was selected as the target pollutant and its oxidative degradation was facilitated by hydroxyl radicals generated during electrochemical treatment in an undivided electrolytic cell. The removal efficiency was evaluated as a function of pH, current density, and supporting electrolyte. Additionally, mass spectrometry was employed to identify major transformation by-products formed during electrochemical oxidation. The results demonstrate that electrochemical degradation is a promising green approach for the efficient removal of phenolic contaminants from aqueous environments.

Keywords: Ortho-methyl phenol; Electrochemical degradation; Wastewater treatment.

P107 Removal of Methylene Blue Dye by Adsorption onto Cation-Exchange Spent Resins: Characterization and Optimization of Operating Conditions

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The removal of cationic dyes from industrial effluents remains a major challenge in environmental remediation. Adsorption is considered one of the most effective methods for dye removal due to its cost-effectiveness and simplicity. In this study, the adsorption of methylene blue onto spent strong cation-exchange resin was investigated under various operating conditions. The resin was characterized by elemental analysis and FTIR spectroscopy to determine its structure, composition, and active sites. The influence of pH, initial dye concentration, resin dosage, and contact time was systematically studied to optimize adsorption performance. Results showed that the resin exhibited high adsorption capacity, with an optimal efficiency of 90.14% achieved within 30 minutes at an initial dye concentration of 200 mg/L, a resin dose of 4 g/L, and pH 6. The maximum adsorption capacity was determined to be 1573 mg/g. These findings highlight the potential of cation-exchange resins as sustainable and cost-effective materials for treating dye-contaminated wastewater.

Keywords: Adsorption; Cation-exchange resins; Dye removal; Methylene blue.

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P108 Microwave Synthesis of a New Furanopyran-Chromene: Studies on Molecular Docking

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Dehydroacetic acid (DHA) and its derivatives are widely utilized in the synthesis of pharmacologically active heterocyclic compounds. Biologically, these molecules display antimicrobial, cytotoxic, and antitumor activities [**?**]. Structure–activity relationship studies have highlighted the importance of furano and pyrano rings fused with polycyclic aromatic systems. Moreover, 4*H*-chromenes exhibit diverse biological properties, depending on substituents at the 4*H*-pyran or adjacent rings [**?**]. Recently, 2-amino-4*H*-chromenes have attracted interest in technological fields such as laser dyes, optical brighteners, fluorescence markers, pigments, cosmetics, and biodegradable agrochemicals. In addition, cyano-substituted 2-amino-4*H*-chromenes have been evaluated for therapeutic use against rheumatism, psoriasis, and cancer [**?**]. In this work, a new furanopyran-chromene derivative was synthesized under microwave irradiation and evaluated by molecular docking. Docking simulations targeted *Staphylococcus aureus* penicillin-binding proteins (PBP2, PBP3, PBP4), thymidylate kinase (TMK), and the cell division Z-ring protein (FtsZ), using AutoDock Vina. Docking validity was confirmed by affinity scores and interaction profiles. The results predicted molecular mechanisms underlying the inhibitory potential of the synthesized heterocycles against *S. aureus* growth.

Keywords: Dehydroacetic acid; Furanopyran; Chromene; Molecular docking.

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P109 Synthesis of a Magnetic Nanomaterial Composite Based on Carbon Nanotubes and Goethite for Effective Removal of Methylene Blue Dye from Aqueous Solutions

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Carbon nanotubes (CNTs) are advanced nanomaterials with fibrous structure, high external surface area, and well-developed mesoporosity. Despite these properties, their high cost limits large-scale applications, particularly in water treatment. Magnetic particle technology offers a promising approach for designing efficient and recoverable adsorbents. In this work, a nanocomposite combining double-walled carbon nanotubes (DWCNTs) with goethite (-FeOOH) was synthesized via precipitation. The composite (DWCNTs/-FeOOH) was characterized by FTIR, XRD, BET surface analysis, and zeta potential measurements. Adsorption performance was investigated for methylene blue dye under batch conditions, considering pH, adsorbent dosage, contact time, and initial dye concentration. The maximum adsorption capacity was 25 $mg{\cdot}g^{-1}$ at pH 7 with 10 $mg{\cdot}L^{-1}$ dye solution. Kinetics followed a pseudo-second-order model, and equilibrium was best described by the Langmuir isotherm ($R^2 = 0.97$). These results demonstrate the potential of the DWCNTs/-FeOOH nanocomposite as an efficient magnetic adsorbent for wastewater treatment.

Keywords: Carbon nanotubes; Nanocomposite; Adsorption; Methylene blue; Goethite (-FeOOH).

P110 Antibacterial and Antioxidant Activity of Ajwa Date (Phoenix dactylifera L.) Fruit Extract Grown in Oued Souf

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Ajwa is a type of date famous in Medina, Saudi Arabia. It has gained widespread popularity due to its mention in the Sunnah (Prophetic tradition) of the Prophet (PBUH). It is also mentioned in the Hadith: "Ajwa dates are from Paradise and contain a cure for poison." Pathogenic bacteria remain a major health issue in developing countries. Despite the availability of treatments, people are turning their attention to consuming certain foods for their medicinal value due to the adverse effects of medications. This includes the consumption of Ajwa dates (*Phoenix dactylifera* L.). Ajwa fruits also have other health benefits as natural antioxidants. This study aimed to determine the antibacterial effect of two extraction methods—hot aqueous extract and ethanolic extract—against bacteria using the diffusion method and to determine the antioxidant effect using the DPPH test. Finally, the antibacterial activity was compared. Antibacterial and antioxidant properties of Ajwa dates grown in the Oued Souf region were compared to those of Madinah dates.

Keywords: Ajwa date fruit (*Phoenix dactylifera* L.); Polyphenols; Antibacterial activity; Antioxidant activity.

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P111 Electrochemical Analysis of Chlorantraniliprole Pesticide Residues in Tomatoes Using Cyclic Voltammetry

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La santé humaine et l'environnement sont fortement impactés par l'usage des pesticides. Cette étude se concentre sur le chlorantraniliprole, un insecticide largement utilisé pour le contrôle des lépidoptères, en combinant une évaluation biologique indirecte et une analyse électrochimique pour le suivi de ses résidus dans des échantillons de tomate. La quantification des résidus a été effectuée par voltampérométrie cyclique en utilisant une électrode de carbone vitreux modifiée, dans une fenêtre de potentiel de –1,0 à +2,0 V, avec une vitesse de balayage de 25 mV/s et un pH de 6,5. La méthode développée a démontré une excellente sensibilité avec une limite de détection de 0,01 µg/mL, et des rendements de récupération allant de 85 % à 98 %. Les résultats soulignent l'efficacité des méthodes électrochimiques pour la surveillance des résidus de chlorantraniliprole, tout en apportant des indications précieuses sur sa persistance environnementale. Cette approche contribue à une meilleure évaluation des risques associés et s'inscrit dans une perspective de gestion durable et sécurisée des produits phytosanitaires.

Keywords: Chlorantraniliprole; Pesticide residues; Cyclic voltammetry.

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P112 Development of a Smart Wound Dressing Based on Sensing Moisture and Acidity from Walnut Extract

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Wounds, especially chronic ones, represent a major health challenge that requires close monitoring to prevent complications and delayed healing. This study aims to develop a smart wound dressing capable of sensing both moisture and acidity, while providing antibacterial activity through walnut extract. Active compounds were extracted from walnuts using aqueous and ethanolic solvents and incorporated into a cellulose film. The phenolic and flavonoid contents were determined, alongside antioxidant capacity (TAC) tests. Antibacterial activity was assessed against *Pseudomonas aeruginosa* and *Staphylococcus aureus*. Moisture content was evaluated with copper chloride, while acidity detection relied on bromothymol blue. Results revealed that aqueous extraction yielded 14% more extract compared to ethanol, although ethanolic extracts were richer in phenolic and flavonoid compounds. Antibacterial assays showed that the ethanolic extract was lethal at 10 mg/mL, whereas the aqueous extract required 20 mg/mL for the same effect. This highlights the potential of walnut-based bioactive dressings as multifunctional smart materials for wound care.

Keywords: Smart dressing; Wound moisture; Wound acidity; Walnut extract.

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P113 Assessment of Olive Leaf Extract as a Corrosion Inhibitor for Mild Steel with Potential Ecological Benefits

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The corrosion of mild steel was prevented using ethanolic extract of olive leaves (OL) in 1 M hydrochloric acid. The performance of this green inhibitor was evaluated through gravimetric analysis and electrochemical tests, including electrochemical impedance spectroscopy (EIS) and potentiodynamic polarization. Thermodynamic analysis and adsorption isotherms were performed to elucidate the adsorption mechanism. The olive leaf extract showed excellent inhibitory performance, with an efficiency exceeding 82%, attributed to the high content of phytochemical constituents. The adsorption process was found to follow the Langmuir isotherm model. Formation of a chemically adsorbed inhibitor film was confirmed through activation parameter analysis, alongside an increase in inhibition efficiency with temperature. UV-Vis, FTIR, and optical microscopy analyses supported these findings. Olive leaf extracts thus provide an efficient, eco-friendly, and non-toxic alternative for preventing acidic steel corrosion, in agreement with previous studies on green corrosion inhibitors.

Keywords: Olive leaf; Mild steel; Corrosion; Green inhibitor.

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P114 Degradation of an Antibiotic in Water by Photocatalysis

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Antibiotics are chemotherapeutic agents used to treat bacterial infections. Today, the detection of antibiotics in the environment is attracting increasing attention, prompting the exploration of various containment methods. The batch adsorption of the antibiotic flumequine by photocatalysis under UV lamp irradiation was performed to examine the influence of contact time, pH of the medium, mass of the semiconductor, and initial concentration of the antibiotic. Indeed, a contact time of 300 minutes for low concentrations was sufficient to reach adsorption equilibrium with an efficiency of 98%. A neutral medium was favorable, with a pH of 6.2. The elimination rate becomes constant beyond a semiconductor mass of 1.5 mg. The yield increases with lower concentrations.

Keywords: Antibiotic; Artificial irradiation; Photocatalysis; Semiconductor.

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P115 Electrodialysis Treatment of Spent Nickel Electroplating Bath: Influence of Parameters on Nickel Recovery Efficiency

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This study aimed to treat a used nickel electroplating bath through electrodialysis and assess the impact of various parameters on the process. Experiments were conducted using a three-compartment electrodialysis cell with $NiSO_4$ in the central compartment and Na_2SO_4 in the others. Different concentrations of $NiSO_4$ (0.0001 M to 0.075 M) were tested, along with the effects of additives such as boric acid and acetate buffer on the I–V curve and limiting current (I_{lim}). The results showed that the polarization plateau appeared at 0.001 M and remained stable up to 0.070 M. At higher concentrations, no further stabilization occurred. Additives like boric acid and acetate buffer had minimal impact on the I–V curve. As $NiSO_4$ concentration increased, so did the limiting current. Nickel recovery efficiency was significantly influenced by the applied voltage. The highest recovery rate of 51% was achieved at 3 V, with minimal improvement beyond this voltage. Furthermore, increasing the number of compartments in the electrodialysis cell can boost the recovery rate to over 90%, improving overall process efficiency. In conclusion, electrodialysis is a promising method for treating used nickel electroplating baths. The voltage applied and the number of compartments in the cell are crucial for optimizing recovery, with 3 V being the most effective voltage. The study also found that different electrolytes do not significantly affect the I–V curve.

Keywords: Electrodialysis; Nickel Recovery; Spent Electroplating Bath.

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P117 Influence of the Concentration of Dopant on Antibacterial Properties of PVA/Polyaniline-Silver Composites Powder

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Polyvinyl alcohol–polyaniline (PVA/PANI) particles were obtained by oxidative polymerization of aniline in acetonitrile. Silver nitrate was used at different concentrations (10^{-1}, 10^{-2}, 10^{-3}, 10^{-4} M) as a dopant. FTIR and UV–visible spectroscopy were applied to analyze the interaction of silver with the synthesized polymer. The antibacterial activity of PANI and PANI–Ag composites was evaluated using the agar well diffusion method against Gram-positive bacteria *Staphylococcus aureus*. The growth of *S. aureus* was inhibited depending on the Ag concentration. Moreover, PANI–Ag exhibited activity against *Pseudomonas*, producing an inhibition zone diameter of 19 mm at an Ag concentration of 10^{-4} M. These results demonstrate that PVA/polyaniline-silver composite powders have promising potential for biomedical applications.

Keywords: Polyaniline; Silver; Antibacterial properties; *Staphylococcus aureus*.

P119 Lignocellulosic Biomass Pretreatment and Production of Second-Generation Bioethanol

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Plants are renewable reservoirs of a vast array of molecules with varied properties and activities. Lignocellulosic biomass is an abundant agricultural residue that can be used either for animal feeding or energetic valorization. Wheat straw is a major biomass worldwide with low commercial value and can be used for second-generation bioethanol production. Pretreatment is essential to break the complex bonds in biomass components. In this study, physical, chemical, thermophysical, thermochemical, and biological pretreatments were applied to break the strong chemical bonds in wheat straw and release monomeric sugars. Hydrochloric acid at 5% concentration was used for 2 hours in the pretreatment process. The resulting monomeric sugars were converted into second-generation bioethanol via anaerobic fermentation using *Saccharomyces cerevisiae*.

Keywords: Lignocellulosic biomass; Anaerobic fermentation; Bioethanol; *Saccharomyces cerevisiae*.

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P120 Anti-diabetic and Anti-Alzheimer Activities and HPLC-DAD Analysis of *Limonium delicatulum* Leaf Extract

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Phytoconstituents from food, spices, and medicinal plants are attracting growing interest as food additives, supplements, and pharmaceutical products. Many plants may possess both nutritional and medicinal value. Species of the genus *Limonium* (Plumbaginaceae) are halophytes reported to be rich in phenolic compounds, terpenoids, polysaccharides, vitamins, and more. *Limonium delicatulum* synthesizes diverse secondary metabolites under abiotic stress, making it a valuable source of bioactive compounds.

In this work, the leaf extract of *L. delicatulum* was analyzed by HPLC-DAD for its phenolic composition and evaluated for inhibitory effects against acetylcholinesterase (AChE), butyrylcholinesterase (BChE), α-glucosidase, and α-amylase. Five phenolic compounds were identified, including salvianolic acid B (14.8 mg/g extract) and polydatin (4.0 mg/g extract). The extract displayed strong inhibitory activities against AChE, BChE, α-glucosidase, and α-amylase, with IC_{50} values of 5.94 $\pm$ 0.54, 11.68 $\pm$ 0.35, 30.17 $\pm$ 0.65, and 22.74 $\pm$ 0.54 μg/mL, respectively—comparable to or better than standard inhibitors.

These results suggest that *L. delicatulum* may represent a promising source of functional ingredients for food, pharmaceutical, and cosmetic applications.

Keywords: *Limonium delicatulum*; AChE; BChE; α-glucosidase; α-amylase.

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P121 Synthesis of Cellulose/MgO Nanoparticles from Algerian Desert Plants and Evaluation of Antibacterial and Antifungal Activities

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Desert plants are a renewable source of natural materials, well-adapted to harsh environments, and provide underutilized raw cellulose. This study focused on extracting cellulose and synthesizing cellulose/magnesium oxide (CNC/MgO) nanoparticles from wild plants of the Oued Souf region, Algeria. Cellulose fibers were extracted via alkaline treatment followed by bleaching with sodium hypochlorite (NaClO). CNC/MgO nanoparticles were then synthesized from the extracted cellulose and magnesium oxide. The nanoparticles were characterized using FTIR, XRD, and UV–Vis spectroscopy. Their antibacterial activity was evaluated against human pathogenic bacteria (*Escherichia coli*, *Klebsiella pneumoniae*, and *Staphylococcus aureus*) and antifungal activity against *Candida albicans*. The cellulose extraction yield was 32%. CNC/MgO nanoparticles exhibited antibacterial activity against *E. coli* but showed no significant effect on the other bacterial strains. They demonstrated excellent antifungal activity against *Candida albicans*, suggesting potential use as therapeutic agents against pathogenic microorganisms.

Keywords: Cellulose nanocrystals; MgO; Antibacterial activity; Antifungal activity.

P122 Valorization of *Origanum glandulosum* through Bioactive Compound Profiling

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Origanum glandulosum is an endemic Algerian aromatic and medicinal plant notable for its rich bioactive compound profile. This study aimed to valorize wild and cultivated O. glandulosum from three Algerian regions (Jijel, Tlemcen, and Setif) through physicochemical and biological analyses of essential oils and hydroethanolic extracts. Essential oils were obtained via hydrodistillation, while hydroethanolic extracts were prepared by maceration. Phenolic and flavonoid contents were quantified using colorimetric assays, and essential oil composition was analyzed by Gas Chromatography (GC). Antioxidant activity was evaluated via DPPH, TAC, -carotene bleaching, and reducing power assays. Antimicrobial activity was assessed against various bacterial and fungal strains. Results indicated significant variability among samples, with wild plants generally exhibiting higher bioactive content and biological activity. These findings highlight O. glandulosum as a promising source of natural antioxidants and antimicrobials, supporting its potential applications in food preservation and biotechnology.

Keywords: *Origanum glandulosum*; Essential oils; Antioxidant activity; Hydroethanolic extracts.

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P123 Unveiling the Antidiabetic Properties of Essential Oils from Two Medicinal Plants: A Comparative Study Using Experimental and Computational Approaches

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The present study explores the extraction and bioactivity of essential oils derived from two medicinal plants with potential antidiabetic properties. The oils were obtained via hydrodistillation and analyzed using gas chromatography-mass spectrometry (GC/MS) to determine their chemical composition. Their antidiabetic activity was evaluated through in vitro and in vivo experiments by assessing effects on key metabolic enzymes. In parallel, molecular docking and molecular dynamics simulations were conducted to predict interactions with targets involved in glucose regulation. This comparative approach provides novel insights into the pharmacological potential of essential oils for diabetes management.

Keywords: Essential oil; GC/MS analysis; Antidiabetic evaluation; Computational study.

P124 Total Phenolic, Flavonoid and Antioxidant Activity of Ethyl Acetate Extract of *Psidium guajava* L.

