PROCEEDINGS OF ABSTRACS
III. INTERNATIONAL BIOLOGICAL & LIFE SCIENCES CONGRESS
BIOLIC 2025

16-19 NOVEMBER, 2025

Megasaray Westbeach Hotel, Antalya, Turkey

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International Researchers Association

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WELCOME NOTES

You are welcome to our III. International Biological and Life Sciences Congress (BIOLIC) which is organized by Trakya University and the International Researchers Association. The congress will be held in Megasaray Westbeach Hotel, Antalya, Turkey, on 16-19 November, 2025 will be normal as well as with online participation.
Our meeting is a premier international science, technology and business forum focusing on Agriculture, Biology and Life Sciences. The program will include oral talks by invited prominent scientists and oral and e poster presentations by participants in selected topics. The Congress is intended that the subjects to be kept broad in order to provide opportunity to the science and research community to present their works as oral or poster presentations in a friendly environment of Antalya, Turkey to share their knowledge and experience and benefit from each other.
The first meeting has been organized in Lviv, Ukraine in 2019 by Trakya University, with part of more than 200 participants from all over the world with 376 scientific papers. In the 2nd congress, there were 68 orals and 64 poster presentation in the congress both joining and presenting normal and online with 101 participants from 22 different countries from the world. The 3rd congress will gather scientists from around the world, and present their recent achievements. The attendees will have ample opportunities for learning, reconnecting, engaging and networking with colleagues from academia and industry as well as meeting with various exhibitors.

As there have been many different scientific meetings around the world, we aimed to bring three different communities together, namely science, research and private investment groups considering practical information sharing that is of value for researchers and scientists from around the world, in a friendly environment of Antalya, Turkey to share their knowledge and experience and benefit from each other as well as prospects to overcome the limitation for sustainable crop production to feed the world.

There are record participation in our 3rd BIOLIC Congress with 600 papers contributed by about 1400 authors from 41 different countries from the world. 233 oral and 205 poster presentations existed in the congress program both joining and presenting normal and online presentations by 188 normal and 144 online as total by 322 participants.

With care for our nature and environment, we aim the green congress, meaning that as little as possible papers will be used. Abstract book is published in electronic book and is distributed to the participants by e mail for online participants. All the e-posters are prepared in electronic form and then submit to via the congress e mail and exhibited in electronical poster boards as well as in online e poster hall in our web page during the congress.

Congress Topics:
Agriculture, Forestry, Life Sciences, Agricultural Engineering, Aquaculture and Biosystems, Animal Science, Biomedical science, Biochemistry and Molecular Biology, Biology, Bioengineering, Biomaterials, Biomechanics, Biophysics, Bioscience, Biotechnology, Botany, Chemistry, Chemical Engineering, Earth Sciences, Environmental Science, Food Science, Genetics and Human Genetics, Medical Science, Machinery, Pharmaceutical Sciences, Physics, Soil Science.

We would like to thank all of you for joining this congress and we would like to give also special thanks to our sponsors and collaborators for giving us a big support to organize this event.

Prof Dr Yalcin KAYA
Head of the Organizing Committee

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CONTENTS

EFFECT OF SOIL AND CLIMATE FACTORS ON BREAD WHEAT GROWTH: ANN ANALYSIS

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ABSTRACT

Bread wheat growth is influenced by a multitude of environmental factors, including those related to soil and climate. These factors are crucial for understanding and predicting wheat yield, which is a vital cereal crop for the global economy. Soil factors include texture, structure, pH, nutrient content, and water-holding capacity. Optimal texture allows for good aeration and root penetration, while an appropriate pH promotes the absorption of essential nutrients. The availability of nutrients such as nitrogen, phosphorus, and potassium is also crucial for healthy wheat growth. As for climate-related factors, climatic conditions, such as temperature, precipitation, and daylight, have a significant impact on wheat growth. Moderate temperatures and well-distributed precipitation support optimal growth. In this study, an artificial neural network analysis system is proposed to model the relationship between these environmental factors and wheat yield. By integrating data on soil and climate conditions as input variables, these systems can accurately predict wheat yield potential. This allows farmers and policymakers to take proactive measures to optimize farming practices and minimize the negative impacts of adverse environmental conditions. Understanding and integrating the effects of soil and climate factors into neural analysis systems is essential to improve the productivity and sustainability of soft wheat cultivation.

Keywords: Bread wheat, environmental factors, soil, climate, ANN modeling

A COMPREHENSIVE EVALUATION OF HERBICIDE RESISTANCE STATUS GLOBALLY IN CEREAL CROPS CULTIVATION

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ABSTRACT

Herbicide resistance in weeds must be minimized, because it is a major limiting factor to food security globally. Weed scientists and evolutionary biologists have to join together towards more integrated understanding of resistance. This approach is likely to simplify the design of innovative solutions to the herbicide resistance challenges. Chemical herbicides exert a high selection pressure on weed fitness, and the diversity of weed community’s changes over time in response to both herbicides and other strategies imposed on them. Repeatedly and intensively, the use of herbicides with the same mode of action may swiftly result in population shifts to tolerant, difficult to suppress and ultimately the development of herbicide-resistant weeds, particularly in absence of using herbicides with different modes of action. The hypotheses and proposals put forward here require field verification, which may prove them to be incorrect.

Keywords: weed fitness, herbicide resistance, selection, mode of action, diversity

WHEAT DWARFING EPIDEMIC IN UKRAINE: CURRENT STATUS AND FUTURE RISKS

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ABSTRACT

Wheat dwarf virus (WDV, Mastrevirus hordei, family Geminiviridae) is a DNA virus that infects wheat, barley, and rye, causing severe dwarfism and chlorosis, often leading to plant death. While symptoms of the disease were first documented in the 19th century, the viral etiology of wheat dwarfism was confirmed only in 1961 by Vacke, who identified the leafhopper Psammotettix alienus Dahlb. as the sole vector. Since WDV is not spread via seed, polen, plant contact, or mechanical means, its distribution is entirely dependent on the life cycle and activity of its vector, which is favored by mild climates characteristic of Eastern Europe. WDV has been present in Ukraine since 2006, but its distribution had previously been limited to southern and central regions. Within the framework of the annual monitoring of viral diseases of cereals in Ukraine, a significant outbreak of WDV was detected in 2025 in the Rivne, Ternopil, and Khmelnytskyi regions. Crops on the southern slopes of these regions were most severely affected, with some farms reporting that 15–20% (2.4–3.2 thousand ha) of winter wheat had been damaged. A similar situation was observed in the northern parts of Vinnytsia and Chernivtsi regions, while only isolated cases were recorded in Kyiv and Cherkasy regions. The presence of the virus in all these regions was confirmed by molecular assays and ELISA. This is the first recorded occurrence of the virus in western Ukraine. The disease affected large areas of wheat fields, forming clearly visible patches of yellowed and stunted plants. Severely infected plants exhibited pronounced dwarfism, extensive yellowing of leaves, and failed spike development. The unusual westward spread of the virus is likely associated with a mild autumn in 2024, which may have stimulated high leafhopper activity and widespread infection during the most vulnerable growth stages of seedlings. Our field research results indicate a growing threat to wheat production in previously unaffected regions. Based on prior studies of Ukrainian WDV isolates demonstrating a correlation between infection rates and crop damage, potential yield losses are foreseeable and will be assessed after harvest. These results raise concerns about the severe consequences of climate change, which may accelerate the spread of cereal virus vectors, increase the number of vector generations, and intensify disease pressure during late summer and early autumn – the most critical period for infection onset.

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Keywords: wheat dwarf virus, climate change, WDV outbreak, Geminiviridae, Psammottetix alienus, epidemiology

PREDICTING MAIZE SEED YIELD AND GRAIN MOISTURE WITH DYNAMIC, MOISTURE-SENSITIVE REMOTE SENSING INDICES

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ABSTRACT

Effective management of maize seed production requires intensive monitoring of both yield potential and factors impacting post-harvest costs, such as grain moisture. This study evaluates the ability of dynamic vegetative indices, particularly those derived from Short-Wave Infrared (SWIR) and Near-Infrared (NIR) satellite bands sensitive to water content, to predict final yield and harvest moisture. Data were collected from 71 commercial maize seed production fields in Southwestern Turkey between 2021 and 2024. Final yield and grain moisture were measured at an industrial scale. Multispectral Sentinel-2 imagery was used to calculate dynamic traits as area under the curve (AUC) integrals for various vegetative indices across different 45-day windows. Partial least squares (PLS) regression models were developed and validated using the 5-fold cross validation to assess predictive power. Our results showed that dynamic, moisture-based indices could effectively predict both target variables, but at different critical growth stages. Final grain yield was best predicted early in the season using an AUC window from 30 to 75 days after planting (DAP), achieving a cross-validated R2 of 0.33. In contrast, final grain moisture was most accurately predicted using a later window from 60 to 105 DAP (cross-validated R2 = 0.45). Notably, the Moisture Stress Index (MSI) was a top predictive variable for both models, highlighting the importance of canopy water status. These findings demonstrate that time-series analysis of SWIR and NIR-based indices provides a dual-forecasting capability: an early-season indication of yield potential and a later, more accurate prediction of harvest moisture. This information can be utilized in seed business to optimize harvest scheduling, better manage drying costs, and improve overall operational efficiency.

Keywords: maize seed production, grain moisture, remote sensing, SWIR, data-driven, satellite

EFFECT OF NACL STRESS ON THE YIELD, PHENOLIC CONTENT, AND PIGMENT COMPOSITION OF BROCCOLI, WHEAT, AND RADISH MICROGREENS

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ABSTRACT

This study investigated the physiological and agronomic responses of three commercially important microgreen species: broccoli (Brassica oleracea var. italica), wheat (Triticum aestivum), and radish (Raphanus sativus) to salinity stress induced by sodium chloride (NaCl) at concentrations of 0 mM (control), 25 mM, 50 mM, and 100 mM. The experiment was conducted under controlled conditions with four replicates per treatment, randomly distributed across three shelves. Due to poor germination and growth at 100 mM, this concentration was excluded from statistical analysis. This exclusion highlights the very low salinity tolerance of microgreens at early developmental stages. Measured parameters included fresh mass yield (g), moisture content (%), total phenolic content (mg/100 g fresh weight), and photosynthetic pigments (chlorophyll a, chlorophyll b, total chlorophyll, carotenoids, and chlorophyll a/b ratio, expressed as mg/100 g fresh weight). Data were analyzed using Linear Mixed-Effects Models (LMM), Analysis of Variance (ANOVA), correlation analysis, polynomial regression, and Principal Component Analysis (PCA) in R, with fixed effects of species, treatment, and their interaction, and random effects for shelf and replicate. The results revealed a statistically significant interaction between the species and the applied NaCl treatment for yield, moisture content, and the chlorophyll a/b ratio (p)

Keywords: Microgreens, Salinity Stress, Yield, Phenolic content, Photosynthetic pigments

THE IMPORTANCE OF INTERCROPPING IN FORAGE PRODUCTION

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ABSTRACT

Intercropping systems that combine cereals with legumes or other forage species have gained increasing attention due to their potential to improve forage yield and nutritive value. Integrating cereals with protein-enhancing species offers both nutritional and economic benefits, particularly in silage production. Numerous studies have demonstrated that intercropping maize with legumes such as soybean, cowpea, or common vetch results in higher dry matter yield and crude protein content compared to sole cropping. For instance, mixed maize–soybean systems produced forage with 11–51% greater crude protein content than pure stands. Similarly, intercropping faba bean with wheat improved dry matter yield and enhanced crude protein, neutral detergent fiber (NDF), and water-soluble carbohydrate (WSC) levels compared to sole crops. Pea–barley and pea–oat mixtures have also been reported to increase forage yield and quality, with land equivalent ratio (LER) values of 1.05–1.24 for biomass and 1.05–1.26 for crude protein, confirming the advantage of intercropping. Maize–legume mixtures consistently show higher digestibility, greater ash content, and reduced NDF and acid detergent fiber (ADF) compared to sole maize. Furthermore, vetch–cereal combinations and specific seeding ratios, such as 65:35 vetch:barley, have been found to optimize forage quality. Overall, intercropping systems effectively enhance forage production by increasing dry matter yield, improving crude protein levels, and enriching digestibility, thereby meeting livestock nutritional needs while promoting sustainable and efficient use of arable land.

Keywords: Intercropping, Forage crops, Crude protein, Dry matter yield, Silage quality, Legume–cereal mixtures, Nutritional improvement

EFFECTS OF PLANT GROWTH-PROMOTING RHIZOBACTERIA-BASED BIOFERTILIZER ON RICE GROWTH AND YIELD

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ABSTRACT

Rice (Oryza sativa L.) is a staple food in Indonesia. However, in 2021, a decrease in harvested rice area was observed, and the corresponding productivity did not significantly increase. A contributing factor to this trend is the overuse of chemical fertilizers and pesticides, leading to environmental degradation manifested as reduced soil quality and fertility. Consequently, biofertilizers are increasingly being adopted as a replacement for chemical inputs. This study investigates a biofertilizer formulation composed of four plant growth-promoting rhizobacteria (PGPR) isolates. The primary objective was to evaluate the impact of this PGPR-based biofertilizer on rice growth and yield through a field experiment. The experimental design included a control treatment (no biofertilizer) and nine biofertilizer treatments, varying in application frequency and rate. The results demonstrated that the PGPR-based biofertilizer significantly influenced rice growth and yield parameters. Specifically, the A2B3 treatment, applied at a rate of 240 ml/plot every 6 days, exhibited the most promising results, achieving a grain yield of 13.7 tons ha^{-1}, which was statistically superior to the control treatment (9.2 tons ha^{-1}). These findings highlight the potential of this PGPR-based biofertilizer formula as an effective strategy for enhancing rice production

Keywords: biofertilizer, PGPR, rice, yield

MOLECULAR IDENTIFICATION AS A CRITICAL STEP IN SCREENING SOIL BACTERIA FOR PGPR USE

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ABSTRACT

In recent years, increasing attention has been directed toward the isolation and characterization of beneficial soil bacteria with plant growth-promoting (PGPR) properties and/or biocontrol potential. These microorganisms play a crucial role in sustainable agriculture by enhancing nutrient availability, stimulating plant development, and suppressing soil-borne pathogens through various direct and indirect mechanisms. Research efforts in this area typically begin with the screening of bacterial isolates for specific functional traits, including siderophore production (which enables iron acquisition), synthesis of phytohormones such as indole-3-acetic acid (IAA), phosphate solubilization (improving phosphorus uptake), and ACC deaminase activity (which mitigates plant stress caused by ethylene accumulation). In addition, many studies assess the antagonistic potential of isolates against phytopathogenic fungi, as this is a key indicator of biocontrol capability. Collectively, these functional attributes form the foundation for selecting promising candidates for bioinoculant development and further field application. However, initial screening is often conducted prior to taxonomic identification, which poses a potential biosafety issue if isolates belong to species that may be pathogenic to humans, plants, or other organisms. The aim of this study was to investigate the presence of potentially pathogenic bacteria in soil samples used for the isolation of PGPR candidates. Thirteen soil samples were collected from different locations across Serbia. Bacteria were isolated using the standard serial dilution plating method on nutrient agar, without pre-selection, in order to capture the full diversity of cultivable strains. All isolates were subjected to 16S rDNA sequencing for taxonomic identification. Identification of isolates was performed based on the 16S RNA gene sequences by using P0 (5′-GAGAGTTTGATCCTGGCTCAG-3′) and P6 (5′-CTACGGCTACCTTGTTACGA-3′) primers, while the sequenced was done by using commercial service (Macrogen Europe). Based on the obtained sequences, the Neighbour-Joining (NJ) phylogenetic tree was constructed in Mega V.11 program. Molecular analyses revealed the presence of Lysinibacillus fusiformis—a species with literature-documented opportunistic pathogenic potential—in two out of thirteen samples. According to published studies, strains of L. fusiformis have been associated with human diseases such as tropical ulcers and dermal or respiratory infections. No potentially pathogenic species were detected in the remaining eleven samples. These findings underscore the importance of molecular identification of soil isolates intended for agricultural application, especially in the context of bioinoculant development. Genetic characterization at an early stage of screening can serve as an essential tool for ensuring the biosafety and regulatory compliance of microbial-based products. In conclusion, when identifying such species additional analyses are required in order to evaluate the safety of its further use.

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Keywords: PGPR, soil bacteria, 16S rDNA sequencing, Lysinibacillus fusiformis, biosafety, microbial inoculants, opportunistic pathogens, sustainable agriculture

EFFECT OF THE BACTERIAL STRAIN BACILLUS THURINGIENSIS BHC 2.4 ON PHYSIOLOGICAL PARAMETERS OF BARLEY GROWN UNDER GREENHOUSE CONDITIONS

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ABSTRACT

The increasing need for sustainable agricultural practices has driven interest in the application of plant growth-promoting rhizobacteria (PGPR), which can enhance crop performance by improving nutrient uptake, stimulating growth, and alleviating plant stress. Among PGPR, certain strains of Bacillus thuringiensis—known primarily for their insecticidal properties—have also shown potential for biostimulant activity in non-target plants. In this study, we evaluated the impact of the native bacterial strain Bacillus thuringiensis BHC 2.4 on the physiological status of barley (Hordeum vulgare L.) under semi-controlled conditions. A pot experiment was set up in a greenhouse using two treatments: (1) a non-treated control and (2) a bacterial treatment where barley seeds were inoculated with a suspension of BHC 2.4 culture. Plants were grown for a period of two months, after which key physiological parameters were assessed using a Dualex Scientific leaf-clip sensor. The following parameters were measured: nitrogen balance index (NBI), chlorophyll content (Chl), flavonoid content (Flav), and anthocyanin content (Anth). These indicators are commonly used to evaluate plant nutritional status and stress levels. Specifically, NBI reflects nitrogen assimilation and availability; chlorophyll content is directly related to photosynthetic efficiency; while flavonoids and anthocyanins are secondary metabolites whose accumulation is often induced by abiotic stress factors. Results showed that plants treated with BHC 2.4 exhibited a 22.9% increase in NBI and a 13.8% increase in chlorophyll content compared to the control, indicating enhanced nitrogen use efficiency and improved photosynthetic capacity. In contrast, flavonoid and anthocyanin levels were reduced by 9.3% and 36.4%, respectively, in treated plants. The reduction of these compounds suggests a lower stress burden in plants exposed to bacterial treatment, potentially due to improved nutrient status and microbial-mediated alleviation of stress. These findings highlight the potential of Bacillus thuringiensis BHC 2.4 as a multifunctional PGPR strain capable of improving crop quality and resilience. Its application could contribute to the development of environmentally friendly agricultural inputs that reduce reliance on synthetic fertilizers and enhance plant productivity through natural mechanisms. Future work will focus on field validation and elucidating the molecular mechanisms underlying the observed effects.

Funding: This research was funded by the Ministry of Science, Technological Development and Innovations of the Republic of Serbia, contract Nos. 451-03-136/2025-03/200011, 451-03-136/2025-03/200214 and by the Science Fund of the Republic of Serbia, GRANT No. 10815, The necessity of healthy crops: Development of a multifunctional bacterial inoculant for the biological protection of cereals - BioHealCrop.

Keywords: Bacillus thuringiensis, PGPR, barley, nitrogen balance index, chlorophyll, flavonoids, biostimulant, stress mitigation.

LOCAL MICROBIOMES, GLOBAL SOLUTIONS: THE FUTURE OF CROP BIOPROTECTION LIES IN NATIVE BACTERIAL BIOINOCULANTS

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ABSTRACT

Cereal crops, including wheat, barley, and oats, are fundamental to global food security but are increasingly exposed to the adverse impacts of climate change, which is altering the dynamics of soil-borne phytopathogens. Rising temperatures, erratic precipitation, and extreme weather events have been linked to the enhanced survival, virulence, and spread of pathogens such as Fusarium, Pythium, and Rhizoctonia spp., leading to significant yield losses, quality reduction, and increased contamination with mycotoxins. Traditional reliance on chemical pesticides to manage these pathogens is proving unsustainable due to declining efficacy under variable climatic conditions, the emergence of resistant pathogen strains, and growing concerns over environmental pollution and human health risks. Microbial biocontrol represents a promising, eco-friendly alternative, particularly through the use of plant growth-promoting rhizobacteria (PGPR) such as Bacillus and Pseudomonas species. These beneficial microbes exhibit multiple antagonistic mechanisms—ranging from the production of antifungal compounds (e.g., iturins, fengycins, phenazines), secretion of siderophores and hydrolytic enzymes, to the induction of systemic resistance and effective rhizosphere colonization—making them valuable agents in plant protection. Their spore-forming ability and stress tolerance further enhance their potential for application in diverse agroclimatic zones. However, a key limitation of currently available bioinoculants is their inconsistent field performance, often due to poor adaptation of commercial strains to local environmental and soil conditions. This has led to a novel and increasingly supported paradigm: the exploration and utilization of native, locally adapted microbial strains for the development of next-generation bioinoculants with superior efficacy and ecological compatibility. These native strains, derived from region-specific soil microbiomes, are more likely to exhibit robust performance under local abiotic stresses and may establish more stable interactions with plants. It also highlights the strategic importance of integrating microbiome research, local soil biodiversity, and targeted strain selection into the development of next-generation bioinoculants. By harnessing the functional potential of indigenous microbial communities—adapted to specific climatic and edaphic conditions—it is possible to discover strains with superior efficacy, environmental resilience, and compatibility with native agroecosystems. This integrative approach not only enhances the reliability and performance of biocontrol agents in the field, but also aligns with key objectives of EU strategies such as the Farm to Fork and European Green Deal, which aim to reduce chemical pesticide use by 50% by 2030, restore soil health, and support biodiversity-based sustainable agriculture. Developing bioinoculants from native beneficial bacteria offers a climate-smart solution for the sustainable protection of cereal crops against emerging soil pathogens. This review underscores the need to shift from generalized, commercial approaches toward

regionally optimized microbial biocontrol, tailored to local agroecosystems. Such innovation is not only critical for maintaining crop productivity and food security under climate stress, but also for meeting the long-term goals of ecological intensification and sustainable agriculture.

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Keywords: native soil bacteria, bioinoculants, microbial biocontrol, cereal crops, climate-smart agriculture

ANTIFUNGAL POTENTIAL OF SOIL BACTERIAL ISOLATES FROM CLAY LOAM SOIL AGAINST FUSARIUM OXYSPORUM

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ABSTRACT

Climate change and its associated environmental shifts have contributed to the increased prevalence and persistence of phytopathogenic fungi in agricultural ecosystems. The widespread use of chemical fungicides, while effective, poses risks to environmental and human health and often leads to the development of resistant fungal strains. As an eco-friendly alternative, native soil bacteria—particularly those adapted to specific local soil types, many of whose physical and chemical properties are influenced by soil texture—represent a promising source of biological control agents for plant protection. Among phytopathogenic fungi, Fusarium oxysporum stands out as a globally distributed species that infects a wide range of economically important crops, resulting in significant yield losses. In this study, we evaluated the potential of a specific soil type to serve as a reservoir of bacterial strains with antifungal activity against F. oxysporum. The soil sample was collected from the region of Čačak, Republic of Serbia. Physical analysis of the sample included particle size analysis, determination of textural class, particle density, and water content on a mass basis. Bacterial strains were isolated using a standard dilution plating method on nutrient agar. Antagonistic activity against F. oxysporum was assessed using the dual culture method: 20 µL of bacterial suspension was spotted onto PDA plates, followed by placement of a 5 mm fungal mycelial plug in the center. Plates were incubated for five days, after which fungal growth was measured and the percentage of growth inhibition calculated. The most efficient isolate was identified based on partial 16S rRNA gene sequencing using universal primers P0 (5′-GAGAGTTTGATCCTGGCTCAG-3′) and P6 (5′-CTACGGCTACCTTGTTACGA-3′), with sequencing services provided by Macrogen Europe. Of all isolates, 12% exhibited moderate antifungal activity, ranging between 10% and 32% fungal growth inhibition. The most effective isolate, BHC8.4, inhibited fungal growth by up to 90%. This isolate was genetically identified as Bacillus pseudomycoides. The results indicate that Clay loam soil, with a particle size distribution of 52.8% sand, 31.3% silt, and 15.9% clay, may represent a promising reservoir of bacterial strains with antifungal potential. Given that a considerable number of isolates displayed at least moderate activity, and one isolate demonstrated a high level of inhibition, soils of this texture class warrant further investigation as a potential source of novel biocontrol agents suitable for development into bio-based plant protection products.

Funding: This research was funded by the Ministry of Science, Technological Development and Innovations of the Republic of Serbia, contract Nos. 451-03-136/2025-03/200011, 451-03-136/2025-03/200214 and by the Science Fund of the Republic of Serbia, GRANT No. 10815,

The necessity of healthy crops: Development of a multifunctional bacterial inoculant for the biological protection of cereals - BioHealCrop.

Keywords: soil bacteria, antifungal activity, Fusarium oxysporum, Bacillus pseudomycoides, biocontrol, Clay loam, PGPR, 16S rRNA identification, sustainable agriculture

FUSARIUM POAE IN CEREAL CROPS: CURRENT KNOWLEDGE AND PERSPECTIVES FOR BACILLUS-BASED BIOLOGICAL CONTROL

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ABSTRACT

Fusarium poae is an increasingly recognized but underexplored phytopathogen affecting economically important cereal crops such as wheat, barley, and oats. Although other Fusarium species—most notably F. graminearum and F. culmorum—have been extensively studied, F. poae remains among the least investigated, despite its role in causing Fusarium head blight (FHB), reducing grain yield and quality, and producing harmful mycotoxins such as nivalenol, enniatins, and beauvericin. Climate variability and limitations in the efficacy and safety of chemical fungicides highlight the need for sustainable alternatives. To date, most research on F. poae has focused on its pathogenicity mechanisms, epidemiology, and the spectrum of mycotoxins it produces, such as nivalenol and enniatins. Studies have also investigated environmental factors influencing its prevalence and interactions with host plants, yet limited attention has been given to developing effective and sustainable control measures. The use of bioinoculants based on beneficial bacteria represents a sustainable alternative to chemical pesticides, reducing environmental pollution and preserving soil and plant health. This approach is particularly important in cereal production, where excessive use of chemical pesticides poses a risk to food safety and long-term soil fertility. This review aims to raise awareness of the importance of studying Fusarium poae as a neglected pathogen and to encourage further research toward the development of effective biological solutions based on Bacillus spp. Based on published studies, strains of Bacillus velezensis, B. subtilis, B. amyloliquefaciens, B. inaquosorum, and B. nakamurai have shown promising antifungal effects against F. poae through multiple mechanisms. These include the production of antimicrobial lipopeptides (e.g., surfactin, iturin, fengycin), secretion of cell wall-degrading enzymes (chitinases, glucanases), synthesis of siderophores that limit iron availability to the pathogen, biofilm formation, and strong rhizosphere competence. Some strains also promote plant health by producing phytohormones (such as indole-3-acetic acid), enhancing systemic resistance, and improving nutrient uptake. By compiling these findings, this review underscores the importance of further investigating F. poae and advancing the application of selected Bacillus strains as biocontrol agents. Their multifunctional traits make them strong candidates for inclusion in integrated pest management (IPM) programs aiming at sustainable protection of cereal crops.

Funding: This research was funded by the Ministry of Science, Technological Development and Innovations of the Republic of Serbia, contract Nos. 451-03-136/2025-03/200011, 451-03-136/2025-03/200214 and by the Science Fund of the Republic of Serbia, GRANT No. 10815, The necessity of healthy crops: Development of a multifunctional bacterial inoculant for the biological protection of cereals - BioHealCrop.

Keywords: Fusarium poae, biological control, Bacillus spp., current knowledge, cereal crops

PERFORMANCE EVALUATION OF IRRIGATION ASSOCIATIONS; THE CASE OF ANKARA PROVINCE

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ABSTRACT

Due to the agricultural sector having the greatest need for clean water usage, water management in this area is becoming a priority. In Turkey, agricultural irrigation management is carried out by local public institutions, irrigation unions, and irrigation cooperatives. Irrigation unions hold an important place in water management due to their producer participation and operation of 23% of the total irrigation area. This study aims to present the comparative performances of irrigation unions in Ankara province. The main material of the study consists of secondary data obtained from the unions in Ankara province for the year 2024. The unions were comparatively evaluated using water distribution and financial performance indicators. In light of the data obtained, it was determined that there were no significant differences among the three irrigation unions in terms of water distribution and financial performance dimensions, and that their examined performances were not at the desired level. It is observed that various improvements and developments are needed for irrigation unions to gain an effective and sustainable operational structure. Additionally, it can be stated that financial and personnel support from State Hydraulic Works (DSI) and related organizations may be important for the unions to provide more effective services.

Keywords: Irrigation association, Performance indicators, Water resources

EXAMINING THE IMPACT OF RURAL TOURISM ON RURAL DEVELOPMENT: THE EXAMPLE OF KUYUCAK VILLAGE

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ABSTRACT

Rural development is the improvement of socially, economically, and culturally disadvantaged conditions of those living in rural areas compared to urban areas. Rural tourism is one of the types of activities that support rural development. This study examines the effect of lavender production on rural tourism in Kuyucak Village of Isparta province. The main material of the study consists of data from 74 residents of Kuyucak village who are involved in lavender production and rural tourism, collected through purposive sampling method and surveys. Rural tourism takes place during the lavender production season in Kuyucak village. Within the scope of the study, the majority of the local population (89%) engages in lavender production, as well as participating in rural tourism activities such as guiding nature walks, photo shoots in lavender fields, production of local foods and lavender-based products, and operating guesthouses. It has been determined that with the start of lavender production in the village, the promotion of the village and economic development have been supported. However, due to the limited lavender production period and the lack of other supporting activities in the village afterwards, it is stated that visitors generally stay for 3-5 hours (58.1%). It is recommended to extend visit durations with different tourist activities and to spread this model to other rural areas.

Keywords: Rural tourism, Lavender, Kuyucak village

CHEMICAL PROFILING OF BIOACTIVE METABOLITES FROM ANTAGONISTIC BACILLUS VELEZENSIS STRAINS

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ABSTRACT

Bacillus species are well-known for synthesizing a broad spectrum of secondary metabolites with antimicrobial properties and plant growth-promoting potential. Among these, volatile organic compounds (e.g. alkanes, alcohols, carboxylic acids, ketones) and lipopeptides (e.g. surfactin, iturin, fengycin, kurstakin) are increasingly gaining attention for their potential applications in biotechnology. In this study, we chemically characterized ethyl acetate extracts of four Bacillus velezensis strains (P-FC 55, RD-FC 88, R-FC 102, and R-FC 114) with confirmed antagonistic activity against Xanthomonas campestris pv. campestris, aiming to reveal bioactive secondary metabolites potentially responsible for their antimicrobial effects. The analysis was performed using Gas Chromatography/Mass Spectrometry (GC/MS) for the detection of volatile organic compounds and Ultra-high-performance liquid chromatography coupled to quadrupole time-of-flight tandem mass spectrometry (UHPLC Q-ToF MS) for lipopeptide profiling. GC/MS analysis detected 96 compounds in the ethyl acetate extracts of four tested B. velezensis strains. The most abundant compounds, each with a relative abundance greater than 1% across all strains, included 2,3-butanediol, urea, phosphoric acid, succinic acid, thymine, phenylalanine, 9H-purin-6-ol. The analysis also detected several unidentified compounds (designated as MS 4 – 6, MS 8, MS 12–15, MS 20–24, MS 29, and MS 30), which could not be matched with spectra from the used MS libraries. UHPLC-QToF-MS analysis revealed only the presence of different isoforms of surfactin (C12–C17) in all four strains. However, the exclusive detection of this lipopeptide family may be attributed to the specific growth conditions applied, and it is likely that additional lipopeptides could be produced under different cultivation conditions. In both types of analyses, none of the detected metabolites were unique to any specific strain; all identified compounds were shared among the four B. velezensis strains. Differences between tested strains were only observed in terms of the abundance of detected metabolites. The results indicate that the identified compounds, known

for their antimicrobial properties, may play a role in the antibacterial activity of B. velezensis strains against X. campestris pv. campestris, highlighting their potential for development into biopesticide formulations for use in black rot control.

Keywords: GC/MS, UHPLC Q-ToF MS, Volatile organic compounds, Lipopeptides, Antimicrobial activity

Acknowledgment: This research was supported by the Science Fund of the Republic of Serbia, #GRANT No.10837, A "vaccine" for black rot – biocontrol of Xanthomonas campestris pv. campestris on autochthonous cabbage cultivar Futoški using plant-associated beneficial bacteria – XanthoSTOP, and is also supported by the Ministry of Science, Technological Development and Innovation of the Republic of Serbia (Contract Nos. 451-03-136/2025-03/200053, 451-03-136/2025-03/200010, 451-03-137/2025-03/200116, 451-03-136/2025-03/200168).

IMPACT OF AN ALGERIAN ULOCLADIUM SP. ISOLATE ON SEED GERMINATION IN BREAD AND DURUM WHEAT VARIETIES

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ABSTRACT

Seedborne fungal pathogens pose a significant threat to cereal crop establishment by reducing germination rates and early seedling vigor. Among them, species of the genus Ulocladium have been increasingly reported in wheat and other cereals as emerging contaminants capable of impairing seed quality and germination potential. This study aimed to assess the aggressiveness of a locally isolated Ulocladium sp. from Algerian wheat fields on the seed germination of eight commonly cultivated wheat varieties (six durum wheat varieties, VD, and two bread wheat varieties, VT). Seeds from each wheat variety were surface-sterilized and placed in Petri dishes lined with sterile absorbent paper. Each plate was inoculated with 10 mL of a conidial suspension of Ulocladium sp. The Petri dishes were then incubated under controlled conditions for 6 days. Control plates were treated with sterile distilled water instead of the conidial suspension. Germination inhibition was assessed after 3 days of incubation, while symptoms were observed daily from day 3 to day 6. The results revealed considerable variation in susceptibility among the tested wheat varieties, with germination inhibition percentages ranging from 7.69% to 50%. Durum wheat varieties were generally more affected than bread wheat varieties. Specifically, VD1 exhibited a moderate inhibition rate of 28%, while VD4 showed the highest inhibition at 50%. In contrast, VT1 and VT2 recorded the lowest germination inhibition rates, at 7.69% and 10%, respectively. Despite the moderate inhibition rates, disease symptoms were observed in all varieties, including those that had germinated. Infected seeds displayed signs of soft rot and fluid exudation, with some becoming completely decayed and releasing a greenish exudate. Additionally, emerging radicles were shorter than normal, brownish in colour, and appeared wilted.This study demonstrates that the Algerian isolate of Ulocladium sp. can significantly reduce seed germination and affect early seedling health in wheat, with clear varietal differences in susceptibility. The observed symptoms suggest that this isolate may pose a risk to seed quality and early plant establishment, even in seeds that manage to germinate.

Keywords: Ulocladium sp.; seed germination; varietal susceptibility; wheat.

THE IMPACT OF AGRICULTURAL INPUTS ON CO2 EMISSSIONS: EVIDENCE FROM TURKISH AGRICULTURE THROUGH THE GRANGER CAUSABILITY TEST

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ABSTRACT

It is well known that approximately 20% of global greenhousegas emissions consist of carbon dioxide (CO_2). In this context, policies and actions aimed at reducing CO_2 emissions play a significant rolein combating climate change.This study aims to investigate the effects of certain keyagricultural inputsnamely, the use of agricultural machinery(representing the level of mechanization), chemical fertilizers, and pesticideson carbon dioxide (CO_2) emissions in Turkeyover the period 1999-2021.To reveal the environmental impacts of agricultural activities, the causality relationship between these variables and CO_2 emissions was analyzed using the Granger causality test. Thedata used in the study were obtained from the TurkishStatistical Institute (TurkStat) and the Food and AgricultureOrganization (FAO). According to the results of the Granger causality test, a unidirectional causality was identified from pesticide andfertilizer use and the number of agricultural machines to theincrease in CO_2 emissions. This finding indicates that theseagricultural inputs significantly influence CO_2 emissions. Population growth, increasing food demand, and the pressureto enhance productivity in agricultural production haveconsiderably intensified the use of these inputs over time. Therefore, agricultural production processes need to be restructured in line with the principles of environmentalsustainability. In particular, pesticide and fertilizerapplications should be carried out in accordance with theactual needs of the crops, and cooperative-based approachesshould be encouraged to ensure the shared use of agriculturalmachinery. In this way, both the input costs for producers can be reduced and the environmental impacts can be minimized.

Keywords: Fertilizer, Pesticide, CO2 Emissions, Agricultural Machinery

THE ART AND SCIENCE OF QUEEN BEE REARING FOR THRIVING APICULTURE

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ABSTRACT

This study delves into the core of modern beekeeping, focusing on queen bee rearing through an advanced technique: grafting**.** Our objective was twofold: not only to highlight this crucial method but also to refine its application. Why? Because producing high-quality queens is the cornerstone for enhancing both the yields and quality of apicultural products. Our research was meticulously conducted on Mr. Bennaidja Samir's private property, nestled in the picturesque regions of Hammam El Sokhna and Dahamcha. The results we obtained are remarkably encouraging: an 87.5% acceptance rate of grafted larvae and an 85% emergence rate of queen cells. These highly satisfactory figures attest to the effectiveness of the mastered grafting technique. Beyond practical experimentation, we also carried out a comprehensive assessment of the beekeeping sector in the Sétif wilaya. Through a rigorous field study, including a detailed questionnaire administered to 40 beekeepers across four regions (North, Center, West, and South), we were able to evaluate the adoption of this innovative technology and conduct an in-depth case study on queen rearing. The findings of this survey are significant: out of the 40 beekeepers interviewed, only 22.5% practice queen rearing. Among these, a significant majority (66.66%, or 6 out of 9 beekeepers) have already integrated the grafting technique into their practices. This data highlights both the developmental potential of this technique and the path that remains for wider adoption.

Keywords: Queen bee rearing, grafting, questionnaire, Sétif, Apis mellifera.

COMPARATIVE TESTING OF SUNFLOWER HYBRIDS IN THE SOIL AND CLIMATIC CONDITIONS OF THE TUTRAKAN REGION

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ABSTRACT

The field experiment was carried out in the area of the village of Tsar Samuil (North-East Bulgaria) during the period 2022–2024. The test was performed by means of a block method with four replications; experimental field area – 25 m2 after wheat as winter predecessor. The following sunflower hybrids were tested; LG5665, LG50510, LG5478 and LG5662. The aim of the investigation was to determine the production potential of the tested sunflower hybrids in the region of North-East Bulgaria. The analysis of the results showed that the the highest values of the productivity elements were reported for the LG56.65 hybrid and the lowest – for the LG56.62 hybrid. The LG56.65 hybrid was most suitable for growing under the conditions of North-East Bulgaria; it gave maximum average seed yield (275 kg/da) during the three years of testing.