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Medicinal plants are rich sources of bioactive phytochemicals, with more than 25,000 species globally used in the pharmaceutical industry. *Psidium guajava* L. (Myrtaceae) is one such plant, widely used as a healthy tea, whose leaves contain abundant phenolic compounds that inhibit oxidative reactions. In this study, dried guava leaves were sequentially extracted with petroleum ether, ethanol, water, and finally ethyl acetate. The total phenolic content was determined using the Folin-Ciocalteau method, while total flavonoids were quantified with aluminum chloride reagent. The antioxidant activity of the ethyl acetate extract was evaluated at room temperature using the DPPH• assay. Results indicated strong antioxidant activity, comparable to ascorbic acid. Quantitative analysis revealed high levels of gallic acid and chrystin as major phenolic and flavonoid constituents, respectively. These findings suggest that ethyl acetate extracts of guava leaves could serve as a potent natural source of antioxidants.

Keywords: *Psidium guajava* L.; Total phenolic; Total flavonoid; Antioxidant activity.

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P125 The Effect of Welding Currents on Hardness of Steel

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This study aimed to analyze the effect of welding current (low, medium, and high) on the mechanical properties of SMAW-welded X60 steel. Hardness tests were performed on different regions of the welded samples: Base Metal (BM), Weld Zone (WZ), and Heat Affected Zone (HAZ). Results showed that higher welding currents generate more thermal energy, leading to a greater influence on hardness. High current produced the most pronounced effect, whereas low current had a limited impact on the mechanical properties of the steel.

Keywords: Current; SMAW; Steel; Hardness.

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P127 Sol–Gel Derived Mesoporous Nano-Silica from Desert Sand as a Low-Cost Adsorbent for Cationic Dye from Wastewater

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This study presents an efficient and eco-friendly approach for synthesizing high-purity amorphous silica nanoparticles (n-SiO_2) from natural sand using the sol–gel method. To optimize key synthesis conditions—reaction temperature, duration, and SiO_2/NaOH ratio—a Box–Behnken design (BBD) was employed. Under optimal conditions, the process yielded up to 87.6% silica. Characterization by XRF and EDX confirmed a purity of 98.4% SiO_2, while XRD analysis revealed the amorphous nature of the product. The nanoparticles exhibited a high specific surface area (632.7 m^2/g), a mean pore diameter of 2.82 nm, and an average particle size of 9.48 nm. Additionally, the synthesized silica was tested as a low-cost adsorbent for Methylene Blue (MB) dye removal from water. Adsorption followed a pseudo-second-order kinetic model and the Temkin isotherm, achieving a maximum adsorption capacity of 209.2 mg/g at 55 °C. Overall, the results highlight the potential of natural sand as a valuable raw material for producing mesoporous silica nanoparticles for environmental applications.

Keywords: Silica gel; Nanoparticles; Adsorption; Dye removal.

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P128 Synthesis of Schiff's Base-Chitosan/TiO_2 Biocomposite for Effective Removal of Reactive Orange 16 Dye: Optimization and Adsorption Mechanism

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Minimizing environmental pollution has become a key focus of current research. In this study, a hybrid biopolymer composite of Schiff's base-Chitosan/TiO_2 (Ch-Be/TiO_2) was prepared as an effective biosorbent for the removal of Reactive Orange 16 (RO16) dye from aqueous solutions. The adsorbent was characterized using BET, FTIR, and SEM techniques. Ch-Be/TiO_2 exhibited a high specific surface area of 307.7m^2/g, and an uptake of 91.8 % for RO16 (100mg/L) at 30min was recorded. Multilayer adsorption on the heterogeneous surface of Ch-Be/TiO_2 followed the Freundlich isotherm, while the maximum monolayer adsorption capacity was 271.5mg/g at 32.1°C according to the Langmuir model. Kinetic studies indicated that the pseudo-second-order model best described the adsorption process. Overall, Ch-Be/TiO_2 demonstrates significant potential as a promising adsorbent for the removal of RO16 dye from contaminated water.

Keywords: Chitosan; Schiff's base; TiO_2; Adsorption; Reactive Orange 16 dye.

P129 Synthesis, Characterization, Functionalization, and Anti-Inflammatory Activity of Graphene Oxide Nanoparticles Functionalized with (3-Aminopropyl)triethoxysilane (GO@APTES)

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Nanotechnology has enabled the functionalization of materials at the nanoscale for diverse applications. Graphene oxide (GO) is particularly attractive in biomedical fields due to its aqueous dispersibility and surface chemistry. In this study, GO nanoparticles were synthesized using a modified Hummers method and functionalized with (3-Aminopropyl)triethoxysilane (APTES) to produce the GO@APTES nanocomposite. The material was characterized using SEM-EDX, FTIR, and XRD, revealing a crystallite size of 2 nm and confirming successful functionalization. The anti-inflammatory activity was evaluated using the albumin denaturation inhibition assay. The GO@APTES nanocomposite exhibited significant anti-inflammatory potential, with a maximum inhibition of approximately XX% (replace with experimental data). These results indicate that functionalization of GO with APTES enhances its biomedical applicability.

Keywords: Graphene oxide; Functionalization; GO@APTES; Anti-inflammatory activity.

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P130 Isolation and Characterization of Saponins from *Zygophyllum album*

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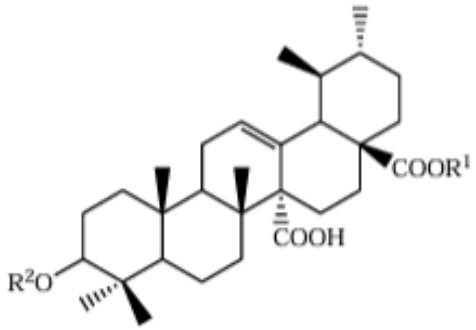
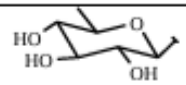
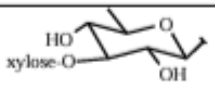
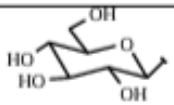
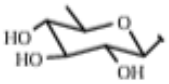
Several Saharan plant species are traditionally used by local inhabitants for flavoring and preserving food, and for the treatment of various ailments such as diabetes, asthma, rheumatism, dysentery, skin diseases, wound healing, and bites from vipers and scorpions. Extracts from these plants exhibit various biological properties including antioxidant, antibacterial, and antifungal activities. In this work, the aerial part of *Zygophyllum album*, a perennial Saharan plant with whitish-green branched stems, whitish flowers, and lobed fruits, was dried and extracted with ethanol. This allowed the isolation of three saponins, labeled 1, 2, and 3, which were further characterized.



Compound	R^1	R^2	Raw formula
1	H		$C_{36}H_{56}O_9$
2	H		$C_{41}H_{64}O_{13}$
3			$C_{42}H_{66}O_{14}$

Keywords: *Zygophyllum album*; Saponins; Isolation; Characterization.

P131 Integrated In Vivo, In Vitro, and In Silico Investigation of Antioxidant Properties of Aqueous Extracts from Leaf, Seed, and Fruit of *Cucurbita maxima*

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This study provides a comprehensive evaluation of the antioxidant potential of aqueous extracts derived from the leaf, seed, and fruit of *Cucurbita maxima*, cultivated in the Saharan region of southeastern Algeria. Extraction was conducted using distilled water to align with traditional medicinal practices. Antioxidant activity was assessed through in vitro assays, including the DPPH method, to quantify free radical scavenging capacity and reducing power. In vivo experiments were conducted using oxidative stress-induced rodent models to evaluate the physiological antioxidant response, including lipid peroxidation (MDA levels), catalase, and superoxide dismutase (SOD) activities. Furthermore, major phytochemicals identified via LC/MS were subjected to in silico ADMET profiling and molecular docking against key antioxidant-related enzymes such as superoxide dismutase and glutathione peroxidase, followed by molecular dynamics simulations to explore interaction stability. Results revealed strong antioxidant activity, particularly in the seed extracts, supported by both in vitro and in vivo data. In silico predictions confirmed favorable pharmacokinetic properties and stable binding interactions of key constituents. These findings highlight the promising antioxidant potential of *Cucurbita maxima* aqueous extracts and support their application as natural therapeutic agents against oxidative stress-related disorders.

Keywords: *Cucurbita maxima*; aqueous extract; antioxidant activity; in vivo assay; in vitro evaluation; in silico study; ADMET; molecular docking; molecular dynamics; Saharan medicinal plants; oxidative stress.

P132 Influence of Copper Oxide Nanoparticle Shape on Binding Affinity with Bacterial DNA Gyrase: A Molecular Docking Study

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In recent years, significant advancements have been made in nanotechnology, with a variety of methods developed to produce nanoparticles of specific sizes and shapes according to particular requirements. Among these, green synthesis and biological methods have gained growing popularity due to their simplicity, cost-effectiveness, safety, eco-friendliness, and high efficiency. Copper oxide nanoparticles (CuO NPs), in particular, have attracted considerable attention for their applications, distinct chemical properties, and low production costs, especially when compared to other metal oxide nanoparticles. This study investigates how the shape of CuO nanoparticles influences their binding affinity with the bacterial enzyme DNA gyrase, using molecular docking simulations. DNA gyrase is an essential bacterial enzyme involved in DNA replication and is a well-known target for antibiotics. Three different geometric shapes of CuO nanoparticles were modeled and optimized using Density Functional Theory (DFT). These nanoparticle models were docked against the DNA gyrase enzyme structure (obtained from the Protein Data Bank) using AutoDock software. The docking results showed that the shape of CuO nanoparticles significantly influences their binding affinity to DNA gyrase. Nanoparticles with shapes that offer greater surface interaction and a better geometrical fit to the binding site tend to exhibit stronger binding, reflected in binding energy values. This highlights the critical role of nanoparticle shape in designing effective nanomaterials for biomedical applications, based on binding energy, interaction types, and surface complementarity with the protein's active site.

Keywords: Nanotechnology; Copper oxide nanoparticle; Molecular docking; AutoDock.

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P133 Impacts of Biological Soil Crusts on Fertility in Desert Ecosystems

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Biotic soil crusts are a global phenomenon in arid and semi-arid landscapes. Biological soil crusts, consisting of cyanobacteria, green algae, lichens, and mosses, form crusts when associated with surface soils. These communities of organisms are crucial because they regulate water supply and retention, improving moisture availability in the upper soil layers. Biological soil crusts are important sources of nitrogen and carbon input to desert ecosystems, contributing to soil fertility through nitrogen fixation and increasing soil organic matter. The germination and establishment of vascular plant seedlings are affected by the presence of crusts. Crusts retain nitrogen that would otherwise be lost through leaching, although some of this nitrogen is available to plants. Overall, biological soil crusts play multiple roles in water dynamics and carbon and nitrogen cycling in dryland ecosystems.

Keywords: Soil crusts; Humidity; Nitrogen; Fertility.

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P134 Identification of Promising Drug Molecules for PTP1B Enzyme Inhibition Using Bioinformatics Tools, Focusing on Thiazolidine-2,4-Dione Derivatives

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A series of 5-(substituted benzylidene) thiazolidine-2,4-dione derivatives was investigated to identify key structural features for designing protein tyrosine phosphatase 1B (PTP1B) inhibitors. A robust quantitative structure–activity relationship (QSAR) model was developed using multiple linear regression (MLR), achieving a high correlation coefficient ($R^2 = 0.942$) for predicting inhibitory activity. The model's reliability was confirmed via leave-one-out (LOO) cross-validation and comprehensive statistical analysis. QSAR analysis revealed 10 structural motifs influencing PTP1B inhibition, with compound 7e serving as a reference scaffold.

Seven novel PTP1B inhibitors were designed based on the QSAR model and further evaluated using molecular docking to predict binding interactions and key structural features. Drug-likeness and ADMET studies assessed pharmacokinetic properties, while density functional theory (DFT) calculations provided information on molecular stability and reactivity. Molecular dynamics simulations offered additional insights into the interaction dynamics and stability of the top-ranked compound, 11c.

This integrative study highlights potential drug candidates for diabetes mellitus treatment and provides a framework for rational design of PTP1B inhibitors.

Keywords: Thiazolidine-2,4-diones; PTP1B inhibitors; QSAR; Molecular docking; Molecular dynamics; ADMET; PASS prediction; DFT

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P135 Green Synthesis of Zinc Oxide Nanoparticles Using *Eucalyptus camaldulensis* Extract: Characterization, Gliding Arc Plasma Stabilization, and Application in Wastewater Remediation

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The utilization of biological systems, particularly plant extracts, has emerged as a promising approach in nanotechnology for the eco-friendly synthesis of nanoparticles. In this study, *Eucalyptus camaldulensis* extract was used for the green synthesis of zinc oxide (ZnO) nanoparticles. The nanoparticles were comprehensively characterized using ultraviolet-visible (UV-Vis) spectroscopy, Fourier transform infrared (FT-IR) spectroscopy, X-ray diffraction (XRD), X-ray fluorescence (XRF), and Raman spectroscopy.

To enhance their stability, Gliding Arc Plasma (GAP) was applied as a post-synthesis treatment. The photocatalytic performance of ZnO nanoparticles was evaluated against Rose Bengal (RB) and Methylene Blue (MB) dyes under sunlight irradiation, showing strong potential for dye degradation in wastewater remediation. Moreover, the nanoparticles were tested for the removal of pesticide residues from contaminated water, confirming their efficiency in reducing both dye and pesticide pollution in treated effluents.

This study demonstrates the integration of green synthesis and plasma technology as a sustainable pathway to produce stable ZnO nanoparticles with enhanced applications in environmental remediation.

Keywords: ZnO; green synthesis; *Eucalyptus camaldulensis*; Gliding Arc Plasma; wastewater remediation.

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P136 *Glycyrrhiza glabra* Extract in the Environmentally Friendly Manufacture of a Sodium Alginate/Magnesium Oxide Nanocomposite: Photocatalytic Properties

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Magnesium oxide nanoparticles (MgO NPs) are an emerging inorganic material with wide-ranging applications in sensing, antimicrobial activity, optical coatings, water purification, catalysis, absorbents, and fuel additives, due to their large energy band gap, surface reactivity, and robust thermal stability. In this study, MgO NPs were synthesized via a green approach using *Glycyrrhiza glabra* extract. Scanning electron microscopy (SEM) revealed agglomerated quasi-spherical nanoparticles within a size range of 30–80 nm. The X-ray diffraction (XRD) pattern displayed sharp peaks at planes (200) and (220), confirming high crystallinity with an average crystallite size of 35.6±5 nm. Energy-dispersive X-ray spectroscopy (EDS) indicated elemental composition of 38.58% magnesium and 45.16% oxygen by weight.

Fourier transform infrared spectroscopy (FT-IR) exhibited characteristic Mg–O bond vibrations at 560 cm^{-1} and 866 cm^{-1}, while Raman spectroscopy confirmed the cubic structure of MgO. The photocatalytic properties of MgO NPs were assessed under visible light irradiation against methylene blue dye. Notably, the incorporation of 0.8 g/L MgO nanocatalyst achieved a degradation efficiency of 95% within 110 minutes, highlighting excellent catalytic performance.

These findings demonstrate that green-synthesized MgO NPs possess high photocatalytic efficiency, positioning them as effective candidates for environmental remediation technologies.

Keywords: Nanoparticles; *Glycyrrhiza glabra*; Photocatalysis; MgO; Green synthesis.

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P137 Estimation of Antioxidant Activity of *Tribulus terrestris* L. Seeds Extracts by Two Different Methods

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The antioxidant capacity of *Tribulus terrestris* L. seed extracts was evaluated using two widely adopted in vitro assays: DPPH radical scavenging and Ferric Reducing Antioxidant Power (FRAP) assays. Results indicated that the ethanolic extract exhibited the highest antioxidant activity among the tested extracts, highlighting its potential as a natural source of antioxidants for pharmaceutical and nutraceutical applications.

Keywords: *Tribulus terrestris* L.; DPPH; FRAP; Antioxidant activity.

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P138 Endophytes and Biodiversity: A Natural Solution for Polluted Environments

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Soil and water pollution by toxic substances is a critical environmental issue. Endophytic microorganisms, which inhabit plant tissues without causing harm, offer a natural and eco-friendly approach to mitigate pollution. These microbes enhance plant health and improve their survival under contaminated conditions.

This study explores the role of endophytes in environmental remediation. Certain bacterial genera, including *Pseudomonas* and *Bacillus*, can degrade harmful chemicals and reduce heavy metal toxicity. Fungal endophytes such as *Neotyphodium* contribute to plant stress resistance by producing hormones and protective metabolites. Additionally, endophytes facilitate nutrient uptake and the biosynthesis of valuable natural products, benefiting both agriculture and ecosystem health.

Endophytic microorganisms exemplify the link between biodiversity and ecosystem resilience. Their multifunctional roles and intimate association with plants make them promising agents for sustainable bioremediation and environmental protection. Further research is required to optimize their large-scale application and understand their mechanisms. Integrating biology, ecology, and green chemistry, endophytes present a potent strategy for restoring polluted environments and preserving biodiversity.

Keywords: Pollution; Endophytic Microorganisms; Biorestoration; Biodiversity protection.

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P139 Efficient Removal of Organic Pollutants from Water Using Schiff's Base: A Novel Approach for Dye Contamination Treatment

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Synthetic dye contamination of water bodies poses a serious environmental challenge due to their chemical stability, toxicity, and resistance to biodegradation. This study presents a novel class of Schiff base-based adsorbents synthesized via functional integration of chitosan, benzoin, and Fe_3O_4 nanoparticles. These hybrid materials were designed to remove organic dye pollutants from aqueous solutions.

Adsorption experiments demonstrated effective removal of methylene blue, Reactive Blue 19 (RB19), and Rose Bengal dyes. High adsorption efficiency was influenced by parameters such as pH, dye concentration, and contact time. Benzoin enhanced interactions with dye molecules via aromatic stacking, while the chitosan matrix provided a biocompatible and functionalized surface. Incorporation of Fe_3O_4 nanoparticles conferred magnetic properties, enabling rapid separation and regeneration of the adsorbents without significant loss of performance.

Kinetic analysis indicated pseudo-second-order adsorption behavior, and thermodynamic studies confirmed the spontaneity and favorability of the process. The materials maintained stability and reusability over multiple cycles, suggesting strong potential for practical wastewater treatment applications. This work highlights the benefits of combining bio-based polymers, aromatic compounds, and magnetic nanomaterials to develop efficient, reusable, and environmentally friendly adsorbents. Future research will focus on refining synthesis and evaluating performance in complex wastewater matrices.

Keywords: Schiff's base; Adsorption; Water treatment; Dyes.

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P141 Green Synthesis of Graphene-Based Nanohybrids for Noble-Metal-Free Hydrogen Evolution Catalysis

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The transition to clean hydrogen energy requires cost-effective, earth-abundant electrocatalysts to replace noble metals in water-splitting technologies. This study reports a green, solvent-free synthesis of graphene-based nanohybrids decorated with transition metal nanoparticles (Ni, Fe, Co) as efficient electrocatalysts for the hydrogen evolution reaction (HER). Microwave-assisted reduction of graphene oxide ensures uniform nanoparticle dispersion and enhanced electron transport, overcoming key catalytic limitations.

Electrochemical studies demonstrate low overpotentials and robust HER activity in both acidic and alkaline media, with stability surpassing conventional non-precious catalysts. The synergy between reduced graphene oxide and metal nanoparticles provides high surface area, abundant active sites, and improved charge mobility, achieving HER performance comparable to platinum-based systems. Unlike traditional methods requiring hazardous reagents or high energy input, this green synthesis offers a scalable and eco-conscious route. This work advances sustainable electrocatalyst development for decentralized hydrogen generation, contributing to carbon-neutral energy technologies.

Keywords: Graphene-based nanohybrids; Green hydrogen production; Electrocatalysis; Microwave assisted synthesis.

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P142 Medicinal Plants of Tassili N'Ajjer: An Ethnobotanical Study for Cultural and Biodiversity Preservation

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The people of the Tassili N'Ajjer region have long relied on plants as traditional medicine, accumulating rich ethnobotanical knowledge. However, this knowledge is under threat due to a lack of documentation and rapid modernization. This study aimed to investigate the use of plants in traditional medicine in Tassili N'Ajjer and to document local medicinal species.

Ethnobotanical data were collected from two towns (Djanet and Ilizzi) between March 2024 and December 2024, involving 80 informants through semi-structured interviews, group discussions, and guided field walks. A total of 30 medicinal plants were reported for treating various human ailments. Leaves were the most commonly used plant part, decoction was the preferred preparation method, and oral administration was the most frequent delivery route. The highest number of medicinal plants were employed for digestive diseases, followed by respiratory ailments. The most represented families were Asteraceae and Lamiaceae.

These findings reveal a rich diversity of medicinal plants in Tassili N'Ajjer, highlighting their vital role in local healthcare. Preservation initiatives are recommended to safeguard both the plant species and associated traditional knowledge.

Keywords: Tassili N'Ajjer; Asteraceae; Traditional medicine; Ethnobotany.

P143 Physicochemical and Bioactive Profiling of *Pistacia lentiscus* L. Fruits: A Potential Natural Antimicrobial Source

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Pistacia lentiscus L. (Anacardiaceae) is a widely distributed Mediterranean plant traditionally valued for its therapeutic properties. The biological activities of *P. lentiscus* are primarily attributed to its rich content of bioactive compounds. This study evaluated the physicochemical properties and antimicrobial potential of methanolic fruit extracts.

Key physicochemical parameters analyzed included pH, Brix degree, free acidity, saponification index, and the presence of acids and esters. The total phenolic content, determined by the Folin–Ciocalteu method, was 311.06 ± 29.89 mg GAE/g extract. Flavonoid content, measured by the $AlCl_3$ method, was 11.06 ± 4.2 mg QE/g extract, while anthocyanins were assessed using the pH differential method. Antimicrobial activity was tested against seven bacterial and five fungal strains via disk diffusion and microdilution assays.

The methanolic extract exhibited strong antibacterial activity against both Gram-positive and Gram-negative bacteria, alongside moderate antifungal effects. These findings validate the traditional medicinal use of *P. lentiscus* and support its potential as a natural antimicrobial source for plant-based alternatives to synthetic drugs.

Keywords: *Pistacia lentiscus*; Phytochemical analysis; Bioactive compounds; Antimicrobial activity; Methanolic extract.

P144 Synthesis of PMMA Spherules in the Development of Removable Total Dental Prostheses

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Dental prostheses are generally fabricated from thermo-polymerizable methacrylic resins based on polymethyl methacrylate (PMMA). This material offers multiple advantages but also limitations, such as volumetric shrinkage and the presence of residual monomers, known for their cytotoxic effects. The incorporation of PMMA spherules as a low molecular weight prepolymer is proposed to overcome these drawbacks.

These spherules, synthesized via radical emulsion polymerization and stabilized by an emulsifying system (SDS/PVA), promote a denser three-dimensional network in the resin matrix, thereby reducing voids responsible for volumetric shrinkage during crosslinking. In this study, experimental methacrylic resins were formulated with PMMA spherules synthesized using varying emulsifier concentrations (2

The results highlight the effect of SDS/PVA concentration on spherule formation and resin shrinkage, demonstrating that optimized emulsifier ratios significantly reduce volumetric contraction. This work provides insights into the development of improved dental biomaterials with enhanced stability and biocompatibility.

Keywords: Methacrylic resin; PMMA spherules; Volumetric shrinkage; Residual monomers; Radical emulsion polymerization.

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P145 Efficient Heavy Metal Adsorption using Activated Carbon Derived from Agricultural Residues and Nanomaterials

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In this study, peanut shell-derived activated carbon, produced by orthophosphoric acid activation, was employed as an adsorbent for methylene blue (MB). An optimization process was conducted to determine the optimal adsorption parameters, including adsorbent dosage, temperature, pH, and contact duration. Adsorption performance was evaluated using four isotherm models, while pseudo-first- and pseudo-second-order kinetic models were applied to assess the kinetics.

The adsorption equilibrium was reached after 120 minutes and was best described by the pseudo-second-order model. The Langmuir isotherm provided the best fit, with a maximum adsorption capacity of 219.7 mg/g at 25 °C. Thermodynamic analysis (H^0, G^0, S^0) indicated that the adsorption process was spontaneous and exothermic. Furthermore, functionalization of the carbon with Fe^{3+} or Ca^{2+} ions significantly enhanced adsorption performance, reducing the equilibrium time to 70 and 50 minutes, respectively.

These results highlight the potential of functionalized agricultural waste-derived activated carbon as an efficient, low-cost, and sustainable material for heavy metal and dye removal in water treatment applications.

Keywords: Peanut shell; Chemical activation; Activated carbon; Functionalization; Methylene blue; Adsorption.

P146 The Phenolic and Lipid Composition of Oilseeds

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Oilseeds represent one of the most valuable agricultural crops, owing to their richness in fats, proteins, and phenolic compounds, as well as their significant economic and nutritional importance. This study focused on evaluating the oil and phenolic content of selected seeds collected from southeastern regions of Algeria. The analysis showed that these seeds contain oil in proportions ranging between 30% and 45%. Several physicochemical properties of the extracted oils were determined, particularly their fatty acid composition. Furthermore, the total phenolic content was estimated at approximately 10%. Both quantitative and qualitative evaluations of phenolic compounds and flavonoids were conducted to assess their diversity and potential biological value.

Keywords: Oilseeds; Vegetable oils; Polyphenols; Fatty acids.

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P147 Towards Clean Fuel from Plant-Based Sources: Castor Oil Biodiesel Production and Evaluation of Its Chemical Properties

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In the pursuit of sustainable and eco-friendly alternatives to fossil fuels, castor oil has emerged as a promising non-edible feedstock for biodiesel production. This study focuses on the synthesis of biodiesel from castor oil through transesterification, investigating the influence of various reaction parameters such as catalyst concentration, reaction time, temperature, and methanol-to-oil ratio on the biodiesel yield. The produced biodiesel was characterized using a range of analytical techniques including Gas Chromatography-Mass Spectrometry (GC-MS), Liquid Chromatography-Mass Spectrometry (LC-MS), Nuclear Magnetic Resonance (NMR), Infrared Spectroscopy (IR), and Ultraviolet-Visible Spectroscopy (UV-Vis). These analyses provided detailed insights into the chemical composition, structural integrity, and purity of the final biodiesel product. The findings highlight the potential of castor oil as a viable raw material for biodiesel production, with favorable physicochemical properties and promising conversion efficiency. This work contributes to the development of green fuels and supports the global transition towards renewable energy sources.

Keywords: Castor oil; Biodiesel; Transesterification; Renewable energy; Green fuel.

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P150 Synthesis and Electrochemical Property of Graphene Oxide/Polymer and Their Application in Solar Energy Storage

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Nowadays, graphene oxide is one of the most studied materials in the world; thanks to its unique properties, it was called a "material of the future". The polymer/graphene oxide nanocomposites have been explored for their thermal, mechanical, and electrical properties and advanced applications. Graphene oxide-based nanomaterials have found applications in photovoltaics, supercapacitors, sensors, batteries, fuel cells, radiation shielding, etc. In this study, we report on the chemical synthesis of hybrid composite material based on conductive organic polymer polypyrrole (PPy), modified by the incorporation of an inorganic semiconductor graphene oxide. The obtained hybrids were characterized by techniques such as scanning electron microscopy (SEM), Ultraviolet-visible (UV-Vis), Fourier transform infrared spectroscopy (FTIR), and X-ray diffraction (XRD) to examine the phase purity and crystal structure. The electrochemical properties of the hybrid composite were investigated by cyclic voltammetry (CV), chronoamperometry (CA), and electrochemical impedance spectroscopy (EIS). The photovoltaic characteristics were determined by photocurrent measurements. The various results obtained are attractive and suitable for solar energy storage applications.

Keywords: Graphene oxide; Conjugated polymer; Characterization; Solar energy.

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P151 Structure-Based Design of HBV Capsid Inhibitors Using 3D-QSAR Modeling, Docking, and In Silico ADMET

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Hepatitis B virus (HBV) remains a significant global health concern, prompting the urgent need for new and effective therapeutic agents. In this study, a combined computational strategy was employed to identify novel inhibitors targeting the HBV capsid. A series of flavanol derivatives were evaluated using 3D-QSAR modeling and molecular docking. The 3D-QSAR model showed strong predictive performance, with R^2 values of 0.96 for the training set and 0.88 for the test set, confirming the model's robustness. Molecular docking studies provided insight into the binding interactions between key compounds and the HBV capsid protein, supporting the structure–activity relationship findings. Furthermore, ADMET predictions identified compounds with favorable pharmacokinetic and toxicity profiles. These results demonstrate the power of integrated computational approaches in the discovery of potential HBV capsid inhibitors and offer valuable direction for future antiviral drug design.

Keywords: Molecular docking; Hepatitis B virus; 3D-QSAR; ADMET.

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P153 Optimization of Sorption Parameters of Congo Red Dye Adsorption by Cross-Linked Chitosan Beads Using Box-Behnken Design: Equilibrium, Kinetic, Isotherm and Mechanism Study

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Cross-linked chitosan-epichlorohydrin beads (CTS/ECH) were prepared and studied for the removal of Congo red (CR) from aqueous solutions. The effects of adsorbent dosage (A: 0.04–0.1 g), pH (B: 4–10), temperature (30–60°C), and contact time (C: 10–60 min) on CR removal were investigated using response surface methodology (RSM) based on a Box-Behnken statistical design at a fixed initial CR concentration (C = 50 mg/L).

The results showed rapid CR removal (98.99%) under optimum conditions: adsorbent dosage 0.07 g, pH 7, temperature 50 °C, and contact time 35 min. At these conditions, the maximum adsorption capacity was 256.41 mg/g. Freundlich and pseudo-second-order kinetic models best described the equilibrium and kinetic data, respectively. These findings confirm that CTS/ECH is an efficient, recoverable, and eco-friendly biohybrid nanocomposite adsorbent.

Keywords: Chitosan; Epichlorohydrin; Congo red dye removal; Box-Behnken design; Adsorption; Langmuir isotherm.

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P154 In Vivo, In Vitro, and In Silico Insights into the Anti-Inflammatory Effects of Aqueous Extracts of Pumpkin (Cucurbita pepo L.) Leaf, Seed, and Fruit

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This study investigates the anti-inflammatory potential of aqueous extracts from the seeds, leaves, and fruit of *Cucurbita pepo L.* cultivated in the Saharan agroecosystem of southeastern Algeria, using in vivo, in vitro, and in silico methods. The extracts were obtained using water as solvent, following traditional preparation methods.

In vivo activity was evaluated using a carrageenan-induced paw edema model in rats, assessing inflammatory markers such as pro-inflammatory cytokines and edema size. In vitro assays, including protein denaturation and membrane stabilization tests, further corroborated anti-inflammatory potential. In silico analyses of major phytochemicals identified via LC/MS were performed to predict pharmacokinetic profiles (ADMET), followed by molecular docking and dynamics simulations to evaluate binding affinities and complex stability with cyclooxygenase-2 (COX-2).

Results showed significant anti-inflammatory effects in both in vivo and in vitro models, supported by in silico predictions of strong COX-2 binding and favorable pharmacokinetics. These findings provide comprehensive evidence of the therapeutic potential of *Cucurbita pepo L.* aqueous extracts in inflammation management.

Keywords: *Cucurbita pepo L.*; aqueous extract; anti-inflammatory; in vivo; in vitro; in silico; ADMET; molecular docking; molecular dynamics; COX-2; Saharan medicinal plants.

P155 In Vivo and In Silico Assessment of Anti-Thyroid Activity of Pumpkin (Cucurbita pepo L.) Extracts from a Saharan Agroecosystem

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This study evaluates the anti-thyroid activity of aqueous extracts derived from the seeds, leaves, and fruit of *Cucurbita pepo L.* cultivated in the Saharan agroecosystem of southeastern Algeria. Extracts were obtained using water as the sole solvent, reflecting traditional preparation methods.

In vivo evaluation was performed using a propylthiouracil-induced hyperthyroidism rat model, with serum T3, T4, and TSH levels analyzed to assess thyroid function modulation. Major bioactive compounds previously identified by LC/MS were further investigated via in silico approaches. ADMET predictions provided pharmacokinetic and toxicity profiles, while molecular docking targeted thyroid-related enzymes such as thyroperoxidase. Molecular dynamics simulations assessed the stability of promising ligand-enzyme interactions.

The aqueous extracts, particularly from seeds, showed significant thyroid-inhibitory effects in vivo. In silico findings supported these results, highlighting favorable ADMET profiles, strong binding affinities, and stable ligand-enzyme complexes. These results underscore the potential of *Cucurbita pepo L.* aqueous extracts as natural modulators of thyroid function.

Keywords: *Cucurbita pepo L.*; aqueous extract; anti-thyroid; in vivo; in silico; ADMET; molecular docking; molecular dynamics; thyroperoxidase; Saharan medicinal plants.

P157 Green Synthesis of Zinc Oxide Nanoparticles Using *Olea europaea* Leaf Extract and Their Protective Role Against Pesticide-Induced Nephrotoxicity in Rats

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Zinc oxide nanoparticles (ZnO NPs) were synthesized using fresh *Olea europaea* leaf extract, containing natural reducing and stabilizing agents such as flavonoids and terpenoids. Nanoparticle formation was confirmed visually by a color change and the formation of a yellowish-white powder. Structural and chemical characterization was performed using UV-Vis spectroscopy, FTIR, XRD, and EDX, revealing spherical to short rod-shaped ZnO NPs with an average size of 18.79 nm.

The biological efficacy of ZnO NPs was assessed in rats exposed to the herbicide Metribuzin. Co-treatment with ZnO NPs (2.5 and 5 mg/kg) for 21 days led to significant improvements in kidney biochemical markers and histopathological features compared to the Metribuzin-only group. ZnO NPs mitigated vascular congestion, glomerular damage, and tubular injury, and restored kidney function markers such as blood urea levels.

These results highlight the nephroprotective potential of green-synthesized ZnO NPs against Metribuzin-induced toxicity.

Keywords: Zinc oxide nanoparticles (ZnO NPs); *Olea europaea*; Green synthesis; Metribuzin toxicity; Nephrotoxicity.

P160 Exploring the Antibacterial Power of Eucalyptus Oil: Impact on Quorum Sensing and Rhamnolipid Production in *Pseudomonas aeruginosa*

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The essential oil of *Eucalyptus* exhibits significant antibacterial properties. This study investigates its effect on two mechanisms associated with bacterial virulence and biofilm formation: quorum sensing and rhamnolipid production, a key virulence factor contributing to adhesion and biofilm formation. The oil was extracted via solvent extraction and analyzed by GC/MS, revealing bioactive compounds such as eucalyptol, alpha-pinene, and -terpineol.

Antibacterial activity was assessed using the microdilution method to determine the Minimum Inhibitory Concentration (MIC) and Minimum Bactericidal Concentration (MBC), alongside agar diffusion tests. The impact on quorum sensing and rhamnolipid production was evaluated using the oil displacement method on culture supernatants. Results demonstrated that eucalyptus oil significantly inhibited *P. aeruginosa* growth at low concentrations and reduced rhamnolipid production, thereby limiting bacterial adhesion and biofilm formation.

These findings underscore the dual action of eucalyptus oil in inhibiting bacterial growth and interfering with cell-to-cell communication, highlighting its potential as a natural alternative for combating antibiotic-resistant bacterial infections in medical and environmental applications.

Keywords: *Eucalyptus* essential oil; Antibacterial activity; Rhamnolipid; Natural antimicrobial.

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P162 Effects of Humic Acid Inclusion on the Adsorptive Properties of Alginate/Wood Sawdust Composite Spheres Against Dyes

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This study investigates the effect of adding humic acid (HA) to sodium alginate/wood sawdust composite spheres for the adsorption of malachite green dye from aqueous solutions. Functional group characterization and morphology were analyzed using SEM, EDX, XRD, and FTIR spectroscopy. Adsorption tests examined the influence of contact time, pH, temperature, initial dye concentration, and adsorbent dose.

Optimized conditions led to a removal efficiency of over 90% at a dye concentration of 20 mg/L and pH 8. Adsorption kinetics followed the pseudo-second-order model, and data were fitted to Langmuir, Freundlich, and Temkin isotherms. The Langmuir model provided the best fit, with a maximum adsorption capacity of 358 mg/g for HA-containing spheres compared to 147 mg/g for spheres without HA. These results demonstrate that HA significantly enhances the adsorption capacity of the composite material.

Keywords: Alginate; Humic acid; Sawdust; Composite; Adsorption.

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P164 Development of Solid Heterogeneous Catalysts for Green Organometallic Transformations

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This study focuses on the development of solid heterogeneous catalysts for green organometallic transformations. Zeolite catalysts, a type of porous crystalline aluminosilicate, were synthesized via a hydrothermal method using Ludox as the silica source, aluminum sulfate ($Al_2(SO_4)_3$) as the aluminum precursor, and TPABr as a structuring agent. The synthesized zeolite was characterized using FT-IR, XRD, TGA, and UV-Vis spectroscopy to examine structural and thermal properties.