Keywords: sunflower, hybrids

STUDY OF HARMFUL AND BENEFICIAL ENTOMOFAUNA ON ZEA MAYS IN THE NORTHEAST BULGARIA

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ABSTRACT

Maize (Zea mays) is a globally important crop for food, feed and industrial use, but is vulnerable to various pests that can reduce yield and quality. In parallel, the natural enemies of these pests (entomophages) play a critical role in maintaining ecological balance. The aim of this study is to establish the species composition of harmful and beneficial entomofauna, the dominant harmful species and their entomophages, as well as the indices of species diversity, uniformity and similarity in maize crops. The observations were conducted in the period 2022-2024, in the land of the village of Tsar Samuil - Tutrakan. To establish the species composition of the entomofauna, the population density of the dominant harmful species and their entomophages, classical methods were used - mowing with an entomological bag and direct counting of individual plants in the field. Monitoring of the entomofauna shows differences in the quantitative and qualitative composition of harmful and beneficial insects during the three years of the study.

Keywords: entomofauna, Zea mays

ASSESSMENT OF THE EFFECTIVENESS OF THE WATERBOXX DEVICE ON THE GROWTH AND SURVIVAL OF YOUNG WOODY PLANTS UNDER WATER STRESS CONDITIONS

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ABSTRACT

The water resource situation in Algeria is a cause for concern, due to both a lack of rainfall and the overexploitation of groundwater. Irrigation is one of the main water-consuming sectors in Algeria, putting additional pressure on already limited resources. In response to these challenges, this study was designed to explore an agricultural adaptation solution by testing the effectiveness of a passive water collection device (Waterboxx) on the growth and survival of young trees of socio-economic interest. The study was conducted over two consecutive agricultural years (2023/2024 and 2024/2025) at the experimental farm of the Faculty of Natural and Life Sciences (FSNV), University of Blida 1. The main aim of this research was to evaluate the effectiveness of the innovative Waterboxx system in improving the growth and viability of young plantations in water-deficient conditions. The experiment focused on two Mediterranean woody species: the olive tree (Olea europaea L.) and the carob tree (Ceratonia siliqua L.). For each species, the sample consisted of forty specimens, divided into two equivalent groups: twenty plants equipped with the Waterboxx system and twenty control plants without this device. The monitoring protocol focused on the evaluation of specific morphological parameters, including plant height, collar diameter, and survival rate in both experimental conditions. At the same time, methodical monitoring of the Waterboxx device's water depletion was carried out to assess its ability to provide a sustained water supply to the root system. This system was selected for its potential to optimise irrigation and promote root development in semi-arid environments. The results revealed a significant improvement in the morphological growth of the plants treated with the Waterboxx device, particularly in the carob tree, which grew more than 30 cm in height, compared to 5 to 20 cm for the control plants compared to their initial states. Stem diameter also increased more rapidly, reaching more than 4 mm. In olive trees, height growth was comparable between the two methods, although some treated individuals exceeded 35 cm. In terms of diameter, the control plants sometimes recorded higher increases, but the Waterboxx plants maintained more stable growth. The survival rate of the plants was significantly higher in the plots equipped with the Waterboxx device. For olive trees, the survival rate reached 69.6% with Waterboxx, compared to 34.8% for the control plants. An even more marked difference was observed for carob trees, with a survival rate of 78.3% compared to only 26.1% for the control plants. These results highlight the potential of the Waterboxx device as an effective solution for improving the survival and growth of young plants in arid conditions, and open up interesting prospects for sustainable management of plantations in areas of water stress.

Keywords: Carob, Drought, Irrigation; Olive, Water stress, Waterboxx

PERFORMANCE EVALUATION OF GRAIN MAIZE VARIETIES UNDER THE ECOLOGICAL CONDITIONS OF THE AMIK PLAIN, HATAY

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ABSTRACT

This study was conducted in 2024 under the ecological conditions of the Amik Plain, Hatay, Türkiye, to compare yield-related traits of nine grain maize (Zea mays L.) varieties and to recommend high-yielding cultivars to local farmers. The experiment was arranged in a randomized complete block design with three replications. Significant differences ($\mathbf{p} < 0.05$) were observed among varieties for ear weight, ear length, ear diameter, kernel weight per ear, and thousand-kernel weight, whereas the number of kernels per ear was not statistically significant ($\mathbf{p} = 0.05816$). The highest ear weight was recorded in P2105 (238.93 g) and P1884 (230.93 g), while P2105 also exhibited the greatest ear length (23.32 cm) and ear diameter (47.86 mm). Kernel weight per ear was highest in P2105 (219.20 g), followed by P1884 (193.27 g) and CA403 (193.00 g). Thousand-kernel weight ranged from 190.48 g (P1551) to 248.50 g (CA403), with P2105 (230.73 g) also ranking among the top performers. In contrast, P1551 consistently produced the lowest values across most traits. The results indicate that P2105, followed by P1884, demonstrated superior performance in the Amik Plain environment, suggesting their suitability for high-yield grain maize production in the region. These findings provide valuable guidance for cultivar selection, aiming to enhance productivity and economic returns for farmers under similar agro-ecological conditions.

Keywords: Zea mays, Grain yield, Variety performance, Amik Plain

STRATEGIES FOR HOST-SEEKING IN ENTOMOPATHOGENIC NEMATODES: MATCHING SPECIES WITH TARGET INSECT PESTS FOR EFFICIENT BIOCONTROL

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ABSTRACT

Entomopathogenic nematodes (EPNs) are endoparasitic organisms capable of actively seeking and infecting a wide range of insect hosts. Furthermore, these organisms stand out as promising future agents in the field of biological control. In this review, three commonly used EPN species, Steinernema carpocapsae, S. feltiae, and Heterorhabditis bacteriophora were comparatively evaluated based on their host-seeking behaviors. Based on current laboratory and field findings, the effects of different foraging strategies (ambushing, intermediate or cruiser) of each species on their effectiveness against specific insect pest groups were reviewed. As an ambush species, S. carpocapsae was found to be more effective against insect pests living near the soil surface or in leaf areas. S. feltiae, an intermediate forager, offers flexibility in use against pests of different stages and in a wide range of habitats, particularly in temperate conditions. H. bacteriophora, a cruiser (active mobile) species, demonstrated superior activity in deeper layers, particularly against insects that are mobile underground. These results suggest that the selection of EPN species should be compatible with the insect pest's behavior and ecological niche to maximize success in biological control

Keywords: Heterorhabditis bacteriophora, Host seeking, Steinernema carpocapsae, Steinernema feltiae

STUDY AND DEMONSTRATION OF THE EFFECTS OF SOWING DATE ON THE DEVELOPMENT AND GROWTH OF SOME BARLEY CULTIVARS (HORDEUM VULGARE L.) UNDER DROUGHT CONDITIONS IN A SEMI-ARID MEDITERRANEAN CLIMATE.

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ABSTRACT

In Algeria, where the climate is predominantly arid and semi-arid, agricultural production faces significant constraints due to low and irregular rainfall coupled with high evaporation rates. Barley is one of the most widely cultivated cereal crops in the country; however, it is frequently subjected to water stress, which severely impacts its productivity. Under these challenging conditions, it is essential to explore techniques that enhance the plant's water use efficiency.
The objective of this study was to investigate the effects of water stress and sowing date on the growth and yield of Some varieties of barley, and late-winter barley genotypes in the El Hmadna region (northwestern Algeria) under semi-arid conditions. The results of the morphometric analyses indicate a clear advantage for genotypes subjected to early sowing, with mean plant heights of 71,57 cm and leaf areas of 22,36 cm². Additionally, the number of plants per square meter, ears per square meter, and grain yields averaged 186,5 plants, 392,66 ears, and 27,97 $Q.ha^{-1}$, respectively. In contrast, compared to early sowing, late-sown genotypes exhibited earlier heading, averaging 102,89 days after sowing, and produced a higher thousand grain weight of 42,52 g. Nonetheless, the highest grain yields were achieved with genotypes established under early sowing conditions.

Keywords: barley, semi-arid conditions, sowing date, supplemental irrigation, water stress.

COMPARATIVE STUDY OF THE EFFECTS OF DIRECT SEEDING AND CONVENTIONAL TILLAGE ON THE PRODUCTION PARAMETERS OF PEA (*PISUM SATIVUM L*).

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ABSTRACT

In Algeria, nearly 95% of the soil is subject to the constraints of an arid and semi-arid climate, which considerably limits its agricultural potential. Peas are among the main legumes cultivated in Algeria. They represent an important source of inexpensive plant-based proteins, which are more accessible and far cheaper than animal proteins, especially for developing countries like Algeria. Indeed, the average yield ranges from 40 to 80 quintals per hectare. Under these conditions, it is advisable to plan for supplementary irrigation, which is not always feasible given the large areas typical of this crop. Direct seeding offers an alternative, as it helps reduce water evaporation thanks to the accumulation of plant residues on the soil surface after harvest. The objective of this research is to compare the impacts of conventional tillage (CT) and direct seeding (DS) on the growth and development of a pea crop under rainfed conditions in a semi-arid climate in the Mostaganem region (Algeria). Accordingly, a randomized complete block design with three replications was established, and the crop's yield components were monitored (including branch number, pod number, seeds per pod, thousand-seed weight, and grain yield). The main results of this study show that the plots managed under DS recorded noteworthy figures: the number of branches per m² was 62 compared to 60 under CT, the number of pods was 139 in DS versus 116 in CT, the number of grains per pod was 8 in DS while it was 5 in CT, the thousand-grain weight was 399 g in DS compared to 278 g in CT, and as for grain yield, we obtained 46 Q/ha in DS against 17 Q/ha in CT. The results of this study indicate that direct seeding (DS), when practiced under semi-arid conditions, is more beneficial than conventional tillage (CT) for pea cultivation.

Keywords: conventional tillage, no-till, pea, semi-arid climate, yield components.

DEVELOPMENT OF A FERTILIZER TO FACILITATE OLIVE HARVESTING

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ABSTRACT

One of the major challenges in olive cultivation is the high labor cost associated with fruit harvesting. Traditional manual harvesting methods are labor-intensive and time-consuming. This study aimed to develop a fertilizer-based approach aligned with the 4R nutrient stewardship principles—right source, right rate, right time, and right place—to accelerate fruit ripening and promote natural fruit detachment from the stem. A liquid-concentrate NPK fertilizer specifically formulated for olive trees was foliar-applied at a selected stage prior to harvest. The impact of the treatment was evaluated by measuring the fruit detachment force and quantifying the amount of fruit fallen after mechanical shaking. In treated trees, fruit detachment force was reduced by 40%, and the quantity of fallen fruit increased fourfold compared to untreated controls. The findings suggest that the application of appropriately formulated fertilizers at the correct dose and timing can significantly enhance harvesting efficiency by reducing fruit retention strength. This improvement enables earlier and more effective harvests, lowering operational costs and minimizing quality and yield losses associated with delayed harvesting. Although the study was conducted on olive trees, the approach offers a promising reference model for similar applications in other fruit crops.

Keywords: fertilizer, olive harvest, harvest facilitator

EVALUATION OF BIOLOGICAL AND AGRONOMIC TRAITS OF PROMISING MALTING BARLEY (*HORDEUM VULGARE L.)* LINES

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ABSTRACT

The present study aims to evaluate the biological and agronomic traits of promising two-row malting barley (Hordeum vulgare L.) lines developed through the breeding program at the Agricultural University of Plovdiv. Over a two-year field trial (2021–2023), eleven newly created lines were assessed against the standard cultivar Emon. Key morphological and yield-related traits were analyzed, including plant height, tillering capacity, spike length and structure, thousand kernel weight, as well as resistance to biotic and abiotic stress factors. The results demonstrated that all tested lines exhibited good adaptability and stability in their performance. Lines 421, 423, 425, and 700 showed superior yield potential, reduced plant height with lodging resistance, and better adaptability compared to the control. These genotypes are recommended as donors for future breeding programs and for advancement to competitive variety trials.

Keywords: malting barley, breeding, productivity, stress tolerance, barley lines

STUDY ON DROUGHT TOLERANCE AND SOME BIOLOGICAL AND ECONOMIC TRAITS IN MALTING BARLEY LINES

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ABSTRACT

Malting barley (Hordeum vulgare L.) is among the most important cereal crops worldwide, with its production highly dependent on tolerance to abiotic stress factors, particularly drought. The present study focuses on the evaluation of newly developed two-row malting barley lines, bred at the Agricultural University – Plovdiv, regarding their agronomic performance, yield stability, and drought tolerance. Field trials were carried out during 2021–2023 with lines 372, 492, 528, and 579, using the variety Emon as a standard. Key morphological and yield-related traits were assessed, while drought tolerance was evaluated through the roll-paper method under PEG 6000-induced osmotic stress. Results revealed that line 492 consistently outperformed the standard in most yield components and demonstrated stability under varying agro-climatic conditions, thus emerging as the most promising candidate for variety registration. Line 579 was characterized by high productivity and remarkable earliness, yet showed susceptibility to lodging, whereas line 528 exhibited the highest drought tolerance under stress simulation. Line 372 maintained good yield potential but showed significant growth depression under osmotic stress. The study highlights the importance of integrating field and laboratory evaluations for the improvement of malting barley and confirms the effectiveness of early-stage screening methods for drought tolerance. These findings provide valuable insights for future breeding programs aimed at developing adaptive and resilient barley varieties suitable for brewing purposes in Bulgaria.

Keywords: malting barley, breeding lines, drought tolerance, osmotic stress, yield potential, Hordeum vulgare L.

A REVIEW OF THE EVIDENCE: WELFARE STATUS AND PRODUCTIVITY OF COWS MILKED IN ROBOTIC MILKING SYSTEMS

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ABSTRACT

Over the past 20 years, a steady increase in herd sizes has been observed, but farms have faced a series of challenges in terms of labour utilisation. Therefore, the positive attitude of producers towards precision livestock farming technologies has accelerated the adoption of new technologies in the dairy industry. The use of robotic milking systems (RMS) has become increasingly common among dairy farms. The RMS has the potential to reduce labour, speed up the milking process and improve cow productivity. Therefore, a comprehensive review of previous scientific and industrial studies investigating the effects of RMS on the welfare and productivity of cows is required. The aims of this study were to compare the advantages and disadvantages of RMS and to discuss the effects of these systems on animal welfare and productivity. Numerous studies have identified the high cost of investing in RMS as a limiting factor in the widespread adoption of these systems. However, researchers agree that RMS significantly reduces labour requirements. While some studies suggest that RMS improves animal welfare, other researchers highlight several shortcomings in the identification of welfare criteria, such as lameness and mastitis. Furthermore, as milking frequency varies from farm to farm in RMS systems, the effect on milk production and quality remains uncertain.

Keywords: Robotic milking systems, cow, animal welfare, productivity

EFFECTIVENESS OF WILD BEES IN THE POLLINATION OF CITRULLUS LANATUS L. IN THE NORTHERN ALGERIAN SAHARA

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ABSTRACT

Our studies are carried out at an experimental site in Laghrousse , province of Biskra , on a Watermelon crop (Citrullus lanatus L.) during the flowering of 2024 , have made it possible to identify five orders of insects pollinating the Watermelon flowers : Hymenoptera (domestic and wild bees, hornets and ants), Diptera (flies), Lepidoptera, Coleoptera and Hemiptera , and our statistics show that Hymenoptera is the most abundant group and the main pollinators in this crop . According to these statistics, it was found that seven species of wild bees , belonging to six genera : Lasioglossum, Hylaeus ; Megachile ; Halictus ; Epeolus and Anthophora , the most effective pollinators of Citrullus lanatus L. , although Watermelon is a self-compatible plant , the intervention of pollinators in this culture by xenogamy, improve their quantitative yield of the Watermelon by a percentage of 94,6% and qualitative by increasing the market value of the fruits by a percentage of 100 % , that in self-pollination by geitonogamy . Finally we specified five spontaneous plants attractive to wild bees the main pollinators of the watermelon which must be reserved for planting at the edges of the fields by farmers

Keywords: Citrullus lanatus L. , Main pollinators, Quantitative and qualitative yield, Self-compatible plant, Xenogamy, geitonogamy

ENHANCING CROP PRODUCTIVITY AND SUSTAINABILITY: THE ROLE OF NANO, MACRO, AND MICRO NUTRIENTS IN MODERN AGRICULTURE

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ABSTRACT

In modern agriculture, the optimal supply of nutrients is fundamental to achieving both high productivity and environmental sustainability. This review comprehensively examines the roles and interactions of nano, macro, and micro nutrients in enhancing agricultural efficiency and promoting sustainable practices. Macro nutrients – primarily nitrogen, phosphorus, and potassium – are essential for fundamental plant growth and yield. Meanwhile, micro nutrients such as iron, zinc, manganese, and copper, although needed in smaller quantities, are critical for enzymatic functions, metabolic pathways, and overall plant health. Recent advancements in nanotechnology have introduced nano-sized nutrient formulations, which provide innovative solutions for controlled and targeted nutrient delivery. These nano-nutrients improve nutrient use efficiency by enhancing absorption and reducing losses through leaching or volatilization, thus mitigating environmental pollution often caused by excessive fertilization. This review also discusses various studies demonstrating the application of nanomaterials in soil and foliar fertilization, highlighting their potential benefits and challenges. Importantly, the review addresses concerns regarding the potential environmental and health risks associated with nanoparticle use, emphasizing the necessity for careful assessment and regulation. Given the global challenges of climate change, soil degradation, and diminishing natural resources, the integration of nano, macro, and micro nutrients into sustainable agricultural systems is crucial. Such integration can lead to increased crop yields, improved soil fertility, and reduced ecological footprints. Furthermore, adopting integrated nutrient management practices could ensure a more resilient food production system. This study highlights the need for further multidisciplinary research and the development of safe and effective technologies to ensure long-term agricultural sustainability while mitigating potential risks.

Keywords: Nano nutrients, Macro nutrients, Agricultural efficiency, Nanotechnology in agriculture, Crop productivity, Soil fertility.

EFFECTS OF USING MICROALGAE AS A BIOFERTILIZER ON THE PLANT GROWTH AND QUALITY PARAMETERS OF CAPIA PEPPER

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ABSTRACT

Capia pepper (Capsicum annuum L.) is a significant vegetable crop for Turkey since it is widely consumed both domestically and internationally, in fresh form and through various processed products. The aim of this study was to reduce the use of chemical fertilizers by utilizing microalgae (MA) solutions while preventing nutrient loss in the pepper fruits and positively influencing yield and quality parameters. The research was conducted under open-field conditions during the summer season in Bursa, Turkey. The capia pepper cv. "AS202," which is well-suited for open-field cultivation under Bursa climate conditions, was used as the plant material. As the microalgae species, Chlorella vulgaris was diluted to the concentrations of 2 x 107 L-1 (MA250) and 4 x 107 L-1 (MA500) and applied to the plants via soil applications. The applications were continued throughout the growing season. Additionally, a nitrogen-based chemical fertilizer (CF) was applied in accordance with the recommendations of the Ministry of Agriculture and Forestry, and a control group (C) without any fertilizer was included for comparison. The results showed that the MA250, MA250+CF, and MA500 treatment groups achieved better outcomes compared to the control group. In conclusion, the best results were obtained from the MA250+CF and MA500 treatments.

Keywords: Capsicum annuum L., Chlorella vulgaris, fertilization, quality, sustainability

EFFECTS OF ORGANIC PRIMING AND DIFFERENT DRYING TREATMENTS ON SEED QUALITY OF CARROT SEEDS

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ABSTRACT

This study investigates the effects of organic priming treatments and different drying methods on seed quality in Nantes-type carrot seeds. To enhance seed quality, priming was performed using solutions of seaweed extract (DY), humic acid (HA), and vermicompost (V) at concentrations of 0, 250, 500, 1000, 1500, and 2000 ppm. The seeds were continuously aerated in these solutions at 16°C for 24 hours. Seeds that did not undergo any treatment were considered as the control group. After priming treatments, seeds were surface-dried and their initial moisture content was determined. Then, they were divided into two groups: one group was subjected directly to germination tests following surface drying (P+SD), while the other group was further dried until reaching their initial moisture content (P+DB) before germination testing. The effects of priming treatments on seed viability and vigor were evaluated based on normal germination rate (NGR), mean germination time (MGT), and germination index (GI). The most effective results in terms of physiological enhancement of carrot seeds were obtained from 1000 ppm DY + P+SD, DY + P+DB, 500 ppm HA+P+DB and 250 ppm V+P+DB treatments. These findings suggest that environmentally friendly fertilizers such as seaweed extract, humic acid, and vermicompost can be used as alternatives to chemical fertilizers in pre-sowing treatments to improve seed quality. The results offer promising insights for sustainable agricultural practices.

Keywords: Ascophyllum nodosum L., Daucus carota L., humic acid, normal germination rate, mean germination time, vermicompost

IMPACT OF BIOFERTILIZERS ON SOIL NEMATODE DIVERSITY IN DEGRADED COFFEE LANDS

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ABSTRACT

Coffee land degradation poses a significant threat to sustainable agriculture. This study investigated the effects of biofertilizer application on soil nematode diversity in degraded coffee lands. A randomized block design with seven treatments (varying biofertilizer doses and organic matter) was employed. The results showed biofertilizer significantly altered nematode community structure, decreasing plant-parasitic nematode populations and increasing beneficial free-living nematodes. Specifically, a dose of 120 ml biofertilizer with 5 liters of organic matter (P4) exhibited the most favorable impact. The genus's variety of nematodes were also being found in 5 ordo (Rhabditida, Dorylaimida, Enoplida, Mononchida, and Tylenchida). This study underscores biofertilizers' potential in restoring soil health and nematode balance in degraded coffee ecosystems

Keywords: Biofertilizer, nematode diversity, degraded land, coffee.

ENHANCING TEA SMALLHOLDER PRODUCTIVITY IN SRI LANKA: EVALUATING THE YARA VILLAGE MODEL AS A SUSTAINABLE 4PS EXTENSION FRAMEWORK IN UVA PROVINCE

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ABSTRACT

Tea smallholders contribute nearly 75% of Sri Lanka's tea production but face challenges such as high input costs, limited access to extension services, knowledge gaps, and climate vulnerability. This study evaluated the YARA Village concept under the CIC Agribusiness framework as a 4Ps (Public–Private-Producer Partnership) model to enhance extension delivery and productivity in Kendagolla village, Uva region. A baseline survey of 100 randomly selected Tea smallholders was conducted to gather data on socio-economic conditions, farming practices, and perceptions of the model. The dependent variable was Behavioural Intention (BI), defined as the intention to adopt the YARA Village concept. Findings revealed that the majority of farmers owned small plots (60%), but comparatively lower in soil fertility and pest management

Keywords: Tea smallholders, YARA Village, Public-Private Producer Partnerships, Extension Services, Behavioural Intention

BRIDGING THE INFORMATION GAP: ASSESSING THE FEASIBILITY OF SOCIAL MEDIA PLATFORMS FOR TECHNOLOGY TRANSFER PLATFORM AMONG PROPRIETARY TEA PLANTERS IN THE RATHNAPURA DISTRICT

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ABSTRACT

Tea is a vital crop for Sri Lanka, providing employment and economic support. While large plantations and smallholders receive guidance from the Tea Research Institute (TRI), proprietary tea planters—owners of medium-sized estates—often lack similar assistance due to the absence of a formal channel for the dissemination of technology. This leaves them struggling to access up-to-date information to improve their farming practices. In an era where most Sri Lankans use mobile phones and social media daily, platforms like WhatsApp and Facebook present new opportunities for information sharing. This digital connectivity could enable proprietary tea planters to obtain essential advice regardless of their location. This research aims to determine the specific information needs of proprietary tea planters in the Rathnapura district, assess their current use of social media, and evaluate the potential of a social media-based platform to connect them with TRI's resources and expertise. The study was conducted in the Ratnapura district, focusing on 55 proprietary tea plantations registered with the Sri Lanka Tea Board (SLTB) in 2022. This group served as the sampling frame. A simple random sampling method was used, and data were collected through a questionnaire survey that explored the planters' backgrounds, information needs, and social media usage. The findings revealed that the planters had a positive attitude toward receiving advice through digital platforms. The proposed model explains 79% of the variance ($R^2 = 0.792$) in platform success. Key factors influencing this success include strong positive effects from digital literacy, awareness of digital dissemination, and current information needs. Additionally, perceived usefulness and social media usage made positive contributions, while age and experience had negative impacts on the results. The study found that 51% of the planters demonstrated a high potential for adopting a social media-based system, while 29% showed moderate potential. However, several key barriers to adoption were identified, including low trust in digital sources, a preference for face-to-face advice, a lack of interest in digital platforms, and difficulty in understanding the content. To address these challenges, the study recommends a hybrid approach that includes clear and verified content. It concludes that WhatsApp, supported by video and voice content in local languages, is the most suitable platform for disseminating technology to proprietary tea planters. This approach aims to enhance technology transfer and strengthen the Tea Research Institute's role in supporting the tea industry.

Keywords: Proprietary tea planters, Technology dissemination, Information need assessment, Social media, Rathnapura district

POLLINATION EFFECTIVENESS OF WILD BEES IN CUCURBITACEAE CROP PRODUCTION IN THE NORTHERN ALGERIAN SAHARA

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ABSTRACT

We chose zucchini (Cucurbita pepo L.) and watermelon (Citrullus lanatus L.) as the most popular products in our study region of Laghrousse, Biskra province in the northern Algerian Sahara. Observations conducted at two adjacent experimental sites during the 2024 flowering period allowed us to identify three Orders of insects pollinating zucchini flowers: Hymenoptera (honeybees, wild bees, hornets, ants), Coleoptera and Hemiptera, and five Orders of insects pollinating watermelon flowers: Hymenoptera (honeybees, wild bees, hornets, ants), Diptera (flies), Lepidoptera, Coleoptera and Hemiptera. Our statistics show that in both cases, Hymenoptera is the most abundant group and the main pollinators in both crops thanks to their highest number of positive visits with 92% and 91% for zucchini and watermelon respectively. Wild bees occupy a percentage of 32% and 67 % for Zucchini and watermelon respectively. Seven species of wild bees were identified on C. lanatus L., and five species of wild bees on C. pepo L.. Our results showed that as long as watermelon and zucchini are self-compatible plants but the intervention of pollinators in these two crops by xenogamy improves their quantitative yield by a percentage of 78% and 95% respectively for zucchini and watermelon. Finally, nine specified spontaneous plants attractive to wild bees pollinators of zucchini and watermelon which must be reserved for planting at the edges of the field

Keywords: Citrullus lanatus L. , Cucurbita pepo L. , Main pollinators, Quantitative and qualitative yield, Self-compatible plant, Xenogamy, geitonogamy

FOOD SAFETY AND LOCAL COMPETITIVENESS: CHALLENGES AND OPPORTUNITIES FOR PRODUCERS IN MOLDOVA

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ABSTRACT

This article examines the impact of food safety regulations on the competitiveness of local producers in the Republic of Moldova, a country heavily reliant on its agricultural sector. With food security remaining a critical issue due to challenges such as limited arable land, drought vulnerability, and dependence on food imports, Moldova’s alignment with national and international standards, including EU directives and Codex Alimentarius, imposes both opportunities and constraints. The study analyzes how compliance with stringent regulations affects small and medium-sized producers, who dominate the agricultural landscape, through increased costs and technological demands. Simultaneously, it explores how adherence to these standards enhances market access and consumer trust, fostering innovation and modernization. Drawing on systemic, institutional, and comprehensive methodological approaches, the article identifies strategies to balance food safety requirements with the need to support local producers’ competitiveness. Recommendations include targeted government support, collaborative initiatives, and improved access to financing to ensure sustainable development in Moldova’s agri-food sector.

Keywords: Food safety, local producers, agricultural sector, EU standards

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QUALITY OVER PRICE: CONSUMER PREFERENCE FOR FREE-RANGE VERSUS BROILER CHICKEN IN AN INDONESIAN TRADITIONAL MARKET

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ABSTRACT

The dual presence of industrially produced broiler chicken and traditionally raised free-range chicken in developing economies presents a complex consumer choice landscape. This study aims to identify the key factors that differentiate consumer purchasing decisions for these two types of poultry and to compare consumer preferences in a traditional market setting in Indonesia. A quantitative survey was conducted with 150 consumers in the traditional markets of Enrekang Regency, Indonesia. The data were analyzed using multiple linear regression to determine the factors influencing purchase decisions for each chicken type and the Mann-Whitney U test to compare consumer perceptions across key variables. The purchase decision for broiler chicken is significantly influenced by price, income, lifestyle, taste, and culture. Conversely, the decision to purchase free-range chicken is driven by product quality, income, lifestyle, taste, and culture, with price not being a significant factor. Comparative analysis reveals that consumers perceive free-range chicken as having significantly higher quality and superior taste but also a higher price. This choice reflects a trade-off between the economic and practical advantages of broiler chicken and the perceived quality and sensory attributes of free-range chicken. This study provides empirical evidence on the drivers of food choice in a transitional economy, highlighting the persistent value of traditional food attributes like quality and taste alongside modern considerations like price and convenience. The findings offer valuable insights for agribusiness stakeholders, marketers, and policymakers aiming to understand and navigate the evolving consumer preferences in emerging markets.

Keywords: Consumer Behavior, Food Choice, Purchase Decision, Broiler Chicken, Free-Range Chicken, Agriculture, Indonesia

BIO-FERTILIZER APPLICATIONS ENHANCE SALT STRESS TOLERANCE IN QUINOA (CHENOPODIUM QUINOA WILLD.)

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ABSTRACT

The adverse effects of global climate change, including irregular precipitation, extreme temperatures, and soil salinization, are among the leading threats to agricultural productivity worldwide. These abiotic stresses are particularly critical for crops cultivated in marginal lands, where soil and water resources are already limited. Quinoa (Chenopodium quinoa Willd.), known as the "grain of the future," has attracted growing attention due to its high nutritional value, exceptional protein quality, and ability to adapt to diverse agro-ecological conditions. However, despite its resilience, quinoa remains highly sensitive to environmental stress factors such as salinity, which significantly limits its yield potential. In light of these challenges, there is a pressing need for innovative and environmentally friendly approaches that can reduce the dependency on chemical fertilizers while sustaining crop productivity. Bio-fertilizers, including compost, arbuscular mycorrhizal fungi (AMF), and plant growth promoting rhizobacteria (PGPR), have emerged as promising alternatives to chemical inputs. These biological amendments improve soil fertility, enhance plant physiological functions, and strengthen tolerance against abiotic stressors. Compost contributes to improved soil organic matter and water holding capacity, while AMF facilitate nutrient uptake, particularly phosphorus, and increase root surface area. PGPR, on the other hand, play a crucial role in promoting plant growth by producing phytohormones, enhancing nitrogen fixation, and stimulating systemic tolerance mechanisms. Collectively, these bio-based inputs not only mitigate yield losses but also support sustainable production systems compatible with ecological balance. The present study was designed to evaluate the impact of compost, AMF, and PGPR applied individually or in combination on quinoa grown under 200 mM salt stress conditions. Plant physiological parameters, including chlorophyll content, leaf traits, and root development, were monitored alongside key yield components such as seed weight, thousand seed weight, and grain yield. Particular emphasis was placed on understanding whether microbial inoculants, either alone or in integrated applications with compost, could compensate for the negative effects of salinity and promote quinoa growth under stress conditions. The results demonstrated clear positive effects of bio-fertilizer applications. PGPR treatments, both alone and in combination with AMF, significantly increased chlorophyll content and improved photosynthetic performance compared to control groups under salt stress. Enhanced root development was observed in treatments involving AMF, suggesting improved nutrient uptake and water absorption capacity. When compost was integrated with microbial inoculants, additional improvements in plant height and biomass accumulation were recorded. Yield related traits, particularly thousand seed weight and overall grain yield, were consistently higher in treatments containing PGPR, underlining the critical role of this microbial group in enhancing quinoa performance under salinity. These findings provide strong evidence that bio-fertilizers can mitigate the detrimental effects of salt stress in quinoa and support its productivity in challenging environments. Beyond their physiological contributions, bio-fertilizers represent cost-effective and eco-friendly technologies that reduce dependence on chemical fertilizers, thereby contributing to healthier

soils and more sustainable farming practices. The integration of AMF and PGPR with organic inputs such as compost may also provide synergistic benefits that extend beyond yield, including long-term improvements in soil structure and biological activity. In conclusion, the study highlights the potential of bio-fertilizer-based strategies to strengthen quinoa cultivation under salinity stress. PGPR, in particular, emerged as the most effective treatment, both individually and in combination with other bio-fertilizers. Future studies should focus on large-scale field trials in diverse agro-ecological regions, as well as molecular level analyses, to further elucidate the mechanisms by which bio-fertilizers enhance stress tolerance in quinoa. These efforts will provide a stronger foundation for integrating bio-fertilizers into farmer-level practices and scaling their use within sustainable agricultural systems.

Keywords: Bio-fertilizer, Quinoa, PGPR, AMF, compost, salt stress

EFFECTS OF INNOVATIVE BIO-FERTILIZERS ON GROWTH PARAMETER AND YIELD IN WHEAT UNDER ABIOTIC STRESS

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ABSTRACT

Wheat (Triticum aestivum L.), one of the most widely cultivated cereal crops in the world, is central to global food security. As a staple crop providing more than 20% of the world's caloric intake, wheat production must remain stable to meet the demands of a growing population. However, wheat is highly vulnerable to abiotic stresses such as drought and salinity, which significantly reduce yield and quality. Smallholder farmers, who constitute a large proportion of wheat producers in many developing regions, are particularly at risk because they often lack the financial resources to compensate for yield losses through costly chemical inputs. Thus, sustainable and affordable strategies to maintain wheat productivity under climate induced stress conditions are of paramount importance. The increasing global climate crisis underscores the urgency of using natural resources with greater care and efficiency. Agricultural production systems, which are already under considerable pressure, are facing significant challenges due to climate change. These environmental and ecological costs call for an urgent transition toward farming practices that are both productive and environmentally sustainable. In this context, bio-based agricultural strategies are gaining increasing attention as viable alternatives to conventional inputs. Biological amendments such as compost, arbuscular mycorrhizal fungi (AMF), and plant growth-promoting rhizobacteria (PGPR) represent innovative tools for maintaining soil fertility, supporting plant resilience, and minimizing environmental damage. Unlike chemical inputs, these bio-fertilizers work through ecological interactions, enhancing nutrient uptake, stimulating plant metabolism, and improving soil structure, all of which contribute to long term sustainability. Importantly, they offer solutions that can be adopted not only in large scale production systems but also by smallholder farmers, who are often the most vulnerable to climate induced yield losses. The present study investigated the effects of compost, AMF, and PGPR on wheat cultivated under abiotic stress conditions, specifically salt stress. The experiments demonstrated that PGPR applications, whether used independently or in combination with AMF, led to significant improvements in chlorophyll content, physiological performance, and yield related parameters. These findings suggest that bio-fertilizers can play a crucial role in mitigating the adverse effects of salinity on wheat, one of the world's most important staple crops. Beyond yield stability, improvements in chlorophyll and plant vigor point to enhanced photosynthetic efficiency and overall resilience, which are essential traits for crops cultivated under stress prone environments. Bio-fertilizers such as compost, AMF, and PGPR are relatively low cost, locally producible, and environmentally friendly, making them highly accessible to smallscale farming systems. Their adoption can reduce dependence on expensive chemical inputs, thus lowering production costs while simultaneously improving soil health. For smallholder farmers, who often operate with limited financial and technological resources, these biological strategies provide an affordable pathway to maintain yields under climate stress conditions. The broader implications of integrating bio-fertilizers into cropping systems extend beyond immediate yield gains. By improving soil organic matter, fostering beneficial microbial communities, and enhancing plant tolerance to abiotic stress, these bio-based approaches contribute to the long term sustainability and resilience of agricultural systems. At the community level, promoting such practices can strengthen food security, reduce environmental risks, and create opportunities for sustainable livelihoods, particularly in regions where agriculture remains the backbone of local economies. In conclusion, the integration of compost, AMF, and PGPR into wheat production systems under abiotic stress conditions demonstrates clear potential to reduce yield losses and enhance resilience. This study highlights the relevance of biological solutions not only as an environmentally sound alternative to chemical inputs but also as a practical tool that can be adopted by farmers at different scales, especially smallholder producers.

Keywords: Wheat, PGPR, AMF, compost, abiotic stress

POTENTIAL USE OF ESSENTIAL OILS AS BEE ATTRACTANTS IN SEED SUNFLOWER (*HELIANTHUS ANNUUS L.)* PRODUCTION

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ABSTRACT

This study was conducted under field conditions in 2024 to determine the effects of certain essential oils on enhancing the pollination efficiency of honeybees in hybrid sunflower seed production. In the study, nanoemulsions (NEs) of lemongrass (*Cymbopogon citratus*), lavender (*Lavandula angustifolia*), rosemary (*Rosmarinus officinalis*), and sage (*Salvia officinalis*) essential oils were prepared at a 5% concentration and applied via drone at doses of 1000 and 2000 ppm to the male and female sunflower parent lines at the beginning of the flowering period. At 50% flowering, the highest bee activity was observed in the plots treated with 2000 ppm *C. citratus* essential oil NE, while bee visits in plots treated with 1000 ppm *R. officinalis* and *S. officinalis* essential oil NEs and Tween-80–chitosan NE were similar to the control. Applications of essential oil NEs resulted in increases of up to 28% in the filled seed rate, 34% in seed number, and 38% in seed yield. The study concluded that 2000 ppm *C. citratus* NE enhanced bee activity, thereby improving seed set in sunflowers, and can be practically used in hybrid sunflower seed production.

Key words: Sunflower, Bee activity, Attractant, Essential oil, Nanoemulsion

ANTIFUNGAL ACTIVITY OF *ROSA DAMASCENA* MILL. LEAF EXTRACTS AGAINST *BOTRYTIS CINERIA* AND *ALTERNARIA ALTERNATA*

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ABSTRACT

This study was conducted to determine the in vitro antifungal activities of *Rosa damascena* ethanol, methanol, and hexane extracts against important plant pathogens, *Botrytis cinerea* and *Alternaria alternata*. In the study, the rates of inhibition of fungal mycelial growth by the extracts were determined on PDA medium at concentrations of 500, 1000, and 2000 µg/ml. In addition, to quantitatively evaluate antifungal activity, Minimum Inhibitory Concentration (MIC) and Minimum Fungicidal Concentration (MFC) values (ranging from 125 to 4000 µg/ml using two-fold serial dilutions) were determined to assess the fungicidal effects of the extracts. The highest antifungal activity against both fungal phytopathogens was obtained from the hexane extract (*B. cinerea* 78.5% ± 3.0, *A. alternata* 84.1% ± 1.3). The MIC and MFC values of the extracts were determined to be 225–358 µg/ml and 2517–3960 µg/ml for *B. cinerea*, and 183–308 µg/ml and 2130–3917 µg/ml for *A. alternata*, respectively. These findings indicate that, particularly, the hexane extract may possess strong antifungal potential against economically important phytopathogens such as *B. cinerea* and *A. alternata*.

Keywords: Antifungal activity, *Alternaria alternata*, *Botrytis cineria*, *R. damascena* extract

COMPARED EFFECT OF LOCAL ORGANIC AND MINERAL FERTILIZER ON TOMATO (*LYCOPERSICON ESCULENTUM MILL.)* PRODUCTIONDURING RAINY SEASON IN TAHOUA, NIGER.