Catalytic activity tests demonstrated that the zeolite exhibited high effectiveness, selectivity, and resistance to deactivation in organometallic transformations. These results confirm the potential of zeolite-based solid catalysts as sustainable and eco-friendly materials for organometallic chemical processes.

Keywords: Catalyst; Organometallic; Zeolite; Synthesis; Characterization.

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P165 Deposition and Electrochemical Performance of Low-Cost Ni-Co Alloy as Electrode for Supercapacitor Application

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This study presents a facile one-step electrodeposition method to fabricate Ni-Co alloy on an indium tin oxide (ITO) substrate as a working electrode for supercapacitor applications. The deposition was carried out at ambient temperature in a three-electrode cell. The structural and chemical characteristics of the alloy films were analyzed using Fourier Transform Infrared Spectroscopy (FTIR) and UV–Vis spectroscopy. The electrochemical performance of the Ni-Co/Ni foam films was investigated through cyclic voltammetry (CV), electrochemical impedance spectroscopy (EIS), and galvanostatic charge-discharge tests, demonstrating their potential for efficient supercapacitor applications.

Keywords: Electrodeposition; Ni-Co alloy; Electrochemical performance; Supercapacitor.

P166 Comparative Analysis of Stormwater Contaminants from Urban Roofs and Roads in Algiers

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Stormwater acts as a primary vector for transporting pollutants from urban surfaces to aquatic environments, containing a complex mixture of organic and inorganic micropollutants. Their concentration and composition depend on surface type, land use, maintenance, frequency of runoff events, and anthropogenic activities. This study evaluates the physico-chemical quality of stormwater collected from rooftops and roads in an experimental catchment in Algiers. Samples were analyzed for pH, electrical conductivity (EC), total suspended solids (TSS), chemical oxygen demand (COD), biochemical oxygen demand over five days (BOD_5), and heavy metal concentrations. Results indicated that road runoff contained significantly higher pollutant loads, including suspended solids, organic matter, and metals, whereas rooftop runoff showed lower contamination. These findings highlight the influence of surface type on stormwater quality and the need for differentiated management strategies. They also support the potential reuse of less contaminated runoff, such as from rooftops, after proper pre-treatment for applications like urban irrigation.

Keywords: Stormwater; Pollutants; Water quality; Environmental risk.

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P167 CO_2 Hydrogenation to Methanol over Supported Catalysts

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This study investigates the catalytic hydrogenation of CO_2 into valuable chemicals over supported catalysts. Cu-ZnO/Al_2O_3, Cu-ZnO/MgO, and Cu-ZnO/SiO_2 catalysts were synthesized via the polyol method and characterized using scanning electron microscopy (SEM) coupled with energy-dispersive X-ray spectroscopy (EDX), N_2 adsorption-desorption (BET), X-ray fluorescence spectroscopy (XRF), and X-ray diffraction (XRD). The catalytic performance was evaluated under atmospheric pressure at various temperatures. The results demonstrate that these catalysts are highly effective for the selective conversion of CO_2, achieving up to 85% methanol yield and complete methane formation under certain conditions. Acidic supports favor methanol production, whereas basic supports promote methane formation.

Keywords: CO_2 hydrogenation; Methanol synthesis; Supported catalysts; Polyol method.

P168 Controlled Biosynthesis of Zinc Oxide Nanoparticles Using Plant Extracts: A Box-Behnken Design for Size Optimization

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This study presents a green and sustainable approach for the biosynthesis of zinc oxide nanoparticles (ZONPs) using a mixture of *Anastatica hierochuntica L* and *Solenostemma argel* plant extracts. To address challenges related to uncontrolled nanoparticle size, the Box-Behnken design (BBD) of response surface methodology (RSM) was applied to systematically study the effects of zinc acetate concentration (ZA-C), reaction temperature (REA-T), and annealing temperature (AN-T) on ZONP size. The synthesized ZONPs were characterized by UV-Vis spectroscopy, FTIR, XRD, SEM, and EDX, confirming pure nanoparticles with hexagonal crystal structure, a band gap of 3.26 eV, and predominantly spherical or slightly elongated shapes ranging from 32 nm to 66 nm. Statistical analysis validated a quadratic model with a predicted R^2 of 95.42% and adjusted R^2 of 97.93%. ANOVA indicated that all parameters and their interactions significantly influenced ZONP size, except for the REA-T × AN-T interaction. Numerical optimization using the desirability function predicted a minimum particle size of 31 nm. These findings demonstrate the effectiveness of RSM in controlling ZONP size via biosynthesis, with potential for further optimization by including additional synthesis parameters.

Keywords: Zinc oxide nanoparticles; Optimization; Response surface methodology; Biosynthesis parameters; *Anastatica hierochuntica L*; *Solenostemma argel*; Size control.

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P169 Comparative Study of Direct and Indirect Electrochemical Degradation of Methylene Blue: Effects of Anode Material, pH, Redox Mediators, and Supporting Electrolyte

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This study investigates the electrochemical degradation of methylene blue (MB) in aqueous solutions using platinum (Pt) and aluminum (Al) anodes. Direct electrolysis showed moderate efficiency at neutral pH, which improved under alkaline conditions. Indirect electrolysis employing a Co^{2+} redox mediator was effective, with Pt exhibiting superior performance. The addition of KCl further accelerated MB degradation, enabling both anodes to perform efficiently. These findings indicate that careful selection of parameters—such as anode material, electrolyte composition, and pH—is critical for maximizing degradation efficiency.

Keywords: Decoloration; Methylene blue; Treatment; Electrochemical oxidation; Electrochemical anodes.

P170 Comparative Bioactivity Profiling of Pumpkin (*Cucurbita pepo L.*) Extracts: Antioxidant, Anti-Inflammatory, and Anti-Thyroid Properties with In Silico Insights

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This study investigates the therapeutic potential of methanolic extracts from seeds, leaves, and fruits of *Cucurbita pepo L.*, a plant traditionally used in southeastern Algeria. The extracts were analyzed via LC/MS to identify their phytochemical constituents. In silico studies were conducted to assess potential antioxidant, anti-inflammatory, and anti-thyroid activities of the major compounds. Pharmacokinetic and toxicity properties were predicted using ADMET tools, while molecular docking evaluated binding affinities toward key biological targets involved in oxidative stress, inflammation, and thyroid regulation. Top-ranked ligands were further studied through molecular dynamics (MD) simulations to assess the stability of ligand–target interactions. Several compounds showed promising bioactivity, favorable ADMET parameters, strong docking scores, and stable interactions over 100 ns simulation trajectories. These findings suggest that *Cucurbita pepo L.* methanolic extracts contain bioactive constituents with significant therapeutic potential, warranting further experimental validation.

Keywords: *Cucurbita pepo L.*; methanolic extract; LC/MS; antioxidant; anti-inflammatory; anti-thyroid; in silico; ADMET; molecular docking; molecular dynamics simulation.

P171 Catalysis and Kinetics of Hydrogen Peroxide Disproportionation by Complexes of Molybdenum and Tungsten with Alpha-Benzoin Oxime

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Since the historical discovery by Khan and Kasha in 1963 of singlet oxygen ($^1O_2$) generation in the oxidation of H_2O_2 by ClO^-, several other chemical sources of $^1O_2$ have been reported. Singlet oxygen is a highly selective and reactive oxidant for the peroxidation of olefinic compounds. In most cases, the process arises from disproportionation rather than oxidation of H_2O_2. Transition elements in their highest oxidation states rapidly react with hydrogen peroxide to form peroxo complexes. In particular, molybdate (MoO_4^{2-}) is an efficient catalyst for the disproportionation of H_2O_2 into $^1O_2$. In this work, the synthesis, characterization, and mechanism of complexes of molybdenum and tungsten with alpha-benzoin oxime were investigated, along with the kinetics of catalytic disproportionation of H_2O_2. Temperature and time significantly influenced the conversion efficiency, with molybdenum complexes achieving complete (100%) conversion of hydrogen peroxide into singlet oxygen.

Keywords: Hydrogen peroxide; Molybdenum; Tungsten; Disproportionation.

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P172 Biopolymer-Assisted Synthesis of Silver Nanoparticles: A Green Chemistry Strategy for Functional Nanomaterials

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This study develops an eco-friendly and efficient method for the green synthesis of silver nanoparticles (AgNPs) via a biological reduction process and evaluates their antioxidant potential. Starch, a natural biopolymer, was employed as a stabilizing agent to enhance nanoparticle stability and functional properties, while glucose served as the reducing agent. Silver nitrate was used as the metal precursor. Formation and physicochemical characteristics of AgNPs were confirmed by FTIR and SEM, revealing diverse and irregular nanoparticle morphologies. Antioxidant activity was assessed via DPPH and FRAP assays, with IC_{50} values of 844.55 µg/mL and 401.17 µg/mL, respectively. These results highlight starch as an efficient stabilizer in green synthesis and indicate that the produced AgNPs exhibit promising antioxidant activity, supporting their potential applications in biomedical and environmental fields. This study demonstrates the value of biopolymer-assisted synthesis as a sustainable strategy for functional nanomaterials with enhanced biological properties.

Keywords: Silver nanoparticles; Green synthesis; Starch; Antioxidant activity.

P173 Application of Electrodialysis Assisted by Advanced Oxidation Process to Treat Water Pollution

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Membrane fouling is a major limitation in the continuous application of electrodialysis (ED) for water treatment. This study combines electrodialysis with an advanced oxidation process (electro-Fenton, EF) using a carbon cathode to enhance the removal of organic pollutants and improve salt ion transport across membranes. Initially, the effects of operating parameters—including cathode material, supporting electrolyte, applied current density, Fe(II) concentration, and initial pH—were studied to optimize the EF process. Subsequently, ED and EF processes were combined, and the performance of the combined process was compared to single ED. Results demonstrated that the ED–EF combination achieved higher efficiency than ED alone.

Keywords: Electrodialysis; Advanced oxidation process; Membrane anti-fouling; Combined processes.

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P174 Application of Chemometric Techniques to Electrochemistry Data in Classification of Algerian Medicinal Plants Species

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Medicinal plants are key sources of natural products and bioactive compounds for pharmaceutical development. This study employs differential pulse voltammetry (DPV) combined with chemometric techniques to classify Algerian medicinal plant species. Electrochemical data from 89 plant samples from the El-Oued region were analyzed using principal component analysis (PCA), hierarchical clustering analysis (HCA), partial least squares (PLS), and partial least squares discriminant analysis (PLS-DA). PCA and HCA enabled classification of plants based on flavonoid and phenolic acid contents and identification of closely related species. PLS and PLS-DA provided accurate prediction of phenolic and flavonoid concentrations (R^2 = 0.9264) with low errors evaluated via RMSEE (0.184238) and RMSECV (0.179719). These results demonstrate that chemometric pattern recognition applied to DPV data is a promising approach for the classification and identification of medicinal plants.

Keywords: Medicinal plants; Electrochemistry analysis; Chemometrics analysis; PCA; HCA; PLS; PLS-DA.

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P175 Antioxidant and Antibacterial Activities of Iron Oxide Nanoparticles Synthesized from the Aqueous Extract of Helianthemum (L.) Pers Plant

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A green synthesis method was developed for mesoporous -Fe_2O_3 nanoparticles using the aqueous extract of Helianthemum (L.) Pers. This simple, one-step, environmentally friendly approach is suitable for large-scale production. The nanoparticles were characterized by SEM, TEM, XRD, XPS, Raman spectroscopy, and UV–Vis spectroscopy. Antioxidant activity was assessed using DPPH and total antioxidant capacity (TAC) assays, while antibacterial activity was evaluated via the disc diffusion method. The -Fe_2O_3 nanoparticles exhibited strong antioxidant activity and significant antibacterial effects against *Escherichia coli* and *Staphylococcus aureus*, with inhibitory concentrations of 10 mg/mL and 5 mg/mL, respectively. These findings indicate that the green-synthesized nanoparticles have promising biomedical potential as antioxidant and antibacterial agents.

Keywords: Helianthemum (L.) Pers; -Fe_2O_3 nanoparticles; Antibacterial activity; Antioxidant capacity.

P176 Analysis of the Chemical Composition and Phenolic Contents in the Heart of Phoenix dactylifera L.

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The heart of *Phoenix dactylifera* L. serves as the central core of the date palm and is a rich source of dietary fibers, proteins, sugars, healthy fats, and essential minerals, as well as phenolic compounds with significant nutritional and health benefits. This study investigates the chemical composition, mineral content, and phenolic profile of heart samples from two date palm cultivars, "Deglet Nour" and "Talaa Al-Dakar," collected from southeastern Algeria. Minerals were quantified using Atomic Absorption Spectrophotometry (AAS), revealing Mg, Fe, Ca, Si, Zn, Cd, B, and K. Phenolic compounds were extracted and quantified, while sugar content was determined by UV–Vis spectroscopy. The biological activity of these compounds, including antioxidant and anticancer potential, was further characterized using Gas Chromatography–Mass Spectrometry (GC/MS). The findings provide insight into the nutritional and functional properties of *Phoenix dactylifera* heart, known locally as "AlJammar."

Keywords: Phoenix dactylifera heart; AAS; Phenolic compounds; Biological activity; Antioxidant.

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P180 Antioxidant Potential of Medicinal Plant Essential Oils: A Comprehensive Investigation Through In Vivo, In Vitro, and In Silico Assessments

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This study investigates the extraction, characterization, and antioxidant potential of essential oils from two medicinal plants. Oils were obtained via hydrodistillation and analyzed using GC–MS to determine their chemical composition. Antioxidant activity was evaluated using in vivo and in vitro assays to measure free radical scavenging capacity and oxidative stress reduction. Additionally, in silico studies including molecular docking and molecular dynamics simulations were performed to explore interactions with antioxidant-related enzymes. The results provide insights into the therapeutic potential of these essential oils for combating oxidative stress-related disorders.

Keywords: Essential oil; GC/MS analysis; Antioxidant activity; Computational study.

P181 Extraction of Polyphenolic Compounds and Determination of Antioxidant Activity from Orange Waste Peels

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Citrus fruits, especially orange (*Citrus sinensis*), are among the most consumed fruits worldwide. Orange peel, a byproduct of agro-food processing, is a rich source of bioactive compounds, particularly polyphenols. This study investigates the valorization of Algerian orange peel waste through extraction of polyphenolic compounds, evaluation of antioxidant activity, and phytochemical profiling. Total phenolic compounds were extracted using conventional solid–liquid extraction with 80% methanol at a 1 g/40 mL ratio. Phytochemical profiles were determined by high-performance liquid chromatography (HPLC). Antioxidant activity was assessed via DPPH and ABTS radical scavenging assays. The total phenolic content of the methanolic extract was 24 mg GAE/g DW, with strong antioxidant activity demonstrated (DPPH: 199 µmol TE/g; ABTS: 287 µmol TE/g). These findings confirm that orange peel waste is a valuable source of phenolic compounds with high antioxidant potential.

Keywords: Antioxidant activity; Extraction; Orange peel (*Citrus sinensis*); Phenolic compounds.

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P182 Synthesis and Biological Evaluation of N-Pyridyl-Hydrazone Derivatives as Potential Monoamine Oxidase (MAO) Inhibitors

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Monoamine oxidases (MAOs) exist in two isoforms, MAO-A and MAO-B, with differing substrate specificities. MAO-A selectively deaminates serotonin and norepinephrine, whereas MAO-B acts on phenylethylamine. MAO inhibitors are clinically significant for treating neurodegenerative disorders and mood-related diseases. In this study, a new series of N-pyridyl-hydrazone derivatives was synthesized via an efficient method and evaluated for their inhibitory activity against MAO-A and MAO-B. Compounds 2a–2n showed significant inhibition, with 2i, 2j, 2k, 2l, and 2n exhibiting notable activity. These findings provide a foundation for designing more effective MAO inhibitors for neurodegenerative disease therapeutics.

Keywords: MAO inhibitors; N-pyridyl-hydrazone derivatives; Inhibitory potency.

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P184 Phytochemical Study and Evaluation of Biological Activities of Hedera helix Leaves Growing Wild in Algeria

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Medicinal plants are of significant interest due to their richness in secondary metabolites, which represent valuable sources of therapeutic agents [**?**]. This study focused on *Hedera helix* L. (commonly known as climbing ivy), a plant recognized since antiquity for its pharmacological properties. The objective was to determine the chemical composition of both the volatile fraction (essential oil) and the non-volatile fraction (secondary metabolites) of *Hedera helix* leaves, and to evaluate their biological activities.

GC–MS analysis of the essential oil revealed a composition rich in bioactive compounds, with more than 93% identified through spectral data and retention indices. Phytochemical screening of the non-volatile fraction demonstrated the presence of fatty acids, coumarins, quinones, tannins, and saponins, with smaller amounts of flavonoids, steroids, and terpenoids. Phenolic compounds, flavonoids, condensed tannins, and hydrolyzable tannins were quantified in extracts obtained via maceration, ultrasound, and Soxhlet extraction using solvents of decreasing polarity (water, ethanol, and isopropanol). The extraction yield and phytochemical content varied depending on solvent and extraction method.

Antioxidant activity, evaluated using the DPPH radical scavenging assay [**?**], revealed that all extracts exhibited stronger antioxidant effects than the synthetic standards BHA and BHT. Antimicrobial activity, assessed via the agar diffusion method, demonstrated antibacterial effects against Gram-negative *Escherichia coli* and Gram-positive *Staphylococcus aureus* and *Bacillus* species, as well as antifungal activity against *Candida albicans* [**?**].

These findings highlight the potential of *Hedera helix* leaves as a promising natural source of antioxidant and antimicrobial agents.

Keywords: *Hedera helix* L.; secondary metabolites; phytochemical screening; phenolic compounds; flavonoids; antioxidant; antibacterial; antifungal.

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P185 Phytochemical and Mineral Composition of Orange Peel Powder through Freeze-Drying: A Pathway to Sustainable Valorization

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In recent years, growing environmental concerns and the increasing demand for natural, health-promoting ingredients have stimulated interest in the valorization of agro-industrial by-products [**?**]. This study investigates the phytochemical profile, mineral composition, and antioxidant properties of freeze-dried orange peel powder, with a focus on its potential applications in sustainable product development.

Phytochemical analysis revealed the presence of polyphenols, flavonoids, vitamin C, and carotenoids. Freeze-drying was found to be highly effective in preserving these bioactive compounds, particularly vitamin C (1.024 mg/g dry matter) and carotenoids (27.72 mg/g). Mineral analysis using Inductively Coupled Plasma Spectrometry (ICP) demonstrated that the powder is rich in essential micronutrients, including magnesium (108 µg/g), iron (0.475 µg/g), copper (0.775 µg/g), and zinc (0.775 µg/g).

The antioxidant activity of the freeze-dried orange peel extracts was confirmed, underlining their potential as natural functional ingredients for the food, cosmetic, and nutraceutical industries. Furthermore, freeze-drying proved to be an efficient technique for the valorization of this agro-industrial by-product, ensuring high nutritional quality while minimizing health risks associated with contaminants [**?**].

This approach reflects the principles of the circular economy, highlighting freeze-dried orange peel powder as a promising, eco-friendly resource for sustainable industrial applications.

Keywords: Freeze-drying; orange peel powder; antioxidant activity; mineral composition; sustainable valorization.

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P187 Nevel acetic acid 2-(1H-benzimidazole-2-yl)quinoline chloride, structural characterization, and Hirshfeld surface study

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The compound, acetic acid 2-(1H-benzimidazole-2-yl) quinoline chloride was synthesized and characterized by single crystal X-ray diffraction. The compound crystallizes in the triclinic space group P-1 with a=8.07676Å, b=9.5636Å, c=11.7639Å, =109.570°, =91.735°, =94.977° and Z=2 in the unit cell. The crystalline cohesion is established through a three-dimensional network of moderate intra and intermolecular hydrogen bonds, including N-H...O, N-H...Cl and O-H...Cl interactions. Utilizing X-ray data, the graphic interface Crystal Explorer allows for the classification, visualization, and quantification of these interactions within the crystal structure. The intermolecular interactions are further analyzed by studying the Hirshfeld surface, which provides insight into the molecular shape and its interaction with the surrounding crystalline environment.

Keywords: synthesis; interaction; crystal X-ray; Hirshfeld.

P188 Optimization of the synthesis of a pyrazolone structure

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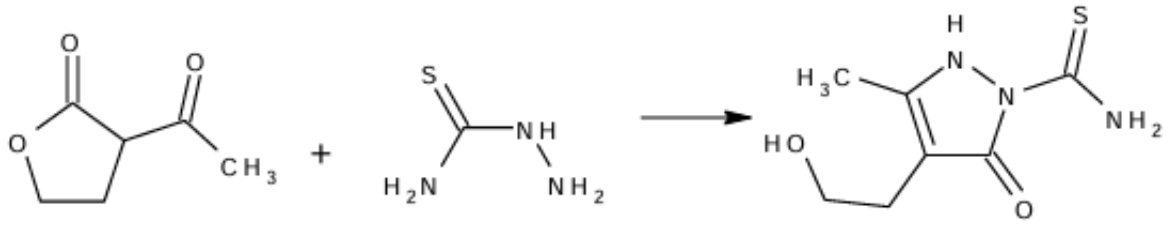
Pyrazole is one of the most extensively studied groups among nitrogen-containing compound families. This core structure leads to diverse applications such as inhibitors of protein glycation, as well as antibacterial, antifungal, anticancer, antidepressant, anti-inflammatory, antioxidant, and antiviral agents [1,2]. Sonochemistry is a new trend in organic chemistry. A large number of reactions can be carried out under ultrasonic irradiation, providing high yields, short reaction times, and mild conditions [3].

This study focuses on optimizing the synthesis of a pyrazolone-based structure through a condensation reaction between thiosemicarbazide and 2-acetylbutyrolactone, using various solvents and reaction conditions, both in the presence and absence of a catalyst, and under classical and ultrasonic activation.



Scheme . Synthesis of pyrazolone.

Keywords: furanone; pyrazole; ultrasonic activation; heteropolyacid.

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P189 Optimizing the production and efficacy of antimicrobial bioactive compounds from Streptomyces ACTIF158 in combating pathogens

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Actinomycetes have provided many important bioactive compounds of high commercial value and continue to be routinely screened for new bioactive substances. The genus *Streptomyces* has long been recognized as a prolific producer of metabolites with antimicrobial activity.

In this study, secondary metabolites produced by the *Streptomyces* S158 strain, isolated from a lake system, were extracted using solvents and tested by the disk diffusion method on agar medium against seven pathogenic strains. The results showed significant antibacterial activity against almost all targeted bacteria, with large zones of inhibition.

This indicates that the potential S158 isolate can be an important source of bioactive substances, in particular antimicrobial molecules.

Keywords: *Streptomyces*; biomolecules; bioactive extracts; antibacterial activity.

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P190 Antioxidant Activity and Alpha-Amylase Inhibition of Different Solvent Extracts from Boraginaceae Plants: Wild Plants of El Oued Region, Algeria

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Plants from the Boraginaceae family are recognized for their medicinal properties and diverse phytochemical compositions. This study aimed to evaluate the antioxidant activity and alpha-amylase inhibitory potential of various solvent extracts from Boraginaceae plants native to the arid El Oued region of Algeria. Hydroalcoholic extracts were fractionated using liquid-liquid extraction into n-hexane, ethyl acetate, butanol, and aqueous fractions.

Antioxidant capacity was assessed using DPPH and TAC assays, while alpha-amylase inhibition was evaluated through microplate-based and iodine assay techniques. Among the fractions, the ethyl acetate extract demonstrated the most potent activity, with the highest DPPH free radical scavenging activity (IC_{50} = 0.64 mg/mL) and a maximum alpha-amylase inhibition of 79.82

These findings highlight the therapeutic potential of Boraginaceae plants from this region, particularly in combating oxidative stress and managing carbohydrate metabolism disorders.

Keywords: Antioxidant activity; alpha-amylase inhibition; Boraginaceae.

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P191 High-Efficiency Corrosion Inhibition of A9 Steel in Acidic Environment Using Imines: Synthesis, Characterization, and Mechanistic Studies

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Metal corrosion, especially in acidic environments, remains a major challenge in industrial sectors such as metal processing, petrochemicals, and construction [1]. To counter this issue, the use of corrosion inhibitors is a simple, cost-effective, and efficient strategy, particularly using organic compounds containing heteroatoms such as nitrogen, oxygen, or sulfur. Schiff bases, formed by the condensation of a primary amine with an aldehyde, are widely studied for their inhibitory properties due to their conjugated structures and active sites capable of interacting with metal surfaces[2].

In this study, the compound 2-(((3-methoxyphenyl)imino)methyl)phenol was synthesized by condensing salicylaldehyde with m-anisidine. The ligand was characterized by UV-Vis and IR spectroscopy and evaluated as a corrosion inhibitor for A9 steel in 1 M HCl. Gravimetric and electrochemical analyses revealed a significant reduction in corrosion rate, with optimal efficiency achieved at 10^{-2} M. Thermodynamic analysis suggested a physical adsorption process following the Langmuir isotherm, and polarization curves indicated mixed-type inhibitor behavior, affecting both anodic and cathodic reactions.

These results demonstrate the high potential of this Schiff base for protecting metallic materials against corrosion in aggressive acidic environments.

Keywords: Schiff base; corrosion inhibition; A9 steel; Langmuir adsorption.

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P192 Insight on the Use of Salts as Additives During the Enzymatic Kinetic Resolution of High Added Value Compounds

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Nowadays, biocatalysis is considered among the most attractive and sustainable approaches for producing enantioenriched building blocks in numerous industrial areas, such as active pharmaceutical ingredients (APIs), cosmetics, fragrances and flavors, agricultural, and valuable fine chemicals [1]. On an industrial scale, the kinetic resolution of racemates catalyzed by lipases is one of the most practical strategies to obtain enantiopure compounds. These biotransformations may include acylation, hydrolysis, aminolysis, and more. Various parameters modulate both reactivity and selectivity, including lipase type, solvent hydrophobicity, water activity, and the presence of additives [2].

In this study, we focused on the enzymatic deacylation of a series of acetates (1-arylethyl acetates and heteroaromatic acetates) in low-water media [3,4]. The impact of introducing several salts (Na_2CO_3, K_2CO_3, $CaCO_3$, Na_2SO_4, Na_2HPO_4, and NaCl) on enzymatic efficiency was examined in anhydrous and micro-aqueous media. Results demonstrate a synergistic effect of salt additives and solvent hydrophobicity, with diverse impacts on lipase reactivity without disrupting enantioselectivity under nonconventional conditions.

Keywords: Enzymatic deacylation; salts; acetates; non-conventional media.

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P193 Evaluation of the Effect of a Honey-Based Gel and Silver Sulfadiazine on Diabetic Wounds in an Animal Model

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Foot ulcers and delayed wound healing are major complications in diabetic patients. Although bee products have demonstrated potential in enhancing wound repair, few studies have evaluated their efficacy in diabetic wounds. This study aimed to assess the healing and antibacterial effects of a honey-based gel composed of spurge honey, propolis, beeswax, and sodium carboxymethylcellulose (CMC-Na) in full-thickness wounds of diabetic and non-diabetic rabbits, compared with conventional 1% silver sulfadiazine therapy.

The experiment included two parts: (1) *in vitro*, involving the preparation and characterization of the honey-based gel by Fourier Transform Infrared Spectroscopy (FTIR) and evaluation of antibacterial activity against *Staphylococcus aureus* and *Escherichia coli* using the well diffusion method, compared with 1% silver sulfadiazine; and (2) *in vivo*, involving macroscopic, morphometric, and histopathological follow-up of wound healing.

The honey-based gel showed inhibitory activity against both bacterial strains, whereas silver sulfadiazine was comparatively less effective ($p < 0.05$). Morphometric analysis revealed that non-diabetic wounds treated with the honey-based gel exhibited significantly higher contraction rates on days 14, 21, and 28 compared with control and silver sulfadiazine groups ($p < 0.05$). In diabetic rabbits, a significant improvement was observed from day 14. Moreover, the honey-based gel shortened the epithelialization period in both rabbit groups relative to conventional treatment.

These results indicate that the topical application of the honey-based gel accelerates full-thickness wound healing by enhancing contraction and reducing epithelialization time. The combination of honey, propolis, and beeswax with CMC-Na represents a promising alternative therapy for both diabetic and non-diabetic wounds.

Keywords: Honey-based gel; 1% silver sulfadiazine; diabetic wound healing; antibacterial activity.

P194 Exploration of the Stereoselective Activity of New HSDHs in the Biotransformation of Wieland Miescher Ketone

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Biocatalysts, derived from biomolecules such as proteins, RNA, and DNA, can be produced in large quantities from diverse sources including plants, animals, fungi, and bacteria using conventional molecular biology techniques [**?**, **?**]. They are widely employed in the pharmaceutical industry, offering a promising alternative to classical organic synthesis due to their mild reaction conditions and exceptional enantio- and stereoselectivity [**?**].

In this study, we focused on the kinetic resolution of a cyclic ketone, Wieland Miescher ketone, and its alcohol derivatives (cis and trans) using a range of newly identified hydroxysteroid dehydrogenases (HSDHs) from an internal metagenomic collection of oxidoreductases. This molecule served as a model substrate to evaluate enzyme selectivity. All products were obtained with enantiomeric excesses exceeding 95% [**?**].

Keywords: Biocatalysts; stereoselectivity; Wieland Miescher cyclic ketone; enantiomeric excesses.

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P195 Exploring the Influence of Manganese and Cerium Addition on the Catalytic Performance of Mg_4Al_2 Hydrotalcite-Like Compounds in n-Butanol Oxidation

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This study investigates (Mn, Ce)-containing MgAl layered double hydroxides (LDH), focusing on their structural and catalytic properties. The materials were prepared via the calcination–reconstruction method, and the effects of manganese and cerium content on structural and catalytic performance were systematically examined. Samples were characterized using XRD, BET-BJH, Raman spectroscopy, XPS, and TGA techniques. The catalytic activity was evaluated in n-butanol oxidation.

XRD analysis of precursors calcined at 280°C confirmed successful regeneration of the crystalline hydrotalcite structure in all Mn^{2} and/or Ce^{3} containing samples, with CeO phases observed in cerium-containing systems, while no manganese-associated phases were detected. Raman spectroscopy revealed $Mn^{3}O$ and MnO octahedra with Jahn-Teller distortions, indicating possible manganese incorporation into the hydrotalcite lattice [**?**]. BET-BJH analysis showed that higher manganese content enhanced surface area and pore volume, whereas increasing cerium content restricted these properties. XPS identified multiple manganese oxidation states (Mn^{2}, Mn^{3}, Mn), with electron transfer from Mn to Ce in Mn–Ce systems, increasing Mn^{3} species and reducing Ce concentrations.

Catalytic activity tests in n-butanol oxidative decomposition revealed significant differences depending on Mn and Ce composition. The $Ce_{0.8}$–Mg_4Al_2 system exhibited high catalytic activity, highlighting cerium's role in oxygen activation. Conversely, the $Mn_{0.8}$–Mg_4Al_2 system showed lower activity, likely due to Mn^{2} predominance. Notably, the $Mn_{0.2}Ce_{0.6}$–Mg_4Al_2 system demonstrated improved low-temperature catalytic activity, indicating a synergistic effect between manganese and cerium.

Keywords: Oxidation; Hydrotalcite; COV; n-Butanol.

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P197 Geochemical Variation of Mentha piperita L. Essential Oils in Algeria

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Peppermint (*Mentha piperita* L.), a member of the Lamiaceae family, is a well-known herbaceous plant recognized for its antiseptic, antineuralgic, analgesic, and antioxidant properties. This study aimed to analyze the composition of essential oils extracted from *M. piperita* leaves collected from six regions of Algeria: Algiers, Béjaïa, Tlemcen, Ouargla, Oued Souf, and Ghardaïa. Extractions were carried out using hydrodistillation with a Clevenger-type apparatus.

The highest yield was obtained from Tlemcen (2.22 ± 0.01%), whereas the lowest was recorded in Béjaïa (0.19 ± 0.01%). All yields fall within AFNOR standards, indicating acceptable quality irrespective of collection site. GC-MS analysis revealed marked variations in chemical composition depending on geographical origin: essential oils from Algiers and Oued Souf were rich in linalool, whereas Ouargla, Béjaïa, and Ghardaïa oils were dominated by carvone. Tlemcen samples stood out for high menthol content. These results identified three main chemotypes of *M. piperita* based on geographic origin, with implications for therapeutic, pharmaceutical, and industrial applications.

Keywords: Mentha piperita; GC/MS; Lamiaceae; phytochemical profile.

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$https : //doi.org/10.3390/foods11213466$

P199 Computational Screening and Molecular Docking of Novel Inhibitors Targeting USP7 for Cancer and Immune-Related Therapeutic Development

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This study performed comprehensive molecular docking and pharmacophore-based screening to identify potential inhibitors of the USP7 protein, a key regulator in multiple oncogenic pathways. The USP7 structure (PDB ID: 5N9R) was retrieved from the Protein Data Bank and subjected to self-docking using Glide software. To enhance identification of novel inhibitors, a pharmacophore model based on the co-crystallized ligand was generated and used to screen small molecules with structural similarity to the ligand. The resulting hits were further docked within USP7's active site to evaluate binding affinities and interactions, aiming to identify promising candidates for future development as USP7 inhibitors.

These findings contribute to ongoing efforts to discover potent and selective USP7 inhibitors as therapeutic agents for diseases associated with dysregulated USP7 activity, including cancer and immune-related disorders.

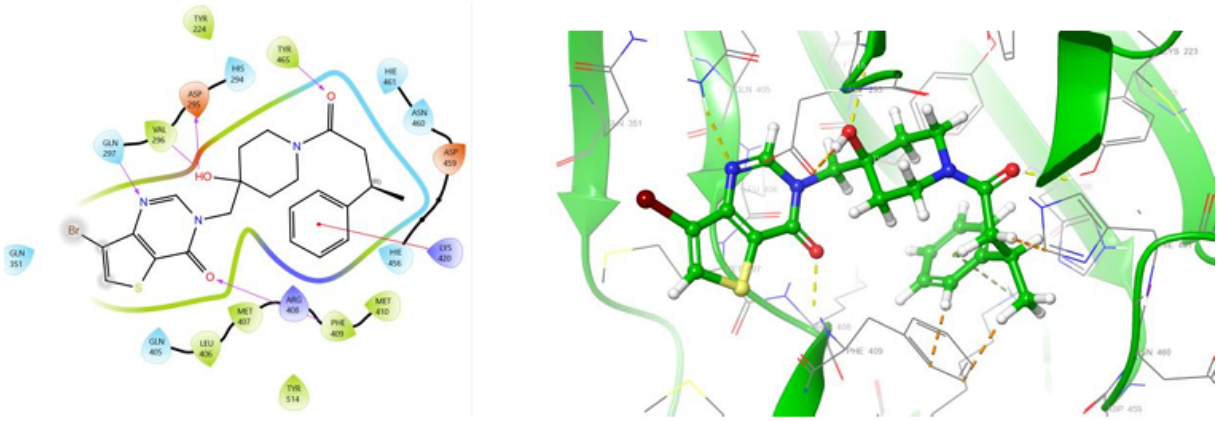

Figure. 2D and 3D visualization of 5N9R-8RN complex

Keywords: USP7; molecular docking; inhibitors; drug design.

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P200 DFT Calculations and Molecular Docking Study as Anticancer of Benzoxazine Derivative

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Benzoxazines represent a highly versatile and increasingly important class of heterocyclic compounds. Characterized by nitrogen and oxygen in a six-membered aromatic ring, benzoxazines have demonstrated significant potential in high-performance polymer design, organic synthesis, and medicinal chemistry. Recent studies have highlighted their promising biological activities, including antimicrobial, anti-inflammatory, antifungal, and especially anticancer effects [1–3].

In this study, we synthesized 3-(benzothiazol-2-yl)-2-(4-nitrophenyl)-3,4-dihydro-2H-benzo [1,3]oxazine via a three-step procedure: (1) condensation of 2-aminobenzothiazole with salicylaldehyde in ethanol under reflux to form 2-((benzothiazol-2-ylimino)methyl)phenol, (2) reduction to 2-((benzothiazol-2-ylamino)methyl)phenol, and (3) intermolecular cyclization with nitrobenzaldehyde in acetonitrile under reflux to obtain the desired product with good yield.

Frontier molecular orbital energies (HOMO/LUMO) were analyzed to describe charge transfer and predict structure-activity relationships using DFT calculations at the B3LYP/6-31G(d,p) level. Molecular docking studies confirmed strong interactions between the synthesized compound and target proteins, with binding affinities ranging from -10.6 to -6.8 kcal/mol, indicating high efficiency and potential as a promising anticancer candidate.

Keywords: Benzoxazines; DFT; Molecular docking; Anticancer activity.