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ABSTRACT

Now a days in Niger crops production is mostly related to the quantity of mineral fertilizer apllied. While it has been provved that continuous and solely use of this type fertilizer is harmful to soil, crop and human. Using of organic manure may improve the production, that’s why we have tested local organic manure effect on tomato production. To better measure this effect, a trial was carried out on the experimental site of the Faculty of Agricultural Sciences at Djibo Hamani University in Tahoua in Niger. The objective of this study is to determine the influence of organic and mineral fertilizers on tomato production. In order to achieve this objective, a randomized complet block design was use with two factors (fertilizer and tomato variety), all repeated four times. The varieties and fertilizers used in this study are: NPK (200kg/ha), compost 10t/ha, poultry droppings 8t/ha and peasant practice (manure+ NPK) and a control treatment without input and the second factor fertilizer has two components: the local variety (Icrinat) and hybrid (Mongol F1). The parameters measured are: growth parameters (height of the plant at flowering, number of branches, stem diameter, number of flowers, leaf length, leaf width, petiole length) and production parameters (number of fruit per plant, fruit length, fruit width, yield and weight of a thousand seeds). The results showed that considering all measured parameters, the best result was obtained with organic manure particularly poultry manure and the best varity is mongol F1. To ensure good tomato production in Niger, it would be necessary to use poultry droppings for the availability of nutrients in the soil.

Keywords: poultry manure, mineral fertilizer, production, tomato.

THE IMPACT OF DISEASES ON SUNFLOWERS UNDER ORGANIC CONDITIONS, IN ROMANIA IN YEAR 2025

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ABSTRACT

In organic agriculture, pesticides are not used to treat seeds before sowing and to treat sunflowers during the growing season and for this reason, the degree of attack by some pathogens is high in some sunflower genotypes. Sunflower crop in organic agriculture is affected by diseases such as downy mildew (Plasmopara halstedii), white mold (Sclerotinia sclerotiorum) and white rust (Albugo tragopogonis). In year 2025, we sown organic sunflower genotypes in organic conditions on date April 22, 2025, in Fundulea location, in the south-east of Romania and on May 20, 2025, we reseeded the same sunflower crop due to the attack of pigeons and crows that ate the sunflower seedlings in the phenophase of cotyledon leaves and two true leaves (BBCH 09-14). The harvesting of sunflower genotypes was done on September 22, 2025. On July 28, 2025, we made observations regarding the attack of pathogens on sunflower crops in the organic farming system and we observed an attack of the pathogen Plasmopara halstedii between 0% on the genotypes ECO 1, ECO 4, ECO 5, ECO 6, ECO 7, ECO 9, ECO 10 and ECO 12 and an attack of 51% on ECO 8. Regarding pathogen Sclerotinia sclerotiorum we observed tall three forms:off attack, basal stalk rot at ECO 5, ECO 6, ECO 10, ECO 11 mid-stem rot at ECO 8, head rot at ECO 4, ECO 5, ECO 6 and ECO14. Regarding pathogen Albugo tragopogonis only sunflower genotypes ECO 5 and ECO 6 are sensitive. Plasmopara halstedii and Sclerotinia sclerotiorum are the most important pathogens who infected sunflower culture in organic agriculture and can lead to low seed yields and to crop failure.

Keywords: organic agriculture, sunflower, Plasmopara halstedii, Sclerotinia sclerotiorum

THE ROLE OF AGRO-MORPHOLOGICAL CHARACTERISATION IN THE EVALUATION OF VEGETABLE GENETIC RESOURCES

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ABSTRACT

Vegetables are a large and diverse group of plants and different vegetable species can be found in every region where people settle. In agricultural production, characterisation studies are of great importance for the effective conservation, evaluation and use of vegetable genetic resources, which are the basis of this diversity and sustainability, in breeding programmes. Agromorphological characterisation is one of the most common and practical methods used to determine genetic diversity in the population to reveal morphological and agronomic differences among vegetable genotypes. In this context, morphological traits can be used as a general technique to examine genetic diversity in morphologically distinct genotypes, as they can be evaluated quickly and easily and are useful for an early assessment. Morphological traits controlled by a single locus can also be used as genetic markers, provided they can be reproduced in a range of media. Genetic diversity is a critical element for the conservation of biodiversity and the development of new crops. Characterisation studies, especially for the selection of parental lines and the design of breeding programmes, are a vital and important step in the beginning of these processes. This review shows that the conservation of vegetable genetic resources for future breeding programmes is an important source of various agricultural traits.

Keywords: Agromorphological, biodiversity, breeding, characterisation, vegetable

DIVERSITY AND IDENTIFICATION OF MITE POPULATIONS IN SELECTED WINE GRAPE CULTIVARS

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ABSTRACT

Vitis vinifera L. is one of the important crops in the world economy, but is also affected by a wide range of mite pests, particularly those belonging to the families Tetranychidae and Eriophyidae. In vineyards, these pest populations are often kept below economic thresholds by predatory mites of the family Phytoseiidae. This study was carried out during 2025 in three wine grape vineyards in Tirana, Albania. Leaf samples were collected once per month, from May to September, from the cultivars Sheshi i Bardhë, Sheshi i Zi, and Muscat Hamburg. The aim was to identify and quantify mite populations associated with these grapevine cultivars. During the survey, mites from the families Phytoseiidae and Tydeidae were found, as well as typical symptoms of Eriophyidae infestations on grapevine leaves. Across all three wine grape cultivars, only one phytoseiid species, Phytoseius finitimus (Ribaga), was identified. Vineyard no. 2, corresponding to the cultivar Sheshi i Zi, showed the highest abundance of phytoseiid mites. Within phytoseiid populations, larval stages predominated, and the sex ratio was biased towards females.

Keywords: Grapevine, Phytoseiids, Tydeidae, Eriophyidae, Cultivar,

SURVEY ON THE RECOMMENDATIONS AND SAFE USE OF PLANT PROTECTION PRODUCT BY PHYTOPHARMACISTS

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ABSTRACT

Pesticides are widely used to protect agricultural production, but their application is associated with risks to human health and the environment. The awareness of stakeholders, particularly farmers and phytopharmacists, is considered essential for mitigating these risks. In this study, the knowledge and practices of phytopharmacists regarding pesticide use in Albania were evaluated. A structured survey with 23 questions was conducted between February and May 2025 across 10 districts. Of 100 phytopharmacists contacted, 95 completed the questionnaire. The findings revealed that a wide range of pesticides is stored in most outlets, with fungicides and insecticides representing the largest share of sales. Biological pesticides accounted for 36% of the sales volume but were less frequently traded due to higher costs and specific storage and application requirements. It was observed that 60% of respondents considered the pre-harvest interval in their recommendations, while 91% were familiar with its importance. Knowledge of hazard pictograms was generally adequate, except for those related to transport.

Keywords: Survey, pre-harvest, phytopharmacists, biological, chemical

THE BIOSTIMULANT POTENTIAL OF BROWN SEAWEED EXTRACTS ON TOMATO (SOLANUM LYCOPERSICUM) GERMINATION AND EARLY GROWTH

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ABSTRACT

In response to the demand for natural bio stimulant formulations in sustainable agricultural research, this study evaluates the impact of aqueous extracts from three brown algae species (Fucus spiralis, Cystoseira tamariscifolia, and Sargassum trichocarpum) on the germination and early growth of Solanum lycopersicum .The design was completely randomized and used to test several concentrations in conjunction with positive and negative control using ten replications per treatment, and based on a systematic procedure of cold maceration during 24 hours and sonication at 50°C for 30 minutes was followed to prepare the extracts. Significant treatment effects were found by statistical analysis for every parameter that was examined. In particular, a 0.2% concentration of Fucus spiralis significantly improved germination, outperforming both high concentration Cystoseira treatments and negative controls, which is probably related to the extract's phenolic compounds, polysaccharides, and vital minerals. However higher amounts of Cystoseira tamariscifolia and Fucus spiralis, have shown inhibitory effects, possibly due to the osmotic stress brought on by increased salinity. Higher concentrations of Sargassum trichocarpum promoted hypocotyl development and seedling vigor, but had differing effects on radicular growth, according to morphological study. Overall, this study demonstrates the bio stimulant capability of the brown seaweed extracts based on the dose dependence, with Sargassum trichocarpum (at high concentrations) and Fucus spiralis (at low concentrations) exhibiting promise for sustainable tomato farming. These findings underline the significance of employing techniques that are appropriate for each species and the proper concentration approaches in agricultural applications.

Keywords: Brown seaweed extracts, bio stimulants, tomato, seed germination, seedling growth, sustainable agriculture

ESTIMATION OF WATER REQUIREMENTS FOR POTATO CULTIVATION IN ARID REGIONS

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ABSTRACT

Water scarcity is a major constraint in Algeria. This scarcity will become even more acute in the future due to climate change and socio-economic development, resulting in ever-increasing demand for water. Market gardening, which is a strategic crop in the country, is experiencing significant growth, particularly potato cultivation, which represents the second largest cultivated area after cereals. Potatoes are grown in most regions of the country and in all seasons of the year (early, mid and late season). They are dependent on irrigation. It is in this context that the present study was conducted, which consists of assessing the irrigation water requirements of potatoes (seasonal crop) in the El Oued region, characterised by a desert climate, using CropWat, over a study period of 23 years (2000-2022). The results obtained showed that the irrigation water requirements for potato cultivation vary from 3 to 4 mm per day before tuberisation, then from 6.5 to 7.5 mm per day once the tubers have formed. The total requirements for a full season amount to 712.5 mm. The results, which enable efficient and rational use of water resources, have benefited managers and farmers growing potatoes in arid regions.

Keywords: Climate, Efficiency, Potato, Irrigation, Water stress

EVALUATION OF HEAT STRESS TOLERANCE IN SIX BARLEY GENOTYPES BASED ON EARLY DEVELOPMENT, CHLOROPHYL CONTENT AND ROOT CARBOHYDRATE ACCUMULATION

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ABSTRACT

Heat stress, an increasingly prevalent abiotic stressor driven by global climate change, poses a serious threat to agricultural productivity, affecting thermosensitive crops. As temperatures continue to rise, enhancing crop resilience to elevated thermal conditions has become a pressing priority for food security. Assessing of the physiological and biochemical responses of barley genotypes under heat stress is essential for effective genotype selections. The present study aims to evaluate six barley genotypes for their tolerance to elevated temperatures during early developmental stages. The evaluation integrates morphological, physiological and biochemical parameters, including germination rate, shoot and root development. Plants were subjected to three temperature conditions at 25°C (control), 30°C and to 35°C, and several parameters were evaluated to assess their heat tolerance. In addition, total carbohydrate accumulation in roots was analyzed as a biochemical indicator of stress adaption. Five out of six analyzed genotypes showed moderate levels of heat tolerance, while genotype showed sensitivity at 30°C. At 35°C, all genotypes showed poor germination rate, and no further development was observed. Carbohydrate accumulation in roots was significantly higher at all genotypes for treatments 30°C compared to control. This first assessment of heat stress tolerance in Albania barley cultivars highlights key morphological and physiological traits that can support the selection of more climate resilience varieties

Keywords: Hordeum vulgare, heat stress, heat tolerance

COMPARATIVE TESTING OF SUNFLOWER HYBRIDS IN THE SOIL AND CLIMATIC CONDITIONS OF THE TUTRAKAN REGION

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ABSTRACT

The field experiment was carried out in the area of the village of Tsar Samuil (North-East Bulgaria) during the period 2022–2024. The test was performed by means of a block method with four replications; experimental field area – 25 m2 after wheat as winter predecessor. The following sunflower hybrids were tested; LG5665, LG50510, LG5478 and LG5662. The aim of the investigation was to determine the production potential of the tested sunflower hybrids in the region of North-East Bulgaria. The analysis of the results showed that the the highest values of the productivity elements were reported for the LG56.65 hybrid and the lowest – for the LG56.62 hybrid. The LG56.65 hybrid was most suitable for growing under the conditions of North-East Bulgaria; it gave maximum average seed yield (275 kg/da) during the three years of testing. The field experiment was carried out in the area of the village of Tsar Samuil (North-East Bulgaria) during the period 2022–2024. The test was performed by means of a block method with four replications; experimental field area – 25 m2 after wheat as winter predecessor. The following sunflower hybrids were tested; LG5665, LG50510, LG5478 and LG5662. The aim of the investigation was to determine the production potential of the tested sunflower hybrids in the region of North-East Bulgaria. The analysis of the results showed that the the highest values of the productivity elements were reported for the LG56.65 hybrid and the lowest – for the LG56.62 hybrid. The LG56.65 hybrid was most suitable for growing under the conditions of North-East Bulgaria; it gave maximum average seed yield (275 kg/da) during the three years of testing.

Keywords: sunflower, hybrids, seed yield, crude fat seed yield

CONTRIBUTION TO THE COMPREHENSIVE STUDY OF CRYPTOGAMIC DISEASES AFFECTING CEREALS IN THE TIZI OUZOU REGION (NORTH-ALGERIA) DURING THE 2024-2025 COMPAIGN

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ABSTRACT

This work consists of identifying and characterising certain cryptogamic diseases affecting cereal crops in Tizi-Ouzou during the 2024–2025 season. In six cereal plots selected in Azazga [durum wheat (Simito, Amar6, Simito R1), soft wheat (HD1220, HD1220 R1), and barley (Rihane)], a total of five fungal diseases were observed on the studied varieties: halo leaf spot, septoria leaf spot, powdery mildew, fusarium head blight, and rhynchosporium leaf spot.Halo leaf spot and septoria leaf spot each recorded the highest infestation rate of 40% (on the Simito R1 durum wheat variety). The same infestation rate (40%) was also recorded for septoria leaf spot on the Simito durum wheat variety. Septoria leaf spot was reported at different rates depending on the variety and phenological stage, namely: [Var. HD1220 soft wheat (10%, 15%, 25%)]; [Var. HD1220 R1 soft wheat (15%)]; [Var. Amar6 durum wheat (15%)].Depending on the phenological stages, halo leaf spot was reported on Var. Simito R1 (late tillering) with an infestation rate of 40%. Septoria leaf spot appeared at different stages and persisted at varying rates: 40% at flowering, 15% at the milky-dough stage, and 15% at the dough stage. Fusarium head blight, powdery mildew, and rhynchosporium leaf spot appeared less frequently across the different stages.

Keywords: Durum wheat varieties; soft wheat varieties; barley varieties; cryptogamic diseases; phenological stages; Algeria (Tizi-Ouzou, Azazga).

ARNICA MONTANA – A STRATEGIC MEDICINAL AND ECONOMIC RESOURCE FOR SUSTAINABLE MOUNTAIN DEVELOPMENT

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ABSTRACT

Arnica montana, a perennial herb from the Asteraceae family, is widely recognized for its pharmaceutical, herbal, and cosmetic applications. Beyond its economic value, it serves as an ecological indicator of healthy mountain meadows and supports biodiversity. In order to introduce this species into cultivation, a study was initiated in 2024 to explore its cultivation possibilities. At the experimental field of INCDCSZ Brașov, a bifactorial experiment was established, with plants grown at two different intra-row spacings (20 and 30 cm) and two different inter-row spacings (40 and 60 cm). Plants were obtained by dividing mature Arnica montana clumps. Vegetation measurements were recorded in 2024 and 2025, during the vegetation period, with the first flowers harvested between May and June 2025 and naturally dried. Due to its multifunctionality — medicinal, ecological, and ornamental — Arnica montana represents a strategic species for sustainable mountain development and the efficient use of renewable natural resources.

Keywords: Arnica montana, perennial herb, sustainable mountain development

GRAIN STORAGE, FACTORS AFFECTING STORAGE, AND CONSIDERATIONS DURING THE STORAGE PROCESS

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ABSTRACT

With the rapid growth of the world population and the emergence of food crises especially in underdeveloped countries grains have gained strategic importance in human nutrition. Therefore, in addition to grain production, storage and preservation have become increasingly important over time. Moreover, the ability to stockpile grains provides a significant advantage in times of war or natural disasters.In the agricultural sector, although the supply of products occurs in a short period, demand is spread over a longer duration. Thus, products must be stored and made available for consumption with minimal loss in terms of both quality and quantity. To prevent such losses, the most critical factors that must be carefully managed include storage temperature and humidity, grain temperature and humidity, the structure of the storage facility, and biological factors. Both ventilation and drying methods should be used to maintain these values at optimal levels and to take preventive measures against potential pest infestations or mold growth. Before the grain is placed into storage, all unfavorable conditions in both the product and the storage area (such as temperature, humidity, foreign materials, and weed seeds) should be minimized to make the product ready for storage. The most commonly preferred types of grain storage facilities are horizontal and vertical silos. In harvest seasons especially in years with high yield when vertical and horizontal storage becomes insufficient, underground storage is also an option. Regardless of the storage method, the primary goal is to preserve the stored product in terms of both quality and quantity and to make it available for consumption without loss of value. This review aims to provide general information about the fundamental principles and key considerations in grain storage.

Keywords: Grain, storage, preservation

CITRUS BREEDING IN THE FACE OF CLIMATE CHANGE: MOLECULAR GENETIC APPROACHES TO HEAT STRESS TOLERANCE

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ABSTRACT

Global climate change has become one of the most serious global challenges of the 21st century and is having increasingly severe effects on agriculture. Due to its increasing impact on agriculture, one major consequence of global climate change is the rise in environmental stress factors such as drought, salinity, frost, and especially heat stress. Heat stress negatively impacts some important physiological and metabolic functions in plants, such as photosynthesis, water use efficiency, and reproductive development, with citrus species being particularly vulnerable. In citrus, heat stress leads to oxidative damage, reductions in fruit yield and quality, and changes in fruit development. Given the adverse effects of high temperature stress on citrus production, it is essential to understand the mechanisms underlying tolerance to such stress conditions. In recent years, advances in molecular biology and genetics have provided new insights into the mechanisms underlying heat stress tolerance in citrus species. This review synthesizes current knowledge on the physiological, molecular, and genetic responses of citrus to elevated temperatures, with a focus on antioxidant defense systems, heat shock proteins, transcriptional regulation, and stress-responsive signaling pathways.

Keywords: Climate change, Abiotic stress, Heat stress, Citrus, Molecular breeding

EFFECTS OF PUTRESCINE AND IBA TREATMENT ON ROOTING OF OLIVE CUTTINGS

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ABSTRACT

Olive propagation occurs vegetatively, mainly through cutting. Propagation by cuttings in olives is a simple and rapid method for maintaining genetic homogeneity. However, the difficulty of rooting in some varieties is one of the problems that limits production. This study aimed to increase the rooting ability of three olive varieties (Gemlik, Domat, and Memecik). For this purpose, auxin (indole butyric acid (IBA) was applied at a concentration of 4000 ppm, either alone or in combination with putrescine (250, 500, and 1000 ppm). A medium containing coconut fiber (45%), peat (45%), and perlite (10%), providing good aeration and high water-holding capacity, was chosen for rooting. Data on root and callus formation (%) were analyzed at the end of the study. The results showed that the three olive cultivars responded differently to the treatments applied. The highest callus formation was observed in the Memecik cultivar in media containing 1000 ppm putrescine (78%) and 4000 ppm IBA (65%), respectively. The highest root formation was observed in the Gemlik cultivar in media containing 4000 ppm IBA + 250 ppm PUT (53%) and 4000 ppm IBA (50%), respectively.

Keywords: Olea europaea L., polyamine, auxin, rooting

MODELING USING FUZZY INFERENCE SYSTEM TECHNIQUES OF THE PROLIFERATION DATE PALM DISEASES

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ABSTRACT

Date palms are often exposed to the disease of inflorescence rot. The pathogen is a fungus (Mauginiella scaettae). Several bioclimatic conditions intervene in its proliferation and the losses of harvest caused are sometimes very important. However, these conditions are far from accurate. Their analysis is then in an uncertain environment. Modeling those using classical mathematical techniques is then very complex if it is not impossible. We considered it useful to analyze them by the artificial intelligence techniques including the principles of fuzzy logic which is perfectly adapted to this situation. In our model, the input variables characterize the factors that intervene in the process of (temperature, rainfall, wind speed, humidity, and the corresponding season). The proposed system remains extensible to other factors that are not considered in this study and that have their effects. These factors determine the degree of pathogenicity that is considered to be the output variable of the system. Once the rule base is established based on real conditions, it becomes possible to predict the rate of proliferation of this disease from the random introduction of the input variables. This can be a tool for preventing date palm diseases.

Keywords: Date palms, Palm diseases, Factors, Fuzzy logic.

POPULATION DYNAMICS OF THE OLIVE FRUIT FLY (*BACTROCERA OLEAE*) IN THE BERAT REGION

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ABSTRACT

Olive cultivation represents one of the most important branches of agriculture in the Berat region. This area is characterized by favorable agroclimatic conditions and a long-standing tradition in olive cultivation, a crop of great economic importance for the region. However, olive production is often affected by the damage caused by the olive fruit fly (Bactrocera oleae), one of the most harmful pests of this crop. This study aimed to monitor the dynamics of the olive fruit fly population through sampling of olive fruits and to assess the level of infestation by fly larvae. The study was carried out using standard methods, analyzing 100 fruits/tree (5 trees) on an area of 0.1 ha. It was conducted from mid-June to the end of September 2025, in the village of Qershnik, Berat district, with the cultivar "Kokermadhi i Beratit". The results showed that during 2025, the infection level of Bactrocera oleae in this area was about 3%. This low level of infestation is attributed to the high summer temperatures and unfavorable conditions for the development of the fly. These temperatures maintained the fly population at low levels, preventing any economic damage to the olive yield.

Keywords: Olive fruit fly (Bactrocera oleae), dynamics, sampling, population, infestation rate.

POTENTIAL OF CARINATA AS AN ENERGY CROP FOR THE MEDITERRANEAN REGION

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ABSTRACT

The transition toward low-carbon energy systems requires sustainable and regionally adapted feedstocks for biofuel production. Carinata (Brassica carinata A. Braun), also known as Ethiopian mustard, has gained increasing attention as an energy crop well suited to Mediterranean conditions. Carinata exhibits several agronomic traits of high value for Mediterranean agriculture: good tolerance to drought and heat, efficient nitrogen use, resistance to pod shattering, and tolerance to common pests and diseases. These attributes make it an attractive option for diversifying cropping systems and improving soil protection and carbon sequestration. The oil produced from carinata seeds contains a high proportion of long-chain fatty acids, providing excellent properties for biodiesel and sustainable aviation fuel production. Additionally, the residual biomass—seed meal and straw—can be used for bioenergy or other industrial purposes, contributing to circular bioeconomy models. Breeding programs have recently achieved significant improvements in oil yield, fatty acid profile, and reduced glucosinolate content, enhancing both processing quality and environmental sustainability. The integration of carinata as an intermediate winter crop between irrigated summer crops such as maize, rice, or sorghum has recently been proposed. Within this scheme, carinata would be cultivated under rainfed conditions from autumn to late spring, without competing for water resources or displacing food production. This use of carinata as a winter energy crop in Mediterranean rotations aligns with policy objectives for renewable energy promotion and carbon neutrality. However, it still requires the development of suitable early-maturing cultivars. By increasing the availability of sustainable feedstocks without indirect land-use change (ILUC), carinata could play a key role in achieving the targets set by international frameworks such as the EU Renewable Energy Directive (RED III). Overall, carinata offers strong potential as a resilient, low-input, and environmentally sustainable energy crop for the Mediterranean region, providing both economic opportunities and ecological benefits within climate-smart agricultural systems.

Keywords: Biofuels; Brassica carinata; Energy crops; Ethiopian mustard; Oilseeds

THE EFFECTS OF BORON DOSES APPLIED IN DIFFERENT GROWTH STAGES ON AGRICULTURAL PROPERTIES OF PEANUT

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ABSTRACT

Boron is a vital micronutrient for plants, and its deficiency adversely affects growth. It is fundamental for strengthening cell wall structure, regulating cell division, and facilitating the transport of sugars and starches; processes which collectively contribute to improved seed yield. Based on this rationale, the present study aimed to investigate the effects of boron doses—applied at distinct growth stages—on the yield and yield components of peanut (Arachis hypogaea L.). The investigated parameters included the number of pods and branches per plant, pod weight per plant, plant height, leaf area index, 100-seed and 100-pod weight, shelling percentage, the first quality pod ratio, and pod yield. The study was conducted in Osmaniye over two growing seasons (2021 and 2022) using a split-plot design with three replications. In this design, the growth stages (R1, R2, and R3) were allocated to the main plots, while the boron doses (0, 30, 60, 120, and 240 ppm) were assigned to the sub-plots. Pod yield was significantly ($p < 0.05$) affected by year and growth stage, but not by boron dose. The highest pod yields were observed in the R3 stage and with the 60-ppm boron dose, with values of 618.69 kg/da and 584.52 kg/da, respectively. In conclusion, the maximum values for all parameters were obtained from the R2 stage and later. Based on this two-year field study, the application of 60 ppm boron at or after the R2 growth stage is recommended as an optimal strategy for achieving higher pod yield.

Keywords: Groundnut, Boron treatments, Pod yield, Yield components

IMPROVING OILSEED CROP YIELD AND QUALITY THROUGH A MULTI-DIMENSIONAL BREEDING STRATEGY

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ABSTRACT

As a crucial component of the food system, vegetable oils provide an important source of energy and represent valuable economic commodities for producers. They can contribute positively to balanced nutrition by providing essential fatty acids, such as omega-6 (linoleic) and omega-9 (oleic), which are vital for human health. Oleic and linoleic acids (unsaturated fatty acids) are important components of vegetable oil; especially oleic acid contributes to higher-quality oil, providing health benefits. Low-density lipoprotein cholesterol and triglyceride levels are lower on the oleic acid diet compared with the saturated fatty acids diet. A high ratio of oleic acids suppresses tumorigenesis, reduces the level of harmful cholesterol and blood glucose levels in type II diabetes. Vegetable oils also serve as important raw materials for industrial applications and biodiesel production. Sesame, soybean and peanut are highly important oilseed crops cultivated in over 100 hundred countries in different climatic zones. These crops are also highly significant for Mediterranean climate conditions which present an extremely suitable growing regime for main and second crop production. Improvement of elite lines belongs to soybean, sesame and peanut therefore is highly important for this climatic area for high seed yield, oil content, oleic acid, and resistance to biotic and abiotic stress factors. In this study, a holistic breeding approach was implemented to enhance production and quality in oilseed crops. The sesame, peanut and soybean collections were examined in field conditions to select desirable traits that can be used in oilseed crops breeding. Marker-assisted-selection was conducted to select peanut lines resistant to leaf spot, rust and sclerotinia blight. The shattering trait was mapped in sesame and hybridization studies were handled to select mechanize-ready lines. Soybean lines were tested in field condition to identify drought-tolerant high-yield types. These results will be used to provide elite lines for future farming under climate change conditions especially for Mediterranean areas.

Keywords: Arachis hypogaea L., Glycine max L., Sesamum indicum, oil

THE EVALUATION OF NODULATING ABILITY OF ALFALFA IN MIXTURES

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ABSTRACT

A field experiment was conducted to study the nodulation ability of two alfalfa varieties, alone and in mixtures with grass crops. The alfalfa varieties Pleven 6 and Dara were used, and the cocksfoot variety Dabrava was used for the mixtures with grass crops. The ratio of legumes to grass crops in the mixtures was 50:50% and 80:20%, respectively. Soil monoliths were taken to determine the number of nodules formed on the alfalfa plants and the level of nodule formation. It was found that the number of nodules formed (16 nodules/plant) on the Dara alfalfa plants was 33.3% higher than that on the Pleven 6 plants (12 nodules/plant). In mixtures of alfalfa and cocksfoot in a 50:50 ratio, the number of nodes was found higher than that formed only by alfalfa in both varieties, with the Dara variety having 26.8% more. In mixtures of alfalfa and cocksfoot in a ratio of 80:20%, the number of nodes formed was the highest due to the larger proportion of the legume component. The number of nodes formed in the alfalfa variety Dara was 26.7% higher than that in the variety Pleven 6, and 15.8% higher in the mixture in a ratio of alfalfa Dara: cocksfoot 80:20% compared to alfalfa alone. In terms of nodule formation, the plants were ranked as follows: Dara alfalfa in mixtures with cocksfoot in a ratio of 80:20% (45.5), Pleven 6 alfalfa in mixtures with cocksfoot in a ratio of 80:20% (43.0), alfalfa variety Dara – single crop (42.0), alfalfa variety Pleven 6 – single crop (40.5) and alfalfa variety Pleven 6 in mixtures with – single crop in a ratio of 50:50% (40.5). The higher potential for alfalfa nodule formation in mixtures with cocksfoot in a ratio of 80:20% was associated with more efficient use of nitrogen for nodule formation.

Keywords: Alfalfa, Nodule formation, Mixtures

ECONOMICAL WHEAT PRODUCTION IN SERBIA AND THE WORLD

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ABSTRACT

Wheat (*Triticum* sp.) is the most important grain that is grown all over the world. In world grain production, according to the quantity produced, it ranks second, right after corn. Geopolitical changes in the world directly affect international trade and the markets of agricultural and food products, as well as the state of the international grain market. The area under wheat varied during the observed period. The highest average yield was recorded in 2022 in the world (3704.4) and Europe (4514.4), and the lowest average yield was recorded in 2000. Wheat production in Serbia varied in the period 2020-2024, while the yield recorded continuous growth (except for 2022), in 2024 it reached 5.8t ha^{-1}.

Keywords: Wheat, sown areas, yield.

DETERMINING EFFICIENCY OF ISSR MARKERS AMONG WILD Prunus spinosa GENOTYPES

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ABSTRACT

Prunus spinosa L., commonly known in Turkey as "Çakal Eriği" or "Güvem," is a wild plum species that naturally occurs across many regions of the country, particularly in the Thrace region. Despite its ability to thrive in harsh environmental conditions and its wide habitat range, this species is not cultivated commercially, and scientific studies involving P. spinosa are limited. This study evaluated the effectiveness of ISSR (Inter Simple Sequence Repeat) markers using seven previously unstudied P. spinosa genotypes collected from the Thrace region. Of the 27 ISSR primers used, 17 produced successful amplifications, yielding 244 bands in total. Of these, 216 were identified as polymorphic, resulting in an average polymorphism rate of 86.49%. The number of bands per primer ranged from five (ISSR 825) to 24 (ISSR 823 and ISSR 844), averaging 14.8 bands per primer. The amplified fragment sizes ranged from 290 to 2,100 base pairs. Polymorphism information content (PIC) values ranged from 0.313 (ISSR 843) to 0.424 (ISSR 825), with an average PIC value of 0.365. These results demonstrate the effectiveness of ISSR markers as molecular tools for assessing genetic diversity among P. spinosa genotypes. The primers ISSR 825 (PIC = 0.424), ISSR 841 (PIC = 0.397), and ISSR 808 (PIC = 0.392) exhibited high levels of discrimination, making them useful for detecting genetic differences. These results suggest that ISSR markers can reliably be employed to investigate genetic diversity in previously uncharacterized P. spinosa genotypes. ISSR 825, ISSR 841, and ISSR 808 stand out with their high discriminative potential.

Keywords: Genetic diversity, ISSR, Prunus spinosa L., Wild plum

EFFECTS OF LOW TEMPERATURE ON OPEN-FIELD CULTIVATION OF PASSIONFRUIT (PASSIFLORA EDULIS) UNDER THE ECOLOGICAL CONDITIONS OF MANAVGAT

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ABSTRACT

In recent years, the cultivation and consumption of tropical fruits in Türkiye have gained increasing prominence, driven by global climate change, rising input costs in greenhouse vegetable production, and the expanding commercial value of tropical fruit species. Among these, passionfruit (Passiflora edulis) has emerged as a particularly attractive crop due to its relatively low labor requirements, capacity to bear fruit twice annually, and potential use as a living fence. Despite the general perception of global warming as a rise in average temperatures, low winter temperatures remain a critical constraint on the cultivation of tropical fruit crops. This study was conducted to assess the impact of low temperatures on open-field cultivation of passionfruit under the ecological conditions of Manavgat, Türkiye, between May 2021 and June 2025. Evaluations included plant growth, flowering dynamics, the effects of low winter temperatures, and post-frost recovery performance. In the first winter following planting, minimum temperatures of 0.3, 0.7, 0.6, and 0.7 °C were recorded on January 2022, 20, 24, 25, and 26 respectively, leading to prolonged frost events. In contrast, no sub-3.0 °C temperatures were recorded in 2023 and 2024, while a single minimum of 2.2 °C occurred in 2025. Flowering was observed twice per year, in June and October. The results demonstrate that open-field cultivation of passionfruit is feasible under the ecological conditions of Manavgat. Nevertheless, to mitigate frost-related risks and extend the flowering period, further investigations into passionfruit production under protected cultivation systems are strongly recommended.

Keywords: Passiflora (Passiflora edulis), Passionfruit, Low temperature, Flowering

EFFECTS OF STORAGE WITH CIRCULATION FAN AND STANDARD ROOM TEMPERATURE FOR 28 DAYS ON EGG INTERNAL QUALITY AND MICROBIAL LOAD OF EGGS PRODUCED IN FREE-RANGE AND CAGE SYSTEMS

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ABSTRACT

In this study, the quality changes and microbial loads of eggs obtained from different production systems under storage conditions were investigated. The animals used in the project were placed in trays in the storage area on the same day and selected randomly. A total of 1120 eggs from cage and organic production systems were used in the study. During the storage period, a significant weight loss was observed in all groups. The weight loss was recorded as 4.05% in fan-assisted cage eggs (FC), 2.66% in cage eggs (C), 2.37% in fan-assisted free-range eggs (FFR), and 2.08% in free-range eggs (FR). The Haugh unit average of eggs stored in fan-assisted rooms (58.52 ± 1.454) was lower than those stored at normal room conditions (61.41 ± 1.454). However, this difference was not statistically significant. Similarly, no significant difference was found in Haugh units between free-range eggs stored in fan-assisted and normal room conditions ($P = 0.946$). The Haugh unit averages of eggs stored in fan-assisted (61.82 ± 1.210) and normal room conditions (61.70 ± 1.214) were found to be very close. In microbiological analyses, a statistically significant decrease ($p < 0.005$) in bacterial counts was detected. On day 1, the bacterial load in all groups was approximately 3.71–4.00 log CFU/g. On day 28, the values were determined as C: 3.30 ± 0.05, FR: 3.36 ± 0.08, FC: 3.54 ± 0.00, and FFR: 3.40 ± 0.002. The most pronounced microbial reduction was observed in cage eggs stored without ventilation. According to these results, egg weight loss was found to be more evident in cage eggs stored under fan-assisted conditions. It was determined that Haugh unit values were independent of production system and storage conditions and met commercial standards. In terms of microbial load, the cage system without ventilation yielded the most favorable result.

Keywords: : Egg, Free-Range System, Cage System, Storage Conditions, Internal Quality, Microbial Load

STUDY OF THE DRYING KINETICS OF CARROT AND POTATO

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ABSTRACT

Food conservation is essential in the agri-food sector, both for product quality and safety. Among the various preservation methods, drying occupies an important place in Morocco. This technique reduces the water content of foods, which inhibits microbial growth and extends their shelf life. We focused on two fresh vegetables: potatoes and carrots. These plants, widely consumed in Morocco and with high nutritional value, constitute relevant case studies for analyzing the heat and mass transfer mechanisms occurring during drying. We studied the drying kinetics at different temperatures applied to these products. The objective of this study is to determine and analyze the drying kinetics curves of these products, to understand the physicochemical phenomena that occur during the drying process, and to identify the key parameters influencing the process, particularly the drying temperature. In addition, sensory analysis performed during the drying process allows us to identify the final moisture content to be achieved without compromising product quality.

Keywords: Conservation, Carrot , potato, Drying, Kinetics , Quality

STUDY OF THE DRYING KINETICS OF EGGPLANT

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ABSTRACT

Drying is widely used in the food industry due to its multiple advantages such as; Improved conservation, Ease of storage and transport, Maintenance of organoleptic and Nutritional qualities and Valorization of agricultural surpluses. Drying generally follows three distinct phases: the Warm-up Period, the Constant Speed Period, and the Decreasing Speed Period. We studied the drying kinetics of eggplant in a static air dryer. This study aims to characterize the product's drying kinetics, elucidate the physicochemical changes during drying, and identify critical process parameters, especially temperature, with the help of sensory analysis to determine the optimal final moisture content for quality preservation.

Keywords: Conservation, Eggplant, Drying, Kinetics , Quality

THE ROLE OF IRON ON PLANT GROWTH AND TUBER QUALITY IN POTATO (Solanum tuberosum L): A Review

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ABSTRACT

Potato (Solanum tuberosum L.) ranks among key crops for worldwide food security, thanks to its rich nutrient profile, capacity to thrive under varied environmental conditions, and major role in human nutrition. Although potatoes are highly adaptable, many cultivation areas especially in Turkey feature alkaline and calcareous soils, which can reduce the accessibility of vital micronutrients like iron.Iron is an essential element for plant metabolic processes, being critical for chlorophyll production, photosynthesis, and enzymatic functions; insufficient iron often causes chlorosis, stunted growth, and lower tuber yields. Research indicates that both foliar and soil iron applications can benefit potato plants, with proper dosing improving growth, chlorophyll levels, tuber yield, and overall quality. However, excessive iron supplementation may induce oxidative stress, disrupt nutrient balance, and negatively affect growth, highlighting the need for careful management. Thus, fine-tuning iron fertilization regarding quantity, delivery method, and timing is essential to achieve optimal agronomic outcomes. Overall, balanced iron management emerges as an essential agronomic practice, not only for increasing productivity but also for improving the nutritional quality of potatoes, thereby contributing to human health and food security

Keywords: Potato, Solanum tuberosum L., Iron applications, Plant nutrition, Tuber yield, Micronutrient

BIO-INSECTICIDAL EFFECT OF BACILLUS STRAINS AND TRICHODERMA SP. AGAINST DACTYLOPIUS OPUNTIAE (COCKERELL, 1929) (HEMIPTERA: DACTYLOPIIDAE) UNDER IN VITRO CONDITIONS

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ABSTRACT

Prickly pear, Opuntia ficus-indica (Caryophyllales: Cactaceae), is a staple crop in rural Morocco, where it finds many applications as food and animal feed and also in industrial and pharmaceutical settings. Its cultivation has, however, been recently disrupted by the introduction of the wild cochineal Dactylopius opuntiae (Cockerell, 1929) (Hemiptera: Dactylopiidae) in 2014. Given the limitations of chemical insecticides, particularly regarding efficacy and environmental impact, this study evaluated the in vitro performance of four microbial antagonists: Bacillus amyloliquefaciens strain I3, Bacillus velezensis strain O4, a commercial strain of Bacillus thuringiensis, and Trichoderma sp. against D. opuntiae, with a commercial product based on pyriproxyfen used as a chemical reference. The assays were carried out using a randomised complete block design with four repetitions and tested three concentrations of each microbial agent (10^6, 10^7 and 10^8 CFU or conidia.mL^{-1}) and pyriproxyfen (0.25, 0.50 and 0.75 mL.L^{-1}). Mortality was monitored for 12 days and corrected using Abbott's formula. Under laboratory conditions, B. amyloliquefaciens I3 and B. velezensis O4 caused significantly higher mortality than pyriproxyfen (Gupta's test, $p < 0.05$), reaching 48% and 36% mortality 12 days after treatment (DAT), compared with 21% for pyriproxyfen. B. thuringiensis (19%) and Trichoderma sp. (14%) were less effective. No dose-response relationship was statistically proven for the various treatments. These findings demonstrate the potential of Bacillus amyloliquefaciens and Bacillus velezensis against D. opuntiae, making them promising candidates for the biocontrol of the wild cochineal.