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P202 Efficient Method for the Preparation of Some Substituted Sulfamoylalkanoates Using a Green Catalyst

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A practical and eco-friendly method is presented for the synthesis of novel substituted sulfamoylalkanoates incorporating a sulfonamide moiety, using the green and efficient Preyssler heteropolyacid $H_{14}[NaP_5W_{30}O_{110}]$ as a catalyst. This approach was applied to demonstrate the method's efficiency and sustainability. The catalytic system promotes a one-step reaction, achieving both deprotection and esterification, resulting in the desired sulfamoylalkanoate derivatives in excellent yields.

The catalyst, known for its low toxicity, recyclability, and strong acidity, demonstrates the advantages of heterogeneous catalysis, including ease of separation, reusability, and minimal environmental impact. This method provides a valuable and sustainable pathway for generating sulfonamide-containing molecules under mild and efficient reaction conditions [1].

Keywords: Catalysis; Heterogeneous catalysis; HPA; Sulfonamides.

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P205 Enhancement of Polycyclic Aromatic Hydrocarbons Biodegradation in Soil by Bioaugmentation and Biostimulation Process

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The application of biotechnology is increasingly important in environmental remediation through clean biological processes called bioremediation. Microorganisms are applied to eliminate toxic substances, including polycyclic aromatic hydrocarbons (PAHs) released into soil from industrial or accidental sources.

This study evaluates, at the laboratory scale, the degradation of naphthalene doped in sterile soil by bioaugmentation using a Bacillus sp. HMS6 strain isolated from an oil site in southern Algeria, and the effect of biostimulation by adding a phosphorus source (Na_2HPO_4), a nitrogen source (urea), or both. Biodegradation rates were measured after 15 days of incubation using gas chromatography-mass spectrometry (GC/MS) following Soxhlet extraction.

Results showed that bioaugmentation combined with biostimulation using both urea and Na_2HPO_4 achieved 99.13% degradation, whereas treatments with only nitrogen or phosphorus reached 79.59% and 68.79%, respectively.

Keywords: Bioaugmentation; Biostimulation; PAH; Naphthalene; GC/MS.

P207 Acyclic and Cyclic Anhydrides as Efficient Irreversible Acyl Donors for the Practical Enzymatic Kinetic Resolution of Secondary Benzylic Alcohols

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The kinetic resolution of alcohols via enzymatic acylation is considered among the most practical approaches for the preparation of active pharmaceutical ingredients (APIs), cosmetics, flavors, agricultural, and valuable fine chemicals [1]. Lipases are particularly attractive due to their mild reaction conditions, recyclability, biodegradability, cofactor-free operation, stability in organic solvents, and excellent stereoselectivity [2].

Several parameters significantly impact both reactivity and selectivity, including the enzyme type, the nature of the organic solvent, and the acylating agent. The judicious choice of acyl donor ensures the irreversibility of the reaction; the most commonly used are enol esters and acid anhydrides [3].

In this study, we report the enzymatic acylation of secondary benzylic alcohols using acetic and succinic anhydrides as irreversible acyl donors. The effects of lipase type and solvent hydrophobicity on both conversion and selectivity were examined. Results showed that these parameters strongly influence enzymatic performance, with conversion rates ranging from 0% to 50% and selectivity factors between 10 and >200.

Keywords: Enzymatic kinetic resolution; Acylation; Cyclic anhydride; Acyclic anhydrides.

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P208 A New Zinc(II) Coordination Complex Based on Benzothiazole Ligand: Synthesis, Structure, Hirshfeld and DFT Calculations

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Benzothiazole-based compounds have shown promising pharmaceutical properties. As part of ongoing studies on the synthesis, structure, and biological activity of benzothiazole complexes [1], we synthesized and determined the crystal structure of the title compound $[Zn(NO_3)_2(C_7H_5NS)_2]$ using an APEX2 single-crystal X-ray diffractometer. The compound crystallizes in the triclinic P-1 system with a slightly distorted tetrahedral environment around the zinc ion. Each Zn atom is coordinated by two nitrogen atoms and two oxygen atoms, with Zn–O and Zn–N bond distances ranging from 1.9788(15) to 2.0447(15) Å, consistent with related complexes [2].

In the crystal, molecules are linked via C–H···O hydrogen bonds, forming $R_2^1(4)$, $R_1^1(8)$, and $R_2^2(18)$ motifs. Additional stabilization arises from $\pi \cdots \pi$ interactions between phenyl and thiazole rings. Hirshfeld surface analysis was used to quantify these intermolecular interactions. Furthermore, Density Functional Theory (DFT) calculations (B3LYP) were performed on the optimized geometry. TD-DFT studies allowed the prediction of UV–Vis spectra and identification of the spectral positions and nature of electronic transitions according to molecular orbital localization.

Keywords: Benzothiazole; X-ray Diffraction; DFT Calculations; Hirshfeld Analysis.

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P209 Application of a Photocatalyst for Organic Pollutant Degradation in Water under Solar Light

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Treating wastewater containing persistent organic contaminants is a pressing environmental issue due to their resistance to biodegradation. Textile industries, in particular, release Congo red dye, which is difficult to remove using conventional wastewater treatments.

This study presents a novel photocatalytic method for dye degradation under solar light using TiO_2–ZnO metal oxide composites supported on silica (SiO_2) matrices. X-ray diffraction (XRD) analysis confirmed the presence of anatase TiO_2 and hexagonal ZnO phases. Fourier Transform Infrared (FTIR) spectroscopy showed Si–O–Si and metal–oxygen bonds, while UV-Vis spectroscopy indicated an energy gap shift to 3.02 eV. Photocatalytic performance was evaluated by Congo red degradation under solar and UV-A irradiation. Enhanced sunlight-induced decomposition was observed due to the material's wide absorption capabilities and effective catalyst activation.

These TiO_2–ZnO/SiO_2 composites demonstrate promising potential for long-term treatment of colored effluents and offer advantages for environmental pollution control.

Keywords: Photocatalysis; Degradation; Congo red; Sunlight.

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P210 In vitro Antioxidant Activities and Secondary Metabolites from the Aerial Parts of the Algerian Cistus ruficomus Viv

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The genus *Cistus* (Cistaceae) comprises about 110 species of evergreen and semi-evergreen shrubs, mainly distributed in the Mediterranean basin, its primary diversity center. Some species are recognized for interesting biological activities such as antibacterial and antioxidant effects.

The chemical investigation of the aerial parts of *Cistus ruficomus* Viv. (EtOAc and n-BuOH extracts) led to the isolation of 11 natural compounds, including a neolignan glucoside, six flavonoids, two benzoic acid derivatives, and two quinic acid derivatives. The separation was achieved by different chromatographic techniques (CC, VLC, TLC, HPLC).

The structures of the isolated compounds (1–11) were determined using 1D NMR (^{1}H, ^{13}C), 2D NMR (COSY, TOCSY, HSQC, DEPTQ, HMBC), mass spectrometry, optical rotation measurements, and comparison with reported data.

The EtOAc extract showed the highest content of phenolics (125.04 ± 1.34 mg GAE/g FW) and flavonoids (232.59 ± 4.76 mg QE/g FW). The antioxidant activities of the PE, EtOAc and n-BuOH extracts were evaluated using DPPH, ABTS, CUPRAC, alkaline DMSO, and -carotene assays. Among them, the EtOAc extract exhibited the strongest antioxidant potential.

Keywords: *Cistus ruficomus* Viv.; Cistaceae; phenolics; flavonoids; antioxidant activities.

P211 Investigation of Silyl Cation–Lewis Base Complexes: Structural Features and Stability via DFT and NBO Analysis

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This work investigates how steric and electronic influences govern the structural and energetic properties of Si–P bonds within silicon-based cationic systems coordinated to phosphine ligands.

Computational analysis revealed that $(CH_3)_3Si^+$ forms the most compact Si–P linkages (2.01–2.03 Å), attributed to low steric hindrance and effective orbital overlap. Slightly elongated bond lengths (2.03–2.05 Å) were observed for $(C_2H_5)_3Si^+$, while the most extended distances (2.08–2.10 Å) corresponded to Ar_3Si^+, where steric congestion and electron-withdrawing aromatic rings hinder close approach.

Angular parameters follow similar trends: bulky phosphines such as $(C_2H_5)_3P$ induce broader Si–P–R bond angles (up to 121° with Ar_3Si^+) compared with less hindered analogs like $(CH_3)_3P$.

Energetically, the $(CH_3)_3Si^+ \cdots (CH_3)_3P$ pair exhibits the strongest interaction (–28 kcal/mol), reflecting optimal steric and electronic compatibility. Charge transfer analysis indicated that $(C_2H_5)_3P$ donates electron density more effectively than $(CH_3)_3P$, consistent with steric and electronic expectations.

Natural Bond Orbital (NBO) analysis confirmed that increased -donation correlates with greater interaction strength, as evidenced by more negative interaction energies. In contrast, Ar_3Si^+ consistently engaged in weaker associations, due to the electron-withdrawing nature of the aromatic substituents.

Overall, this study highlights the interplay between geometry and electronic structure in modulating Si–P bonding, offering design principles for future silicon–phosphine systems relevant to catalysis and materials science.

Keywords: Silyl cations; Lewis bases; Density Functional Theory; Natural Bond Orbital analysis.

P212 Development of Composites Based on Lamellar Double Hydroxides and Their Application in the Elimination of Micropollutants from Water

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Liquid industrial effluents contain mineral and organic substances, which may be in solution or suspension, some of which are toxic. This water requires treatment before being released into the natural environment to protect natural water resources and avoid environmental risks.

Conventional treatment processes require complex and costly operations, particularly in terms of electrical energy, which necessitates the use of simpler and more efficient techniques. Currently, the preparation of low-cost and efficient hybrid materials is attracting growing interest due to their numerous applications.

With this in mind, this work aims to prepare a hybrid material based on layered double hydroxides and study its use as an adsorbent for the removal of cationic and anionic substances from aqueous media.

Keywords: Effluents; Treatment; Hybrid materials; Layered double hydroxides.

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P213 Elimination of Orthophosphate Ions from Aqueous Solution Using Layered Double Hydroxide Material

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Phosphorus is an essential element widely used in industry, especially in fertilizers. However, its abundant use causes environmental issues. High concentrations of orthophosphate in water negatively affect aquatic life, particularly fish. To remove this contamination, Zn/Al type layered double hydroxides (LDH) were used as adsorbents.

The materials were characterized using X-ray diffraction (XRD) and Fourier Transform Infrared (FTIR) spectroscopy. Adsorption kinetics of orthophosphate ions were studied by varying parameters such as contact time, adsorbent dose, initial concentration, pH, and temperature. Experimental data were fitted using Langmuir, Freundlich, and Dubinin–Kaganer–Radushkevich (DKR) isotherm models. The Langmuir model provided the best fit with a correlation coefficient of 0.945, indicating monolayer adsorption.

Keywords: LDH; Adsorption; Orthophosphate; Isotherm.

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P214 Sustainable Production of Activated Carbon from Date Palm Biomass: Characterization and Application in Dye Adsorption

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Biomass is an abundant source of raw materials. This study focuses on producing activated carbon from date palm waste using a two-step pyrolysis process at 600°C for 3 hours, followed by chemical activation with potassium hydroxide and phosphoric acid at a 1:1 impregnation ratio under a nitrogen atmosphere.

The obtained activated carbon was characterized using Fourier Transform Infrared Spectroscopy (FT-IR), Scanning Electron Microscopy (SEM), Thermogravimetric Analysis (TGA), Brunauer–Emmett–Teller (BET) surface area analysis, Boehm titration, and point of zero charge (pHpzc). These analyses revealed variations in surface structure and functional groups.

Dye removal was evaluated under different conditions including contact time, adsorbent dosage, dye concentration, and pH. Adsorption thermodynamics were analyzed to elucidate the adsorption mechanism. Isotherm modeling using Langmuir, Freundlich, and Dubinin– Radushkevich models showed that the activated carbon possessed high adsorption capacity, confirming its suitability for wastewater treatment.

Keywords: Waste biomass; Activated carbon; Biochar; Thermal properties; Dyes.

P215 Chemical Composition and Antioxidant Activity of Essential Oil Extracted by Hydro-distillation and Steam Distillation for *Mentha spicata* Recollected from Two Regions in Algeria

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Mentha spicata is a medicinal plant from the Lamiaceae family with several biological properties. Essential oils were extracted by hydro-distillation (HD) and steam distillation (SD) from aerial parts collected from Bouira and Blida regions in Algeria. Volatile components were analyzed by GC and GC-MS. Major compounds identified included carvone (55.1–55.9%), limonene (17.2–27.3%), and 1,8-cineole (2.9–6.9%), depending on the extraction method and region. Germacrene D was detected at 3.5% in the SD oil from Bouira and 0.6% in the Blida sample.

Antioxidant activity was assessed using DPPH radical scavenging assay. The essential oils showed weak antioxidant activity, with IC_{50} values of 74.10 mg/mL and 17.5 mg/mL for Bouira HD and SD oils, and 28.8 mg/mL and 20.1 mg/mL for Blida HD and SD oils, respectively.

Keywords: *Mentha spicata*; Hydro-distillation (HD); Steam distillation (SD); Antioxidant activity.

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P216 Polyphenolic Composition and Antioxidant Properties of Aromatic Herb *Ballota nigra* Leaves Extracts from Algeria

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The aerial parts (leaves) of *Ballota nigra* were studied to valorize its natural products. The objective was to determine the chemical composition of polyphenol extracts using HPLC/DAD and to evaluate flavonoid antioxidant activity using the DPPH• method.

HPLC/DAD analysis revealed the presence of cinnamic acid, ascorbic acid, quercetin, orientin, vitexin, 2-O-rhamnoside, rutin-2--D-glycoside, apigenin, and luteolin. Antioxidant assays indicated that flavonoid extracts exhibited significant antioxidant activity.

Keywords: *Ballota nigra*; Phenolic acids; HPLC/DAD; DPPH.

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P217 Toxicity Potential of Organophosphorus Pesticides Detected in Some Vegetables from Southeast Algeria

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In vegetables cultivated in the Southeast region of Algeria, eleven organochlorine and nine organophosphorus pesticides were detected at trace levels. Initial detection was performed using gas chromatography with a micro-electron capture detector (GC-µECD) and confirmed by gas chromatography coupled with mass spectrometry (SIM mode).

The recorded pesticide concentrations ranged from 0.033 to 0.066 mg·kg^{-1} for organochlorine compounds and from 0.033 to 0.01 mg·kg^{-1} for organophosphorus compounds. Health risk assessment indicated that the cumulative risk exceeded 1 for both adults and children. These findings highlight the need for extended monitoring of foodstuffs across multiple regions over a consistent period to obtain a representative understanding of pesticide exposure.

Keywords: Trace pesticide residues; Organophosphorus pesticides; Health risk; QuEChERS.

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P218 Anti-Inflammatory and Cytotoxic Potential of Imidazole Derivatives: In Vitro Assays and Molecular Docking Insights

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Imidazole derivatives are pharmacologically privileged scaffolds with applications in inflammation and cancer therapy. Their potential to modulate key enzymes and signaling pathways was explored using a library of imidazole analogues.

Compounds were evaluated for cyclooxygenase (COX-1/COX-2) and 5-lipoxygenase (5-LOX) inhibition, and tested in LPS-stimulated RAW 264.7 macrophages for nitric oxide and cytokine production. Cytotoxicity was assessed against HeLa, MCF-7, and HepG2 cell lines, with HEK-293 cells as non-malignant controls. Molecular docking was performed against COX-2, 5-LOX, iNOS, NF-B p65, EGFR, and tubulin.

Several derivatives showed selective COX-2 inhibition with sub-micromolar IC_{50} values and reduced pro-inflammatory mediator release without affecting macrophage viability. Active compounds also exhibited low-micromolar cytotoxicity and favorable selectivity indices. Docking studies supported experimental results by revealing strong binding affinities and conserved interactions.

This combined in vitro and in silico study highlights imidazole derivatives as promising dual-acting anti-inflammatory and anticancer agents, providing a foundation for further optimization and mechanistic investigations.

Keywords: Imidazole derivatives; Anti-inflammatory; Cytotoxicity; Molecular docking; COX-2; 5-LOX; RAW 264.7; SAR.

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P219 Removal of Aspirin from Aqueous Solutions Using Chitosan Beads as a Green Biosorbent

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Pharmaceutical pollutants are an increasing environmental concern, with compounds such as aspirin frequently detected in aquatic environments at nanogram to microgram per liter concentrations. These contaminants enter water bodies through improper disposal and wastewater discharge, posing risks to ecosystems and human health.

This study explores the use of chitosan beads as a biodegradable and eco-friendly biosorbent for the removal of aspirin from aqueous solutions. The beads were characterized using Fourier-transform infrared spectroscopy (FTIR), X-ray diffraction (XRD), scanning electron microscopy (SEM), laser granulometry, and differential scanning calorimetry (DSC). Particle size analysis showed a D(90) value of 1042µm, while SEM images revealed predominant bead sizes of approximately 1225µm. XRD indicated an amorphous structure with a broad peak at 2 20°, FTIR spectra confirmed the presence of secondary amine groups with bands at 1620cm^{1} and 3469cm^{1}, and DSC thermograms displayed both endothermic and exothermic transitions.

Batch adsorption experiments were performed at pH 4 and 25°C, with an initial aspirin concentration of 10ppm. Equilibrium was reached after 8hours, achieving a removal efficiency of 62%. These results demonstrate that chitosan beads offer a sustainable and effective solution for removing pharmaceutical contaminants from water, contributing to greener water treatment technologies.

Keywords: Biopolymer; Pharmaceutical pollutants; Chitosan; Aspirin

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P220 Biosynthesis of ZnO Nanoparticles Using Citrus sinensis Peel Extract and Their Antibacterial Evaluation

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Zinc oxide nanoparticles (ZnO NPs) were synthesized via a green method using orange peel extract (*Citrus sinensis*). The biosynthesized nanoparticles were characterized by UV-Visible spectroscopy, Fourier Transform Infrared Spectroscopy (FTIR), and X-ray Diffraction (XRD). The antibacterial activity of the ZnO NPs was also evaluated to determine their potential for practical applications in controlling bacterial growth.

The study demonstrates that *Citrus sinensis* peel extract provides an eco-friendly and cost-effective route for ZnO NP synthesis, offering promising antibacterial properties suitable for biomedical and environmental applications.