Keywords: Opuntia ficus-indica, Dactylopius opuntiae, biological control, Bacillus amyloliquefaciens, Bacillus velezensis, Bacillus thuringiensis, Trichoderma sp., integrated pest management.

SOMATIC EMBRYOGENESIS IN AZMAN AND GRAND NAINE BANANA CULTIVARS

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ABSTRACT

Banana, which plays an important economic and social role worldwide, has the highest export and import volume in the tropical and subtropical climate zones of the world. Tissue culture techniques, which are at the forefront of biotechnological methods today, are an important tool to shorten the long and difficult breeding processes and overcome problems. Somatic embryogenesis in banana can be induced from various explants, including mature/immature zygotic embryos, immature male-female flowers, scalps, rhizomes and corm tissues. However, scalps and immature male flowers have been the most responsive, with consistent results across diverse banana genotypes. In this study, it was aimed to optimize embryo formation by somatic embryogenesis using 'Azman', a banana genotype belonging to the Gross Michel (AAA) group, which has high commercial importance in Türkiye, and 'Grand Naine', a banana genotype belonging to the Cavendish (AAA) group. Immature male flower buds positioned between 0–21 were used as explant sources for callus induction. Culture initiation was performed on MS nutrient medium supplemented with 0.175 mg/L IAA and 0.550 mg/L TDZ, 30 g/L sucrose, and 7 g/L agar, and maintained at 25°C under dark growth room conditions. Callus structures after three subcultures were induced in Murashige and Skoog (MS) medium supplemented with 1.0 mg/L 2,4-D. To enhance embryogenic callus development, MS media containing control, and various concentrations/combinations of auxins (2,4-D, Picloram) and cytokinins (2iP, BAP) were tested. These media contained 2,4-D/ 2iP (1.0-1.5/0, 0.1-0.3-0.5 mg/L) and Picloram/BAP (1.0/0.05-1.5/0.05 mg/L). After four months of induction, the total percentage of callus formed ranged from 100% in explants of 10–21 flower buds positions to 75% in explants of 0–9 flower buds positions. After three subcultures on the callus development medium (1.0 mg/L 2,4-D), embryogenic calli and embryo structures were obtained both cultivars. At the end of the callus multiplication and development studies, observations were made regarding the presence of embryos in the developed structures. The rate of embryogenic callus formation was 100% in Grand Naine and 93.3% in Azman. Overall, 62.5% of Grand Naine explants and 81% of Azman explants produced embryos. These percentages were calculated as the ratio of embryo-forming explants to the total number of explants per genotype. Statistical analysis showed that the average number of embryos was higher in Grand Naine (3.53 embryo/explant) compared to Azman (2.89 embryo/explant). No statistically significant difference was found between genotypes in terms of callus weight; however, the mean callus weight was 4.00 g for Grand Naine and 3.43 g for Azman. As a result of media experiments conducted to proliferation of somatic embryos and maturation, the nutrient medium containing 1.0 mg/L Picloram and 0.05 mg/L BAP was found to be successful.

Keywords: Azman, Banana, Callus, Grand Naine, Somatic Embryogenesis

EFFECTS OF ETHEPHON, ETHYLENE AND ACETYLENE APPLICATIONS AT DIFFERENT DOSES AND TEMPERATURE CONDITIONS ON FLOWER INDUCTION IN SOME BROMELIACEAE SPECIES

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ABSTRACT

This study comparatively investigates the effectiveness of flowering-inducing hormones in two species of the Bromeliaceae family—Guzmania ostara and Tillandsia cyanea—under constant pH conditions (5.0) and two different temperature levels (22°C and 35°C). The primary aim of the research is to evaluate the impact of hormones such as ethephon, ethylene gas, and acetylene gas on flowering success through varying dosages and application frequencies, while also considering plant height as a key trait for marketability. At 22°C, Tillandsia cyanea showed the most successful response to ethephon treatment. Trials with single applications of ethephon at doses of 60, 80, and 150 ml/100 liters of water resulted in consistent and successful flowering in this species. Under the same conditions, applications of ethylene and acetylene gas led to irregular flowering, even when the number of applications was increased. This indicates that ethephon is a more effective hormone for promoting flowering in Tillandsia cyanea. In Guzmania ostara, however, ethylene and acetylene gas treatments at 22°C resulted in taller plants compared to ethephon treatments. While ethephon applications produced plant heights ranging from 36 to 45 cm, treatments with ethylene and acetylene gas yielded heights of 55 to 56.5 cm. This suggests that in ornamental plant markets where taller plants are preferred, ethylene and acetylene gas applications may offer a marketing advantage. At 35°C, Tillandsia cyanea continued to show successful flowering only with ethephon treatments, while no flowering was observed with other hormone applications. In Guzmania ostara, flowering was not observed at low doses of ethephon under high temperature conditions; only the highest dose (150 ml/100 liters of water) resulted in irregular flowering. Ethylene and acetylene gas treatments were also ineffective in promoting flowering in this species at elevated temperatures. In conclusion, ethephon successfully promotes flowering in Tillandsia cyanea at both low and high temperatures, while ethylene and acetylene gas treatments enhance plant height in Guzmania ostara, supporting its marketability. Hormone selection should be optimized based on plant species and environmental conditions, as each species and temperature level elicits different physiological responses.

Keywords: bromelia flower induction hormone guzmania tillandsia ethephon ethylene acetylene

EFFECTS OF PESTICIDE-INDUCED MICROBIOTA DYSREGULATION ON BEHAVIOUR: MOUSE MODEL

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ABSTRACT

Humans are subject to various environmental factors, which influence body homeostasis in different ways. Chemical factors, and more particularly pesticides, represent the most important environmental factors. Ingestion of food containing pesticides is the main route of non-occupational pesticide contamination. As a result, the first organ in contact with pesticides in the body is the gastrointestinal system. The relationship between the gut microbiota and the brain, or what is known as the gut-brain axis, is a major communication channel between the gastrointestinal system and the brain. Thus, it has been shown that there is a relationship between the disturbance of the intestinal microbiota and certain neurological dysfunctions, such as Alzheimer's disease and autism. To explore this way, we conducted this study,evaluating the impact of a mixture of most used phytosanitary products (Chlorpyrifos-ethyl & Glyphosate), administered chronically on the behavior of mice. To perform this work, balb/c (n=20) mice aged 4 weeks were placed in breeding conditions with access to water and food ad libidum. To assess the effect of pesticides, mice were divided into two groups: a control group (n=10) and the test group (n=10) where the mice had access to mineral water containing a mixture of pesticides (Chlorpyrifos-ethyl & Glyphosate) at a concentration of 1/100 of LD50. The test were performer during 140 days. The effect of pesticides on behaviour is assessed by evaluating their impact on depression, anxiety and memory through the Open Field, Barnes Maze, Dark.light box, Elevated zero Maze, Forced Swim and Morris Water Maze tests. After 140 days, the mice are sacrificed and fecal samples and intestinal homogenate are collected and used for bacteriological culturomics tests. In the results of the open field and Dark-Light box tests show that mice exposed to pesticides have significantly ($p \leq 0.01$) higher anxiety behavior than non-exposed mice. However, mice exposed to pesticides did not appear to experience memory impairment or depressive behavior. Bacteriological analysis shows a deregulation of the microbiota of mice with a reduction of up to 80% in the bacterial load, and more particularly enterobacteria, but an increase in the presence of Escherichia coli 1. The different results obtained show that pesticides administered orally at concentrations induce dysbiosis with decreased levels of enterobacteria and increased levels of Escherichia coli 1. This dysbiosis is with a change in behaviour and especially an increase in anxiety.

Keywords: Gut-Brain axis, Behaviour, Pesticides, Mouse model, Microbiota

THE GLYPHOSATE AND CHLORPYRIFOS PESTICIDE MIXTURE PROMOTES HUMAN GLIOBLASTOMA XENOGRAFT GROWTH IN IMMUNOCOMPETENT MICE.

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ABSTRACT
Background**:** In this study, we suggested an experimental procedure demonstrating the impact of pesticide on the development of ectopic xenografts of human glioblastomas in immuno-competent Balb/c mice.
Method: In this in-vivo study, the mice were treated with or without a mixture of pesticide (Glyphosate and Chlorpyrifos), using a concentration corresponding to 1/8 of LD50 of each pesticide. The pesticides were injected intraperitoneally every 72 hours. The human glioblastoma cell suspension was cultured with tumor cerebrospinal fluid and then injected subcutaneously into the treated and not treated mice with a mixture of pesticide (Glyphosate and Chlorpyrifos) following 18 days after the beginning of the experiment.
Results: The body mass index of the male and female mice treated with pesticide was statistically ($P = 0.0048$) higher than those not treated with pesticides. 66.6% of the mice treated with pesticides and xenografts of glioblastoma developed masses at the injection site. The histological analysis revealed that 41.66% of the masses were astrocytic tumors. The other found masses corresponded to inflammatory lymph nodes and fibroblastic tissue formations.
Conclusion: The treatment of mice with pesticide mixture was found to allow the development of glioblastoma xenografts in immunocompetent mice.

Keywords: Glioblastoma, Xenograft, Pesticides, Cerebrospinal fluid, Mouse model

BACTERIOPHAGES: ISOLATION, PURIFICATION, AND AMPLIFICATION

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ABSTRACT

The primary aim of this study was to isolate bacteriophages that are specific to various bacterial strains from both raw and treated wastewater samples collected from the municipal wastewater treatment plant located in Sétif, Algeria. Following isolation, the phages were subjected to purification and amplification procedures. Subsequently, we characterized the isolated phages, particularly focusing on their host range and lytic activity against different bacterial strains. In parallel, we investigated the natural self-purification capacity of the wastewater treatment system by monitoring the survival and persistence of specific bacterial strains over time within the treatment environment. The isolation success rate of bacteriophages varied significantly depending on the bacterial host strain used. For example, when Escherichia coli strain SATE was employed as the host, phages were successfully isolated in 56.5% of the samples. For E. coli strain A21E1R, the isolation rate was slightly lower, at 46.3%. In contrast, no bacteriophages were isolated against Staphylococcus aureus, with a 0% isolation rate. Notably, this latter strain showed a marked and progressive decline in viability during incubation within dialysis tubes placed in the treatment basins, and it nearly disappeared entirely after four weeks. This suggests that S. aureus may be highly sensitive to the physicochemical or biological conditions within the wastewater treatment system, indicating effective natural attenuation mechanisms at play.

Keywords: Bacteriophage or phage, isolation, wastewater, Escherichia coli, Staphylococcus aureus, treatment plant.

PRODUCTION OF AGAR-AGAR FROM MARINE ALGAE

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ABSTRACT

This study focuses on the extraction of agar-agar, a natural gelling agent, from two species of red algae—Gelidium sp. and Gracilaria spp.—harvested along the Algerian coastline. The extraction process employed a conventional technique, which included an alkaline pretreatment followed by hot water boiling, allowing the polysaccharides to be released from the algal cell walls. The extraction yields varied between the two species, with Gelidium sp. producing up to 60% agar and Gracilaria spp. yielding around 40%. Moreover, the agar derived from Gelidium demonstrated superior gelling properties, making it more suitable for high-grade applications. Despite these promising results, the quality of the extracted agar remains inferior to commercial-grade products, primarily due to the presence of residual impurities such as pigments, proteins, and other polysaccharides. To improve the purity and functionality of the extracted agar, the study recommends additional purification steps such as dialysis, activated carbon filtration, or enzymatic treatments, which can significantly enhance gel strength, clarity, and stability. Overall, this research emphasizes the economic and biotechnological potential of Algeria's native marine algae. Developing a local agar production industry could reduce dependence on imports, add value to underexploited marine biomass, and promote sustainable biotechnological development within the country.

Keywords: Key words: Agar-agar, red algae, Gelidium and Gracilaria, extraction technics, local bioindustries

EXPRESSION OF METABOLIC GENES: A RISK FACTOR FOR DIABETIC NEPHROPATHY

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ABSTRACT

Introduction: Diabetic nephropathy (DN) is one of the most common microvascular complications of diabetes mellitus which is characterized by microalbuminuria and macroalbuminuria. DN's etiology is multifactorial and involves complex interactions between environmental and genetic factors. This case-control study aimed to assess the expression of metabolic genes such as ET, AdiqQ, TCF7L2, APOE, LPL, and FTO genes in subjects suffering from diabetic nephropathy (DN). Methodology: The study's subjects (n = 200) were enrolled from the Service Institute of Medical Science, Lahore, and were grouped into control, and DN groups. Along with the collection of demographic data, an analysis of metabolic genes ET, AdiqQ, TCF7L2, APOE, LPL, and FTO genes was performed by rt-PCR, and biochemical parameters were performed by the chemical analyzer. Result: A highly significant difference in levels of metabolic genes was observed among the control and DN groups. There was a negative correlation between the expression of the FTO gene and the LPL gene (r = -0.205, p = 0.041). The expression of the ET gene and the LPL gene were also negatively correlated (r = -0.237, p = 0.018). A highly significant negative correlation was found between the expression of the ET gene and the AdiqQ, gene (r = -0.309, p = 0.002). There was a highly significant positive correlation between the expression of the FTO gene and the TCF7L@ gene (r = 0.589, p = 0.001). The expression of the FTO gene was directly correlated to TC (r =0.240, p = 0.01) in the DN group. Conclusion: The present study implicates that increased expression and interplay of metabolic genes ET, AdiqQ, TCF7L2, APOE, LPL, and FTO genes were associated with the development of DN. A substantial increase in gene lexpression evels highlights its potential role in the pathophysiology of DN. Moreover, the expression of all the genes except APOE was correlated to the expression of one other gene. Odd ratios of all the metabolic genes predicted them as the risk factor in the progression of DN.

Keywords: Expression, Metabolic Genes, risk factor Diabetic Nephropathy

HUMAN BCL-2 FAMILY PROTEINS DELAY YEAST CELL AGING BY MITIGATING OXIDATIVE STRESS

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ABSTRACT

Aging, a fundamental degenerative, biological, and time-dependent process, impacts all living organisms. In yeast, this manifests as a physiological decline marked by progressive cellular transformation that compromises viability and vitality. While yeast aging shares similarities with that of higher organisms, its genetic simplicity and characterization offer unique advantages for aging research. Herein, we explored the effects of human anti-apoptotic Bcl-2 and Bcl-xL proteins on aging within a yeast model. Our compelling results demonstrate that these proteins possess remarkable anti-aging properties in yeast cells. Our data suggest that the presence of both Bcl-2 and Bcl-xL enhances the reproductive survival of aging cells, likely through their influence on redox-active components that fluctuate between pro- and anti-oxidant roles across the yeast lifespan. Both proteins afforded partial protection against aging-related morphological deformations and cellular damage. Notably, Bcl-xL-expressing yeast cells achieved maximum activity for nearly all major antioxidant enzymes and overall antioxidant status by the 8th day, offering potent protection throughout the later stages of the investigated aging period. Chemometric analysis of IR spectra independently validated our morphological and biochemical findings. Consequently, a deeper understanding of Bcl-xL's mechanism of action on the cellular redox state in yeast may provide invaluable insights into its indirect antioxidant function in higher eukaryotes.

Keywords: Anti-apoptotic proteins of Bcl-2 family, aging, yeast, antioxidant system, oxidative stress, biochemical make-up

UNVEILING THE THERAPEUTIC POTENTIAL OF TURKISH MEDICINAL PLANTS

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ABSTRACT

The escalating complexity of human diseases necessitates the urgent development of novel, efficacious, and safe therapeutics, particularly where existing treatments fall short. Traditional medicinal plants, with their centuries-old use in folk medicine for infections and lesions, have re-emerged as a promising avenue of research. Recent studies (since 2010) consistently highlight the multifunctional bioactivities of crude plant extracts, notably their dual capacity to promote tissue regeneration and combat infection. This inherent versatility positions natural compounds as viable solutions for intricate health challenges. Building upon this compelling evidence, the present study systematically investigates the diverse biological activities of seven selected medicinal plants: Thymus spp., Glycyrrhiza glabra, Lavandula angustifolia, Echinacea purpurea, Curcuma longa, Urtica dioica, and Achillea millefolium. These plants were chosen for their extensive traditional use in Turkish folk medicine and their rich phytochemical profiles. Their regional distribution within Turkey underscores their ecological and cultural significance: Thymus species are widespread, L. angustifolia is concentrated in the Marmara Region, G. glabra is found along southeastern Anatolian river valleys, while U. dioica and A. millefolium are broadly distributed. C. longa and E. purpurea are primarily cultivated. Ethnobotanical data confirms their diverse therapeutic roles, ranging from respiratory and digestive ailments to wound healing and immunostimulation. Our investigation utilized a comprehensive methodological approach to assess the therapeutic potential of both aqueous and organic solvent extracts from these plants. Conventional maceration was employed to obtain bioactive compounds. We evaluated their antifungal efficacy against clinically relevant pathogenic yeasts (Saccharomyces cerevisiae, Candida albicans, Candida krusei). To assess their anticancer properties and safety profiles, parallel in vitro cytotoxicity assessments were conducted on human lung carcinoma (A549) and normal lung fibroblast (MRC-5) cell lines. Additionally, wound-healing capabilities were evaluated using scratch assays on MRC-5 fibroblasts to mimic tissue regeneration. This multi-faceted assessment, encompassing antimicrobial, cytotoxic, and regenerative assays, aims to define the full therapeutic potential of these botanicals, thereby providing a scientifically rigorous foundation for their traditional applications and identifying promising candidates for further pharmacological research.

Keywords: Medicinal Plants, Antifungal Activity, Cytotoxicity Profile, Wound Healing

IMPACT OF ARBUSCULAR MYCORRHIZAL FUNGI ON THE PHOTOSYNTHETIC RESILIENCE AND SALT STRESS TOLERANCE OF CAPER SHRUBS

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ABSTRACT

Soil salinization poses a significant challenge for agriculture, and leveraging biostimulants, such as beneficial rhizospheric microorganisms, has become a promising approach to enhance plant resilience. This study investigates the effect of arbuscular mycorrhizal fungi (AMF) on the photosynthetic performance of caper shrubs under salt stress. Caper shrubs were separated into two groups, one treated with mycorrhizal fungi and the other without it. After an acclimatization period in normal conditions, the plants were irrigated with NaCl solutions at different concentrations to induce salt stress. Photosynthetic efficiency and chlorophyll content were measured to assess the effects of AMF on photosynthesis under salt stress. AMF inoculation significantly enhanced the photosynthetic efficiency of caper-bush plants under salt stress. Photochemical efficiency increased by 14.5% in AMF-treated plants exposed to high alt stress, indicating improved light capture and energy conversion. Chlorophyll content also rose by around 50-58%, suggesting enhanced light absorption and overall photosynthetic capacity. These improvements demonstrate that AMF helps maintain photosynthetic function under salt stress, potentially boosting plant resilience and growth in salt-affected areas. Inoculating caper shrubs with native AMF improved their photosynthetic efficiency and chlorophyll content, providing a promising approach to enhance plant performance under salt stress.

Keywords: Photosynthetic Resilience, Caper Shrubs, Salt Stress, Plant Tolerance, Mycorrhizal Inoculation

THE ASSESMENT STRATEGIES ON ULTRASOUND ASSISTED EXTRACTION (UAE) OF BIOCHEMICALS AND BIOACTIVES FROM FRUIT PROCESSING BY-PRODUCTS

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ABSTRACT

Recently, ultrasound technology has proven to be a beneficial tool in food science and research, and this field of research has become extremely valuable. Two different approaches to ultrasound applications have been explored, primarily related to ultrasonic vibration power and frequency. One approach utilizes high-frequency, low-intensity ultrasound, with its primary focus on monitoring the quality of food products/crops and/or processes, such as assessing food composition analysis and/or product ripening time. These applications primarily involve measuring ultrasonic velocity, signal attenuation, or frequency spectral analysis. These applications do not impact the process or product. The increasing popularity of fruit and vegetable processing has led to a large volume of byproducts, including seed, skin, pomace, and rind, which contains a large amount of bioactive compounds, such as polysaccharides, polyphenols, carotenoids, and dietary fiber. These waste processing materials are considered to have little value compared to the processed fruit or vegetable due to the lack of a sustainable extraction method. Conventional extraction has a number of drawbacks in terms of softime, energy, and solvent needed. Ultrasound-assisted extraction (UAE) is more efficient than other methods in extracting bioactive components in a short period of time, at a low temperature, with a lower energy consumption and a smaller amount of solvent necessary. Because of its non thermal nature, UAE is more suited to the retention of the functionality of the bioactive compounds. However, the variables associated with the UAE, such as frequency, power, duty cycle, temperature, time, solvent type, and liquid-solid ratio, need to be understood and optimized for each byproduct. This presentation explores the mechanism, concept, and factor that affects the extraction of bioactive compounds from particular focus on fruit and vegetable byproducts. Ultrasounds are successfully used to extract polyphenols, carotenoids, aromas, and polysaccharides from plant materials (both whole plants and byproducts). The variables associated with the UAE, including frequency, power, duty cycle, temperature, time, solvent type, and liquid to solid ratio, need to be precisely controlled in order to have the greatest effect on the extraction process. The individual effects as well as the interactive effects of these variables have been documented by multiple scientists that seek to harvest bioactive compounds from the byproducts of fruit and vegetable harvests. There are positive reviews regarding the UAE regarding food and natural products, the extraction of specific components, such as pectin, using innovative techniques, plant-based antioxidants.

Keywords: KeyWords: Ultrasound Assisted Extraction (UAE), Ultrasound, Fruit By-Products, Vegetable By-Products, Bioactive Phenolics

TROPICAL FRUIT SEEDS OILS AS FUNCTIONAL BIONUTRACEUTICAL AND BIOPHARMACEUTICAL AGENTS : IMPROVING OIL QUALITY WITH NOVEL FOOD PROCESSING PULSED ELECTRICAL FIELDS (PEF)

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ABSTRACT

It has been reported that over 70 different species of tropical fruits from foreign countries. Around 20 species are commonly eaten, including banana, pineapple, tropical citrus, mango, papaya, durian, jackfruit, mangosteen, palm, longan, guava, tamarind, sour soup, passion fruit, chempadak, langsat, honeydue, and rambutan. These species are best known for their large-scale cultivation in the commercial sector. The seeds of tropical fruits are a byproduct of the processing or consumption of the fruit. Plant oils derived from fruit seeds, also known as fruit seed oils, are extracted from the most popular tropical fruits seeds, including their germs and endosperms. Their macromolecules, including oil, protein, and carbohydrates, are found to differ due to either genetic differences or geographic variations. These are primarily composed of triglycerides (98%), and are composed of one molecule of glycerol and three different types of fatty acids (FAs), all of which are unsaturated (UFA). Fatty acids are vital for healthy organism functions, for serving as energy storage, and regulating the cell growth, differentiation and gene expression that are classified based on the chain length and saturation level into saturated, mono unsaturated and polyunsaturated fatty acid as SFA, MUFA and PUFA, respectively; especially PUFA are considered as essential FAs obtained through nutrition. It is important to recognize that UFA have a significant role in maintaining the fluidity of the membrane, decreasing blood cholesterol, and lowering the risk of CVD, particularly in regards to PUFA. It is said that the range of oil is from 1.8 to 49%, while the range of protein is from 6 to 40%. It's documented that tropical fruit seeds that are high in oil have the potential to be innovative sources of oil, while new high protein sources that utilize the recovery of protein have the potential to be innovative sources of protein. Additionally, some edible tropical seeds have chemical compounds that can be used with medical protocols, these chemical compounds include polyphenols and other compounds with a nutritional value that can be used in healthcare. Pulsed electric field (PEF) is a novel technique of extracting oil that employs a novel technology to break the cell walls of plant oils and seed oils. The treatment of PEF increases the oil yield, quality, and anti-inflammatory properties of seed oils by increasing the porosity and the destruction of cell membranes, this increases the extractability and quality of seed oils. This presentation demonstrates that the tropical fruit seeds have the potential to be utilized in multiple areas of bio-health, including pharmaceuticals and food production. Besides, they have the potential to be utilized as by-products or waste in life science and food science, agriculture producing sustainable safety food that is then added value.

Keywords: Tropical fruit, fruit seed, seed oil, oil quality, oil yield, novel food processing, PEF, fatty acids, MUFA, PUFA, UFA

A RESEARCH ON LIPIDOMICS ANALYSIS OF FIVE TROPICAL FRUIT SEED (TFS) OILS : SATURATED AND UNSATURATED FATTY ACID PROFILES OF AVOCADO, PASSION FRUIT, LONGAN FRUIT AND LITHCI FRUIT GROWING IN TURKEY

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ABSTRACT

The global production of tropical fruits has grown steadily over the past decade, predominantly in response to increasing demand in major producer areas. Currently, the size of the tropical fruits market has experienced significantly growth. In 2024, the market was worth \$4.64 billion and it will grow to \$4.93 billion in 2025. This represents a compound annual growth rate (CAGR) of 6.1%. Tropical fruit consuming and utilizing as dietary supplement are widely increasing worldwide. Innovative food processing strategies have been applied for new tropical fruit-based products including fruit juices, dried fruits, jams and ready-to-eat slices. Tropical fruit seeds (TFS) are also used for value- added fruit-based products and oil sources. In this research, avocado (Persea americana Mill.), passion fruit (Passiflora edulis Sims.fo. edulis), longan (Dimocarpus longan Lour.) and Litchi (Litchi chinensis Sonn) fruits were obtained from fruit and vegetable market managements (Izmir, Istanbul/Antalya) as controlled conditions. The samples were transported to the laboratory at frigrophilic chain ; their seed parts were separated, rinsed with water and dried under controlled conditios (43 ◦C for 18 h). The analysis of fatty acid composition using GC-FID were performed. The fatty acid methyl esters (FAMEs) were prepared from extracted lipids from each tropical fruit seeds by esterification reaction with 14% Boron trifluoride (BF3) - methanol complex by Tokusoglu and Unal,2003-Journal of Food Science,USA Wiley). The oil samples were transferred to amber glass bottles and stored at 4 ◦C. FAMEs were prepared from tropical fruit seeds and subsequent FA profiles obtained by gas-liquid chromatography (GC). The fatty acid methyl esters were analyzed using a 100-m (with 0.20 m film thickness), 0.25-mm-inside dia WCOT fused-silica SP-2560 capillary column installed on a Hewlett-Packard 5890 gas-liquid chromatograph (Albertville, Minn., U.S.A.) with a flame ionization detector (FID). The gas chromatograph was temperature-programmed to start at 170 °C and to increase at 1 °C/min to 205 °C. Injector and detector temperatures were set to 250 °C and 270 °C, respectively. Carrier gas was hydrogen at a flow rate of 1.5 mL/min and split ratio was 33:1. The samples were injected as 2 uL. In our detailed technopark analysis, 9c C18:1 (oleic acid) was found as 17.22% , 12.16%, 25.87%, 22.53% in avocado, passion fruit, longan fruit and lithci fruit, respectively. C18:3n-6 levels (Omega-6; linoleic acid) were 3.56%, 5.06% in avocado and longan fruit, respectively. C18:3n-3 levels (Omega-3; linolenic acid) was 4.96% in litchi fruits as majorly whereas 0.66% for avokado fruits, respectively. Total saturated fatty acids (SFA) were found as 46.65%, 15.06%, 36.88%, 31.07% ; total monounsaturated fatty acids (MUFA) were found as 23.87%, 12.97%, 27.86%, 24.17% ; total polyunsaturated fatty acids (PUFA) were found as 31.89%, 73.05%, 36.92%, 45.73% ; total unsaturated fatty acids (UFA) were found as 55.76%, 86.02%, 64.78%, 69.90% for avocado, passion fruit, longan fruit and lithci fruit, respectively. Each of these has been identified as a valuable source of essential fatty acids for human nutrition and food science applications. The high SFA level of avocado seed oil was found to similar as cocoa butter fatty acid profile. It was found that the unsaturated fatty acid (UFA) composition of passion fruit seed oil (86.02 %) may be more convenient for daily essential fatty acid need in accordance with Mediterranean or Nordic dietary patterns.

Keywords: Lipidomics, Tropical Fruit Seed, Fatty Acid, GC-FID, SFA, MUFA, PUFA, UFA, Avocado, Passion, Longan, Lithci

SHEDDING LIGHT OF SPIRULINA PLATENSIS ON MICROBIOTA AND LIFE QUALITY

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ABSTRACT

A healthy and balanced diet is known to strengthen the immune system. Also, it is especially important to include antioxidant-rich foods in the daily diet, such as phytogenic compounds, flavonoids, essential oils, phenolic compounds, and some natural plants. Due to their rich content, natural antioxidants have become even more important in maintaining health, improving life quality, and combating various diseases, especially pandemics today. Recent studies have revealed that humans have their own microbiota ecosystem, and this system plays a crucial role in maintaining a balanced physiological process. The microbiota, which begins at birth and develops with age, is particularly affected by nutrition, environmental factors, and stress. Considering the gut microbiota provides a multifaceted communication within the human body through neural, endocrine, immunological, and metabolic pathways, it’s clear that microbiota production and balance for a healthy life become important. Since the last century, in addition to various diseases, environmental factors, such as insufficient water, climate change, or new viruses, have contributed to infectious diseases and epidemics. In this context, the World Health Organization has reported that 80% of the world's population uses herbal products for a protect their life. Nowadays, among natural products, there is an increasing tendency towards Spirulina and its extracts especially against diseases and for improving life quality. This study aimed to review the effects of S. platensis supplementation on gut microbiota function, metabolism, and life quality.

Keywords: Microbiota, life quality, Sprulina platensis, stress

EVALUATION OF THE CYTOTOXIC EFFECTS OF BEE VENOM (APIS MELLIFERA) ON HEP3B HEPATOCELLULAR CARCINOMA CELLS

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ABSTRACT

Bee venom is a product that attracts attention due to its many biological effects, primarily antioxidant and anticancer effects, thanks to the bioactive components it contains with unique pharmacological properties. The biologically active components in its content, such as melittin, apamin, and phospholipase A2, are the main substances responsible for these effects. The HEP3B cell line is a widely used model in in vitro studies of hepatocellular carcinoma. This study was conducted to investigate its cytotoxic effects on HEP3B hepatocellular carcinoma cells. Bee venom was applied to HEP3B cells at different concentrations, and cell viability was measured using the MTT assay after 24-hour incubation. In cytotoxicity analyses, bee venom was found to reduce cell viability in a dose-dependent manner, and IC_{50} values were found to change over time. In conclusion, bee venom was shown to be both a natural pharmacologic and potential antitumor agent, and it was concluded that further studies are needed to understand the molecular mechanisms of this property.

Keywords: Bee venom, Melittin, Cytotoxicity, HEP3B cells, Hepatocellular carcinoma

SAVING LIVES WITH QUANTUM MID-IR MICROSCOPY.

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ABSTRACT

Introduction: Breast cancer, in common with many others, is diagnosed and staged primarily using H&E pathology. A tissue biopsy is harvested, fixed, embedded in wax, and sliced, before being stained and graded by eye. The assay is flawed and the treatment (chemotherapy) is dangerous**;** 27% of cancer deaths are due to overprescribed treatment as opposed to the disease itself. Digistain quantifiess the DNA concentration in a 300µm square biopsy patch, a well known and highly regarded cancer biomarker. It gives an objective "Digistain Index" (DI) which oncologists use to guide treatment decisions. We would like to image the DNA across the biopsy slice, but interference from thermal IR background makes images too irreproducible for clinical decision making. The solution is "Quantum Imaging with Undetected Photons (QUIP)". This uses entangled photon pairs, one in the infrared and one in the visible. When the infrared photon interacts with the biopsy sample, quantum correlations mean its visible twin instantaneously "feels" the event, in a way that allows the transfer the image information from the mid-IR to the visible whilst leaving the thermal background behind. It offers a way of getting reliable clinical images, with cheap uncooled CMOS cameras, with the detection sensitivity increased by ~1013. Methods: DI was calculated in 801 patients with hormone receptor-positive, HER2-negative primary breast cancer and ≤3 positive lymph nodes. All patients were treated with systemic endocrine therapy and no chemotherapy. DPS, incorporating the DI, was assessed for prediction of 5- and 10-year outcomes (recurrence, recurrence-free survival [RFS] and overall survival [OS]). **E**ntangled photon pairs, comprising ~792nm "signal" and ~1620nm "idler" photons were generated with pump beam that traverses the non-linear crystal twice then spatially overlapped. When the photons are detected, it is imposible to know which pass generated them, and this ignorance generates interference which can be registered in the signal beam. Blocking part of the idler with an object destroys the interference, so that you can register images with light that has not itself interacted with the sample. We have engineered the original ~1m x 2m lab. setup down to a portable 20 x 30 cm demonstrator that has already been carried around the world in a rucksack and is ~10x cheaper and many decades more sensitive than a thermal IR camera. Result: DPS was consistently highly accurate and had negative predictive values for all three outcomes, ranging from 0.96 to 0.99 at 5 years and 0.84 to 0.95 at 10 years. Using QUIP we have achieved high quality images of a number of test samples, typically gold microelectrodes and insect wings. Discussion: DPS showed high accuracy and predictive performance, was able to stratify patients into low or high-risk, and, considering its cost and rapidity, has the potential to ofer clinical utility . A recent independent analysis, funded by Innovate UK, has concluded that were it to be adopted across the NHS, for Breast Cancer alone, it would result in savings of £287M pa, 450 tonnes of CO_2, and 1266 patient life-years.

Keywords: Cancer, Quantum Imaging, mid-infrared, spectroscopy

SPECTROSCOPIC MID-IR IMAGING OF SINGLE CELLS AT THE NANOSCALE.

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ABSTRACT

Introduction: The ~250 nanometer diffraction limited resolution of optical microscopes means they cannot be used to study the internal structure of cells. The majority of our knowledge of their internal organelles, collectively termed “ultrastructure”, comes from electron microscopy (EM). EM uses heavy metal stains to generate contrast and the cells have to be processed into a form where they are conducting and can resist vacuum and electron bombardment. The consequence is that our knowledge of cells’ internal structure is almost all second hand, and based on the way they take up the metal stains. Scattering type- Scanning-Near field-Optical-Microscopy (s-SNOM) is a probe based microscopy that was developed by solid-state physicists to study microelectronics. Here we have adopted it to study cells and can image them across the infrared fingerprint region with a resolution better than ~20 nm, beating diffraction by 150x. We are imaging the intracellular chemical maps directly and may even find structures that are currently unknown to science. Methods: a commercial near-field microscope system (neaSNOM, NeaSpec, Germany) equipped with a Quantum Cascade Laser (QCL) system (MIRcat-QT, Daylight Solutions, USA) with four lasing chips covering a spectral range of (900–1900) cm−1 was used for s-SNOM imaging. A pseudoheterodyne detection scheme was employed to obtain background-free phase measurements. Commercially available probes (Arrow NCPt, NanoWorld, Switzerland) with resonant frequency ~285 kHz were driven in tapping mode with ~50 nm amplitude. RPMI-8226 human myeloma cells were cultured, and ~ 25 × 106 cells were pelleted, washed and embedded in Quetol resin (Sigma). Selected samples were post-stained with 5% uranyl acetate and lead citrate for EM. The embedded pellets were cut using a Leica UC7 ultramicrotome (Leica, Austria) to (70–200) nm thick sections which were collected on carbon-coated TEM copper grids (EM) or on silicon wafer chips (s-SNOM), for imaging. Result: As a demonstration, we chemically map intracellular structures in human multiple myeloma cells and compare the morphologies with EM images of the same cell line. We also demonstrate label-free mapping at wavelengths chosen to target the chemical signatures of proteins and nucleic acids, in a way that can be used to identify biochemical markers in the study of disease and pharmacology. Discussion: We have demonstrated a new mid-IR imaging technology capable of mapping cellular ultrastructure at nanoscale spatial resolution optically for the first time. It offers wide ranging impact across the biosciences.

Keywords: Cell chemical imaging, nanoparticles

CURRENT METHODS IN THE CONTROL OF STORED-PRODUCT INSECT PESTS

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ABSTRACT

Losses in agricultural production are a major problem, even in developed countries. Stored-product insect pests in particular cause significant economic losses by reducing the nutritional value and germination power of products (Barış and Er, 2025), altering the chemical composition, producing unpleasant odours and degrading the final product quality. They also facilitate the spread of toxigenic microorganisms (Rajendran and Somiahnadar, 2020, Coşkuncu, 2005). To minimise these economic losses, pest control practices that also consider food safety are required. Although chemical control is commonly used against stored-product pests, these methods are becoming less favoured due to their negative environmental impact, the presence of chemical residues in products, the development of resistance in pests, and the potential harm to non-target organisms (Barış & Er, 2005). Initially, pheromone traps were developed for the detection of infestations. Later, they were enhanced to disrupt sexual communication and suppress pest populations (Rajendran & Somiahnadar, 2020). These tools enable the early detection of low-level pest populations and infestations, allowing contaminated areas or products to be identified (Coşkuncu, 2005). However, in some countries, pheromones are also subject to registration procedures similar to those for traditional insecticides (Rajendran & Somiahnadar, 2020). Recently, fumigation techniques have been developed with potential insect resistance in mind. Barış and Er (2025) tested the effectiveness of the fungi Beauveria bassiana 5-4 and Metarhizium robertsii S3 isolates against the pests Sitophilus oryzae, Rhyzopertha dominica, and Plodia interpunctella. They used five different carrier substances (diatomite, clay, kaolin, talc, and calcite), both individually and in combination. The formulations significantly enhanced effectiveness compared to the use of isolates alone. Another promising area of insect control involves the use of nanoparticles, either on their own or as carriers for other control agents. Studies have shown that nanoparticles of alumina, carbon, silica, silver, copper, zinc oxide, nickel oxide, titanium dioxide, nano-zeolite, and chitosan, as well as polymer nanoparticles, exhibit strong insecticidal activity against various pests, sometimes surpassing the mortality rates achieved by conventional insecticides when used at the recommended dose (Raja et al., 2025; Kadir et al., 2025). Structural, biochemical, and molecular-level analyses have revealed that nanoparticles induce oxidative stress, disrupting cellular homeostasis, and causing structural damage in pests (Kadir et al., 2025). One of the most recent pest control strategies involves molecular technologies such as RNA interference (RNAi) and CRISPR/Cas9. These approaches aim to develop precise, environmentally friendly pest control strategies (Ghareeb et al., 2025). RNAi-based applications aim to inhibit the expression of specific essential genes in target organisms. This is achieved through the uptake and processing of double-stranded RNA (dsRNA) by the organism, leading to the degradation of the target gene's mRNA (Germing et al., 2025). The primary objective of the numerous studies in this field is to identify effective and environmentally friendly protection methods. The objective of this review is to shed light on the methods used to control stored-product pests, which are of significant economic importance.

Keywords: Stored product pest, pesticide, post-harvest losses, pest management

WOUND-HEALING POTENTIAL OF CUCURBITA PEPO SEED OIL IN A WISTAR RAT MODEL

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ABSTRACT

The oil extracted from Cucurbita pepo seeds is particularly rich in unsaturated fatty acids, phytosterols, tocopherols, and phenolic compounds, all of which are well documented for their anti-inflammatory, antioxidant, and regenerative properties. To assess its wound-healing potential, an in vivo study was conducted in Wistar rats using a controlled model of second-degree thermal burn injury. A topical cream formulated with this oil was applied daily, and its effectiveness was compared with that of a reference treatment containing ß-sitosterol. The results demonstrated a rapid reduction of local inflammation, a progressive decrease in burn surface area, and complete re-epithelialization by day 14 in the group treated with Cucurbita pepo oil. The quality of the newly formed tissue was satisfactory, indicating structured epidermal restoration and efficient cutaneous regeneration. Compared with ß-sitosterol, the experimental formulation exhibited comparable, if not slightly superior, wound-healing activity, particularly in terms of wound closure rate and tissue integrity. These findings suggest that the synergistic action of the bioactive constituents of Cucurbita pepo oil contributes to inflammation modulation, stimulation of cell proliferation, and acceleration of tissue regeneration. Therefore, this oil represents a promising candidate for the development of topical formulations intended for the management of burns and other skin injuries.

Keywords: Cucurbita pepo ; Wistar rats ; Burn wound healing ; Topical formulation ; Tissue regeneration

INVESTIGATION OF THE EFFECTS OF SOME RETROTRANSPOSONS ON FRUIT CRACKING IN POMEGRANATE (*PUNICA GRANATUM L.)*

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ABSTRACT

Pomegranate (Punica granatum L.) is an important fruit species in terms of nutrient content and antioxidant properties. It is a common and valuable plant for use in health, cosmetic and industrial fields as well as indispensable in human nutrition. These characteristics lead to increases in pomegranate demand and increasing demands create pressures to increase production. However, many problems in fruit production cause decreases in production and serious economic losses. The most important of these problems is fruit cracking. Cultural practices and especially genetics are the factors causing the problem. Studies on the effects of retrotransposon elements on fruit cracking are quite limited. Therefore, our study investigated the effects of retrotransposon elements on fruit cracking. Peel tissues from the Izmir 15 variety, which is susceptible to fruit cracking, and the Hicaznar variety, which is resistant to fruit cracking, were used in the study. The analyses determined the gene expression levels of seven different retrotransposon elements in the tissues of the varieties. The analyses revealed that all retrotransposons were expressed at different levels in the tissues of both varieties, and gene expression profiles for the varieties were generated. This suggests that some retrotransposon elements may contribute to fruit cracking, or that changes in the expression of some retrotransposons may occur as a result of fruit cracking.

Keywords: Fruit cracking Gene expression, Retrotransposon elements, Pomegranate (Punica granatum L.)

ANTI-AGING POTENTIALS OF BLUEBERRIES AGAINST D-GLUCOSE-INDUCED SENESCENCE IN IN-VITRO

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ABSTRACT

Aging is the accumulation of known and unknown biological changes slowly occurring at cellular level, leading an individual's functional decline over time. Longer lifespans are typically advantageous, however maintaining health throughout these extra years is crucial, highlighting the necessity of anti-aging treatments. The current study was conducted to evaluate the anti-aging potentials of blueberries against high glucose-induced cellular aging in brain microglial cells. Brain microglial cells (BV-2) were treated with D-Glucose (25 mM) for two weeks, followed by treatment with BBE (50 mg/ml) for 24h. MTT assay for cell survival, BrdU incorporation assay for cell proliferation, DCFDA staining for ROS estimation, Hoechst/PI double staining for cell death, and western blot for expression analysis of various protein markers were conducted. Significant decrease in cell survival and BrdU incorporation as well as a high ROS accumulation and increased cell death was found in the D-glucose-treated group as compared to the control group. The expression of protein markers, Caspase-3, p53, and p-NF-kB was up-regulated; however, the expression of p-AMPK and p38-MAPK was down-regulated in the glucose-treated cells. Altogether, blueberries significantly attenuated the senescence effects of glucose and protected the BV2 microglial cells.

Keywords: Blueberries, D-Glucose, Cell aging, Cell survival, ROS, Apoptosis, Microglia

STUDY OF THE EFFECT OF ANTIBIOTICS AND PROBIOTICS ON SPERM QUALITY IN VITRO USING AN AUTOMATED SEMEN ANALYSIS SYSTEM (CASA).

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ABSTRACT

The experimental study focused on the effect of antibiotics and probiotics on sperm quality in vitro using an automated semen analysis (CASA) system. Previous studies have confirmed the harmful effects of antibiotics on sperm. Through our study, we aim to explore the use of probiotics as a biological alternative to antibiotics in the treatment of genital infections. We also aim to find synergy between certain non-toxic antibiotics and probiotics in order to broaden the spectrum of activity in certain therapeutic strategies. This work was carried out at the Animal Reproduction Biotechnology Laboratory (LBRA), located at the Blida 1 Veterinary Institute. To carry out our experiment, we chose for our first approach, the most widely used antibiotics in human medicine and in veterinary routine. To respect the minimum inhibitory dose, eight antibiotic discs were used during this study. These are tetracycline (TE 30), ciprofloxacin (Cip5), erythromycin (E5), rifampicin (Rif30), gentamycin (GN10), co-trimoxazole (CT10), colistin (Co10), amoxicillin and clavulanic acid (AMC30). Each antibiotic is Co incubated at 37°C for 4 hours, with frozen bovine semen from the artificial insemination and genetic improvement center (CNIAAG). For our second approach, we co-incubated the semen with a probiotic (lactobacilli) while respecting the minimum effective dose, which must be 106 CFU/g. The final step involves selecting the antibiotic that would be suitable for co-incubation with the probiotic. To do this, an antibiogram was developed using only non-toxic antibiotics, after inoculation with the lactobacilli. Our study confirmed the toxic effect of ATB on sperm, unlike probiotics, which demonstrated a significant improvement in all sperm cell parameters during co-incubation. We hope to use further studies to select antibiotics that would not have a toxic effect on sperm cells and to identify a likely antibiotic-probiotic combination.

Keywords: semen, sperm, CASA, infection, antibiotic, probiotic, Artificial Insemination

INFERTILITY IN DAIRY FARMS "Peripartum management and field approach"

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ABSTRACT

Today, infertility problems in dairy cattle are increasing. There has been a marked deterioration in reproductive performance, and parameters are far from the defined standard objectives. This suggests the existence of specific and non-specific determining factors. The objective of our work is to implement a monthly program to investigate reproductive pathologies in order to manage the postpartum period, a period during which the cow undergoes metabolic disturbances that make her very fragile following uterine involution, poor rumen assimilation, and lactation. In the first part of our work, we conducted a survey on four farms in the Tizi-Ouzou region. The results of this initial study showed that energy and protein deficiency has a depressive effect on production as well as reproduction. The AI1 success rate set as a target drops from 60% to 27.27%. For the second part of the study, we selected only one farm; we deemed it appropriate to improve breeding conditions and, above all, take hygiene and feed quality into account. Each cow underwent systematic examinations on D0 (calving day), D30, D60, D90, D120, and D150, during which several biochemical parameters (blood sugar, liver function tests) and progesterone levels were measured to describe abnormalities observed during the postpartum period and assess their effects on fertility. We also carried out cytobacteriological studies at D30 and D60. The study revealed the existence of germs such as Staphylococcus aureus, Streptococcus beta hemolytica, Klebsiella, Echerichia coli, Pseudomonas aeruginosa (sometimes culture with individual flora, sometimes with mixed flora). At the end of our work, we observed a significant improvement in reproductive and production performance, including an increase in the AI success rate from 27.27% to 45%. However, under our experimental conditions, the results obtained cannot be considered satisfactory because reproductive parameters are still far from the recommended standards, requiring in-depth study to explain the low yields in dairy farms.

Keywords: infertility, cattle, reproduction, pathologies, postpartum, metabolism, biochemistry.

EFFECT OF SUBCLINICAL MASTITIS ON MILK PRODUCTION AND MINERAL COMPOSITION OF MILK IN DAIRY CAMELS (*CAMELUS DROMEDARIUS)*

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ABSTRACT

The Subclinical mastitis is an inflammation of the udder that shows no visible signs in the female, nor in the milk, nor in the udder itself. It is characterized by an increase in the somatic cell count in milk, but without apparent clinical symptoms such as changes in the appearance of the milk or the udder . A study was conducted on a dairy camel farm in the Djelfa region to investigate the impact of subclinical mastitis on milk production and the mineral composition of milk in camels. The results show a significant reduction in milk production in infected camels (2.80 L/day compared to 3.32 L/day, $p = 0.02$) .The mineral composition is also altered, with an increase in sodium (Na), potassium (K), and iron (Fe), and a decrease in calcium (Ca) and magnesium (Mg). However, other minerals such as zinc (Zn) and copper (Cu) do not show significant variations .**The** Subclinical mastitis thus affects milk quality and quantity, leading to characteristic mineral imbalances. These parameters could serve as early indicators for the diagnosis of this pathology. In conclusion, regular monitoring of milk production and milk mineral composition is essential to effectively detect and manage subclinical mastitis in dairy camels .

Keywords: • Subclinical mastitis, dairy camel, mineral composition, diagnosis

MACROSCOPIC AND MICROSCOPIC STUDY OF MAIN GENITAL LESIONS IN FEMALE CAMELS IN THE ELOUED REGION IN ALGERIA

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ABSTRACT

This study aimed to characterize the macroscopic and microscopic lesions of the genital organs in culled female dromedary camels in the Eloue slaughterhouse, Algeria. The research addresses the critical need for more information on reproductive abnormalities in she-camels to improve herd management and breeding, as these anomalies significantly impact productivity and profitability A total of 250 genital tracts (matrices) were collected from culled camels over a 120day period (January to Avril 2023) . The reasons for culling were unknown . In All parts of the genital tract, including the uterine cervix, uterine body, uterine horns, oviducts, and ovaries, underwent systematic visual inspection and palpation. Longitudinal incisions were made to examine internal structures for inflammatory lesions and other anomalies . the Tissue fragments (approximately 1 cm x 1 cm) from the ovaries and uterine horns were fixed in 10% formalin, dehydrated through increasing alcohol concentrations, cleared with toluene, and embedded in paraffin. Sections (5 µm thick) were then cut using a microtome, flattened on a water bath, mounted on slides, and stained with Hemalun-Eosin for microscopic analysis.Of the among the 250 non-pregnant matrices, 170 (73.59%) were pathological . This high prevalence of reproductive anomalies contributes significantly to the burden on national camel herd profitability .the Uterine infections were the most frequent uterine anomaly, observed in 30.58% of pathological cases. Other less frequent uterine anomalies included abscesses, hydrometra, and polyps, each at 1.17%.The Salpingitis was the most common oviduct lesion (12.94%), followed by pyosalpinx (7.05%) and hydrosalpinx (1.17%) . theOvarian cysts were the most dominant ovarian pathology, found in 28.23% of cases. Parovarian cysts were present in 8.82%, oophoritis in 5.29%, and tumors in 2.35% . Most ovarian cysts were noted on the right ovary . The study confirms that uterine infections and ovarian cysts are the most prevalent reproductive pathologies in female dromedary camels in the El oued region. These affections lead to substantial economic losses due to reduced fertility, treatment costs, and premature culling of infertile females. The findings underscore the importance of improved technical management, including feeding, reproduction, and genetic selection, and advocate for regulations against culling healthy pregnant females. Further in-depth research using advanced diagnostic techniques on farms is recommended to establish precise diagnoses and effective treatments for these reproductive disorders .

Keywords: Reproductive system . Femal Camel .Pathologies .Macroscopy. Microscopy . Algeria

IMPORTANCE OF BIOCHEMICAL ANALYSIS OF HORSES IN EQUESTRIANS SPORTS

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ABSTRACT

The aim of this study was to evaluate key hematological and biochemical parameters in sport horses at rest and to establish reference values for future monitoring during and after competitions. Regular assessment of blood indicators is essential for maintaining optimal performance, detecting early signs of physiological imbalance, and preventing overtraining or metabolic disorders. Blood samples were collected from clinically healthy horses used in equestrian sports and analyzed for hematological (RBC, hemoglobin, hematocrit, leukocyte profile, platelets) and biochemical parameters (glucose, total protein, urea, creatinine, electrolytes, and major enzymes). The results were compared with standard reference ranges and interpreted according to breed, age, and training level. These findings provide a valuable baseline for evaluating physiological responses to exercise and competition stress, supporting better health management and performance optimization in equine athletes. This study emphasizes the importance of systematic hematological and biochemical monitoring as a tool for maintaining the health, welfare, and athletic performance of equestrian horses throughout their training and competition cycles.

Keywords: equestrians sports, horse, blood count, biocgemical analysis

A CASE OF CONJUNCTIVITS WITH SERRATIA MARCESCENS IN HORSE

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ABSTRACT

Bacterial conjunctivitis is a common cause of ocular discomfort in horses, often leading to reduced performance, extended treatment, and economic losses. While several bacteria are commonly involved, Serratia marcescens is an opportunistic Gram-negative organism that is rarely reported in equine ocular disease but can cause severe infections. This study reports three cases of conjunctivitis caused by S. marcescens in horses from the same equine center in Romania. All animals presented with conjunctival hyperemia, mucopurulent discharge, and mild corneal involvement. Samples from the conjunctival sac were collected for bacterial culture and identification. S. marcescens was confirmed as the etiologic agent in all cases. Antimicrobial susceptibility testing was performed to guide therapy. Targeted antibiotic treatment based on sensitivity results led to full clinical recovery in each case. These cases emphasize the pathogenic potential of S. marcescens in equine ocular disease and highlight the importance of accurate microbiological diagnosis and antibiotic sensitivity testing in the effective management of bacterial conjunctivitis in horses.

Keywords: conjunctivitis, horse, serratia marcescens, equine ophthalmology

INBREEDING LEVEL AND GENETICALLY PROGRAMMED PROBLEMS IN GENETICALLY TESTED COWS IN LATVIA

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ABSTRACT

Global genetic trends in recent decades have shifted towards the use of inbred breeding stock to maximise desirable traits. Our study aimed to determine the extent of this trend in genomically tested Holstein Friesian (HF) cows in Latvia in 2023-2024. Until recently, HF populations were managed only on the basis of pedigree information, rather than genomic data. Due to such breeding stock selection, homozygous genes could be shared, which, in addition to desirable traits, can also have negative consequences in terms of congenital pathologies and diseases. Materials and Methods. The study included 136 HF cows born in 2023-2024. Genome analyses were performed at the laboratory of Genetic Visions-ST[X] in Wisconsin, USA. Genomic inbreeding level (gINB) and genomic predicted future inbreeding level (gEFI) were analysed, and 15 Holstein Genomic Haplotypes were checked, which are connected to genetically inherited problems (https://uscdcb.com/haplotypes/). Data were analysed in relation to the population reference genetic base values of HF cows in the USA. IBM SPSS 21 software was used to calculate the mean, standard deviation, two-way correlations, and the Mann-Whitney U test for two independent groups. The difference in values was considered statistically significant if $p < 0.05$. Results: gINB values from 2023 to 2024 were insignificantly increased, namely 10.7±2.78 and 11.8±3.29, respectively ($p>0.05$), while the gEFI values were increased statistically significantly from 11.4±0.76 to 11.7±0.62, respectively

Keywords: Holstein Friesian dairy cattle, genome test, inbreeding level

AGRONOMY EFFICIENCY AND PHOSPHORUS RECOVERY RATE OF ORGANOPHOSPHATE FERTILIZERS BASED ON BIOCHARS

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ABSTRACT

Phosphorus (P) is an essential element for plant growth, and its low availability in highly weathered tropical soils, due to their high P adsorption capacity, is frequently reported. The development of fertilizers with integrated protection has been proposed to increase the efficiency of mineral phosphate sources in such soils. In this context, the objective of this study was to evaluate, under greenhouse conditions, the efficiency of organophosphate fertilizers produced from biochars derived from coffee husk (CHB), poultry litter (PLB), and eucalyptus bark (EBB), applied in either a coating or homogeneous mixture form, and compare them to triple superphosphate (TSP). The treatments were arranged in a 3 x 2 x 4 factorial scheme: three types of biochar used in fertilizer formulation (CHB, PLB, and EBB), two methods of fertilizer preparation (homogeneous mixture and coating), and four CHB/TSP ratios in the fertilizer composition (10, 20, 30, and 40% w/w). Additionally, two control treatments were included: one with TSP (positive control) and one without P application (negative control). A P dose of 174.8 mg dm^3 was applied to a clayey Red-Yellow Latosol with high P adsorption capacity over three successive maize crops as test plants. On average, the biochar-based organophosphate fertilizers showed 5.52% higher agronomic efficiency and 8.16% higher P recovery rate than TSP. Across the three crops, these fertilizers resulted in higher average levels of P in water (133.78 mg dm^{-3}), P extracted with Mehlich-1 (875.03 mg dm^{-3}), P content in plants (123.70 mg pot^{-1}), and P recovery rate (16.63%). However, the physical and chemical protection of P in the organophosphate fertilizers, which leads to slow nutrient release, resulted in lower available P levels for plants during the first crop cycle, reducing dry matter production. Nevertheless, when considering all three crop cycles, the organophosphate fertilizers resulted in a higher average shoot dry mass yield (56.50 g pot^{-1}). Considering the highest agronomic efficiency, the 30% CHB/TSP ratio proved to be the most effective. Increasing the CHB/TSP ratio promoted greater P availability in the soil over time, especially in treatments with PLB, which has high levels of cations, P, and N, and lower water solubility. From a practical standpoint, additional cost-benefit studies are needed to determine in which scenarios these organomineral fertilizers may be economically viable. Furthermore, long-term studies are essential to confirm whether the observed changes in soil P fractions will lead to increased plant uptake and greater P use efficiency over time.

Keywords: Agricultural Waste. Soil Fertility, Phosphate Adsorption

EXPLORING HEAVY METAL RESISTANCE AND PLANT GROWTH-PROMOTING TRAITS OF BACTERIA FROM THE CHLORAGOGENOUS TISSUE OF APPORECTODEA MOLLERI

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ABSTRACT

Earthworms serve as a rich microhabitat that supports a wide variety of soil microorganisms. Consequently, bacteria associated with earthworms have attracted attention for their high metabolic activity and their positive impacts on soil fertility and plant growth. In this study, we isolated, for the first time, aerobic bacteria from the chloragogenous tissue of the earthworm Apporectodea molleri and assessed their Plant Growth-Promoting (PGP) potential as well as their resistance to heavy metals (Mn, Zn, Cu, Cd, and Ni). Sequencing of the 16S rRNA gene revealed that the fifteen isolates belonged to six key bacterial genera: Enterobacter, Citrobacter, Aeromonas, Pseudomonas, Bacillus, and Terribacillus. These strains exhibited various PGP traits, such as the production of indole-3-acetic acid (IAA), siderophores, nitrogen fixation, and phosphate and potassium solubilization. Additionally, they showed varying degrees of resistance to the tested heavy metals. Among them, Bacillus strains, specifically B. subtilis strain TC34, B. circulans strain TC7, and Bacillus sp. strain TC10, demonstrated all PGP traits and resistance to all heavy metals. This study underscores the potential of bacteria from the chloragogenous tissue to display multiple beneficial characteristics, likely related to the tissue's role in storing metabolites and neutralizing toxic elements.

Keywords: Earthworms, soil, fertility, PGPR, plant growth, heavy metals

ISOLATION AND CHARACTERIZATION OF ENDOPHYTIC BACTERIA FROM CHICKPEA NODULES CULTIVATED IN CONTRASTING ALGERIAN AGROECOSYSTEMS : POTENTIAL BIOINOCULANTS FOR SUSTAINABLE AGRICULTURE

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ABSTRACT

Plant–microbe interactions are integral to sustainable agriculture, particularly under abiotic stress conditions such as drought. This study focused on the isolation and functional characterization of endophytic bacteria associated with root nodules of chickpea (Cicer arietinum L.) cultivated in two agroecologically distinct regions of Algeria: Annaba (humid, eastern region) and Ain Temouchent (semi-arid, western region affected by recurrent drought). Nodule-derived bacterial endophytes were isolated and screened for key plant growth-promoting (PGP) traits, including inorganic phosphate solubilization, atmospheric nitrogen fixation, indole-3-acetic acid (IAA) biosynthesis, and siderophore production. Isolates exhibiting multiple PGP traits were taxonomically identified using matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (MALDI-TOF MS), which revealed a dominance of strains belonging to Paraburkholderia fungorum and Pantoea agglomerans. The plant growth-promoting potential of selected strains was further validated under controlled hydroponic conditions. Results indicate that endophytic bacteria originating from drought-impacted environments possess significant capabilities to enhance chickpea growth and may serve as promising candidates for the development of microbial bioinoculants aimed at improving legume resilience and productivity in arid and semi-arid agroecosystems.

Keywords: Endophytic bacteria, Cicer arietinum, drought stress, plant growth-promoting rhizobacteria (PGPR), bioinoculants, MALDI-TOF MS, sustainable agriculture, Algeria

EFFECT OF USING EUCALYPTUS BARK BIOCHAR ON SOIL C POOLS AND ENZYMATIC ACTIVITY

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ABSTRACT

The cultivation of Eucalyptus spp. accounts for 7% of the world's planted forest area, and Brazil stands out as one of the largest producers. Among the residues generated by this sector, bark, branches, and leaves represent about 58% of the total. Thus, converting eucalyptus bark into biochar emerges as a sustainable solution, utilizing abundant and accessible material from the forestry industry. This study aimed to evaluate the effects of applying biochar produced from eucalyptus bark at pyrolysis temperatures of 350 °C and 600 °C on soil carbon pools and enzymatic activity in an area cultivated with Eucalyptus urograndis. The field experiment was carried out in a randomized block design with a 2 x 5 factorial scheme, with two pyrolysis temperatures (350 °C and 600 °C) and five biochar application rates (0; 0.625; 1.25; 2.5; and 5 Mg ha^{-1}), with three replications. Soil analyses were performed before and after the application of biochar to evaluate C pools and the enzymatic activity of β-glucosidase and acid phosphatase. The results showed that biochar produced from eucalyptus bark at a pyrolysis temperature of 350 °C had a positive impact on enzyme activity and C pools compared to the biochar produced at 600 °C. These results indicate that the 350 °C biochar had greater reactivity in the soil. Its soil surface application led to an increase of 33% and 95% in β-glucosidase activity in the 0–5 and 10–30 cm layers, respectively. The biochar produced at 600 °C resulted in a 68% and 54% increase in β-glucosidase activity in the 5–10 and 10–30 cm layers, respectively. Acid phosphatase activity decreased by an average of 31% for both biochars produced at 350 °C and 600 °C. Total organic C (TOC) increased by 56%, and C stock by 55% in the 0–5 cm soil layer with the application of biochar produced at 350 °C. In the 10–30 cm layer, the carbon stock increased by 21% with the application of biochar produced at 600 °C. Water-soluble C content increased by an average of 115% and 44% for biochars produced at 350 °C and 600 °C, respectively. Biochar application rates of 2.5 and 5 Mg ha^{-1} resulted in the highest values of β-glucosidase activity and TOC. Long-term studies are essential to understand the dynamics of soil organic matter following biochar application.

Keywords: slow pyrolisus, C stock, soil enzyme, water-soluble C

IMPACT OF HYDRO-EDAPHIC CONDITIONS ON THE ROOT GEOTROPISM OF THE DATE PALM IN OUARGLA (SOUTH-EAST ALGERIA)

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ABSTRACT

Date palm root geotropism normally changes depending on root and abiotic and biotic stresses. It is negative for respiratory roots located at the base of the stipe and positive for absorption and nutrition roots in the soil. The rooting of date palms is confronted with several hydro-edaphic constraints in Ouargla. Research conducted in this region shows that geotropism is conditioned by the fluctuation of groundwater levels and those of gypsum-limestone crusts. Our estimation models show that in areas of deep water tables, geotropism is positive and becomes negative in the presence of shallow crusts. In the case of mechanical resistance, young roots develop in the opposite direction to the force of gravity. Roots, through geotropism, seek water from deep within, attempting to penetrate the crusts in the case of water stress due to deficiency. This tendency is dictated by the growth, water, and nutritional needs of date palms. On the other hand, in areas of shallow water tables without crusts or associated with crusts, geotropism becomes negative. The roots flee the zone of waterlogging in asphyxiating groundwater and that of dense crusts, resistant to root penetration. The hydro-saline-alkaline stress of phreatic water produces negative geotropism that increases with rising water levels. The roots sink deeper and deeper into the crusts as the water table lowers. The needs of the date palm force the roots to modify their geotropism to meet their growth and water and nutrient supply needs. This observation indicates the inconveniences and effects of hydromechanical constraints in palm groves. To ensure ideal hydro-edaphic conditions for agricultural development, it is necessary to reduce waterlogging, saline and gypsum-limestone accumulations in the soil. To achieve this, irrigation and drainage must be controlled to combat soil salinization and thus prevent the formation of saline and gypsum-limestone accumulations. Breaking up is necessary in the event of hard mechanical obstacles such as crusts or slabs. It is imperative to adopt this approach to hydro-agricultural development to ensure sustainable development in the Saharan regions.

Keywords: Root geotropism, date palm, soils, water table, Ouargla, Algeria,

CLASSIFICATION OF PALM GROVE PERFORMANCE BY THE TYPOLOGY OF ROOT PROFILES IN THE ALGERIAN SAHARA

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ABSTRACT

Palm groves in the Algerian Sahara face several constraints linked to climatic, water and edaphic parameters. Our research revealed the presence of hydro-edaphic constraints in the cultivated date palm oases of Ouargla, Oued Righ, Oued Souf and Oued M'Zab. This speculation is the pivot of Saharan agriculture, where its level of rooting and its yield can constitute an indicator of soil quality. We conducted an agro-environmental cause-effect diagnosis based on the water-soil-palm grove relationship. The results show that irrigated soils have variable morpho-analytical characteristics, showing deep to shallow water tables, with or without mechanical obstacles. These parameters appear to be major constraints for the development of date palms. Root architecture in soils does not depend on planting age. Root profiles vary mainly depending on hydromechanical situations. Waterlogging and hard gypsum-limestone accumulations significantly hamper date palm roots and yield. Based on these practical natural standards, we propose a new classification of palm groves by identifying the typology of root profiles (Tp). It aims to situate the performance of old palm groves or to predict the situation of those recently created. The classification key is composed of predominant criteria, three rooting levels (Nr) deep (N1: > 3 m), medium-deep (N2: 1.5 - 3 m) and superficial (N3 < 1.5 m), 9 hydromechanical obstacle levels (No) symbolized in lowercase letters (a to i), resulting from the combination of three water table levels (Nn) and the same for gypsum-limestone mechanical obstacles (Nm), given the significant positive correlations demonstrated during our research work. Also, we counted 84 types of accumulations in the profiles (Np) defined by the combination of 8 forms of accumulations (Fc), 4 degrees of accumulations in poorly soluble salts (Dc), 2 degrees of salinity (Ds) and 2 degrees of richness in coarse elements (Dg). The classification identified 1260 Tp subdivided into three groups of palm grove performance, named A (good), B (average) and C (poor) respectively for N1, N2 and N3. Each group is composed of 420 profile codes (e.g.: number 1 = Aa1). This classification approach can simplify the mapping of soil quality and their hydro-agricultural development. It remains crucial for better conservation and development of hydro-edaphic resources, guaranteeing the sustainable development of Saharan regions.

Keywords: Classification, performance, palm groves, rooting, soils, Sahara, Algeria,

THE EFFECT OF CONSERVATION FARMING PRACTICES ON GREENHOUSE GAS EMISSION

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ABSTRACT

The quality of soil and its management practices significantly influence climate conditions. Correct soil quality management is a key strategy to sequester carbon (C) and gas emissions limitation to potentially mitigate climate change. Conservation agriculture is based on four principles. minimizing soil disturbance through reduced tillage, leaving an appropriate amount of plant residues on the soil surface, crop rotation with an economic cultivation pattern, and sustainable production of agricultural products with benefits are the basis of these four principles. The aim of this study was to determine how conservation agriculture and conventional tillage affect greenhouse gas emissions and in the western Golestan, Iran. This work sought to investigate N_2O, CH_4, and CO_2 emissions of soils under two different tillage practices and straw retention scenarios: (I) conventional tillage (CT) and (II) conversation agriculture (CA) and The land had been managed under these practices for eight years.This study sampled soil at a depth of 0-30 cm following the harvesting of Wheat in 2024 for Measuring soil properties and used static flux chambers to collect gas samples. Then, gas chromatography (GC) was employed to evaluate the gas samples. It was found that CT yielded 353.6% higher microbial biomass carbon (MBC), 52.1% higher soil Respiration (SR), 67.2% higher microbial biomass nitrogen (MBN), and 59.2% higher microbial community (MC) relative to CT and organic C (OC) significantly improved under CA. It was also found that CA led to 5.2%, 5.9%, and 5.2% larger CH_4, NO_2, and CO_2 emissions relative to CT, respectively. It is necessary to conduct long-term assessments of optimized CA principles integrating all recommended factors to ensure the generalizability of the results.

Keywords: Conservation agriculture, Greenhouse gas emissions, Organic Carbon, Biological activity, Soil propertie

HEAT TRANSFER IN SOIL SYSTEM

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ABSTRACT

Heat transfer in soil system, is one of the most important soil physical processes, influences most of agronomic practices. Heat transfer equation based on the boundary conditions of T(0,t)=T0+A.sin(wt) representing temperature change on soil surface (where; T0 - average temperature of soil surface, °C; A - amplitude, w=2π/P- angular frequency; P - period) was examined in the study. Heat diffusivity coefficient, damping depth, retardation time in 10, 20 and 30 cm layers of soil were calculated according to the analytical and the mathematical expressions. The range of heat diffusivity coefficient was determined as 0.79x10-4 and 6.67x10-4 cm/sec. The retardation time of maximum or minimum temperature on soil surface in 10; 20 and 30 cm layers was determined in a range of 2.31-10.67 day, and damping depth in these layers ranged between 8.05 and 62.06 cm. As a conclusion, for further development of the theoretical solution, heat transport parameters must be determined experimentally through field studies and compared with theoretical values.

Keywords: Soil, heat, temperature, diffusivity, retardation, damping depth

EFFECT OF MANURE ON SOIL MECHANICAL PROPERTIES AND CULTIVATION

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ABSTRACT

In this study, effects of farmyard manure application on Atterberg limits of a clay soil were investigated in the field study. Farmyard manure was incorporated to soil as four different rates (0, 2, 4, and 6%) with three replications in a randomized block design for eight months. Manure application increased liquid limit (LL) and plastic limit (PL) with increasing the application rates. According to control treatment, the highest increments for liquid and plastic limits were statistically determined with the highest application rate of manure. Liquid limit showed significant positive correlations with plasticity index and plastic limit. As a result, increments in the organic matter contents of soil increased the Atterberg limits. It indicates that addition of organic wastes to soil allows for field operations in high moisture contents.

Keywords: Atterberg limits, organic waste, soil moisture, cultivation

EFFECT OF SEWAGE SLUDGE BIOCHAR AMENDMENT ON SANDY SOIL QUALITY IN OUARGLA REGION (ALGERIA)

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ABSTRACT

This work aims to study the effect of biochar produced from sewage sludge by pyrolysis at a temperature of 300°C on the quality of sandy soil in Ouargla region. Three application rates of biochar (1%, 2%, and 5%) were studied. A pot experiment was conducted over a 90 days period under semi-controlled conditions. The results revealed an increase in EC, C/N ratio, water retention capacity (WRC), and organic carbon of the sandy soil with the increase in biochar application rate. A decrease in initial bulk density (BD), final bulk density, total nitrogen, and soil pH was also observed with the increase in biochar dose. The results indicated that the application of biochar significantly improved the physical properties of the tested sandy soil (bulk density and water retention capacity), particularly at the 5% dose. The application of sewage sludge biochar to sandy soil significantly modified the soil's organic carbon, organic matter, and pH: increasing organic carbon and organic matter, while decreasing pH with increasing biochar application rate. Future field studies are indispensable to determine if the same effects of biochar observed in pots can be reproduced.

Keywords: Soil quality, Sand, Biochar, Sewage sludge, Ouargla.

ARTIFICIAL NEURAL NETWORK MODELING FOR PREDICTING HEAVY METAL PHYTOREMEDIATION EFFICIENCY: A MACHINE LEARNING APPROACH

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ABSTRACT

Objective**:**This study investigates the potential of Helianthus annuus (sunflower) for soil remediation, specifically targeting its capacity to absorb and detoxify heavy metals from contaminated soils. With the rising concern over heavy metal pollution from industrial activities, it is crucial to explore sustainable and effective remediation strategies. Method**:** We utilized artificial neural networks (ANNs) to analyze various factors that influence the phytoremediation process. Key variables examined included soil composition, metal concentration, moisture levels, and environmental conditions. Experimental data was gathered from controlled pot trials, and the ANN was trained to identify the critical factors affecting sunflower uptake efficiency and overall health. Results**:** The ANN model provided valuable insights into the relationships between the identified variables and the sunflower's ability to remediate soil. The analysis highlighted optimal conditions for enhancing the phytoremediation effectiveness of Helianthus annuus. Conclusion**:** The findings of this research contribute to a deeper understanding of the phytoremediation capabilities of sunflowers and demonstrate the effectiveness of advanced computational techniques in environmental science. This study aims to improve the practical applications of Helianthus annuus in sustainable soil management and pollution mitigation efforts.

Keywords: Phytoremediation, Helianthus annuus, Heavy metals, Soil remediation Artificial neural networks

EVALUATION OF COLLOPHONIC ACIDS AGAINST BAYOUD, VASCULAR FUSARIUM WILT AGENT OF DATE PALM

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ABSTRACT

North African date palm cultivation experiences severe damage from Bayoud disease because of the Fusarium oxysporum f. sp. albedinis pathogen. The traditional control measures using chemical fungicides demonstrate poor effects alongside ecological issues. The research investigates the antifungal behavior of collophonic acids extracted from natural resins when confronting F. oxysporum which attacks date palm vascular systems. The fungal growth inhibition dynamics were investigated by performing in vitro tests using different concentrations of the collophonic acids. The tests through disk diffusion and radial growth measurements established minimum inhibitory concentration (MIC) and growth inhibition values. Test results showed that antifungal activities in collophonic acids increase as the concentration rises to suppress fungal multiplication effectively. Scientists found the most efficient antifungal compounds, which now show promise in integrated pest management plans. The research demonstrates that the use of collophonic acids represents an environmentally compatible solution for managing Bayoud disease instead of chemical fungicide applications. Researchers should conduct additional studies to investigate both the working principles and practical usage of collophonic acids as a solution against this harmful plant disease.

Keywords: Collophonic acids, Bayoud disease, Fusarium oxysporum f. sp. albedinis, date palm, antifungal activity

ENCAPSULATION OF ESSENTIAL OIL OF ROSES AND THEIR COMPOSITION AS AFFECTED BY PLANT GROWTH PROMOTING RHIZOBACTERIA (PGPR) AND SALICYLIC ACID

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ABSTRACT

Present attempt was aimed to enhance the preservation of essential oil of roses through encapsulation. The essential oil was obtained from plants treated with plant growth promoting rhizobacteria (PGPR) Pseudomonas putida and Bacillus cereus and Salicylic acid (SA). Prior to plantation encapsulation can be done using plant or animal protein. Encapsulation using animal protein was more efficient than that of plant protein. Rose essential absolute oil (20mg) was filled in the shell (shell weight 40mg) containing 240mg lactose. Whereas, Hydroxy propyl methyl cellulose (vegetable capsule) (micro – crystalline plant extract) was used 203.70 mg and essential oil was 16.28 mg. the shell weight was 40 mg. capsules were stored in the refrigerator at 5-8oC. Encapsulation of essential oil treated with these treatments induce release of volatile bioactive metabolites e.g. monoterpene, sesquiterpene, monoterpene alcohol, unsaturated bicyclic monoterpene etc. which are active as antioxidant, anti-inflammatory agent, as disinfectant, pesticide, insect repellant, antiviral, antifungal and anticancer agent.

Keywords: Encapsulation, Essential Oil, Pseudomonas putida, Bacillus cereus, Salicylic acid.

GENOTYPIC VARIABILITY OF MORPHO-PHYSIOLOGICAL LEAF CHARACTERISTICS IN FOUR GENOTYPES OF COMMON WHEAT (TRITICUMAESTIVUM L.) CULTIVATED UNDER RAIN-FED CONDITIONS IN SETIF REGION –ALGERIA

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ABSTRACT

The study was carried out at the experimental farm of Setif 1 University, in a semi-arid environment. The aim was to assess the genotypic variability of four soft wheat varieties (T. aestivum L.) in terms of dry matter content (DMC); specific leaf area (SLA), flag leaf thickness (FLT) and excised leaf water loss (ELWL). The results indicate a wide variability in the measured parameters at the heading stage (Z55). Water stress induces variability in measured parameters based on which the genotypes tested were classified according to their degree of tolerance to local climatic conditions. The El-Wifak variety is distinguished by its good tolerance to water stress, with significant values (P)

Keywords: Common wheat, water stress, genotypic variability, morpho-physiological leaf characteristics.

GENOTYPIC VARIABILITY OF PHYSIOLOGICAL LEAF CHARACTERISTICS IN TWO CULTIVARS OF COMMON WHEAT (TRITICUM AESTIVUM L.) GROWN UNDER RAIN-FED CONDITIONS IN SETIF REGION -ALGERIA

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ABSTRACT

The experiment was conducted at the experimental field of the Technical Institute of Field Crops (ITGC) near Setif province, with aim to assess genotypic variability of two common wheat cultivars (Triticum aestivum L.) grown under rain-fed conditions in terms of chlorophyll content (ChlC), flag leaf area (FLA), relative water content (RWC) and cell membrane stability index (SI) at the heading stage (Z55). The results emphasize a wide variability in the measured parameters. El-wifak cultivar outperformed Hidhab in terms of FLA (17.0 cm2, P

Keywords: Common wheat, Selection, Physiological parameters; Rain-fed conditions

ANTIOXIDANT DEFENCE IN DROUGHT-TREATED WHEAT IS MODULATED BY ROOT APPLICATION OF MELATONIN

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ABSTRACT

Drought stress affects several aspects of plant biochemistry, notably compromising antioxidant defence systems. To alleviate the adverse effects, plants trigger adjustments in gene expression, resulting in certain physiological responses, including initiation of their defence mechanisms, comprising both enzymatic and non-enzymatic antioxidants. The search for chemicals that may mitigate the adverse effects of water shortage in plants by enhancing their antioxidant capacity is of special interest. Melatonin is a naturally occurring antioxidant that can regulate plant stress responses. Young wheat (Triticum aestivum L.) cultivars Fermer and Gines were subjected to a five-day water deficit, after which irrigation was resumed. Twenty-four hours later, the plants received root supplementation with a 75 µM melatonin solution. The amount of phenolics and thiol-containing compounds, together with the activity and gene expression of catalase (CAT), guaiacol peroxidase (POX), and glutathione reductase (GR), were assessed in the leaves on the second day of recovery. Drought elevated the activity of antioxidant enzymes and the levels of non-enzymatic antioxidants. The effect was more significant in the drought-sensitive cv. Fermer. Substantial dynamic changes in gene expression resulting from drought were noted for GPX in both cultivars. Minimal increase was seen for GR and CATA transcripts. CAT3 expression was markedly up-regulated by drought only in cv. Gines, but POD was down-regulated in both cultivars. The application of melatonin after drought decreased the levels of non-enzymatic antioxidants to some degree, while concurrently enhancing the activity of catalase, peroxidase, and glutathione reductase, as well as modulating gene expression that facilitates plant recovery.