Keywords: Citrus sinensis; Biosynthesis; Nanoparticles; ZnO NPs; Antibacterial activity

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P221 A Preliminary Study on the Impact of Increasing Antimicrobial Activity of Oxidized Potato Starch by Endogenous Hydrogen Peroxide (H_2O_2) of Euphorbia Honey

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This study investigates the use of dual-modified potato starch (OPS) combined with Euphorbia honey (UEH) to produce hydrogels with enhanced antimicrobial activity. The hydrogels were characterized using Fourier Transform Infrared Spectroscopy (FTIR) and Ultraviolet-Visible (UV–Vis) spectrophotometry, and their in vitro antimicrobial properties were evaluated against *Pseudomonas aeruginosa*, *Staphylococcus aureus*, and *Candida albicans* using the well diffusion assay (WDA).

FTIR spectra indicated differences between honey and potato starch, reflecting variations in water content and carbohydrate composition. UV–Vis analysis revealed distinct chemical profiles. The UEH exhibited promising antimicrobial activity, with inhibition rates ranging from 62.5% to 86%. OPS further enhanced the antimicrobial effect, achieving maximum inhibition rates of 85.85% (*P. aeruginosa*), 85.04% (*S. aureus*), and 75% (*C. albicans*). These preliminary results highlight OPS as a promising material for improving the antimicrobial efficacy of Euphorbia honey-based hydrogels.

Keywords: UEH; DEH; HPS; OPS

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P222 Helicobacter pylori Infection among Hemodialysis Patients in Zawia City, Libya

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Background: *Helicobacter pylori* is a bacterium that infects the stomach, potentially causing symptoms such as mild blood vomiting, burning stomach pain, and weight loss. It can also lead to stomach ulcers and cancer. Risk factors include poor diet, irregular eating habits, aging, and unhealthy lifestyle practices such as smoking.
Methods: A total of 99 blood samples were collected from kidney dialysis patients at Al-Zawia Kidney Center. Samples were collected in sterilized tubes, centrifuged, and tested for the presence of *H. pylori* antibodies using Rapid Test cards (A Con Company).
Results: The majority of dialysis patients were aged 21–54 years (73.73%). Overall, 57.60% of patients were infected with *H. pylori*, with the highest infection rate (65%) observed in the 55–71 age group. Female patients had a higher infection rate than male patients. Stomach pain was reported in both infected and uninfected patients, but it was more associated with infection among females.
Conclusion: The prevalence of *H. pylori* infection is high among hemodialysis patients, with female patients being more susceptible than male patients.

Keywords: *H. pylori*; hemodialysis; blood group; Al-Zawia Kidney Center

P223 Valorization of Agricultural Residues for Sustainable Cellulose-Based Materials in Advanced Electrochemical Applications

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This study explores the valorisation of almond shell agricultural residues as a sustainable and cost-effective raw material for producing biodegradable, functional, and environmentally friendly cellulose-based composites. Cellulose fibers were extracted using a sequential chemical process involving alkaline delignification, followed by sodium chlorite bleaching to improve fiber purity. A subsequent alkali treatment removed residual hemicelluloses, resulting in high-purity cellulose[1]. This method confirmed the efficient recovery of cellulose from agro-residues and provided a scalable, eco-conscious platform for material development.

To enhance functional properties, zinc oxide (ZnO) nanoparticles were incorporated into the cellulose matrix, forming cellulose/ZnO (AS/ZnO) nanocomposites. Additionally, multi-walled carbon nanotubes (MWCNTs) were introduced to improve the mechanical strength, electrical conductivity, and thermal stability of the composite. This integration enhanced the material's structural integrity and homogeneity, enabling the development of strong, lightweight, and conductive bio-composites suitable for various high-performance applications, including sensors, electronics, and biomedical devices[2].

The resulting bio-composite was drop-cast onto the working surface of commercial screen-printed carbon electrodes (SPCE), serving as the functional layer of a highly sensitive and selective electrochemical sensor. This sensor was specifically designed for the detection and real-time monitoring of antibiotic residues in food, addressing critical public health concerns associated with contamination.

Keywords: Agricultural wastes; Antibiotic detection; Biomedical devices; Electrochemical sensor

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P224 Fibre Cellulose from *Juncus maritimus*: Preparation, Characterization and Application

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Developing sustainable materials that meet evolving technological and environmental demands remains a critical challenge in materials science. In this context, cellulose and its derivatives have attracted considerable interest due to their unique combination of abundance, renewability, and versatile functional properties. As the most abundant organic polymer on Earth, comprising up to 50% of wood biomass and 90% of cotton fibers, cellulose offers a fully renewable feedstock that can be replenished on human time scales. Its robust mechanical durability, inherent biocompatibility, and extensive chemical modifiability underpin applications in sectors ranging from packaging and textiles to biomedical devices and advanced composites.

Despite this potential, many naturally occurring cellulose sources remain underexploited. One such example is *Juncus maritimus*, a halophytic plant that thrives in saline-affected coastal regions and riverbanks. Traditionally used only in crafts and local construction, *J. maritimus* biomass represents a low-cost, high-availability resource for valorization. By investigating this abundant but overlooked feedstock, this work seeks to expand the portfolio of sustainable cellulose sources and foster circular-economy practices in coastal ecosystems.

The significance of this study lies in demonstrating how regionally abundant biomass residues can be transformed into high-value biopolymer materials without competing with food crops or primary forestry resources. Focusing on a plant adapted to challenging growth environments also highlights the resilience and adaptability of cellulose-based supply chains under changing climatic conditions. Ultimately, valorizing *J. maritimus* aligns with global efforts to reduce reliance on petrochemical polymers, diminish waste streams, and promote decentralized, community-driven biomass processing. This approach broadens the horizons for renewable material development and supports sustainable livelihoods in rural and coastal communities.

Keywords: Fibre; cellulose; *Juncus maritimus*; characterization.

P225 Antioxidant and Antibacterial Activities of Saponin Extracts from Three Wild Halophytes Native to the Algerian Desert

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This study investigates the phytochemical characteristics and biological activities of saponin extracts from three wild halophytic species native to the Algerian desert: *Halocnemum strobilaceum Pall.*, *Salsola tetragona Del.*, and *Suaeda fruticosa L.* These obligate halophytes, adapted to saline ecosystems, were selected for their potential as sources of natural bioactives.

Antioxidant assays (DPPH, hydroxyl radical scavenging, and total antioxidant capacity) revealed significant differences ($p < 0.05$) among the extracts. *Salsola tetragona* demonstrated the most potent DPPH radical scavenging (IC_{50} = 75.38 ± 0.86 µg/mL) and highest total antioxidant capacity (95.32 ± 0.89 µg GAE/mg extract), while *H. strobilaceum* showed superior hydroxyl radical inhibition (71.50 ± 1.64%). Hemolytic activity also varied significantly, with *H. strobilaceum* exhibiting the lowest cytotoxicity (668.90 ± 13.71 µg/mL).

Antibacterial assays indicated moderate activity, with *S. tetragona* producing the broadest inhibition, significantly outperforming the other species against *P. aeruginosa* and *L. monocytogenes*. FTIR analysis confirmed saponin-specific functional groups in all extracts. The statistically validated results emphasize *S. tetragona* as the most promising species, followed by *H. strobilaceum*, for developing natural antioxidant and antibacterial agents. These findings support further phytochemical isolation and mechanistic studies to identify the active constituents and evaluate their pharmaceutical potential.

Keywords: Saponin extract; Halophytes; Antioxidant activity; Antibacterial activity.

P226 Thermo-Environmental Analysis of Sustainable and Conventional Fuels in Combustion

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This research provides a thermal and environmental assessment of hydrogen (H_2), biogas, methane (CH_4), and natural gas under comparable operating conditions. Key performance indicators such as Specific Emission Rate (SER), Carbon Footprint (CF), and Sustainability Index (SI) were evaluated.

Results indicate that hydrogen is the cleanest fuel, with zero CO_2 emissions and the highest thermal efficiency (78.6%), although significant NO emissions were observed due to high combustion temperatures, suggesting technical modifications are needed. Biogas, as a renewable option, demonstrates environmental potential but exhibits a relatively high carbon footprint and SER owing to its CO_2-rich composition. Methane and natural gas were included for comparison, showing intermediate emission levels and efficiency.

These findings highlight the potential roles of hydrogen and biogas in future energy systems and emphasize the importance of balancing environmental performance with thermal efficiency in fuel selection strategies.

Keywords: Fuels; Thermal Efficiency; Emissions; Environmental Sustainability.

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P227 Utilization of Waste Gypsum Plasterboard as a Sustainable Adsorbent for Congo Red Dye Removal from Wastewater

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This study investigates the potential of waste gypsum plasterboard as an environmentally friendly adsorbent for the removal of Congo Red (CR) dye from contaminated water, aligning with sustainability and industrial waste recycling principles. While gypsum has diverse applications, its capability for removing organic pollutants such as CR dye has been under-explored.

The physical and chemical properties of treated waste gypsum plasterboards were characterized, and adsorption efficiency was evaluated at a dye concentration of 5 ppm with varying contact times (20–140 minutes). Absorbance measurements decreased over time from 0.121 at 20 minutes to 0.029 at 140 minutes, demonstrating improved dye removal performance and highlighting the importance of contact time in the adsorption process.

These results confirm the potential of gypsum plasterboard as a low-cost, sustainable adsorbent for wastewater treatment, contributing to environmental protection and reduction of industrial pollution.

Keywords: Eco-friendly adsorbents; Gypsum plasterboards; Recycling; Wastewater treatment.

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P228 Vibrational Signature of Dichloromesitylene: A Combined IR/Raman and DFT Study in a Halogenated Aromatic System

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Dichloromesitylene (1,3-dichloro-2,4,6-trimethylbenzene), a halogenated aromatic compound, is a vital precursor in organic synthesis. This work presents a detailed structural, electronic, and vibrational study using Fourier-transform infrared (FT-IR) and Raman spectroscopy (200–3200 cm^{-1}), complemented by density functional theory (DFT) calculations at the B3LYP/6-311++ G(d,p) level.

Molecular optimization and electronic properties, including HOMO–LUMO energies (via TD-DFT) and molecular electrostatic potential surfaces (MEPs), were investigated. Vibrational analysis shows excellent agreement between experimental and calculated spectra (deviation < 10 cm^{-1}), enabling complete assignment of fundamental vibrations. Key features include: (i) C–Cl stretching (656 cm^{-1}), (ii) ring deformation modes (400–650 cm^{-1}), and (iii) C–H stretching of sterically constrained methyl groups (3000–3200 cm^{-1}).

The combined spectroscopic and computational approach elucidates complex steric-electronic interactions in polyfunctional aromatic compounds and provides the first full vibrational assignment of dichloromesitylene, linking its spectroscopic characteristics to synthetic applications.

Keywords: IR; Raman; DFT calculations; Precursor.

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P230 Charged Extracellular Vesicles (EVs) Interfere with *Leishmania* Parasite Binding and Uptake by Phagocytic Cells

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Leishmania donovani is an intracellular protozoan parasite causing visceral leishmaniasis, infecting macrophages and dendritic cells (DCs). This study investigated the role of cationic and anionic extracellular vesicles (EVs) in parasite uptake by phagocytic cells. Flow cytometry and confocal microscopy analyses revealed that mucin-coated EVs strongly bind *Leishmania*, while cationic EVs show slightly weaker interactions. Binding of mucin-coated EVs reduces parasite uptake by macrophages and DCs. Surface plasmon resonance (SPR) experiments demonstrated strong electrostatic interactions between mucin-coated EVs and model membranes mimicking the parasite plasma membrane. These findings highlight the role of host cell membrane lipids and electrostatic interactions in parasite binding and entry.

Keywords: Extracellular vesicles; *Leishmania donovani*; Phagocytosis; Electrostatic interactions; Mucin.

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P231 Low-Cost Adsorbent from Foundry Waste for Congo red Removal: A Study of Adsorption Mechanism and Efficiency

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This study aimed to investigate the adsorption of Congo red (CR) from aqueous solutions using Waste Foundry Sand (WFS) as a low-cost, sustainable adsorbent. The resulting biosorbent was characterized by Scanning Electron Microscopy (SEM), X-ray Diffraction (XRD), Fourier Transform Infrared Spectroscopy (FTIR), Boehm titration, and pH_{pzc}. The Box–Behnken design (BBD) of experiments was applied to determine the influence of initial concentration (A), biomass biosorbent (B), and pH of the solution (C) on CR dye elimination from the aqueous system. The significant interaction between the factors was BC with p-value < 0.05. The biosorption processes followed pseudo-second-order rate kinetics. The equilibrium data were fitted to Langmuir, Freundlich, and Temkin isotherms. Based on R^2, the equilibrium sorption data were better fitted to the Freundlich isotherm model than to any other model. The adsorption reached equilibrium after 60 min, and the maximum adsorption capacity was about 29.57 mg/g at 20 °C according to the Langmuir model. The results indicated that the bioremoval efficiency of 20 mg/L CR reached approximately 90.49%. Thermodynamic parameters of the adsorption ($\Delta H°$, $\Delta S°$, and $\Delta G°$) were also determined, showing that the adsorption of Congo red by WFS was a spontaneous and endothermic process.

Keywords: Adsorption; Photocatalysis; Congo red; Waste Foundry Sand.

P232 Activating Illite Kaolinite Clay with CTAB for Adsorbing Methylene Blue: Isotherms, Kinetics, and Thermodynamics Studies

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This study created a stable multilayered composite by combining illite kaolinite (IKaol) clay with cetyltrimethylammonium bromide (CTAB) surfactant through electrostatic self-assembly. The adsorption efficiency of the IKaol/CTAB composite for removing methylene blue (MB) dye from aqueous solutions was investigated, supported by multiple characterization techniques. Five key factors affecting MB adsorption were optimized using the Box–Behnken design method. The highest removal efficiency (86.24%) was achieved under optimized conditions (0% CTAB loading, 0.06 g adsorbent dose, pH 7, 45 °C, and 17.5 minutes), with an adsorption capacity of 114.94 mg/g. The adsorption process followed the Freundlich isotherm and pseudo-second-order kinetic models. The mechanism involved electrostatic attractions, n–π interactions, and hydrogen bonding. These findings demonstrate that IKaol can serve as an efficient adsorbent for removing cationic dyes from aqueous environments.

Keywords: Illite Kaolinite; CTAB; Methylene blue; Box–Behnken design; Adsorption; Isotherm models.

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P233 Valorization of Waste Foundry Sand for Integrated Removal of Malachite Green Dye via Adsorption and Photocatalysis

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The study investigated the dual functionality of modified waste foundry sand as both an adsorbent and a support for photocatalyst development in removing malachite green dye through adsorption and photocatalysis. The effects of dye concentration, thermodynamic, and material dosage were investigated to assess performance. The resulting sorbent was characterized by Scanning Electron Microscopy (SEM), X-Ray Diffractometer and Fourier Transformer Infrared Spectroscopy (FTIR) techniques, Boehm titration, and pH_{PZC}. The Box–Behnken design (BBD) of experiments was applied to determine the influence of initial concentration (A), dose of adsorbent (B), and pH of the solution (C) for the MG dye elimination from the aqueous system. The significant interactions between the factors were AB and BC with p-value < 0.05. The MG dye adsorption experiments were examined by applying the kinetic and isotherm models and by studying temperature and pH effect. It was found that the MG adsorption followed the pseudo-second-order ($R^2 > 0.99$) and the removal data were well fitted to the Langmuir isotherm model. The Langmuir maximum adsorption capacity Q_m of MG dye was 48.80 mg/g. The experimental results showed that adsorption alone removed approximately 75% of MG within 10 minutes, while photocatalysis achieved a higher efficiency of around 90%. These results confirm the effectiveness of both processes, with photocatalysis showing superior performance thanks to light-induced catalytic degradation. The study reveals the potential of industrial waste as a sustainable, low-cost material for eco-friendly wastewater treatment.

Keywords: Waste Foundry Sand; Adsorption; Photocatalysis; Pollutants; Malachite green.

P234 Quantum Chemical Investigation of Energetic and Reactive Properties of Coumarin Derivatives

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This study focuses on the electrostatic potential (ESP) and its role in determining the structure-activity relationship (SAR) of coumarin-based molecules. By employing quantum chemical calculations, we aim to analyze the molecular electrostatic potential distribution and how it influences chemical reactivity and intermolecular interactions. Additionally, the molecular orbital energies, including the highest occupied molecular orbital (HOMO) and lowest unoccupied molecular orbital (LUMO), will be investigated to understand the electronic properties and stability of coumarin derivatives. These parameters are crucial for predicting the reactivity, potential biological activity, and interaction mechanisms of these compounds. By integrating density functional theory (DFT) and chemoinformatics approaches, this study provides a comprehensive theoretical framework to explore the electronic, structural, and reactivity properties of coumarin derivatives, contributing to the rational design of novel compounds with improved properties.

Keywords: DFT; Coumarin; HOMO; LUMO; SAR; ESP

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P235 Evaluation of the Antioxidant and Antimicrobial Activity of Protein Extracts from Moringa Leaves from the Region of Ghardaïa

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This work aims to evaluate the biological activity of protein compounds extracted from the leaves of *Moringa oleifera* from the region of Metlili (Ghardaïa).

Moringa leaves contain yellowish-green lipids at about 6%. However, they are rich in proteins (25.61% dry matter), particularly albumin (10.786%), which was quantified using two methods (Biuret and Lowry). Lower concentrations were recorded with the Lowry method (6.214–19.732%). Furthermore, local Moringa leaf extracts show good oxidative status, comparable to that of vitamin C, particularly the albumin extract (2.238 mg VCEAC), as evaluated by the phosphomolybdate assay.

The *in vitro* evaluation of the antimicrobial activity of the extracts, using the disc diffusion method on agar medium, showed that *E. coli* and *S. aureus* strains are sensitive to the prolamin fraction, with an inhibition zone of 12 mm.

Keywords: *Moringa oleifera* leaves; Proteins; Antioxidant activity; Antibacterial activity.

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P236 Evaluation of the Impact of Nitrate Pollution on Groundwater Quality Using GIS: Case Study of the Oued Souf Valley (Southeastern Algeria)

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The protection and preservation of groundwater resources represent a vital priority, particularly in arid regions such as the Oued Souf Valley, where they constitute the main water supply.

This study aims to assess and map the quality of groundwater resources through a physicochemical analysis of 42 samples, integrated within a Geographic Information System (GIS) for an in-depth spatial approach.