Keywords: wheat, drought, melatonin, antioxidant defence, gene expression

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SURFACE DECONTAMINATION OF MAIZE GRAINS BY NON-THERMAL PLASMA APPLICATION

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ABSTRACT

Presently, contamination by seed-borne microbial pathogens can lead to annual maize production losses of up to 15 % in moderate climates (e.g. Central Europe), primarily due to reduced germination and increased mortality of young seedlings. This number can increase in the upcoming decades, as climate change may create more favourable conditions (such as warmer temperatures and erratic rainfall) for the emergence of seed-borne diseases. These losses may be mitigated by using advanced technologies of pre-sowing seed treatment that could eliminate the presence of seed-borne microbial contamination. Exposing seeds to non-thermal plasma could be an efficient tool for this purpose, as the plasma generated in air contains UV radiation, and reactive oxygen and nitrogen species (RONS) that can inactivate many pathogenic microorganisms on the seed surface. In our study, we evaluated the efficiency of non-thermal plasma generated in ambient air at atmospheric pressure using a Diffuse Coplanar Surface Barrier Discharge (DCSBD) system for maize grain decontamination. We investigated the inactivation of both naturally occurring seed-borne microorganisms and artificially inoculated Alternaria alternata spores on maize grains in Petri dishes under in vitro conditions. The grains were treated with plasma for varying exposure times (ranging from 10 to 90 seconds), and both germination and decontamination rates were assessed for each experimental setup. Our results showed that longer plasma exposure times (30, 60, and 90 seconds) reduced seed-borne microbial contamination by approximately 20 to 50 % compared to the untreated control. However, the longest exposure time (90 seconds) was associated with a noticeable reduction in maize germination capacity. Artificial inoculation of maize grains with A. alternata spores resulted in 100 % contamination in the control (untreated) group. Plasma treatment reduced the contamination rate to approximately 70 % to 0 % three days after inoculation, and to approximately 90 % to 10 % six days after inoculation, depending on the exposure time. Moreover, not only the contamination rate but also the diameter of the resulting fungal mycelium decreased with longer exposure times. Interestingly, inoculation of control grains with A. alternata spores led to a lower germination rate compared to non-inoculated control grains. While the plasma treatment partially restored the germination capacity of inoculated grains at shorter exposure times, a longer exposure time resulted in lower germination despite achieving greater contamination reduction. Our results indicate that non-thermal plasma treatment for seed surface decontamination represents an environmentally friendly pre-sowing approach with strong potential in modern agriculture, as it may reduce reliance on synthetic chemicals. However, optimizing the plasma exposure time is essential to achieve the best balance between effective microbial decontamination and preserved or improved seed germination.

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Keywords: Alternaria alternata, maize, non-thermal plasma, seed decontamination

EARLY ROOT RESPONSE OF SUNFLOWER HYBRIDS TO OROBANCHE CUMANA: FOCUS ON CATALASES GENE EXPRESSION

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ABSTRACT

The pre-attachment phase of host–parasite interaction plays a decisive role in the outcome of parasitic plant infection, as it involves early signaling events that can determine compatibility or resistance. In Helianthus annuus, catalase enzymes (CAT), important for detoxifying hydrogen peroxide (H_2O_2), may contribute to oxidative stress regulation during early-stage responses to the root parasite Orobanche cumana. However, the expression dynamics of catalase gene isoforms in the root system during this initial stage remain largely unexplored.
This study aimed to comparatively analyze the expression profiles of four catalase-encoding genes (CATA1–CATA4) in the roots of three sunflower F_1 hybrids, Favorit and P64LE20 (resistant) and Performer (susceptible), during the pre-attachment phase. Plants were exposed to germinated O. cumana seeds and sampled at four time points (2, 6, 12, and 24 h post-inoculation). Gene expression was assessed using real-time PCR with actin gene (AF282624.1) as the internal control. Results revealed distinct transcriptional patterns between resistant and susceptible genotypes. Favorit exhibited a rapid and dynamic upregulation of catalase genes, indicating a robust early defense. P64LE20 showed a moderate but synchronized response. Conversely, Performer displayed a biphasic expression profile: an early pike in catalase gene activation followed by significant repression at 24 h, suggesting compromised antioxidant regulation and greater susceptibility to infestation. These findings suggest that catalase gene expression patterns during the pre-attachment stage can serve as early molecular indicators of resistance or susceptibility to O. cumana. Moreover, this approach may enhance our understanding of whether the initial oxidative stress functions solely as a defense mechanism or also creates a favorable environment for parasite anchoring, thus influencing the compatibility of host–parasite interaction.

Keywords: Sunflower (Helianthus annuus), Orobanche cumana, Pre-attachment phase, Catalase genes (CAT), Gene expression

Acknowledgements: The study was developed within the framework of Subprogram 011101 Genetic and biotechnological approaches to the management of agroecosystems in the conditions of climate change, funded by the Ministry of Education and Research of the Republic of Moldova.

PHYTOCHEMICAL COMPOSITION OF VOLATILE OIL EXTRACTED FROM SUNFLOWER PETALS

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ABSTRACT

In recent years, there has been a growing interest in identifying and valorizing plant-derived natural products with potential applications in the food, pharmaceutical, cosmetic, and agricultural sectors. Although the seeds and oil of Helianthus annuus L. have traditionally been the primary focus of research and utilization, sunflower aerial parts (particularly the reproductive structures) are known to be rich in various biologically active compounds that may exhibit antimicrobial, antioxidant, and anti-inflammatory properties. However, this aspect remains underexplored. In this context, the aim of the present study was to determine the phytochemical composition of the volatile and lipophilic fractions extracted from sunflower petals, with an emphasis on identifying bioactive compounds of potential industrial relevance. Samples were collected from a single hybrid cultivated in three distinct agro-ecological locations in the Republic of Moldova during the full flowering stage. The petals were subjected to two standard extraction techniques: steam distillation using a Clevenger-type apparatus for volatile oils, and Soxhlet extraction for non-polar compounds. The resulting extracts were analyzed by gas chromatography coupled with mass spectrometry (GC-MS), allowing for both qualitative and quantitative identification of phytochemical constituents. GC-MS analysis of the volatile oil extracts revealed a complex mixture of more than 50 individual components, with notable differences in composition across the three sites. The major compound identified was α-pinene, a compound known for its anti-inflammatory properties. Its content ranged from 66.71% to 77.62% of the volatile oil, depending on the locality. Other abundant terpenes included β-felandrene, γ-terpinene, α-gurjunene, α-terpineol, and terpinen-4-ol. Differences in the abundance of these compounds suggest that environmental factors, such as temperature, soil composition, and humidity, may significantly influence the biosynthesis of secondary metabolites in sunflower petals. The non-polar fractions yielded a similarly diverse composition, with a total of 27 identified compounds. The total terpene content in these fractions exceeded 67% in all three samples, highlighting their dominance in sunflower petal extracts. The identified compounds included monoterpenes, diterpenes, triterpenes, sesquiterpenes, long-chain alkanes, fatty acids, and fatty acid esters. Diterpenes accounted for the largest proportion of identified compounds, with α- and β-pimaric acids reaching concentrations of up to 17%. The comparative chemical profiling of samples from different locations demonstrated both qualitative and quantitative variability, indicating genotype × environment interactions in the biosynthesis of volatile and lipophilic phytochemicals. These findings support the notion that sunflower petals, often considered agricultural waste, can be repurposed as valuable raw material for natural product extraction. Their diverse composition of terpenes, fatty acids, sterols, and antioxidant molecules underscores their potential for

industrial utilization, particularly in the development of health-promoting or functional products.

Keywords: Helianthus annuus, petals, Phytochemical profile, Volatile compounds

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CHANGES IN POLYAMINES CONTENT, AMINO OXIDASE ACTIVITIES AND TRANSCRIPT LEVELS OF SELECTED METABOLIC POLYAMINE ENZYMES IN ZUCCHINI COTYLEDONS TREATED WITH CYTOKININS AND METHYL JASMONATE

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ABSTRACT

Polyamines (PAs) are growth regulators that contain two (putrescine, Put) or more (spermine, Spm; spermidine, Spd) amino groups. They are actively involved in the modulation of plant growth and development. PAs endogenous concentration tends to fluctuate during cell division, depending on the balance between their synthesis and degradation. The biosynthesis of Put occurs through two alternative pathways: via the action of arginine decarboxylase (ADC) or ornithine decarboxylase (ODC). The syntheisis of Spm and Spd is catalyzed by spermine/spermidine synthase (Spm/Spd Synth). Diamine oxidase (DAO) oxidizes Put, while polyamine oxidase (PAO) degrades Spm and Spd. This study aimed to explore the changes in endogenous PAs content, and gene expression of Spm/Spd synthase, ADC, ODC, DAO and PAO in isolated zucchini cotyledons grown in light for 6 days in the presence of methyl jasmonate (MeJ) – an inhibitor of cell separation, and cytokinins, including benzyladenine (BA) and N1-(2-chloro-4-pyridyl)-N2-phenylurea (4PU-30), which both are activators of cell division. Additionally, the enzymatic activities of DAO and PAO were monitored. Free Put content increased over time due to cytokinin application, while the higher molecular weight PAs decreased. No conjugated PAs were detected, but the relative level of their insoluble form remained stable. Alterations in gene expression were both, time- and treatment-dependent, with the strongest positive effect observed after MeJ application. MeJ did not affect DAO and PAO enzymatic activities, whereas 4PU-30 (either alone or in combination with MeJ) significantly inhibited their levels. Our results highlight a coordinated interaction among key enzymes in the polyamine pathway that maintains optimal PAs levels, ensuring normal seed growth and development in response to different regulators of cell division.

Keywords: polyamines, zucchini cotyledons, gene expression, amino oxidases, plant growth regulators

LOW-TEMPERATURE PLASMA AS AN EFFECTIVE TOOL IN REDUCING SALINITY STRESS

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ABSTRACT

According to FAO, a significant portion of the Earth´s land surface (over 833 million hectares) is affected by salinity. Soil salinization negatively affects soil properties, crop production and of course the food quality. The solution may be the use of modern technologies, such as low-temperature plasma, which has great potential for use in agricultural practice. In our work, we studied the effect of low-temperature plasma (LTP) generated at atmospheric pressure in the ambient air using Diffuse coplanar surface barrier discharge - DCSBD on salt stress in pea plants. Legumes (including beans, lentils, peas) with an annual production exceeding 92 million tons are generally classified as glycophytes, meaning they have low tolerance to increased salt concentrations in the soil. This high sensitivity was showed (at the morphological, anatomical and biochemical levels) in experimental pea plants at 100 mM salinity (NaCl). Compared to the unstressed control, the plants were significantly smaller, the tissues were poorly turgid and etiolated. Pre-sowing treatment of pea seeds with LTP (we tested 10, 20 and 30 second exposure time) brought interesting results. The results show that the plasma-treated variants were significantly better prepared to handle salinity stress. In the roots of these plants, we observed earlier lignification and suberinization, which is important for maintaining tissue integrity and more efficient water transport. In the tissues of both roots and aboveground parts (stem and leaves), we observed a higher concentration of compatible solutes (e.g. proline) and phenolic substances. Higher activity of antioxidant enzymes (SOD, CAT, APX, G-POX, PPO) also indicate better readiness to quench emerging reactive oxygen species that are produced during stress. Immunodetection of important proteins forming photosystems (D1, Lhcb) as well as the large subunit of the enzyme Rubisco (RbcL) indicated the preservation of the integrity of the photosynthetic apparatus. This better potential to handle salinity was also reflected in the overall habitus of the plants, the plasma-treated variants (their morphological structure) were comparable to unstressed control plants. It is clear, that further testing is necessary, but the potential of low-temperature plasma in increasing yields of economically important crops is significant. This work was supported by the Slovak Research and Development Agency under the contract No. APVV-21-0147 and Scientific Grant Agency of Slovak Republic VEGA [1/0334/25].

Keywords: low-temperature plasma, pea, salinity stress

ENHANCING NUTRITIONAL QUALITY OF BROCCOLI MICROGREENS THROUGH COLD PLASMA SEED TREATMENT: EFFECTS ON GROWTH AND GLUCOSINOLATE BIOSYNTHESIS

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ABSTRACT

Current global nutritional challenges emphasize the need for food that is not only safe and accessible, but also enriched with bioactive compounds offering potential health benefits. Among emerging technologies, non-thermal plasma (NTP) has gained attention in the agri-food sector, especially in the pre-treatment of seeds. In this context, NTP has been shown to exhibit strong decontamination effect while having a positive influence on seed germination, growth dynamics, and plant vitality. Experimental studies further suggest that plasma treatment of cereal grains, legume seeds, and seeds for microgreen production may modify the nutritional profile of the resulting crops. Building on previous research, our study investigates the application of two different plasma sources – PiezoBrush[X] PZ3 and Diffuse Coplanar Surface Barrier Discharge (DCSBD) – for the treatment of Brassica oleracea var. italica (broccoli) seeds. The main objective is to promote the biosynthesis of specific secondary metabolites, namely glucosinolates – precursors of isothiocyanates, compounds with proven anticancer activity. Our work involves 7-day-old broccoli seedlings, which are often consumed as dietary supplements due to their dense nutritional profile. Seeds are exposed to plasma treatment for various durations, ranging from 5 to 180 seconds, depending on the used plasma source. We evaluate basic growth and productivity parameters such as germination rate and biomass accumulation. Additionally, we analyze physiological indicators like the concentration of photosynthetic pigments (chlorophylls and carotenoids), which not only reflect the plant stress response to excessive plasma treatment, but are also valuable antioxidants themselves. To assess the changes in glucosinolate synthesis, we perform RT-qPCR targeting the key enzymes of the biosynthetic pathway, including specific cytochrome P450s and UDP-glucosyltransferase. Our findings indicate that both the type of plasma source and the treatment duration influence growth performance, pigment content, and the transcriptional regulation of glucosinolate biosynthesis. These insights may contribute to the development of optimized protocols for producing nutritionally enriched plant-based foods using plasma-based technologies.

Keywords: broccoli, glucosinolates, microgreens, plasma, pigments, RT-qPCR

THE USE OF MEDICINAL PLANTS IN THE DEVELOPPEMENT OF GREEN PHARMACOLOGICAL PROCESSUS

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ABSTRACT

In the context of a transition towards more sustainable pharmacology that respects biodiversity, a plant belonging to the Asteraceae family, is part of an approach to promote natural resources. Known for its high content of phytochemicals such as flavonoids and polyphenols, this plant could represent a natural alternative to conventional non-steroidal anti-inflammatory drugs (NSAIDs). This work aims to evaluate the antioxidant, anti-inflammatory, and antimicrobial potential of extracts from different parts of plants(flowers, leaves, stems), while identifying the bioactive compounds they contain. A comparison with ibuprofen was conducted to assess the efficacy of plant extracts in a pharmacological context. Phytochemical analyses revealed a high content of flavonoids in the flowers (32.96 mg QE/g) and phenolic compounds in the leaves (13.99 mg GAE/g). Antioxidant activity measured by the DPPH method showed a strong free radical scavenging capacity, particularly in the flowers (IC_{50} = 0.064 mg/mL), even exceeding that of ascorbic acid. In terms of anti-inflammatory activity, the floral extracts showed remarkable efficacy (IC_{50} = 0.113 mg/mL), significantly higher than that of ibuprofen (IC_{50} = 0.900 mg/mL). However, no significant antibacterial activity was observed. The results obtained confirm that our plants particularly its flowers, is a promising source of bioactive molecules with marked antioxidant and anti-inflammatory properties. These data pave the way for the development of natural pharmaceutical formulations, particularly in the form of topical creams based on plant extracts, in line with the principles of green pharmacology.

Keywords: green pharmacology, anti-inflammatory, antioxidant, NSAID, ibuprofen

THE PHYTOCHEMICAL BEHAVIOR AND THE MORPHOLOGICAL ADJUSTMENT OF THE ARGAN TREE (*ARGANIA SPINOSA L. SKEELS)* UNDER CONTRASTING CLIMATES: CASE STUDY OF MARGINAL POPULATIONS.

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ABSTRACT

The present work concerns the phytochemical behavior and the morphological adjustment of the Argan tree, Argania spinosa, in response to the contrasting climatic conditions of two sites of its main geographic extent. The Argan tree (Argania spinosa (L.) Skeels) is a plant of the Sapotaceae family, endemic to Morocco. It plays several socioeconomic and ecological roles of primary importance. Therefore, the argan ecosystem finds itself under anthropogenic pressure due to the growing exploitation of argan oil, but also abiotic pressure linked to climatic events caused by global climate change to which the Mediterranean region is particularly prone. Morpho-physiological study of the two populations at the northern and southern limits of the range revealed that trees at both sites adopt a conservative strategy of water use to adapt to drought stress. A rigorous stomatal control, in addition to other morphological adaptations, allows the species to balance carbon uptake and water loss through transpiration. The species is sensitive to drought stress in its southern limit, recording limited carbon uptake from spring onwards. The water deficit linked to the scarcity of rainfall between spring and summer limited the distribution of the species in this area to the beds of the wadis. The phytochemical study reveals rather similar behavior in the two populations studied. Indeed, the trees of the two sites showed very similar and rarely different total phenolic and flavonoid contents, which implies relatively identical seasonal variations. HPLC-MS analyzes of leaf extracts over the entire duration of the study gave chromatographic profiles with the same major flavonoid molecules: Myricetin 3-galactoside, Myricitrin, Hyperoside, Quercetin-O-pentose, Quercitrin and apigenin or genistein. The semi-quantitative study shows that the levels of some compounds are affected by both the season and the location. Other compounds show only seasonal variations without showing any differences between the two areas.

Key words: Argania spinosa, climate change, abiotic stress, phytochemical efficiency, phenolic compounds, HPLC-MS.

CHEMICAL COMPOSITION AND BIOLOGICAL ACTIVITIES OF TWO PLANT SPECIES: PINUS HALEPENSIS MILL. AND SALVIA OFFICINALIS L.

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ABSTRACT

Plants are an important source of natural bioactives used in different fields such as medicine, food, cosmetics and agriculture. The objective of thisworkis the valorizationof twospecies of the Algerian flora : Pinus halepensis Mill. And Salvia officinalis L. througha phytochemical analysis and an evaluation of the biological activities of their leaf methanolic extract. Extracts were obtained by a methanolic maceration of the dried leaves, followed by a filtration and evaporation under reduced pressure. The content of phenolics, flavonoids, hydrolysable tannins, were respectively measured by Folin-Ciocalteu, aluminum chloride, and potassium iodate spectrophotometric methods. The antioxidant capacity was estimated by the 2,2-diphenyl-1-picrylhydrazyl test. The anti-inflammatory activity was evaluated by the ovalbumin method. Total phenolic compounds gave values of 106,04 and 137,07 milligram gallic acid equivalent per gram of dry matter, total hydrolysable tannins were estimated at637,06 and 337,27 tannic acid equivalent per gram of dry matter while total flavonoids showed values of 5,98 and 2,89 milligram quercetin equivalent per gram of dry matter, respectively for P. halepensis and S. officinalis. The evaluation of the antioxidant capacity showed median effective concentrations of 295,85 and 176,37 µg/mL respectively for P. halepensis and S. officinalis. against 0,04 mg/mL for ascorbic acid while measurement of anti-inflammatory power gave values of 2,322 and 1,885 mg/µL against 0,90 mg/mL for diclofenac sodium. Phenolic compounds are known for their antioxidant and anti-inflammatoryproperties mainly linked to the number and positions of phenolic hydroxyl functions which characterize them.
P. halepensis and S. officinalis are two interesting plants in the treatment of pathologies linked to oxidative stress and inflammatory processes. Conducting additional chemical, biological and pharmacological analyzes will increase the possibility to discover new molecules with great effectiveness against this type of pathologies.

Keywords: Pinus halepensis ; Salvia officinalis ; phenolics ; flavonoïds ; tannins ; antioxidant ; anti-inflammatory ; antibacterial.

EFFECT OF BENEFICIAL BACTERIA ON ANTIOXIDATIVE AND AMINO ACID METABOLIC RESPONSES OF CABBAGE PLANTS INFECTED WITH XANTHOMONAS CAMPESTRIS PV. CAMPESTRIS

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ABSTRACT

Cabbage cv. Futoški is well recognized in Serbia as an autochthonous cultivar with exceptional quality attributes and nutritional traits. The projected annual yield of cabbage is threatened by the black rot disease caused by phytopathogenic bacterium Xanthomonas campestris pv. campestris (Xcc). In an effort to suppress the disease in an ecologically friendly manner, bacterial strains with antagonistic activity are being evaluated for their efficacy in disease suppression. This study examined the response of cabbage plants to infection with Xcc and preventive treatment with the indigenous Bacillus velezensis strain RD-FC 88. To fully understand the plant–pathogen–biocontrol agent interaction, we analyzed changes in the plant's primary and antioxidative metabolism, focusing on antioxidative enzymes activity, redox status of ascorbate and glutathione, and the soluble amino acid content. Results showed that the activities of catalase (CAT) and polyphenol oxidase (PPO) were not significantly affected by Xcc infection. However, peroxidase (POD) activity was reduced twofold in Xcc infected plants compared to respective controls. The preventive application of the biocontrol strain to infected plants did not modify the response compared to treatment with Xcc alone. Infection with Xcc led to an increased concentration of reduced glutathione (GSH), while the level of reduced ascorbate (AsA) was lowered compared to the corresponding controls. This could imply a central role of GSH in maintaining redox homeostasis and the regeneration of ascorbate through the ascorbate–glutathione cycle contributing to the overall plant's antioxidative defense metabolism. Additionally, Xcc infection resulted in a reduction in the levels of most free amino acids, including those involved in the three biosynthetic pathways of glucosinolates**.** The most significant decreases were observed in aliphatic amino acids such as alanine, valine and leucine, but also in the content of aromatic acids e.g. tyrosine and tryptophan in the presence of the pathogen Xcc. Notably, the application of the biocontrol strain restored the levels of nearly all measured amino acids, with the most pronounced recovery observed in lysine and tryptophan concentrations. Infection with Xcc modifies the components of the antioxidative and amino acid metabolism in cabbage cv. Futoški. While application of Bacillus velezensis strain RD-FC 88 did not restore enzyme activity, it showed promising results in recovering amino acid levels, highlighting its potential as a biocontrol agent. Understanding interactions between biocontrol agents, pathogens, and host plants, particularly their effects on plant metabolism, is essential for their effective and sustainable use in field conditions.

Keywords: Cabbage cv. Futoški, Xanthomonas campestris pv. campestris, Biocontrol, Redox status, Glutathione, Ascorbate, Amino acids.

Acknowledgment: This research was supported by the Science Fund of the Republic of Serbia, #GRANT No.10837, A "vaccine" for black rot – biocontrol of Xanthomonas campestris pv. campestris on autochthonous cabbage cultivar Futoški using plant-associated beneficial bacteria – XanthoSTOP, and is also supported by the Ministry of Science, Technological Development and Innovation of the Republic of Serbia (Contract No. 451-03-136/2025-03/200053).

COMPARATIVE ANTIOXIDANT AND PHENOLIC DYNAMICS IN THREE BASIL VARIETIES UNDER ARTIFICIAL AND OPEN FIELD CONDITIONS

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ABSTRACT

Basil (Ocimum spp.) is a commonly used aromatic plant that is valued for culinary, medicinal and industrial use due to its high content of various bioactive compounds, like phenols and terpenoids. In this research three basil plant varieties (Ocimum basilicum var. Genovese – GB, Ocimum × citriodorum – LB and Ocimum basilicum var. purpurascens – PB) were grown in a growth chamber under controlled conditions at 600 µmol m-2 s-1 and then transferred to open field with an average midday sunlight intensity of 1000–1200 µmol m-2 s-1 to investigate the effects of growth conditions on reduced ascorbate content, antioxidant status and phenolic accumulation. In addition, a novel approach combining fluorescence spectroscopy and multivariate curve resolution with alternating least squares (MCR-ALS) analysis was used to differentiate varieties and evaluate treatment effects. Despite the constitutive differences in ascorbate content among the three varieties, exposure to sunlight in the open field led to its accumulation in all of them, with the greatest increase being found in GB (almost 4-fold). This was accompanied by a twofold accumulation of total phenolics in GB after sun exposure, a 50% increase in PB, while the phenolic content remained unchanged in LB plants in comparison to control conditions. In terms of antioxidant activity, exposure of the basil plants to sunlight resulted in an increase in antioxidant activity only in purple basil, while the antioxidant capacity remained unchanged in the other two varieties. MCR-ALS analysis revealed two spectral components– C1 (corresponding to hydroxycinnamic acids such as rosmarinic acid, chlorogenic acid and caffeic acid) and C2 (corresponding to flavonoids such as quercetin, or anthocyanins), indicating the presence of two main types of fluorophores in all analysed samples. Variations in the ratio between these two components may indicate the impact of treatments on different basil varieties. Taken together, exposure to sunlight in the open field leads to increased content of bioactive compounds. Despite the presence of various disrupting factors, outdoor cultivation remains a better approach for producing higher-quality food.
Acknowledgment: This research was funded by the Ministry of Science, Technological Development and Innovation of the Republic of Serbia (Contract No. Contract No. 451-03-136/2025-03/200053).

Keywords: Basil varieties, Phenolics, Ascorbate, Antioxidants, MCR-ALS

BIOLOGICAL ACTIVITIES OF ORIGANUM COMPACTUM AQUEOUS EXTRACT AGAINST MULTIPLE MYELOMA: IN VITRO AND IN SILICO INVESTIGATIONS

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ABSTRACT

Multiple myeloma is a hematological cancer characterized by the malignant proliferation of plasma cells in the bone marrow. Its current treatment includes chemotherapy, immunomodulators, proteasome inhibitors, and, in some cases, stem cell transplantation. However, these approaches are often associated with significant side effects, such as fatigue, immunosuppression, and renal toxicity. Given these limitations, there is growing interest in natural compounds, particularly plant extracts, due to their potential to provide targeted therapeutic effects with fewer side effects. In this study, we investigated the antioxidant, anti-inflammatory, and anti-myeloma activities of the aqueous extract of Origanum compactum (O. compactum) using both in vitro and in silico approaches. O. compactum has attracted considerable interest for its pharmacological properties, particularly its anti-cancer potential. The antioxidant activity of the extract was assessed using the TAC (Total Antioxidant Capacity) and ABTS·+ radical scavenging assays. Its anti-inflammatory potential was evaluated through the BSA (Bovine Serum Albumin) denaturation assay. Additionally, the anti-myeloma activity was explored using a molecular docking approach, in which major bioactive compounds isolated from the aqueous extract - lithospermic acid, rosmarinic acid, and salvianolic acid C - were tested for their binding affinity to key proteins involved in multiple myeloma progression (CKS1B, FGFR3, KRAS, MMSET, and NRAS). Phytochemical screening of the aqueous extract was conducted using colorimetric and quantitative assays, revealing the presence of a diverse range of secondary metabolites. The extract exhibited notable antioxidant activity, with values of 295.40 ± 1.93 µg/mL for the TAC assay and 20.97 ± 0.17 µg/mL for the ABTS·+ assay. It also showed promising anti-inflammatory effects, with an IC_{50} value of 562.59 ± 25.05 µg/mL. Molecular docking results indicated strong binding affinities of the selected compounds to the target proteins, with binding energies of -8.2 kcal/mol (CKS1B), −10.5 kcal/mol (FGFR3), −10.3 kcal/mol (KRAS), −9.3 kcal/mol (MMSET), and −9.2 kcal/mol (NRAS). Overall, these results suggest that the aqueous extract of O. compactum holds significant promise as a potential therapeutic candidate for the treatment of multiple myeloma, owing to its combined antioxidant, anti-inflammatory, and anti-myeloma properties.

Keywords: Multiple myeloma; Origanum compactum; Antioxidant; Anti-inflammatory; Phytochemical; molecular docking

GROWTH AND TRAIT COVARIATIONS IN 100 *OLEA EUROPAEA* L. VARIETIES: IMPACTS OF GENETIC AND GEOGRAPHIC ORIGINS ON PHENOTYPIC STRUCTURE

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ABSTRACT

Understanding how traits covary and influence growth is key to understanding adaptation in perennial species. In the Mediterranean olive tree (Olea europaea L.), both genetic background and geographical origin may shape trait variability, covariation patterns, and growth strategies, however these relationships remain largely unexplored. We analysed 100 olive varieties, representing four genetic groups and two geographical origins (North vs. South Mediterranean), measuring eleven morpho-anatomical and physiological traits, as well as two growth indicators, at leaf, stem/branch and whole-plant levels. We applied PCA to identify main axes of phenotypic variation, correlation networks to explore trait covariation, and network centrality analyses within and among groups. Growth–trait relationships were assessed via bivariate regressions and multiple linear regressions using the first three PCs as predictors for yearly stem growth (SDG) and whole-plant growth (TGR). Trait covariation networks revealed a robust structure across varieties, with central traits linked to tissue density. However, subtle differences emerged between groups. The South group exhibited a more modular and less connected trait network, reflecting simplified trait associations typical of arid environments. Growth analyses revealed consistent negative associations between leaf resource conservation traits and SDG across varieties. The multiple regression model explained over 50% of SDG variance. In contrast, TGR showed weaker and more variable associations. Our findings show that genetic background influence both trait variation and covariation in cultivated olive, reflecting the roles of evolutionary history, selection, and environmental adaptation. Trait networks reveal a coordinated structure between leaf and stem traits, with modularity and connectivity varying across groups, reflecting potential adaptive differences in the coordination of these traits. At the stem level, trait–growth relationships suggest that conservative leaf tissue traits impose growth limitations. In contrast, cumulative growth (TGR) shows a distinct pattern, notably a positive association with leaf area, suggesting that different mechanisms are at play in long-term growth. Overall, genetic factors, environmental context, and trait coordination jointly structure olive phenotypic diversity.

Key words: *Olea europaea* L., growth, phenotypic traits, genetic diversity, geographical origin, Mediterranean, trait correlation networks

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THE EFFECTS OF PLANT SECONDARY METABOLITES ON DNA DAMAGE

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ABSTRACT

Organisms are continually exposed to numerous internal and external factors that may cause DNA damage throughout their lifespan. In response, several cellular DNA repair mechanisms are activated to mitigate such damage and maintain genomic stability. However, these systems are not flawless, and any deficiency can trigger genomic instability, potentially resulting in various diseases. Notably, impairments in these mechanisms have been strongly associated with carcinogenesis. Given the growing emphasis on preventive health strategies, increasing attention has been directed toward plant-derived compounds recognized for their antioxidant properties. Numerous studies have shown that, when administered in appropriate doses and combinations, these compounds exhibit a wide range of biological activities, including anti-carcinogenic, antioxidant, anti-inflammatory, anti-allergic, antimicrobial, and anti-thrombotic effects. Among these, phenolic compounds have received particular attention due to their multifaceted roles in maintaining cellular homeostasis. These compounds have demonstrated capabilities such as DNA protection, modulation of the cell cycle, reduction of DNA lesion formation, alteration of cancer cell membrane potential, and regulation of apoptotic gene expression. However, the growing popularity of plant-derived substances raises safety concerns. It is crucial to recognize that a compound exerting genotoxic effects on tumor cells may also impact healthy cells adversely. Therefore, unregulated use of such compounds without comprehensive evaluation may pose serious health risks. Further analysis is essential to ensure their safety and therapeutic efficacy.

Keywords: Antioxidant Activity, Cancer Prevention, DNA Repair, Plant-Derived Phenolic Compounds, Oxidation

REGULATORY ROLE OF CYSTEINE APPLICATION ON HSP90 AND THE GLUTATHIONE-DEPENDENT GLYOXALASE SYSTEM IN ARABIDOPSIS THALIANA UNDER HIGH TEMPERATURE STRESS

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ABSTRACT

High temperature (HT) stress is one of the major abiotic factors limiting plant growth and crop productivity. However, the complete defense mechanisms that plants employ against HT stress are yet to be fully elucidated. In this study, the modulatory effects of cysteine (CYS) application on the interaction between heat shock proteins (HSP90.1 and HSP90.4) and the glutathione-dependent glyoxalase (GLX) system under HT conditions in Arabidopsis thaliana were investigated, with a focus on its role in enhancing stress tolerance. The experimental design included wild-type Col-0 plants as well as hsp90.1 and hsp90.4 mutants. Additionally, some plants were treated with BBGD (S-p-bromobenzylglutathione cyclopentyl diester), an inhibitor of the GLX system. Following CYS application, plants were exposed to HT stress at 37 °C for 48 hours. Quantitative assessments were performed for oxidative damage markers (TBARS, hydrogen peroxide accumulation) and physiological parameters (relative water content, total chlorophyll content). Furthermore, HSP90 protein levels were analyzed via immunoblotting, and GLX enzyme activities were evaluated using spectrophotometric assays. CYS application significantly reduced TBARS and H_2O_2 accumulation under HT conditions and markedly improved relative water content and chlorophyll levels. In parallel, increased expression of HSP90.1 and HSP90.4 proteins and elevated GLX enzyme activities were observed. These responses were found to be associated with glutathione-dependent regulatory mechanisms. The findings demonstrate that cysteine modulates oxidative stress responses by activating the GLX system in coordination with the HSP90 proteome under HT stress, contributing to the maintenance of redox homeostasis in A. thaliana. This study highlights cysteine as a promising regulator with potential to enhance heat stress tolerance in plants.

Keywords: Arabidopsis thaliana, high temperature stress, cysteine, HSP90, glyoxalase system, glutathione, oxidative stress

STUDY OF THE ANTIMICROBIAL AND ANTIFUNGAL ACTIVITY OF CLOVE EXTRACTS (SYZYGIUM AROMATICUM) ON GERMS INVOLVED IN VAGINAL INFECTIONS

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ABSTRACT

Vaginal infections, whether bacterial or fungal, represent a major public health issue in women, often aggravated by the emergence of resistance to conventional antimicrobial treatments. The present study aims to evaluate the antimicrobial and antifungal activities of several extracts of Clove (Syzygium aromaticum), a medicinal plant widely used in phytotherapy for its therapeutic properties. Four forms of extract were studied: an aqueous extract, a hydroalcoholic extract and an oily extract obtained by maceration, as well as a commercially oil based on clove. The antimicrobial and antifungal activity of these preparations was evaluated by the aromatogram method, on four microorganisms frequently responsible for vaginal infections: Escherichia coli, Staphylococcus aureus, Pseudomonas aeruginosa and Candida albican. The results obtained reveal a marked inhibitory activity for the hydroalcoholic extract, and the commercial oil, in particular against S. aureus and C. albican. The aqueous extract showed a more moderate efficacy. These results suggest that extracts of Clove, particularly in hydroalcoholic form, commercial oil, could constitute an interesting natural alternative for the treatment of vaginal infections.

Keywords: Syzygium aromaticum, antimicrobial activity, antifungal activity, vaginal infections, aromatogram, plant extracts, essential oil.

COMPARATIVE STUDY OF TWO SPECIES OF THE LEPTOSPIRAE SECTION FROM THE GENUS MEDICAGO, MEDICAGO LACIANATA L (MILL), AND MEDICAGO POLYMORPHA L: KARYOTYPE; C BANDING, GENOME SIZE

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ABSTRACT

The Medicago genus constitutes an extremely rich and diverse genetic heritage. As part of the development of phytogenetic fodder resources in Algeria, this genus constitutes a material of choice for the study of evolutionary phenomena in plants and their co-evolution with Rhizobiaceae. The biological richness of the Medicago genus means that it still remains insufficiently known from a taxonomic and phylogenetic point of view; new species continue to be described around the world and the classification of the genus remains to be updated. It is in this sense that we proposed to launch a cytogenetic study, a study of DNA by flow cytometry, and the analysis of the electrophoretic profiles of the proteins of two species, M. polymorpha and M. laciniata. The two Medicago polymorpha L species and Medicago laciniata. L. Were the subject of a cytogenetic study. The Feulgen protocol was utilized to process eleven ecotypes of M. polymorpha and six ecotypes of M. laciniata to determine their chromosome number and type. The results show that all the ecotypes of M. polymorpha studied are 2n=2x=14 with a symmetrical karyotype, only one present (M. polymorpha polymorpha) a chromosome number 2n =2x=16 like the ecotypes of M. laciniata. The index chromosome asymmetry varied from 61.78% in M. Polymorpha at 61.15% in M. laciniata. Statistical analyzes showed significant differences ($P < 0.05$), for each inter- and interspecific chromosomal pair, which refers to the variation in genome size. ; The Giemsa C-band differential staining technique applied to all populations indicates that the two species M. polymorpha and M. laciniata show the standard pattern of centromeric bands on all chromosomes.

Keywords: M.polymorpha, M.laciniata chromosome, karyotype, heterochromatin, C- Banding, flow cytometry, genome size,

EFFECT OF N2-FIXING MICROBACTERIUM OXYDANS BIOINOCULANT ON MAIZE (ZEA MAYS L.) SEED GERMINATION AND SEEDLING DEVELOPMENT

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ABSTRACT

Microbacterium oxydans is well known for its characteristic range of metabolic functions, which enable its survival in various environments and determine its potential practical applications in the pharmaceutical industry, agricultural sector, and for bioremediation purposes. Sustainable agriculture benefits from M. oxydans' metabolic capabilities to produce compounds that improve plant growth, protect them from diseases and pests, and enhance soil nitrogen availability through N2 fixation. The current study aimed at assessing the effect of the N2-fixing M. oxydans L29 bioinoculant on maize seed germination and seedling development under laboratory conditions. A new N2-fixing bacterial strain was isolated and identified as Microbacterium oxydans L29. Fresh cultures were obtained by batch cultivation for 72 h at 30 oC on MPB medium. Bioinoculant formulations were prepared at 0.1, 0.2, and 0.4% final concentration. Seed germination tests were applied to evaluate the effect of these formulations on the germination and seedling growth promotion. Two Bulgarian maize (Zea mays L.) hybrid cultivars were chosen for analysis. The germination capacity of the seeds and growth parameters - length of the primary root, length of the coleoptile, and the number of lateral roots - were evaluated. The results of the current study showed that seed inoculation significantly enhanced seed germination and seedling development of maize. The best root growth-promoting effect on both maize cultivars was revealed by M. oxydans L29 at 0.4%. Results have also shown that the stimulatory effect is cultivar-dependent. It was found that the length of the primary roots (192.85 %) and the length of the coleoptile (238.33 %) for cv. Kneza 310 were significantly enhanced as compared with the untreated control. The M. oxydans L29 bioinoculant's potential to enhance maize seeds' germination and seedling development revealed encouraging preliminary results in promoting plant health and minimizing reliance on synthetic fertilizers.

Keywords: plant growth; N-fixing;

COMPARATIVE STUDY OF SALT STRESS TOLERANCE IN CICER ARIETINUM GENOTYPES THROUGH MORPHOLOGICAL AND PROTEIN MARKERS

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ABSTRACT

In this study, the impact of salt stress on two chickpea (Cicer arietinum) genotypes, FLIP (sensitive) and GAB (tolerant), was assessed through the analysis of their morphological and biochemical responses. The study focused particularly on total protein quantification and their separation by SDS PAGE. The results show that the tolerant genotype copes better with salinity, exhibiting enhanced root development under stress conditions, whereas the sensitive genotype shows a more pronounced growth reduction, particularly in the roots. Morphologically, the high variability observed among FLIP individuals, under both normal and stress conditions, suggests lower genetic stability or a less specific adaptive response. In contrast, GAB exhibits more homogeneous morphology across individuals and shows a clear shift in growth toward the roots under stress, suggesting an effective adaptive strategy. Electrophoretic profiles revealed that GAB expresses fewer proteins but shows a more targeted induction of specific protein bands under salt stress. SDS-PAGE analysis highlighted proteins specifically induced in GAB, which could correspond to ATPases, CDPKs, LEA proteins, or aquaporins, as well as stress-related proteins such as HSPs, LEA proteins, or detoxification enzymes like peroxidases. Although SDS-PAGE does not allow precise protein identification, hypotheses were formulated based on apparent molecular weights and literature data. Complementary analyses, such as mass spectrometry or 2D-PAGE, will be necessary to confirm their identity and functional role.

Keywords: Cicer arietinum, salinity tolerance, proteins, SDS-PAGE

EVALUATION OF THE ANTIOXIDANT AND ANTI-INFLAMMATORY POTENTIAL OF RUTA CHALEPENSIS L. (RUTACEAE)

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ABSTRACT

In a context where the valorization of local medicinal plants is a strategic priority for pharmaceutical research and traditional medicine, this study focused on Ruta chalepensis L., collected in the Souk Ahras region (Algeria), due to its potential as a source of bioactive compounds. Phytochemical screening revealed a richness in various secondary metabolites, including coumarins, flavonoids, reducing compounds, tannins, free quinones, triterpenes, and sterols. Hydrodistillation allowed the extraction of essential oil with a yield of 0.8% relative to dry weight. The extracts prepared from the dry plant material exhibited varying yields: aqueous (9.67%), butanolic (5.43%), dichloromethane (0.38%), and ethyl acetate (0.30%). Phytochemical analysis revealed a predominance of polyphenols, with particularly high contents in the essential oil (520.73 mg GAE/g), butanolic extract (479.68 mg GAE/g), and ethyl acetate extract (434.42 mg GAE/g). In vitro pharmacological tests demonstrated that the essential oil exhibited notable anti-inflammatory activity, while the ethyl acetate extract showed significant antioxidant potential. These findings confirm the promising therapeutic potential of Ruta chalepensis as a natural source of antioxidants and anti-inflammatory agents.

Keywords: Keywords: Ruta chalepensis L., secondary metabolites, essential oil, anti-inflammatory activity, antioxidant capacity

METABOLIC REACTIONS TO PHOTOPERIOD AND SALINITY STRESS IN THE ROOTS OF SPRING WHEAT

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ABSTRACT

Here, we report 83 metabolites associated with responses to combined salt stress and prolonged photoperiod in wheat roots. The top 20 DEMs that were further identified in this study fell into two clusters across the four wheat genotypes studied under 0, 40 and 80 mM NaCl-induced salt stress conditions. In controlled growing conditions, salt-sensitive and salt-tolerant spring wheat roots behaved differently to an extended photoperiod. We found 58 highly expressed metabolites in these wheat genotypes' roots, including galacturonic acid, an important component of pectin.Materials and Methods: Four spring wheat genotypes (GS-6058, JS-7, XinChun-31, Yongliang-15) to varying levels of NaCl-induced salt stress (0, 40, 80 mM) under two photoperiods (22 h light/2 h dark and 12 h light/12 dark) were investigated. Metabolomics followed Liquid Chromatography-Mass Spectrometry (LC-MS). All analyses were performed using MetaboAnalyst 6.0. Results and Discussion: Of the 83 metabolites that were identified in spring wheat roots that varied under different salinity and photoperiod, there were 58 significant differentially expressed metabolites (DEMs). Salt, photoperiod and their interactions effect regulated 50, 45 and 7 DEMs, with a set of 11, 6 and 2 unique metabolites, respectively. The impact of the 12L:12D photoperiod was highest on ferulic acid, while the 22L:2D photoperiod had more impact on jasmonic acid. The fold-change volcano plot of the top-20 significant DEMs showed that GABA, jasmonic acid, malic acid, alanine, succinic acid, galacturonic acid, beta-alanine, pyruvic acid, fumaric acid, lactic acid, inosine, glutamine, lysine, uridine, nicotinic acid, methionine sulfoxide, ornithine and glycine were upregulated, while vanillin and ferulic acid were downregulated by 22L:2D. The first cluster for DEMs had gallic acid, DIBOA, vanillic acid, ferulic acid, vanillin, methyl jasmonate and asparagine. The second cluster had inosine, methionine, sulfoxide, jasmonic acid, alanine, GABA, beta-alanine, pyruvic acid, succinic acid, fumaric acid, malic acid, galacturonic acid, coumarin, and caffeic acid. Irrespective of the spring wheat genotype and salinity effect, photoperiod had a significant effect on the clusters under which each of the root-stressed conditions fell. There were two strongly unique clusters for genotypes that were exposed to either 40 mM or 80 mM NaCl. Genotype XC31, which was exposed to 80 mM NaCl under both 12L:12D and 22L:2D conditions, clustered with its counterpart from the 40 mM NaCl group under the 12L:12D condition, as well as with YL15, GS60, and JS7 from both the 40 mM and 80 mM NaCl groups. DEMs from YL15 in 0, 40 and 80 mM NaCl at 22L:2D showed a similar expression pattern, as these were in the same cluster. Also in this second group were JS7 and GS60 (both in 40 mM and 80 mM) and XC31 (0 mM and 40 mM). The remaining genotypes, mostly from 0 mM NaCl belonged in the third group. Conclusion: Salt-sensitive and salt-tolerant spring wheat roots react differentially to extended photoperiod.Galacturonic acid, an essential pectin component that affects plant cell wall structure and function, was significantly upregulated alongside succinic acid, alanine, malic acid, jasmonic acid and GABA Ferulic acid and vanillin, were the most significantly down-regulated DEMs. Ferulic acid affects roots in complicated and context-dependent ways, while low vanillin concentrations encourage root growth.

There is a need to study and relate their biological functions to important salt-tolerance and photoperiod response pathways that could further provide insights into photoperiod-driven metabolic mechanisms of salt-stress tolerance in wheat.

Keywords: Metabolic, salinity stress, wheat, roots,

STUDY OF THE INFLUENCE OF THE HARVESTING REGION ON THE PHYTOCHEMICAL COMPOSITION OF FUMARIA PARVIFLORA FROM MOROCCO

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ABSTRACT

Species of the genus Fumaria are medicinal plants known for their anti-inflammatory, antioxidant, and antidiabetic effects. Our species, Fumaria parviflora, locally known under different names, is a green, herbaceous, annual plant that grows in wheat fields, plains, and low hills. It is a ubiquitous species, found in Europe, Africa, America, Australia, and more significantly in India, Pakistan, and Iran. In traditional medicine, this species has been used to treat numerous diseases and infections such as diabetes, digestive disorders, eczema, burns, fever, influenza, headaches, toothaches, poisoning, hepatobiliary dysfunction, blood disorders, urinary diseases, and male infertility. Despite its remarkable therapeutic potential, few scientific studies have focused on evaluating its biological activities. Hence, the aim of our research is to conduct a comparative study of the phytochemical composition of F. parviflora harvested in three different Moroccan regions (Casablanca, El Jadida, and Khouribga). Lipids, carbohydrates, proteins, minerals, and pigments were determined using standard methods, while secondary metabolites were evaluated through screening. Our results showed that the chemical composition varies according to the harvesting region, with a higher polyphenol content in the Casablanca sample. Thus, it can be concluded that the environmental conditions of each region influence the chemical composition of this plant. Species of the genus Fumaria are medicinal plants known for their anti-inflammatory, antioxidant, and antidiabetic effects. Our species, Fumaria parviflora, locally known under different names, is a green, herbaceous, annual plant that grows in wheat fields, plains, and low hills. It is a ubiquitous species, found in Europe, Africa, America, Australia, and more significantly in India, Pakistan, and Iran. In traditional medicine, this species has been used to treat numerous diseases and infections such as diabetes, digestive disorders, eczema, burns, fever, influenza, headaches, toothaches, poisoning, hepatobiliary dysfunction, blood disorders, urinary diseases, and male infertility. Despite its remarkable therapeutic potential, few scientific studies have focused on evaluating its biological activities. Hence, the aim of our research is to conduct a comparative study of the phytochemical composition of F. parviflora harvested in three different Moroccan regions (Casablanca, El Jadida, and Khouribga). Lipids, carbohydrates, proteins, minerals, and pigments were determined using standard methods, while secondary metabolites were evaluated through screening. Our results showed that the chemical composition varies according to the harvesting region, with a higher polyphenol content in the Casablanca sample.

Thus, it can be concluded that the environmental conditions of each region influence the chemical composition of this plant.

Keywords: Fumaria; chemical composition; harvesting region; comparative study; phytochemical profile.

TRACING GENOMIC EVOLUTION OF TUBULIN GENE FAMILY FOR CAMELINA SPECIES GENOTYPING

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ABSTRACT

Tubulins play crucial roles in numerous fundamental processes of plant development. In flowering plants, tubulins are grouped into α-, β- and γ-subfamilies, while α- and β-tubulins possess a large isotype diversity and gene number variations among different species. This circumstance leads to insufficient recognition of orthologous isotypes and significantly complicates extrapolation of obtained experimental results, and brings difficulties for the identification of particular tubulin isotype function. Correct identification of isotypes and determination of the orthology of tubulin genes in plants is a non-trivial task that requires the involvement of a complex of bioinformatics approaches.The aim of this research is to identify and characterize evolution of tubulins within Camelina genus, which, in part, includes an emerging biofuel crop Camelina sativa. Here we report a comprehensive genome-wide search and identification of tubulin genes was carried out in four diploid representatives of the genus Camelina, in particular in the C. neglecta, C. laxa, C. hispida species, as well as in their descendant, allohexaploid C. sativa. Complete sets of α-, β-, and γ-tubulin genes and pseudogenes was identified and characterized in the mentioned five Camelina species. Phylogenetic analysis and a series of genome-wide comparisons allowed us to establish the orthology of the tubulin genes, determine isotype identity of the encoded tubulins, and trace evolutionary changes in tubulin gene sets during species divergence and the emergence of allohexaploid C. sativa species. Recognition of orthologous tubulin isotypes was cross-referred, involving data of genes allocation on reconstructed genomic blocks of Ancestral Crucifer Karyotype. An investigation of expression patterns of tubulin homeologs revealed the predominant role of N6 (A) and N7 (B) subgenomes in tubulin expression at various developmental stages, contrarily to general the dominance of transcripts of H7 (C) subgenome. Finally, genotyping of the accessions of different Camelina species using TBP-, cTBP-, and γTBP-markers allowed effective differentiation of species based on the assessment of polymorphisms of intronic regions of the β- and γ-tubulin genes. The study demonstrates the comprehensive approach of precise inferring tubulin gene orthology.The obtained results lay a strong groundwork for further studies of the isotype and functional diversity of tubulins in Cruciferae and other groups of flowering plants, and will also contribute to the development and implementation of new highly efficient molecular marker systems for DNA-barcoding and marker-assisted breeding of plant species, including such promising oilseed crops as C. sativa.

Keywords: Ancestral Crucifer Karyotype, Camelina, crop wild relatives, cytoskeleton, DNA-barcoding, genome evolution, polyploidy, tubulin, tubulin-based polymorphism

PHYTOHORMONE AND NANOPARTICLE SYNERGY: SEEDLING GROWTH ENHANCEMENT IN GARDEN CRESS (*LEPIDIUM SATIVUM L.)*

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ABSTRACT

Nanotechnology and phytohormone applications offer innovative strategies for promoting plant growth. Indole-3-acetic acid (IAA) is a core phytohormone involved in cell division and elongation, while zinc oxide nanoparticles (ZnO NPs) synthesized via green methods using Acanthus spinosus L. leaf extract, can enhanced the growth. This study investigated the effects of single and combined applications of IAA and biosynthetic ZnO NPs on growth promotion in Lepidium sativum L. seedlings. Seven-day-old of Lepidium sativum seedlings were organised as The control, IAA, ZnO NPs, and IAA + ZnO NPs treatment groups. Growth parameters, Pigment contents, secondary metabolites, and enzyme activities were analyzed. The results are showed that both IAA and ZnO NPs applications enhanced growth and pigmentation, with the highest values obtained in the combined application. Proline supports osmotic balance, while increases in POD and CAT activities have been linked to increased ROS signaling during growth. Furthermore, ZnO NPs were determined to be biocompatible at low concentrations. Our study demonstrates that the combined use of phytohormone and nanoparticle applications contributes an effective approach to promoting plant growth and enhancing physiological responses.

Keywords: Growth promotion, Green synthesis, Phytohormone–nanoparticle synergy, ZnO nanoparticles

EXPRESSION AND PHYLOGENETIC ANALYSIS OF NRAMP AND ZIP GENES IN *BRASSICA JUNCEA* AND *BRASSICA RAPA* UNDER DIFFERENT ZINC LEVELS

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ABSTRACT

Zinc (Zn) is an essential trace element in plants, but it becomes toxic at high doses. While Zn deficiency is a widespread problem both globally and in Türkiye, Zn toxicity resulting from agricultural pollution also poses a significant risk in some regions. In this study, the response to Zn stress was investigated in Brassica juncea and Brassica rapa. This study investigated the Zn-responsive transporter gene families NRAMP and ZIP, examining the organ- and species-specific expression patterns of NRAMP4 and ZIP4 under varying Zn treatments using quantitative real-time PCR (qRT-PCR), and conducted a phylogenetic analysis of these families within the Brassicaceae. Seedlings were cultivated in vermiculite for 45 days with three replicates; at the end of the experiment, Zn accumulation in roots and leaves was measured using ICP-OES, while morphological observations and qRT-PCR analysis of NRAMP4 and ZIP4 expression profiles were conducted. The physiological results showed that the viability of the plant growth was maintained at low to moderate Zn levels, but toxicity symptoms appeared at higher doses (500–1000 µM). ICP-OES analysis revealed a dose-dependent increase in Zn accumulation, with B. juncea showing a tendency for higher root accumulation and B. rapa for higher leaf accumulation. NRAMP4 expression increased in the roots of B. juncea at moderate Zn levels, while in B. rapa leaves, it showed a strong, dose-dependent induction reaching approximately 7-fold at 1000 µM. ZIP4 expression was limited in B. juncea roots but increased 10–27-fold at 500–1000 µM in B. rapa leaves. Phylogenetic analyses yielded high bootstrap support for the NRAMP and ZIP/IRT gene family trees. Cross-species analysis revealed that subfamily members (e.g., NRAMP1, NRAMP2, ZIP3) clustered on similar branches, indicating that these regions are evolutionarily conserved. In conclusion, by integrating dose, organ, and species interactions under Zn stress, the expression dynamics of the NRAMP4–ZIP4 axis, and the in-silico profiling of the NRAMP/ZIP gene families, this study offers a comprehensive framework for Zn homeostasis in Brassica species and provides candidate genes for biotechnological and phytoremediation strategies targeting Zn deficiency, efficiency, and toxicity conditions.

Keywords: Brassica juncea, Brassica rapa, Zinc (Zn), NRAMP transporters, ZIP transporters, qRT-PCR, Phylogenetic analysis, Phytoremediation

Funding: This study was supported by TÜBİTAK Project No. 125Z015

VARIATION IN BIOACTIVE COMPOUNDS AND ANTIOXIDANT ACTIVITY OF GALIUM APARINE L. IN RELATION TO ECOLOGICAL AND GEOGRAPHICAL FACTORSPROVIDE

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ABSTRACT

Galium aparine L. (cleavers) is an annual plant from the family Rubiaceae, well known for its diverse biological activities. In Europe and the Balkans, the aerial parts of the plant have been traditionally used since ancient times as diuretics, blood purifiers, and liver detoxifiers. Numerous scientific publications report the presence of bioactive compounds in G. aparine, including flavonoids, polyphenols, iridoids, anthraquinones, and phytosterols, which contribute to its antioxidant, anti-inflammatory, antimicrobial, anticancer, and immunomodulatory effects. The present study evaluated the influence of ecological and geographical factors on the content of bioactive compounds and antioxidant activity in methanolic extracts of cleavers. Samples were collected from three Bulgarian populations: Eastern Stara Planina, Thracian Lowland, and Tundzha Hilly Plain. Total phenolic and flavonoid contents were quantified spectrophotometrically, and antioxidant activity was assessed using the DPPH radical scavenging assay. The effects of environmental and soil conditions on the phenolic and flavonoid contents and the corresponding antioxidant activity have been evaluated. Results indicate that ecological factors particularly soil type, altitude, and sunlight intensity significantly influence the accumulation of bioactive compounds in the aerial parts of the species. The findings of this study can contribute to defining the phytochemical profile of G. aparine and provide guidance for optimizing its collection and use in pharmacological and phytochemical applications. Funding: This work is financially supported by the EU and the Bulgarian Ministry of Education and Science through project BG-RRP-2.004-0006-C02 “Development of scientific research and innovation at Trakia University in the service of health and sustainable well-being”.

Keywords: Galium aparine L., bioactive compounds, flavonoids, phenolic acids, antioxidant activity, ecological factors, DPPH assay

EVALUATION OF THE NUTRITIONAL VALUE OF AMARANTHUS ALBUS L. AND AMARANTHUS DEFLEXUS L. AS POTENTIAL FOOD AND FORAGE PLANTS

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ABSTRACT

This research evaluated the nutritional properties of two widespread Amaranthus species in Bulgaria: Amaranthus albus L. and Amaranthus deflexus L. These species typically grow in disturbed habitats such as agricultural lands, gardens, roadsides, and other ruderal areas, occurring at altitudes ranging from sea level up to 1000 meters. A total of 14 populations were examined, including five populations of A. albus and nine of A. deflexus, sampled across five floristic regions: Central Stara Planina, Thracian Plain, Strandzha Mountain, Tundzha Hilly Plain, and the Western Rhodopes. The study aimed to explore their potential as alternative food and forage crops. The analysis included determination of the chemical composition of the aboveground biomass (crude protein, crude fat, crude fiber, ash, and nitrogen-free extract), mineral concentrations, digestibility, and gas production over 24- and 48-hour periods. Additionally, metabolizable energy (ME) and relative feed value (RFV) were calculated, and neutral detergent fiber (NDF) and acid detergent fiber (ADF) contents were assessed. Regression models were developed to estimate ME and predict RFV from fiber fractions. The findings suggest that specific populations of Amaranthus species possess notable potential for use in food and forage applications, provided that suitable agronomic practices are applied.

Keywords: Amaranthus albus L., Amaranthus deflexus L.; chemical composition; mineral content; fiber analysis; in vitro gas production; relative feed value

ANTIOXIDANT AND ANTIMICROBIAL POTENTIAL OF MALVA NEGLECTA WALLR. EXTRACTS

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ABSTRACT

Malva neglecta Wallr. belongs to the genus Malva from the Malvaceae family. It is rich in biological active compounds, and known with its health benefits. In this study extracts from different parts (leaves, flowers and roots) of this plant were prepared by 70% ethanol, and natural deep eutectic solvents based on choline chloride and acetic acid (NADES1) or glycerol (NADES2). Their antioxidant, antibacterial (against B. cereus, S, aureus, E. coli, and P. aeruginosa) and antifungal activities (against P. chrysogenum, F. oxysporum, A. parasiticus, A. flavus, A. niger A. carbonarius, and A. ochraceus) were compared. The ethanol extracts characterized with the highest contents of total phenols, flavonoids, and condensed tannins. The ethanol and NADES flower extracts were the richest in the tested antioxidants. Alkaloids were extracted in low quantities. The antioxidant potential of the extracts did not differ significantly depending on the solvent applied. Generally, the antibacterial potential of NADES1 extracts was higher than the activity of the ethanolic extracts. Such clear tendency regarding the antifungal potential was not observed. NADES2 extracts displayed a lack of antimicrobial activity. Regardless of the type of the solvent, the highest antifungal activity was exhibited by the root extracts of M. neglecta as compared to the potential of the leaf and flower extracts, which can result from their higher alkaloid content.

Keywords: Malva neglecta Wallr., Ethanol, Natural deep eutectic solvents, Antimicrobial activity; Antioxidants

GC-MS ANALYSIS OF THE ESSENTIAL OIL OF A MEDICINAL PLANT

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ABSTRACT

Teucrium polium has been used as a medicinal herb with diuretic, inotropic, chronotropic, tonic, antipyretic, antiulcer, antibacterial, anti-inflammatory, and anticonvulsant properties. In the present work, the essential oils from the aerial parts of this plant were extracted by the hydrodistillation method using a Clevenger-type apparatus. Gas chromatography–mass spectrometry (GC–MS) analysis in electron impact (EI) mode allowed the identification of one hundred and twenty-two compounds belonging to different chemical families. Among the major identified constituents were: 2-Ethyl-1,4-benzodioxin (18.7%); Propanoic acid, 2-(tricyclo [3.3.1.1^{3},^{7}] dec-2-ylidene) (10.7 %); Benzene, 1-methoxy-2-methyl (7.0%) and β-Pinene (5.8 %).

Keywords: Medicinal plant , Teucrium polium, Hydrodistillation , essential oil, GC-MS

REPRODUCTIVE STRATEGIES AND CHOICE OF PROPAGATION METHOD IN THREE BULGARIAN THYMUS SPECIES *(THYMUS LONGEDENTATUS, T. ZYGIOIDES, T. PANNONICUS)*

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ABSTRACT

The study of reproductive strategies in Thymus species is of key importance for developing effective approaches to the conservation and sustainable cultivation of genetically valuable populations. In the present investigation, the results of seed and vegetative propagation were compared in three Bulgarian Thymus species, T. longedentatus, T. zygioides and T. pannonicus, all characterized by high biotechnological and phytochemical potential. The data revealed relatively high seed viability and germination capacity in all three species: 72% in T. longedentatus, 84% in T. zygioides and 89% in T. pannonicus. Under optimal laboratory conditions, the seeds germinated rapidly and synchronously, confirming their potential for generative reproduction. However, under field conditions, significant seedling loss was observed, primarily due to limited soil moisture, shallow substrates, and competition with herbaceous vegetation. In view of these limitations, and in order to achieve genetic stability of the propagation material, vegetative propagation through rooting of cuttings was selected as the preferred approach, as it ensures complete preservation of the maternal genotype. Cuttings taken from healthy and morphologically typical plants in the active growth phase exhibited high rooting success – 88% in T. longedentatus, 93% in T. zygioides and 91% in T. pannonicus. The obtained plantlets demonstrated homogeneity in morphological traits and stability in phytochemical profile compared to the wild populations. These results confirm that a combined strategy, employing seed propagation for assessing viability and adaptive potential, and vegetative propagation for producing planting material with guaranteed genetic identity is the most appropriate for the three studied Thymus species. This approach provides a sustainable basis for the reproduction and preservation of valuable genetic resources of Bulgarian thyme species within the framework of the ThymoBioTech project.

Keywords: seed propagation, vegetative rooting, genotype stability, sustainable cultivation

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PHYTOCHEMICAL PROFILE OF THYMUS PANNONICUS EXTRACT AND EXUDATE ORIGINATING FROM BULGARIA

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ABSTRACT

Thymus pannonicus All. (Hungarian, Eurasian or Pannonian thyme) is a perennial herbaceous plant, distributed in Central and Eastern Europe and it is a relatively unexplored species. Various chemotypes have been recorded based on the essential oil profiles of the species. The main chemotypes, including geranial (citral), α-pinene and germacrene-D. In the Bulgaria germacrene-Dhas chemotype been reported. Although the essential oil composition of the species from different origin have been well studied, the metabolite composition of alcoholic extracts of the species are insufficiently studied. The aim of the current work is to examine the metabolite profiles of acetone exudate and methanolic extract of T. pannonicus originating from Bulgaria. Plant material was collected from Eastern Rhodopes, Bulgaria. The chemical composition of exudate and extract were analyzed using GC/MS and HPTLC. Mono- and disaccharides, fatty acids, polyols, fatty alcohols, organic acids, alkanes were found as the main primary metabolites in the studied extracts. Regarding bioactive compounds, rosmarinic acid and other phenolic acids were identified in the methanolic extract whereas triterpenic acids: oleanolic, ursolic and micromeric, monoterpenes: hydroquinone, thymol, carvacrol were identified as the most abundant in the exudate. Thin-layer chromatography analysis of the extract and exudate revealed the presence of apigenin and luteolin and their glycosides as well as kaempferol 3-glycoside. Luteolin 7-glucoside was found as the most abundant flavonoid in the methanolic extract. The results showed that extract and exudate from the species are rich in bioactive compounds, which outlines them as a promising source of various biological activities. The study present for the first time data about chemical composition of alcoholic extract and exudate of Thymus pannonicus from Bulgaria.

Keywords: flavonoids, thymol, triterpene acids, GC/MS and HPTLC

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VARIATION IN PHENOLIC CONTENT OF THYMUS LONGEDENTATUS AT DIFFERENT PHENOLOGICAL GROWTH STAGES

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ABSTRACT

Thymus longedentatus (Degen & Urum.) Ronniger is a Balkan endemic species whose essential oil is rich in citral isomers—neral and geranial (Aneva et al., 2019). In addition to the pleasant lemon aroma that these compounds impart, they also exhibit important biological activities such as antimicrobial and acetylcholinesterase inhibitory effects. The limited distribution of the species in nature and its valuable properties necessitated its cultivation. A comparative analysis of material from cultivated and wild populations demonstrated that the metabolic profile is preserved during cultivation (Nikolova et al., 2025). The aim of the present study was to examine the variations in the accumulation of phenolic substances in plant material collected at different phenological stages from cultivated populations of the species. Five phenological growth stages were identified according to the BBCH (Biologische Bundesanstalt, Bundessortenamt and CHemical industry) scale: vegetative propagation; beginning of flowering; full flowering; end of flowering; and maturity of fruit and seed. The contents of total phenols and flavonoids were determined using spectrophotometric methods. The content of rosmarinic acid was determined by TLC analysis and quantified using QuantyScan software. HPTLC analysis was employed for the identification of flavonoids and phenolic acids. The total phenolic content varied from 6.19 to 16.13 mg/g extract, reaching its highest levels at the beginning of vegetation and at full flowering. The flavonoid content ranged from 1.12 to 1.45 mg/g extract. Although significant variations in total flavonoid content between phenological stages were not observed, changes in individual flavonoid compounds were detected in subsequent TLS analyses. The rosmarinic acid content ranged between 0.42 and 0.73 mg/g DW and was highest at full flowering. HPTLC analysis revealed the presence of flavonoids and phenolic acids. Luteolin-7-glucuronide, luteolin-7-glucoside, and quercetin 3-rutinoside were identified as the main flavonoids, while kaempferol-3-glycoside and apigenin-7-glucoside were detected in trace amounts. At the full flowering stage, chlorogenic, caffeic, and rosmarinic acids, along with quercetin 3-rutinoside and luteolin-7-glucoside, were found in the highest quantities. During the vegetative stage, luteolin-7-glucuronide predominated, whereas at seed maturity, the overall phenolic and flavonoid contents declined significantly. The results demonstrate that the phenolic profile of T. longedentatus is dynamic and closely related to the plant's phenological development. The full flowering stage represents the optimal period for harvesting due to the highest accumulation of total phenolics, rosmarinic acid, and key flavonoids with recognized biological activity. These findings provide valuable information for optimizing the use of T. longedentatus in pharmacological and industrial applications and for standardizing the quality of plant material obtained from cultivation.

Keywords: phenolic compounds, flavonoids, rosmarinic acid, HPTLC, phenological stages, cultivation

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MEDITERRANEAN OAK SPECIES IN BULGARIA – GENE POOL, DIVERSITY AND CONSERVATION

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ABSTRACT

Bulgaria lies at the crossroads of several major biogeographic regions, including the Mediterranean, Continental, and Pontic–Euxinian zones. This position has contributed to the exceptionally rich and heterogeneous flora of the country, where Mediterranean floristic elements represent one of the most distinctive and ecologically important components. Among the tree species, the genus Quercus (oak) stands out for its high taxonomic, genetic, and ecological diversity, forming a major structural and functional element of forest ecosystems. Several oak species occurring in Bulgaria can be classified as Mediterranean or at least partially adapted to Mediterranean-type environmental conditions. These include Quercus frainetto Ten., Q. cerris L., Q. pubescens Willd., Q. hartwissiana Steven, Q. trojana Webb, and Q. coccifera L., along with two endemic taxa – Q. protoroburoides Dončev & Busov and Q. thracica Stef. & Nedyalkov. These species are distributed mainly in southern and southeastern Bulgaria, where the climate is characterized by warm summers, mild winters, and a pronounced summer drought. In many cases, they form mixed stands or transitional vegetation types reflecting both Mediterranean and temperate influences. Genetic studies have shown that most Bulgarian oak species maintain a high level of genetic diversity. This is attributed to their long evolutionary history and the role of the Balkan Peninsula as a major glacial refugium during the Pleistocene. The persistence of oak populations in multiple refugial microhabitats within the territory of Bulgaria has contributed to the retention of ancient genetic lineages and to the differentiation of local gene pools. Such diversity underlies their adaptive potential and resilience to environmental change. However, some Mediterranean oaks, such as Q. protoroburoides and Q. hartwissiana, are rare and have restricted distributions. Their populations are often fragmented and vulnerable to anthropogenic pressures including habitat destruction, overexploitation, and climate change. These species require targeted conservation measures, both **in situ**—through the protection and management of natural habitats—and **ex situ**, via seed banks, gene banks, and living collections. Many Mediterranean oak communities in Bulgaria represent relict vegetation types with high ecological and conservation value. Examples include Quercetum frainetto-cerris and Quercetum pubescentis-cerris formations, as well as thermophilous shrub–oak associations on limestone and serpentine substrates. Such habitats are often included in the Natura 2000 ecological network and protected under various national conservation categories—nature reserves, protected areas, and managed forest zones. The Mediterranean oak species in Bulgaria represent an important component of the country's forest gene pool and a key link between the Central European and Mediterranean biogeographic regions. Their high genetic diversity reflects both their ancient evolutionary history and adaptation to diverse ecological conditions. The preservation of rare and endemic taxa, along with the maintenance of genetic variability within widespread species, is essential for sustaining ecosystem stability under changing climatic conditions. Strengthening conservation strategies through integrative genetic

monitoring, sustainable forest management, and habitat restoration will ensure the long-term protection of these emblematic elements of Bulgaria's natural heritage.

Keywords: Quercus, Mediterranean oaks, Bulgaria, genetic diversity, endemism, conservation, glacial refugia, Natura 2000

Acknowledgement: The financial support for the study was provided by the project KP-06-H81/8 of the Bulgarian National Science Fund.

SEED GERMINATION INHIBITORY ACTIVITY OF METHANOLIC EXTRACTS OF THREE INVASIVE ALIEN SPECIES: GLEDITSIA TRIACANTHOS, AMORPHA FRUTICOSA, REYNOUTRIA JAPONICA

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ABSTRACT

Alien plant species that are not naturally distributed in a given territory, but have been introduced into the country's nature from other countries, are a great challenge. These are usually species with strong mechanisms for reproduction and survival. The aim of the present study was to evaluate the inhibitory effects of leaf methanolic extracts of Gleditsia triacanthos, Amorpha fruticosa, and Reynoutria japonica on seed germination and root elongation of Lolium perenne L. The experiment was conducted in vitro using Petri dishes. Extracts dissolved in a water–methanol mixture (99.5:0.5) were tested at concentrations of 2, 5, and 10 mg/mL. The phytochemical profiles of the methanolic extracts were analyzed by GC–MS and HPTLC. Aqueous solutions of G. triacanthos, A. fruticosa, and R. japonica leaf extracts at 10 mg/mL inhibited L. perenne seed germination by 93%, 78%, and 53%, respectively. At the same concentration, more than 70% inhibition of root elongation was observed. The main bioactive constituents of the extracts were identified as flavonoid glycosides. Quercetin 3-rhamnoside and quercetin 3-glucoside were the dominant flavonoids in A. fruticosa and R. japonica, while quercetin 3-glucoside was most abundant in G. triacanthos. Flavonoid aglycones such as luteolin, quercetin, and kaempferol were detected in high amounts in A. fruticosa. Neochlorogenic acid was present in all extracts, while gallic acid and catechin were found in G. triacanthos and A. fruticosa, respectively. Arbutin, caffeic acid, and other phenolic derivatives were also identified across all samples. In addition, GC–MS analysis revealed the presence of organic acids, polyols, and other primary metabolites.The results demonstrate that leaf methanolic extracts of Gleditsia triacanthos, Amorpha fruticosa, and Reynoutria japonica possess significant inhibitory effects on the germination and early growth of Lolium perenne seeds. The allelopathic activity of these invasive alien species is closely related to their rich phenolic and flavonoid composition. These findings contribute new information on the biochemical interactions of invasive plants with native species and provide a basis for future studies on their ecological impact and potential use in natural herbicidal formulations.

Keywords: allelopathy, Gleditsia triacanthos, Amorpha fruticosa, Reynoutria japonica, methanolic extracts, Lolium perenne, seed germination inhibition, flavonoids

FIVE-YEAR ASSESSMENT AND STATISTICAL EVALUATION OF OCCUPATIONAL RADIATION DOSES FOR CUSTOMS OFFICERS IN ALBANIA

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ABSTRACT

This study evaluates the occupational exposure to ionizing radiation among customs officers in Albania who work in proximity to X-ray scanning systems used for inspecting individuals and cargo at border checkpoints. The monitoring program involved approximately 120 customs officers stationed across six major customs points in the country, where full-body and vehicle scanners are regularly operated. Thermoluminescent dosimeters (TLD-100) were used to monitor personal doses, with readings performed using Harshaw TLD reader models 6600 and 4500 located in Institute of Applied Nuclear Physics. The selection of TLDs and equipment ensured reliable dose measurement under routine working conditions in customs environments. The data collected were subjected to statistical analysis to determine the distribution of exposure across different customs points and among the personnel. The results showed that the average annual effective dose was approximately 1.47 mSv, which is significantly below the internationally recommended occupational exposure limit of 20 mSv per year (ICRP guidelines). This study represents one of the first systematic evaluations of occupational radiation exposure among Albanian customs officers. The findings confirm that current operational practices and protective measures are adequate for maintaining radiation safety. However, continued surveillance, periodic training, and equipment calibration are recommended to ensure long-term protection.

Keywords: Occupational exposure, Thermoluminescent dosimeters (TLD-100), Annual effective dose

OPTIMIZATION OF EXPERIMENTAL CONDITIONS FOR THE SKYRAY 6000B XRF SPECTROMETER IN CULTURAL HERITAGE PIGMENT ANALYSIS

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ABSTRACT

The study of pigments from cultural heritage objects was conducted using energy dispersive X-ray fluorescence (EDXRF) to establish optimal analytical methodologies. This work centers on the SkyRay 6000B spectrometer, a new instrument at the Institute of Applied Nuclear Physics acquired through the ALB1009 project in collaboration with the International Atomic Energy Agency (IAEA). The purpose of our study is to outline the optimization of measurement conditions necessary for performing high-resolution elemental analysis of artistic and archaeological materials. Key experimental parameters were refined, including the determination of the system's geometry and the implementation of various radiation filters. This allows for the creation of specialized conditions for analyzing the full range of elements, from light elements (low Z) to medium and heavy elements (high Z). To integrate the instrument into existing laboratory workflows, a spectral converter was developed using Python, enabling data from the SkyRay 6000B to be processed with established software packages such as AXIL, PYMCA, and Bruker's ARTAX. To validate the system's analytical performance, data from pigment samples taken from cult objects and archaeological sites were measured with both the SkyRay 6000B and a Bruker ARTAX 800A spectrometer. This paper will present a comparison of the results. Furthermore, a quantitative analysis of a certified tin standard is shown, providing a direct comparison of the systems' quantification algorithms, geometry, and detection limits.

Keywords: X-ray fluorescence, Pigment analysis, Quantitative analysis, Cultural heritage, Spectrometer optimization

STRATIGRAPHIC THICKNESS DETERMINATION OF MURAL PAINTINGS FROM THE JANI AND VASILI ATELIER USING EDXRF

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ABSTRACT

The study of post-Byzantine artistic techniques gives us information about the evolution of materials and methods used by historical painters. This work presents our research on 18th-century murals from the atelier of the Albanian painters Jani and Vasili. The investigation covered frescoes from several key sites, including the Monastery of Saint Michael in Nivan (1779), the Church of Saint Nikolla in Dhrovjan (1796), and the Monastery of Saint Mary of Athali in Himara (1795). The aim of this study was to apply and test a method for determining the thickness of pictorial layers, using a minimally invasive approach on micro-samples analyzed ex-situ at the Institute of Applied Nuclear Physics. To fully characterize the samples' palette and stratigraphy, we used a combination of analytical techniques. Energy Dispersive X-Ray Fluorescence (EDXRF) revealed the elemental makeup of the layers, allowing us to detect iron (Fe) in pigments like red and yellow ochres and Prussian blue, as well as lead (Pb) in lead white. For molecular identification, we turned to Raman Spectroscopy, which was crucial for identifying carbon-based black pigments. This dual-technique approach was essential for confirming the composition of the uppermost layer, a necessary first step to correctly interpret the EDXRF data for thickness calculations. The thickness itself was calculated using the principles of the Lambert-Beer law. We created theoretical calibration curves with Monte Carlo (MC) simulations, which modeled how the thickness of a pigment layer affects the attenuation of X-ray signals, such as the change in the Pb $L\alpha/L\beta$ intensity ratio from a lead white ground layer. The calculated thicknesses were validated against direct physical measurements from paint cross-sections, which were prepared from the micro-samples and analyzed with optical microscopy. We measured the stratigraphic thicknesses on these cross-sections using ImageJ software. Our findings show that the proposed EDXRF and simulation method gives good results for simple structures of one or two layers, with the calculated values showing strong agreement with the physical measurements. For more complex structures of three or more layers, however, the determination error becomes significantly over 30%—which highlights the limitations of this technique when dealing with highly complex stratigraphies.

Keywords: EDXRF, Raman Spectroscopy, Layer Thickness, Monte Carlo Simulation, Post-Byzantine Painting

COMPREHENSIVE CALIBRATION AND UNCERTAINTY EVALUATION OF THE HARSHAW 6600 PLUS TLD SYSTEM IN ALBANIA

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ABSTRACT

This study presents a detailed calibration and performance evaluation of the Harshaw 6600 Plus thermoluminescent dosimetry (TLD) system using reference dosimeters ("gold cards") irradiated at the Secondary Standard Dosimetry Laboratory (SSDL). The measurements were performed at the Institute of Applied Nuclear Physics in Albania. The dose response of the internal beta source was evaluated, and multiple uncertainty contributions were analyzed, including those derived from the calibration laboratory, element correction coefficients (ECCs) and reader calibration factors (RCFs). A statistical analysis was performed to assess the stability and repeatability of the system response across a large set of dosimeters. The findings allowed for refinement of existing maintenance and calibration procedures, contributing to the advancement of quality assurance practices in personal dosimetry. This work reinforces the reliability of the Harshaw 6600 Plus system for routine individual monitoring and provides a methodological framework for quantifying uncertainty in TLD systems.