The results reveal nitrate (NO_3) concentrations ranging from 11.56 to 97.47 mg·L^1, with an average of 51.07 mg·L^1, frequently exceeding the limit of 50 mg·L^1 established by the World Health Organization (WHO, 2008). The highest levels were recorded in the agricultural zones of the central and northern parts of the valley (up to 97.47 mg·L^1 in Sidi Aoun and 92.5 mg·L^1 in Ourmes), while concentrations below the standard were mainly observed in the south.

These variations are mainly explained by the intensification of agriculture in the north and groundwater pollution caused by uncontrolled domestic discharges. The study therefore highlights the urgent need to strengthen sanitation infrastructure, rationalize agricultural practices, and implement integrated water resource management to ensure the sustainability of groundwater in the Oued Souf Valley.

Keywords: Nitrate; Groundwater; Pollution; GIS; Oued Souf.

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P237 Preparation of Nanoparticles by Cold Plasma Technique in the Presence of Clay as an Adsorbent Material

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This research aims to study the preparation of zinc oxide (ZnO) nanoparticles using the cold plasma technique, in the presence of clay as a support material only, without playing any active role in the adsorption process or chemical reactions. Nanoparticles are considered advanced materials that exhibit unique properties due to their small size and large surface area, making them highly effective in various applications such as photocatalysis, water treatment, and medical fields.

Zinc oxide (ZnO) stands out as one of the most important nanostructured semiconductors due to its excellent electrical, optical, and chemical properties.

In this work, the cold plasma technique was employed as a modern physical method to synthesize ZnO nanoparticles, offering the advantage of producing highly pure particles with precise structural characteristics without the need for high temperatures or organic solvents.

Natural clay, such as montmorillonite or sepiolite, was used as a solid support for these nanoparticles because of its suitable structural properties, including its layered structure and large surface area. The aim of integrating clay was to anchor the nanoparticles onto its surface in a uniform manner without agglomeration, ensuring a homogeneous distribution that enhances particle stability and preserves their properties.

Structural analyses (XRD, SEM, TEM) confirmed the successful formation of nanoparticles on the clay surface, showing that the clay acted as a supportive material without influencing the chemical reactions. Moreover, the ZnO/Clay composite retained the intrinsic properties of the ZnO nanoparticles, indicating the success of the preparation method and highlighting the efficiency of the cold plasma technique as an environmentally friendly approach.

Keywords: Nanoparticles; Cold Plasma; Clay; Photocatalysis.

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P238 Green Synthesis of ZnO and AgO Nanoparticles Using *Cornulaca monacantha* Del. Extract: In Vitro Evaluation of Anti-Diabetic Potential

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The increasing prevalence of diabetes mellitus calls for safe and cost-effective therapeutic approaches. In this study, *Cornulaca monacantha* Del., a halophytic plant with ethnopharmacological significance, was employed for the green synthesis of zinc oxide (ZnO) and silver oxide (AgO) nanoparticles. The aqueous plant extract acted as a natural reducing and stabilizing agent under eco-friendly conditions.

The synthesized nanoparticles were characterized using UV-Vis spectroscopy, Fourier-transform infrared spectroscopy (FTIR), and scanning electron microscopy (SEM) to confirm their formation, morphology, and functional group interactions. Their anti-diabetic potential was assessed in vitro via -amylase and -glucosidase inhibition assays. Both ZnO and AgO nanoparticles demonstrated notable inhibitory activity, with AgO showing superior efficacy.

These findings suggest that *Cornulaca monacantha*-mediated nanoparticles are promising candidates for developing novel anti-diabetic agents.

Keywords: *Cornulaca monacantha* Del., green synthesis, ZnO nanoparticles, AgO nanoparticles, anti-diabetic activity

P239 Integrated In Vivo and In Silico Assessment of the Antidiabetic Potential of *Origanum majorana* L. Essential Oil

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Origanum majorana L. essential oil (EO) was evaluated for antidiabetic potential using a multidisciplinary approach. GC-MS analysis identified 42 compounds, with cis-verbenyl acetate (CVA) and -pinene oxide (BPO) as major constituents. In vitro assays demonstrated strong inhibitory activity against -amylase and -glucosidase, which was supported by significant hypoglycemic effects in vivo.

Molecular docking revealed that CVA and BPO have high binding affinities to these enzymes, comparable to acarbose. ADMET profiling indicated favorable pharmacokinetic properties and low toxicity. Molecular dynamics simulations and MM-PBSA analyses confirmed stable interactions and favorable binding energies. Density Functional Theory (DFT) calculations provided insights into the electronic properties and solubility of the active compounds.

These results suggest that *O. majorana* EO and its major constituents possess promising potential as natural antidiabetic agents.

Keywords: *Origanum majorana*, essential oil, diabetes mellitus, -amylase, -glucosidase, molecular docking, ADMET, MD simulation, DFT

P240 QSPR Applications on Heat of Sublimation of Monocarboxylic Acids Using Quantum Molecular Descriptors

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Density Functional Theory (DFT) calculations using the B3LYP method with the 6-31G(d,p) basis set were performed to obtain quantum chemical descriptors for 19 monocarboxylic acids (C2–C20). These descriptors, together with the enthalpies of sublimation (H_{sub}), were used to develop quantitative structure–property relationship (QSPR) models via multiple linear regression (MLR).

A three-descriptor MLR model showed strong predictive performance, with a multiple correlation coefficient $R^2 = 0.994652$, leave-one-out cross-validation $R^2_{LOO} = 0.984681$, and a root-mean-square deviation (RMSD) of 2.70075. External validation confirmed the model's predictive power with $Q^2_{ext} = 0.993678$.

These results indicate that the QSPR model is both stable and predictive, demonstrating strong correlations between molecular structure and enthalpies of sublimation (H_{sub}), total energy, dipole moment, and molecular softness of monocarboxylic acids.

Keywords: Molecular descriptors; Multiple linear regression; Monocarboxylic acids; QSPR; DFT

P241 Leaf Extract from *Azadirachta indica*: Phytochemical Makeup and Antifungal, Antibacterial, and Antioxidant Properties

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The chemical composition and bioactive properties of *Azadirachta indica* A. Juss. leaf extract from arid environments were investigated. LC-MS analysis identified quercetin, oleanolic acid, salicin, and catechin among the major bioactive compounds. Antioxidant activity was evaluated using DPPH (IC_{50} = 25.01 ± 0.71 g/mL), -carotene bleaching (IC_{50} = 22.29 ± 0.66 g/mL), and ABTS (IC_{50} = 45.09 ± 1.23 g/mL) assays.

The extract showed antibacterial activity against *Bacillus subtilis*, *Escherichia coli*, *Staphylococcus aureus*, and *Pseudomonas aeruginosa*, with MIC values ranging from VHC to 30 mg/mL. Antifungal activity was observed against *Alternaria sp.*, *Fusarium solani*, and *Thielaviopsis paradox*.

These results demonstrate that *Azadirachta indica* leaf extract from dry regions exhibits significant antioxidant, antibacterial, and antifungal effects, supporting its traditional use in medicine and agriculture.

Keywords: *Azadirachta indica*; leaf extract; phytochemical profile; antioxidant activity; antibacterial activity; antifungal activity

P242 Evaluation of the Wound-Healing Effect of *Fraxinus angustifolia* Extracts

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Green chemistry emphasizes the design of products and processes that reduce or eliminate hazardous substances, making it highly relevant to the study of medicinal plants. *Fraxinus angustifolia* is traditionally used to treat various pathologies.

This study conducted a phytochemical analysis and evaluated the wound-healing activity of ethanolic extracts from *Fraxinus angustifolia* leaves (FAF) and bark (FAE). Burn wounds were induced in rabbits. Quantitative analysis showed that FAF was richer in polyphenols (515.80 ± 4.43 and 25.55 ± 0.50 mg Catechin Eq/g E) and flavonoids (25.55 ± 0.50 and 24.75 ± 1.72 mg Rutin Eq/g E) than FAE.

Topical application of bark and leaf extracts accelerated wound healing. Both extracts, along with Cicatrol, significantly increased wound contraction ($p < 0.001$): bark extract (95.34 ± 0.82%), leaf extract (98.79 ± 0.45%), and Cicatrol (92.73 ± 0.73%), whereas the placebo group showed 89.93 ± 0.55%.

These findings confirm that *Fraxinus angustifolia* leaves and bark have wound-healing properties, supporting their traditional medicinal use for burns.

Keywords: Wound healing; *Fraxinus angustifolia*; extracts; wound; polyphenols

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P243 Lanthanum- or Iron-Doped Nickel Catalysts for Hydrogen Production via Methane Steam Reforming

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This study investigates the activity and stability of Ni/α-Al_2O_3 catalysts promoted with lanthanum (La) or iron (Fe) for methane steam reforming (MSR) to produce syngas (CO + H_2). A series of bimetallic catalysts with the general formula 10 wt% (Ni–M)/α-Al_2O_3 (M = La, Fe) were synthesized using the incipient wetness impregnation method. To maintain an industrially relevant Ni loading (10 wt%), the Ni-to-La and Ni-to-Fe mass ratios were fixed at 8:2.

Comprehensive characterization—including X-ray fluorescence (XRF), thermogravimetric analysis (TGA), X-ray diffraction (XRD), particle size analysis, H_2-temperature programmed reduction (H_2-TPR), and N_2 adsorption–desorption—was employed to study the structural and physicochemical properties of the catalysts. The addition of La or Fe significantly reduced the average NiO crystallite size, with La yielding the most pronounced reduction and enhanced dispersion due to strong metal–support interactions.

Catalytic tests revealed a strong correlation between the catalyst's temperature profile and MSR activity. The La-promoted catalyst exhibited superior performance, achieving complete methane conversion at 600 °C with high stability. In contrast, the Ni–Fe/α-Al_2O_3 catalyst formed a stable nickel ferrite spinel requiring reduction at ∼800 °C, resulting in lower activity under standard reforming conditions.

Keywords: Nickel Catalyst; Lanthanum; Nickel Ferrite Spinel; Methane Steam Reforming

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P244 Natural Product-Based Antagonists of Estrogen Receptor Alpha (ER): A Computational Approach for Breast Cancer Therapy

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Breast cancer (BC) is the most common malignancy among women, with 70–80% of cases being estrogen receptor alpha (ER)-positive. Although endocrine therapies like selective estrogen receptor modulators (SERMs), aromatase inhibitors (AIs), and selective estrogen receptor degraders (SERDs) are standard treatments, resistance remains a major clinical challenge. Fulvestrant, the first approved SERD, has demonstrated clinical efficacy by degrading ER; however, its poor oral bioavailability and need for intramuscular administration limit its widespread use, highlighting the need for more effective and accessible SERDs.

Citrullus colocynthis (L.) Schrad., a desert plant from the Cucurbitaceae family, has long been recognized for its medicinal properties, including anticancer effects. Its fruits are rich in bioactive compounds such as flavonoids, glycosides, and notably cucurbitacins, a class of highly oxygenated tetracyclic triterpenoids with known antitumor activities.

In this study, the objective was to investigate cucurbitacins as natural alternatives to traditional SERDs like fulvestrant for targeting ER-positive breast cancer. Molecular docking was performed to assess the binding affinities of cucurbitacins to ER, followed by ADMET (Absorption, Distribution, Metabolism, Excretion, and Toxicity) analysis to evaluate their drug-likeness and safety profiles. Additionally, molecular dynamics (MD) simulations were conducted to explore the stability and dynamic behavior of the most promising compounds in complex with ER.

Preliminary findings revealed that cucurbitacins exhibit strong binding affinity and stable interactions with ER, along with favorable predicted pharmacokinetic properties. These results suggest that cucurbitacins could serve as potential natural SERD candidates, offering a new direction for the development of orally available, effective therapies for ER-positive breast cancer.

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P245 Green Synthesis of Hematite (α-Fe_2O_3) and Magnetite (Fe_3O_4) Nanoparticles Using Eco-Friendly Methods and Their Sustainable Applications

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The increasing environmental challenges associated with waste management have intensified the need for sustainable and circular economy strategies. In this study, iron filings—an abundant industrial waste—were valorized as a raw material for the eco-friendly synthesis of hematite (α-Fe_2O_3) and magnetite (Fe_3O_4) nanoparticles through a tailored preparation protocol. Structural and spectroscopic characterizations using Raman spectroscopy, UV-Vis, and Fourier-transform infrared spectroscopy (FTIR) confirmed the successful formation of the desired iron oxide phases, with spectral features consistent with reported data for nanoscale hematite and magnetite. The resulting nanomaterials exhibit a synergistic combination of properties: the strong magnetic behavior of Fe_3O_4 and the high chemical reactivity of α-Fe_2O_3. These multifunctional characteristics make them promising candidates for diverse applications, including biomedical and pharmaceutical fields, water treatment and environmental remediation, energy storage, and solar energy conversion. Overall, this work demonstrates a sustainable route for converting industrial waste into high-value nanomaterials, contributing to both circular economy practices and reduced environmental impact.

Keywords: Green synthesis; Hematite (-Fe_2O_3); Magnetite (Fe_3O_4); Industrial waste valorization; Circular economy; Nanomaterials; Sustainable applications.

P246 Equilibrium, kinetic and thermodynamic study of the adsorption of the drug (Theophylline) on charcoal prepared from eucalyptus leaves

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This study reports the preparation of a novel type of activated carbon derived from eucalyptus leaves collected from the forests of Mosul city. Characterization revealed that the synthesized carbon is nanoscale in nature, with particle sizes ranging from 43.69 to 63.97 nm. The prepared carbon was applied for the removal of the drug theophylline from aqueous solutions. Adsorption isotherm analysis demonstrated that the Langmuir model provided a better fit to the experimental data compared to the Freundlich model, as indicated by higher correlation coefficients (R^2 = 0.9955 for Langmuir vs. 0.9488 for Freundlich). Thermodynamic investigations revealed that the adsorption process is spontaneous, as confirmed by negative ΔG° values, and associated with decreased randomness after adsorption (negative ΔS°). The process was exothermic (ΔH° = 16.899 kJ/mol), and the interaction between the drug and the carbon surface was mainly physical in nature. Kinetic analysis was performed using pseudo-first-order, pseudo-second-order, and intraparticle diffusion models. The results indicated that the adsorption system follows the pseudo-second-order kinetic model, whereas intraparticle diffusion was not the sole rate-controlling step.

Keywords: Eucalyptus leaves, activated carbon, adsorption, theophylline.

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P247 Contribution to the Study of Secondary Metabolites and Some Biological Activities of a Plant of the Genus *Cerinthe*

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For thousands of years, humans have used plants found in nature to treat and cure illnesses. Phytotherapy is an emerging field of medicine worldwide; it represents an interesting alternative to treat and heal without creating new diseases. Despite the phenomenal development of the pharmaceutical and chemical industries, popular interest in herbal medicine has never stopped evolving. This research focuses on several aspects: (i) bibliographical studies on the family, genus, and species of *Cerinthe major* L., (ii) ethnobotanical studies on plants in Algeria, (iii) phytochemical screening, extraction of active ingredients, purification of extracts, and spectral study of isolated compounds, and (iv) recent biological studies on extracts and isolated compounds. **Methods:** Aqueous and ethanolic extracts were prepared, followed by quantitative estimation of metabolites. Antioxidant activities were determined using DPPH, ABTS, and FRAB assays. Qualitative analysis was performed using chromatographic techniques (LC-MS). **Results:** The aqueous extraction method provided the highest yield of compounds, while the ethanolic extraction method gave the lowest yield. These results underscore the variability of extraction efficiencies and highlight the complex array of phytochemicals present in *Cerinthe major* L.

Conclusion: The polarity of solvents plays a crucial role in extraction. Hydrophilic compounds, such as flavonoids and some alkaloids that are abundant in *Cerinthe major* L., are particularly well-extracted by aqueous solvents. This study emphasizes the importance of choosing proper extraction methods to optimize the therapeutic potential of plant-derived compounds. Future research should expand chemical controls and explore biological activities of isolated extracts to fully exploit the medicinal value of *Cerinthe major* L.

Keywords: *Cerinthe major* L.; aqueous extraction; ethanolic extraction; bioactive compounds; phytochemical profile; medicinal plants; solvent polarity.

P248 Sustainable development and environmental transition at the university: Case Study of Promoting Research Products

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Combining knowledge on the traditional use of plants, scientific research on active constituents, and the exploitation of renewable sources of medicinal plants through an eco-responsible approach could be a lever for the national economy. The adopted concept addresses the challenges of the 21st century, protecting both the environment and consumers while improving industrial competitiveness. We adopt an eco-responsible approach to the valorization of plant-based bioactive molecules by using: a new strategy to improve the extraction of phenolic compounds using statistical modeling based on ultrasonic eco-extraction, promoting renewable parts such as buds of the plant and using non-CMR (Carcinogenic, Mutagenic, Non-Reprotoxic, and Non-Volatile) extraction solvents.

The purpose of our study is the valorization of black poplar by the pharmaceutical industry. The extract of *Populus nigra* L. showed no toxicity in several cellular and animal models. Furthermore, the extract demonstrated an antioxidant potential using several approaches. Characterization of the active compounds of black poplar buds revealed the presence of cinnamic acid and ester derivatives, notably caffeic acid and cinnamyl caffeate, and flavonoids such as pinobanksin-3-O-acetate, chrysin, tectochrysin, pinobanksin-5-methyl ether, and kaempferol.

To better exploit bioactive substances in the pharmaceutical industry, a market study was conducted using three approaches: an online questionnaire, a SWOT analysis, and a key tool, the business model canvas.

Keywords: *Populus nigra*, buds, valorisation, SWOT analysis

P249 Synthesized organometallic perovskite CH3NH3SnI2Cl

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Halide organometallic perovskites are crucial for enhancing solar cell efficiency. In this work, we synthesized a basic organic perovskite nucleus and analyzed its properties. X-ray diffraction (XRD) confirmed a homogeneous and preferentially oriented growth along the (100) plane, indicating optimal experimental conditions. Subsequently, a mixture of tin iodide and methylammonium chloride in DMF/DMSO was deposited via spray pyrolysis at 120°C onto a glass substrate, forming a thin black perovskite layer. XRD of this film revealed a preferential orientation along the (110) plane. Optical characterization showed a low band gap of 1.78 eV, a high absorption coefficient of 8×10^4 cm^{-1}, and a low transmittance of 1.6% in the visible spectrum. Despite a relatively high Urbach energy of 0.6 eV, suggesting some crystal disorder, the material's strong optical properties indicate its potential as an active layer in solar cells.

Keywords: Perovskite, methylammonium chloride, Active layer, solar cell

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