Keywords: TLD, Harshaw 6600 Plus, calibration, uncertainty evaluation, ECC, RCF, statistical analysis, personal dosimetry, quality assurance.

EFFECT OF FENUGREEK (TRIGONELLA FOENUM GRAECUM L.) ON THE PHYSIOLOGICAL PARAMETERS OF THYROID FUNCTION IN WISTAR RATS.

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ABSTRACT

Fenugreek (Trigonella foenum-graecum L.) is an annual herb belonging to the Fabaceae family. It is found all over the world, but it is of Mediterranean origin. The whole fenugreek plant can be used in herbal medicine, but it is mainly the seeds that are of therapeutic interest. The aim of this study is to strengthen the scientific data on the benefit of using the aqueous extract of fenugreek seeds in the medical field. The purpose of this study is to evaluate the effect of fenugreek on the secretion of thyroid hormones in male Rats of the Wistar strain. The administration of the aqueous extract of fenugreek seeds (Trigonella foenum-graecum L.) for 30 successive days by the method of oral gavage at a dose of 250g/l of water, aims to assess the role of this plant on altering the modification of hormonal production of T3, T4 and even the pituitary hormone TSH and ACTH. This work indicates that consumption of aqueous extract from fenugreek showed a decrease in the thyroid secretion of T3 as well as a reduction in pituitary secretion of TSH and ACTH, moreover more a significant increase in the hormone T4.

Keywords: Rat wistar, Fenugreek, TSH, T3, T4, ACTH.

NATURAL VESICLES FROM MILK VS LAB-FORMULATED LIPOSOMES: COMPARATIVE EFFICACY IN DELIVERING PHENOLIC PLANT COMPOUNDS

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ABSTRACT

The formulation of effective and biocompatible nanocarrier platforms is a platform for drug delivery system development, particularly for plant phenolic compounds with pharmacological activities and low bioavailability. In the current research, a comparative assessment of milk-derived extracellular vesicles (mEVs) and synthetic liposomes fabricated by thin film hydration and freeze-thaw cycling is reported. Both carriers were assessed for encapsulation efficiency, particle size distribution, zeta potential, morphology, and stability for target delivery of phenolic compounds of plant origin.Dynamic light scattering (DLS) and nanoparticle tracking analysis (NTA) confirmed nanoscale sizes and colloidal stability for both nanovehicles, while transmission electron microscopy (TEM) showed spherical vesicular morphology. UV-Vis spectrophotometry quantified encapsulation efficiency and release profiles. Antioxidant potential was likewise assessed.The findings indicated that milk EVs were naturally biologically active and biocompatible, while liposomes offered better control over physicochemical parameters. Both vehicles could encapsulate phenolic cargo and retain functionality, with variations based on uptake efficiency and release pattern.The article points toward the possibility of using naturally occurring nanovesicles and synthetic ones together with respective benefits for drug delivery using plant therapeutics. The discovery is contributing toward the growing field of green nanomedicine and further supports exploring using milk EVs as green and scalable drug delivery vehicles.

Keywords: Milk-derived extracellular vesicles, Liposomes, Phenolic compounds, Plant-based nanocarriers, Nano drug delivery systems

PHOTOPROTECTIVE AND ANTIOXIDANT PROPERTIES OF PALLENIS HIEROCHUNTICA: A PROMISING NATURAL RESOURCE FOR SKIN PROTECTION APPLICATIONS

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ABSTRACT

Pallenis hierochuntica, a desert-adapted medicinal plant traditionally used in North African folk medicine, has recently attracted scientific interest due to its rich phytochemical profile and biological activities. This study investigates the antioxidant and photoprotective properties of different extracts from the aerial parts of Pallenis hierochuntica collected during the fructification stage in the Tebessa region, Algeria. Methanolic, ethanolic, and aqueous extracts were prepared and evaluated for total phenolic and flavonoid contents. Antioxidant activity was assessed using DPPH, ABTS, and CUPRAC assays, while photoprotective activity was determined by measuring the in vitro sun protection factor (SPF). The methanolic extract showed the highest phenolic content and strongest antioxidant capacity, with significant SPF values indicative of moderate natural UV protection. The findings support the traditional use of P. hierochuntica for skin-related disorders and suggest its potential application in the development of natural skincare and cosmeceutical products.

Keywords: Pallenis hierochuntica, Antioxidant activity, Photoprotection, SPF, Natural skincare, Desert plants, Algeria

ANTIOXIDANT CAPACITY AND PHENOLIC COMPOUNDS CONTENT OF MEDICINAL PLANTS OF SOUTHERN MOROCCAN.

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ABSTRACT

This study includes an inventory and identification of Aromatic and Medicinal Plants sourced from some localities in the south of Morocco. The aim is the valorization of some medicinal plants used traditionally by the population in this area. several species belonging botanical families are investigated. An ethnobotanical study was carried using a questionnaire, to collect informations on the local traditional uses of these plants. Antioxidant activity, total phenolic and total flavonoid contents were determined. The ethnobotanical survey showed that the leaves are the most used part and the plants are mainly used for treatment of several diseases such as rheumatism, gastrointestinal diseases…The samples screened for their total phenolic, totral flavonoids content and antioxidant property showed a high antioxidant activity and very different contents in the phenolic compounds. Indeed, the tested plants exhibit significant biodiversity, hence a significant diversity in their content of phenolic and flavonoid compounds. The total phenolic content of methanolic extracts from the investigated species ranged from 0.48 to 144,5 µg GAE/mg dry weight, while flavonoids in the samples ranged from 0,91 to 117 µg RE/mg dry weight. Based on our results, a number of plant species, were identified as among the best sources of free radical-scavenging compounds. There was a positive linear correlation was recorded between the levels of total phenolic content and antioxidant power. Thus, it was concluded that phenolic compounds were the predominant antioxidant components in the investigated plant species.

Keywords: South of Morocco, Ethnobotany, antioxidant activity, total phenolics, total flavonoids, medicinal plants.

OPTIMIZATION OF A ROSEMARY ESSENTIAL OIL-BASED EMULGEL: FORMULATION, ANTIBACTERIAL, AND PHARMACOTOXICOLOGICAL PROPERTIES

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ABSTRACT

The richness of Algeria's flora is undeniable, encompassing significant plant resources distributed across its coasts, plains, and mountains. Rosemary (Rosmarinus officinalis L.) is a perennial shrub native to this flora and is commonly found throughout the Mediterranean regions. This study focuses on optimizing the formulation of an emulgel and evaluating the antibacterial and pharmacotoxicological properties of the optimal emulgel formulation containing rosemary essential oil as the active ingredient. The emulgel formulation was optimized using experimental design methodology, allowing us to determine the optimal composition and processing conditions for the most stable emulgel formulation. This formulation exhibited shear-thinning behavior and adhered to the Cross model. Rosemary essential oil was extracted from Rosmarinus officinalis L. plants harvested at two different altitudes in Algeria: 2 meters in the wilaya of Boumerdès and 300 meters in the wilaya of Tizi-Ouzou. The extraction was performed using the Clevenger hydrodistillation method, yielding 0.2% for the high-altitude sample and 1.1% for the low-altitude sample. Characterization of the rosemary essential oil samples revealed slight differences in antioxidant and antibacterial activities, with a significant difference in anti-inflammatory activity, showing a more pronounced effect for the high-altitude sample. These findings underscore the potential of rosemary essential oil as a bioactive compound in pharmaceutical and cosmetic formulations, with its efficacy varying based on ecological factors such as altitude.

Keywords: Rosmarinus officinalis L.; essential oil; emulgel; optimization; Anti inflammatory

IMPROVING THE SODIUM ALGINATES EXTRACTION FROM THE BROWN SEAWEED SARGASSUM VULGARE USING EXPERIMENTAL DESIGN METHODOLOGY

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ABSTRACT

Seaweed contains highly promising substances for application in human nutrition, pharmaceuticals and the food industry. Among these metabolites are phycocoloïdes, which have particularly interesting properties. This study focuses on the extraction of alginates, a type of phycocoloïdes, from brown algae. Alginophytes species such as Laminaria, Ecklonia and Macrocystis which are rich in these compounds, do not grow naturally in Algeria. Therefore, optimizing the alginates extraction process offers a solution to improve extraction yields from species with lower concentrations. The main objective of this study is to optimize the extraction of sodium alginates from the brown algae Sargassum vulgare, collected in the coastal region of Boumerdes in Algeria, using the experimental design methodology. The extracted alginate was characterized by spectroscopic methods, and the viscosity of 1% alginate solutions was measured and compared to that of commercial alginate. The results highlight the significant influence of extraction temperature, extraction time and sodium carbonate concentration on alginate yield. According to the verification experiment carried out under optimal conditions, the yield result was 10%, closely matching the prediction of the experimental design.

Keywords: Sargassum vulgare, phycocoloïdes, experimental design

OPTIMIZING MANAGEMENT OF ESSENTIAL HYPERTENSION: THE ROLE OF COMBINATION THERAPY

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ABSTRACT

Arterial hypertension is defined as systolic arterial pressure greater or equal values of 140mmHg and / or arterial diastolic pressure greater or equal to 90mmHg. The purpose of the study is to examine the combined treatment of essential HTA therapy in persons paved in cardiology ward at QSUT between November 2012 and February 2023. The methodology that followed was the examination of each card for each patient paved in the pavilion where population distribution studied according to gender, place of residence, HTA staging, age group, risk factors dyslipidemia, type II diabetes mellitus, and therapy used in patients for hospital days. The data processed in the Exel 2007 software program where the most effective therapy is β-blocker - ACE Inhibitor. Today HTA by WHO is termed deadly disease. For this reason, primary control and treatment in non-personalized forms or combined therapy is considered necessary.

Keywords: arterial hypertension, combined therapy, beta blocker, cardiovascular

BETA ADRENO BLOCKERS IN 21-ST CENTURY: NAVIGATING THE CROSSROADS OF LEGACY, INNOVATION AND FUTURE THERAPEUTICS

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ABSTRACT

Beta-blockers (β-blockers) are competitive antagonists of β-adrenergic receptors, first introduced into clinical practice more than five decades ago. They have long been considered a cornerstone in the treatment of cardiovascular diseases, including hypertension, angina pectoris, arrhythmias, and myocardial infarction. However, the role of β-blockers has been redefined with the advent of newer classes of drugs such as angiotensin-converting enzyme inhibitors (ACEIs), angiotensin receptor blockers (ARBs), calcium channel blockers (CCBs), and direct renin inhibitors. Objective: This review aims to critically evaluate the clinical value of β-blockers in current cardiovascular medicine, with particular emphasis on their use in hypertension, ischemic heart disease, heart failure, and arrhythmias. The analysis compares traditional and vasodilating β-blockers with newer pharmacological alternatives, highlighting the benefits, limitations, and guideline-based recommendations. Methods: A structured literature search was performed across MEDLINE, Embase, Current Contents, and Cochrane Library databases. The review included randomized controlled trials (RCTs), cohort studies, case-control studies, meta-analyses, and systematic reviews published between 2000 and 2024.

Key search terms included “beta-blockers, hypertension, angina pectoris, myocardial infarction, arrhythmias.” Relevant clinical guidelines from the European Society of Cardiology (ESC), American Heart Association (AHA), and National Institute for Health and Care Excellence (NICE) were also reviewed. Results: Evidence suggests that β-blockers are no longer recommended as first-line therapy for uncomplicated hypertension, especially in patients over 60 years, due to inferior protection against stroke and overall mortality compared to ACEIs, ARBs, and CCBs. Nevertheless, β-blockers remain highly effective in reducing angina symptoms, preventing reinfarction, and lowering mortality in post-myocardial infarction patients with reduced left ventricular ejection fraction. They are essential in managing arrhythmias, including atrial fibrillation and ventricular tachyarrhythmias. Vasodilating β-blockers such as carvedilol and nebivolol may offer metabolic advantages over traditional agents. Conclusion: Although β-blockers have a reduced role in the initial management of hypertension, they continue to be indispensable in ischemic heart disease, post-myocardial infarction care, heart failure with reduced ejection fraction, and arrhythmia management. Their future use may increasingly rely on precision medicine approaches, selecting specific subtypes tailored to patient comorbidities and genetic profiles.

Keywords: BETABLOCKERS, HYPERTENSION, ANGINA PECTORIS

AGE SPECIFIC CONSIDERATIONS IN ANTICOAGULANT THERAPY: MECHANISMS, DOSING AND SAFETY ACROSS LIFE STAGES

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ABSTRACT

Anticoagulant therapy is a cornerstone in the management of thromboembolic disorders such as venous thromboembolism (VTE), atrial fibrillation (AF), and myocardial infarction (MI). The pharmacodynamics of anticoagulants are influenced by several factors, including age, comorbidities, and genetic predisposition. This paper provides an in-depth review of the pharmacology, clinical use, and age-specific considerations of commonly prescribed anticoagulants. Special focus is placed on pediatric, adult, and elderly populations, considering the pharmacokinetic and pharmacodynamic differences that impact drug efficacy and safety. The review highlights the evolving role of direct oral anticoagulants (DOACs), their comparative effectiveness, safety profiles, and challenges in age-related dosing. By emphasizing individualized treatment strategies, this review aims to optimize therapeutic outcomes and minimize adverse events related to anticoagulant therapy

Keywords: ANTICOAGULANT, INDIVIDUALIZED THERAPY, SAFETY DOSES

ANTIOXIDANT ACTIVITY AND PHYSICOCHEMICAL STABILITY OF CARVACROL IN LIPOSOMAL NANOFORMULATIONS: EFFECT OF CONCENTRATION ON PARTICLE CHARACTERISTICS

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ABSTRACT

Carvacrol, a phenolic compound, is widely recognized for its potent antioxidant activity and therapeutic potential. However, its poor aqueous solubility and sensitivity to degradation limit its broader application in pharmaceutical and food systems. Toovercome these limitations, carvacrol was encapsulated into liposomal nanoformulations and evaluated for its physicochemical characteristics and antioxidant activity. In this study, liposomes were prepared with different concentrations of carvacrol to investigate how drug loading influences key physicochemical properties, including particle size,polydispersity index (PDI), and zeta potential. As the concentration of carvacrol increased, particle size grew and PDI values rose, indicating reduced dispersion homogeneity. Zeta potential became less negative, suggesting decreased colloidal stability. Despite these changes, the formulations maintained high encapsulation efficiency, confirming effective carvacrol incorporation in the liposomal bilayers.In addition to the physical characterization, antioxidant tests showed that carvacrol maintained its ability to neutralize free radicals after encapsulation. In some cases, the liposomal environment even seemed to protect the biocompound, helping to preserve or slightly enhance its bioactivity. Overall, these results suggest that liposomal systems not only improve the stability of carvacrol but also help retain its antioxidant function, with the formulation concentration playing an important role in how well the nanoformulations perform.

Keywords: Carvacrol, nanoformulations, antioxidant activity, physicochemical properties, drug loading, encapsulation efficiency

OPTIMIZING ROSEMARY ESSENTIAL OIL NANOSYSTEMS: PARTICLE SIZE MODULATION AND STABILITY ENHANCEMENT

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ABSTRACT

Nanotechnology provides effective strategies to improve the delivery, protection, and functionality of bioactive compounds such as Salvia rosmarinus (rosemary) essential oil (REO), which possesses strong antioxidant and antimicrobial properties. In this study, two lipid-based nanosystems—nanoemulsions and liposomes—were designed and optimized to improve the encapsulation efficiency, physical stability, and functional performance of REO. Nanoemulsions were developed using high-pressure homogenization, producing nanoscale droplets with narrow size distribution and high encapsulation capacity across a range of REO concentrations. These formulations exhibited excellent colloidal stability and maintained their physicochemical properties over time. Liposomes were formulated using three different phospholipids—Lipoid S75, S100, and PC3—to evaluate the influence of lipid composition on structural characteristics and encapsulation behavior. Results revealed marked differences in particle size and encapsulation efficiency depending on the lipid source, highlighting the critical role of lipid chemistry in modulating nanosystem properties. Phospholipid type also impacted the system's stability and retention of antioxidant activity under storage at varying temperatures (4 °C and 25 °C). All formulations demonstrated good physical stability during storage, maintaining particle size, homogeneity, and antioxidant activity when monitored over time under different temperature conditions (4 °C and 25 °C). These results confirm that adjusting lipid composition and essential oil concentration enables precise control of particle size and encapsulation behavior, resulting in stable and efficient nanosystems suitable for pharmaceutical and cosmetic applications.

Keywords: Salvia rosmarinus, rosemary essential oil, nanoemulsions, liposomes, encapsulation efficiency, stability, particle size

EXPLORING THE ANTI-INFLAMMATORY AND ANTIMICROBIAL POTENTIAL OF ALGERIAN EPHEDRA ALTISSIMA (DESF.) AERIAL PARTS EXTRACT

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ABSTRACT

Ephedra altissima Desf. (Ephedraceae), has traditionally been used for medicinal activity in Algerian, is gaining attention for its dual importance in health promotion and ecosystem sustainability. The aim of the current study was to evaluate the anti - inflammatory and antimicrobial potential of the aqueous extract of E. altissima Desf. aerial parts collected in Algeria. The anti-inflammatory activity was determined using two in vitro methods: Protein Denaturation Inhibition and Hemolysis Inhibition (Red Blood Cell membrane stabilization). The extract exhibited a dose-dependent anti-inflammatory effect in the both methods. Regarding the Protein Denaturation Inhibition assay, the IC50 value of the extract was 12.36 ± 0.18 ug/mL. The standard drug Diclofenac produced an IC50 value of 2.78 ± 0.002 ug/mL. Conversely, for Human Erythrocyte Hemolysis Inhibition assay, the aqueous extract showed remarkably high potency with an IC50 value of 0.05 ± 0.001 ug/mL. This result demonstrated a significantly stronger membrane stabilizing effect compared to diclofenac with IC50 of 0.136 ± 0.004 ug/mL. Furthermore, the extract exhibited good antimicrobial activity against tested clinical human pathogens strains. Using the well diffusion method, the zone of inhibition ranged between 9.1 ± 16.36 and 17.3 ± 0.05 mm. This effect was primarily observed against a panel of bacteria (Escherichia coli, Staphylococcus aureus, Klebsiella pneumoniae, and Bacillus sp.) and the yeast (Candida albicans). Overall, this study successfully demonstrated the potent anti-inflammatory and antimicrobial properties of the aqueous extract of E. altissima. These findings validate its traditional use and strongly highlight its potential as a source of natural therapeutic compounds for the pharmaceutical and food industries.

Keywords: Ephedra altissima Desf., Aqueous extract, Anti-inflammatory, Antimicrobial

EVALUATION OF THE ORAL ACUTE TOXICITY (OECD 423) AND HISTOLOGICAL IMPACT OF THE AQUEOUS EXTRACT OF EPHEDRA ALTISSIMA (DESF.) IN WISTAR RATS

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ABSTRACT

Ephedra altissima Desf. (Ephedraceae), is a traditionally used medicinal plant whose safety and security profile require scientific validation. The present study aims to estimate the acute toxicity of the aqueous extract of this plant in Wistar rats, based on the OECD 423 guidelines (Acute Toxic Class Method). Wistar male rats (200 g) were divided into groups receiving the aqueous extract of Ephedra altissima orally, at progressive doses (500, 2000, 5000 mg/kg) or physiological saline (control group). A single dose was administered per rat, followed by a prolonged clinical observation period of 14 days (30 min, 2 h, 4 h, 24 h, and then daily). After 14 days, the animals were sacrificed for the determination of several plasma biochemical parameters (glycaemia, cholesterol, triglycerides, GOT and GPT) and the examination of histological sections of the liver and kidneys. The results showed that the extract induced no signs of acute toxicity or mortality for all administered doses, allowing it to be classified in the low-toxicity category (LD50 > 5000 mg/kg). Nevertheless, the biochemical analysis revealed favorable metabolic modifications, notably a significant decrease in plasma glucose and cholesterol levels, triglycerides, and the enzymatic activity of hepatic enzymes (GOT and GPT), suggesting a protective effect on lipid metabolism and hepatic detoxification. Importantly, the examination of histological sections of the liver and kidneys revealed no major structural lesions or significant cellular alteration, even at the highest dose. In conclusion, the aqueous extract of Ephedra altissima is considered practically non-toxic in acute administration. The absence of histological alterations supports its safety profile and justifies the continuation of research into its pharmacological activities.

Keywords: Wistar Rat, Ephedra altissima Desf., Aqueous extract, Acute Toxicity, OECD 423, Histology, Liver, Kidney

MACROECONOMIC DRIVERS OF AQUACULTURE DEVELOPMENT IN THE BALTIC SEA REGION: A FACTOR ANALYSIS APPROACH

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ABSTRACT

The aquaculture sector in the Baltic Sea region has emerged as a key driver of economic growth and environmental sustainability. It is responding to the growing global demand for aquatic products and the need for innovative resource management strategies. Over the past decade, the region has experienced steady annual GDP growth of around 2.3%, with aquaculture emerging as a promising means of diversifying income in traditional fishing communities and tackling pressing environmental issues such as eutrophication. However, the sector faces significant challenges, such as balancing economic expansion with ecological preservation and adapting to regional specifics, like the Baltic Sea's low salinity. This research uses a detailed macroeconomic dataset covering sixteen structural indicators from ten countries in 2023 to identify the main macro-level factors affecting aquaculture development. The analytical framework is based on multivariate statistical techniques, specifically principal component analysis (PCA) with Varimax rotation. This was preceded by rigorous variable selection based on correlation structure, communalities, the Kaiser–Meyer–Olkin (KMO) measure and Bartlett's test for sphericity. The resulting factor model explains 93.1% of the total variance, highlighting its robustness and effectiveness in capturing the latent dimensions of sectoral development. Three major factors were identified. The first, which accounts for 44.1% of the variance, is closely linked to research and development (R&D) expenditure and GDP per capita. This highlights the critical role of innovation and productivity in driving sectoral advancement. This finding is consistent with endogenous growth theory, which emphasises the transformative impact of knowledge-intensive investments and technological adaptation on economic performance. The second factor (accounting for 25.2% of the variance) is characterised by strong associations with export volume and population size. This reflects the importance of market integration and labour resources in shaping export dynamics. Notably, the analysis reveals that export growth exceeds population growth, suggesting economies of scale and the necessity for smaller economies to specialise in high-value niches. The third factor (23.8% of variance) is defined by a strong negative correlation with aquaculture output, indicating ongoing structural transformation within the primary sector. This pattern resonates with theories of economic development describing a gradual shift from resource-based to knowledge-driven activities. It also highlights the necessity of strategic specialisation and diversification to ensure sectoral resilience. Empirical results demonstrate a negative relationship between import dependence and GDP per capita, consistent with the Balassa–Samuelson effect, as well as a robust positive link between R&D investment and aquaculture productivity. Regression analysis confirms that a one-unit increase in R&D spending is associated with a 0.682-unit rise in productivity ($R^2 = 0.61$), indicating that innovation accounts for a significant proportion of productivity variation. Demographic factors are shown to significantly impact export dynamics, with larger populations correlating with greater export volumes. However, smaller countries can offset scale disadvantages through targeted specialisation.

The reserch's findings offer a nuanced understanding of the various factors driving aquaculture development in the Baltic Sea region. Identifying innovation capacity, export competitiveness and sectoral transformation as key factors offers a conceptual framework for designing integrated policy interventions. These should be used to harmonise innovation support, trade facilitation and the modernisation of traditional sectors, with the aim of maximising the sector’s potential. The research highlights the importance of a comprehensive approach that combines technological progress, market access and sustainable resource management to ensure long-term competitiveness and ecological balance in regional aquaculture.

Keywords: Economic indicators, Statistical modeling, Regional integration, Policy recommendations

ECONOMIC DIFFERENTIATION AND STRUCTURAL CLUSTERING OF BALTIC SEA REGION STATES: INSIGHTS FROM HIERARCHICAL CLUSTER ANALYSIS OF THE AQUACULTURE SECTOR

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ABSTRACT

In order to formulate effective policies and foster sustainable aquaculture development, it is essential to understand the economic heterogeneity of the Baltic Sea region. This research employs hierarchical cluster analysis on a macroeconomic dataset covering ten countries. Ward's method and squared Euclidean distance are used to classify states into homogeneous groups based on their structural characteristics and sectoral performance. The analysis is based on a robust factor model which captures the multidimensional nature of regional economic development. This model integrates various indicators, including R&D expenditure, GDP per capita, export volume, population size and aquaculture output. The cluster analysis identified four distinct groups, each representing a unique developmental trajectory and structural profile. The first cluster, comprising Germany, exemplifies innovation leadership, with a high GDP per capita and substantial investment in research and development. This group's economic model is characterised by advanced industrial specialisation and a well-integrated innovation ecosystem, offering valuable lessons for other states seeking to enhance their competitive position. The second cluster, which includes Denmark, Finland, Iceland and Sweden, reflects the 'Nordic model' of economic organisation, characterised by robust welfare systems, significant innovation intensity and efficient public–private collaboration. These countries benefit from favourable institutional environments that promote creativity, knowledge transfer and technological adoption. The third cluster comprises Estonia, Latvia, Lithuania and Poland. These countries have a shared history of economic transition and are confronted with similar challenges concerning lower R&D investment, productivity and innovation capacity. These countries are at risk of falling into the 'middle-income trap' and require targeted interventions to strengthen their innovation systems, encourage collaboration between the research and business sectors, and invest in human capital. The fourth cluster is represented by Norway and is characterised by a resource-based development model with high aquaculture output and GDP per capita, but comparatively low R&D expenditure. Norway's experience highlights the opportunities and risks associated with resource dependence, emphasising the importance of balanced investment in natural resources and innovation for long-term sustainability. Analysis of variance (ANOVA) confirms statistically significant differences between the clusters in all the key factors, with the greatest differentiation observed in the innovation and productivity metrics. These results validate the cluster solution and reveal the fundamental economic distinctions that underpin regional diversity. The findings emphasise the importance of tailored policy approaches: countries with advanced innovation systems should focus on maintaining their leadership through continuous investment and institutional improvement, while transition economies must prioritise capacity building and structural reform. Resource-rich states should seek to diversify their economic base and mitigate the risks of overreliance on primary sectors. The research demonstrates the value of multi-level statistical analysis in shedding light on the complex landscape of economic development in the Baltic Sea region. By combining factor and cluster analysis, the research offers a thorough framework for understanding the relationship between innovation, market integration and sectoral transformation. These insights can inform the design of differentiated policy instruments, promote cross-border learning and support the sustainable growth of the aquaculture sector. Ultimately, the study emphasises the pivotal role of economic diversity and strategic specialisation in bolstering regional resilience and competitiveness within an ever-evolving global landscape.

Keywords: group classification, development patterns, comparative analysis, regional typology, economic stratification, sustainability strategies, sectoral differentiation

NUTRITIONAL CHARACTERIZATION AND ANTIOXIDANT POTENTIAL ASSESSMENT OF THE FLESH AND BY-PRODUCTS OF UNUSABLE FARMED MUSSELS (MYTILUS GALLOPROVINCIALIS) FOR POTENTIAL APPLICATION IN HUMAN NUTRITION

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ABSTRACT

Fisheries and aquaculture play a significant role in human nutrition and food security. The valorization of marine by-products, however, could represent a major technological advancement in the agri-food industries and the medical field.The objective of this study is to valorize by-products from inedible farmed mussels (Mytilus galloprovincialis) through the evaluation of their nutritional composition and antioxidant activity. Non-commercialized broken farmed mussels were sorted and cleaned, the flesh was separated from the shell, and the byssus was air-dried and ground. The results revealed a high protein content in both the flesh and the byssus of the mussel (11.58 g/100 g and 87 g/100 g, respectively), with low levels of lipids and carbohydrates. Mineral analysis showed significant concentrations of calcium and magnesium, while heavy metals were present in minimal amounts. Furthermore, the DPPH free radical scavenging capacity of the mussel flesh, byssus, and shell was considerable (1.6%, 1.2%, and 0.93%, respectively). In conclusion, mussel by-products should be valorized due to their remarkable nutritional and therapeutic potential, offering sustainable alternatives for human nutrition and contributing to waste reduction in the aquaculture industry.

Keywords: Farmed mussels, Fesh, by-products, Antioxidant, Nutrition

ECONOMIC SIGNIFICANCE AND DEVELOPMENT TRENDS OF INLAND FISHERIES IN ALBANIA

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ABSTRACT

This study analyzes the economic significance and development dynamics of the inland fisheries sector in Albania over the period 2016–2024. It focuses on the sector's contribution to national income, rural employment, and food security, while also assessing trends in production, investment, and institutional support. The analysis is grounded in key financial indicators and macroeconomic data, including value added, and the sector's role within the broader framework of Albania's sustainable development and EU integration policies. Catch volumes increased steadily during the study period, reaching 4,858 tonnes in 2023. This growth is linked to enhanced stock management, hatchery-based restocking efforts, and improved monitoring and reporting systems. Inland fisheries also stimulate ancillary economic activities such as fish processing, local trade, and informal market networks, contributing to the socio-economic resilience of remote communities. Despite these developments, the sector faces structural challenges. Albania's vast hydrographic network—over 11,000 kilometers of rivers and streams—remains largely untapped, reflecting a gap in investment, infrastructure, and policy focus. Limited access to financing, modern equipment, and formal markets further constrain the sector's potential. Addressing these limitations through targeted investment, improved governance, and better data collection can significantly enhance the economic impact of inland fisheries. The findings underscore the importance of integrating inland fisheries into broader rural development policies, enhancing cross-sectoral cooperation, and promoting sustainable value chains. Doing so would unlock new opportunities for inclusive growth and strengthen Albania's freshwater economy in line with regional and EU development goals.

Keywords: Inland fisheries; rural economy; employment; fisheries value chain; regional development; production trends; financial indicators; sustainable development; Albania

THE ROLE OF PHYTOPLANKTON AND ZOOPLANKTON IN INTENSIVE FISH FARMING

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ABSTRACT

One of the earliest forms of intensive fish cultivation was the use of fish ponds. These anthropogenic systems were exclusively designed for fish farming and were significantly influenced by human activity in many aspects (filling and draining of ponds, stocking with specific species and quantities of fish, fertilization, etc.). Other types of facilities used for fish farming are systems originally constructed for other purposes (irrigation, flood control, etc.)—these are reservoirs. In recent times, both anthropogenic systems and natural lakes have seen increasing application of intensive aquaculture techniques such as cage culture.
The fundamental characteristics of phytoplankton and zooplankton can indicate the degree of eutrophication and can also serve as indicators of the level of saprobity.
In the phytoplankton community of the reservoirs targeted in our research, the dominant species by abundance included the cyanobacteria Aphanizomenon flos-aquae and Microcystis aeruginosa in the Tikveš Reservoir, and Aphanizomenon and Anabaena in the Streževo Reservoir. In the Mladost Reservoir, a phenomenon of water "blooming" was observed, though not as pronounced as in the other two.
The qualitative composition of zooplankton was comprised of Protozoa, Rotatoria, Cladocera, and Copepoda.In 2023, we conducted an investigation in the cage culture system for common carp (Cyprinus carpio) in the Tikveš Reservoir, analyzing the presence of phyto- and zooplankton.
The number of phytoplankton species recorded during the study period was low, with only three species present. None of the observed species appeared in mass quantities. Furthermore, there were no significant differences among sampling points, indicating no detectable negative impact during that period.
The zooplankton composition consisted of the same groups as in the other studied systems. However, the number of zooplankton species was lower compared to the other locations.

Keywords: Reservoirs, phytoplankton, zooplankton

A VARIETY OF MUD CRABS (SCYLLA SPP) CAPTURED IN MANGROVE SWAMP IN ESTUARINE WATERS OF PANGKEP REGENCY, SOUTH SULAWESI, INDONESIA

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ABSTRACT

The estuary waters of Pangkep Regency are home to mangrove forests and nipa palm plants. This area provides habitat for a variety of aquatic animals, such as scylla genus mud crabs. These crabs are a valuable item with substantial economic potential that local fisherman use to supplement their livelihood. This study's goals were to collect the diversity of mud crabs found in Pangkep's mangrove swamp. The study was carried out in 2024 between October and December. Primary data were gathered directly from the mud crabs that fishermen caught using a survey procedure. Traps were used to capture mud crabs in the Pangkep mangrove swamp. The fishing gear is set up at 18.00 in the afternoon and removed at 06.00 in the morning to observe the mud crabs that have been ensnared. According to the findings, there are four different kinds of mud crabs in the Pangkep area: S. olivacea 1005 (50,7 %), S. serrata 674 (34%), S. Paramamosain 172 (8.6%), S. tranquebarica 131 (6.6%), and S. olivacea 1005 (50.7%). Male to female sex ratios for S. olivacea (1.35:1), S. serrata (1.34:1), S. Paramamosain (0.95:1), and S. tranquebarica (1,9:1) are as follows. The environmental parameters are salinity (10–20 ppt), pH (7.1–7.3), and water temperature (24–27 oC).

Keywords: Scylla, sex ratio, mangrove, Pangkep

INNOVATIVE PLANT-BASED FEED FORMULATION ENHANCES GROWTH AND HEALTH OF RED TILAPIA IN ALGERIAN AQUACULTURE

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ABSTRACT

Fish feed is a major challenge for the development of aquaculture in Algeria, as the quality and composition of feed directly influence fish health, growth, and the profitability of farming operations. This study presents a novel feed formulation designed for red tilapia. This formula is an novel combination of ingredients with a high protein content from plant sources (PV 70% / PA 30%). During a 50-day rearing period, the growth of red tilapias (31 ± 3.26 g) was monitored under two distinct feeding regimes: an innovative feed and a conventional commercial feed. To evaluate the efficacy of these two diets, the growth performance indicators for red tilapia including survival rate, average weight, average daily gain, specific growth rate, and feed conversion ratio are mesured. The results reveal that the survival rate is significantly higher in the group fed with the innovative feed (95%) compared to the reference feed group (86%). Furthermore, the innovative formula significantly promotes growth, with a final average weight of 129 g, a specific growth rate of 3.02% per day, an average daily weight gain of 2.01 g, and a notably low feed conversion ratio (0.11). This study thus demonstrates that this novel formulation markedly improves the growth of red tilapia while enhancing disease resistance and supporting the immune system.

Keywords: Red Tilapia, fish, growth, feed.

COMPARATIVE GROWTH OF LOCAL CHLORELLA SP. STRAINS 5CNR AND 2ST IN BG11 AND NON STERILE TILAPIA WASTEWATER EFFLUENT

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ABSTRACT

Background & Objectives: Optical density (OD) at 680 and 750 nm is widely used to monitor microalgal growth, but its reliability can decline in non-sterile aquaculture effluents because of suspended solids and co-occurring microbes. This study compared the growth of two local wastewater-derived Chlorella sp. isolates (5CNR, 2ST) in nutrient-rich BG11 and non-sterile tilapia wastewater effluent (TWW), and evaluated whether OD680/OD750 can accurately estimate biomass and cell concentration across these media. We quantified biomass, cell concentration, specific growth rate (μ), and doubling time (Td), and tested the strength and significance of relationships between OD and direct growth indicators to guide monitoring for wastewater-based cultivation. **Methods:** Each strain was cultivated separately in BG11 and TWW for 10 days. Growth was tracked by OD680 and OD750, dry-weight biomass (mg L^{-1}), and direct cell counts (cells mL^{-1}). From time-series data, μ (d^{-1}) and Td (d) were calculated. Associations were evaluated by linear regression (R^2) and Pearson correlation (r, p), with statistical significance at p

Keywords: Microalgae, BG11 medium, Tilapia wastewater, Growth performance, Optical density, Biomass estimation

STRATEGY FOR DEVELOPING LOBSTER CULTIVATION BUSINESSES (PANULIRUS SP) ON BALANGLOMPO ISLAND

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ABSTRACT

This study aims to determine the business development strategy of Panulirus sp lobster shrimp farming on Balang Lompo Island, Pangkajene Islands Regency. The research was conducted in August - October 2023 on Balang Lompo Island, Pangkep Regency. The type of research used in this research is survey research with a sampling method carried out by purposive sampling. The number of samples in this study were 48 people. The data collection techniques used such as observation, interviews and literature studies which are then analyzed using SWOT analysis.The results of the subtotal score of the IFAS matrix and EFAS matrix of the SWOT quadrant diagram, it can be seen that the Lobster cultivation business on Balanglompo island is in quadrant I. This position is a very favorable situation. This position is a very favorable situation. And also the Lobster cultivation business has opportunities and strengths so that it can take advantage of existing opportunities. The strategy that must be applied in this condition is to support aggressive growth policies (Growth strategy) and sustainable.

Keywords: Lobster Farming Business, Growth Strategy, Strategic Partnerships, Sustainable Development

THE SPERM QUALITY PARAMETERS OF COMMONLY AQUACULTURED TILAPIA SPECIES

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ABSTRACT

Tilapia species are members of the family Cichlidae. Although this group is known as African freshwater fish, they have spread all over the world over last decades. Some advantages of tilapias such as fast growth rate, feeding on different trophic levels, ability to survive extreme aquatic conditions and reproduction performance are attributed to this wide distribution. Moreover, tilapias include also edible and aquarium species. Two species, Oreochromis niloticus and O. mossambicus, have become prominent in this group in terms of evaluation of their spermatological characteristics. Sperm densities and motility parameters (duration of sperm motility, total motility, velocity, linearity, etc.) of both stripped and testicular sperm samples have been revealed for these species. Additionally, the effects of some ions, pH and temperature on their sperm motility parameters were determined and discussed to understand how environmental and ecological factors affect these parameters. In general, spermatozoa of these species could be characterized by slower velocity and longer motility duration when compared to spermatozoa properties of the most cultured species like rainbow trout and common carp which their sperm parameters are established very well.

Keywords: Tilapia, Oreochromis, Spermatozoa, Sperm Motility

EXOSOME-MIMETIC NANOCARRIERS VS SYNTHETIC NANOLIPOSOMES: A COMPARATIVE STUDY ON TARGETED DELIVERY OF PLANT-DERIVED BIOACTIVE COMPOUNDS

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ABSTRACT

The establishment of effective and biocompatible nanocarrier platforms is essential to enhancing drug delivery systems, particularly for medicinal value-containing plant-derived bioactive compounds with intrinsic low bioavailability. This study included a comparative evaluation of exosome-mimetic nanocarriers derived from milk extracellular vesicles and synthetic liposomes that were fabricated by thin film hydration followed by freeze-thaw cycling. The two systems were both characterized and compared for the feasibility in delivering plant phenolics.
Physicochemical characterization included the particle size distribution, zeta potential, vesicle morphology, and rheology, which were characterized by dynamic light scattering (DLS) and nanoparticle tracking analysis (NTA). The encapsulation efficiency and antioxidant activity were analyzed using UV-Vis spectrophotometry.
Outcomes revealed that both nanocarriers existed in nanoscale dimensions, spherical morphology, and favorable stability. mEVs had superior intrinsic biocompatibility and natural bioactivity, while synthetic liposomes offered superior formulation parameter manipulation and payload loading. Despite the fact that both systems efficiently encapsulated phenolic compounds of botanical origin and maintained their antioxidant activity, there was difference in uptake patterns and release behavior.
These findings identify the potential of both exosome-mimetic nanocarriers and synthetic nanocarriers in phytotherapeutic applications, which are of varying advantages. The research contributes to the expanding horizon of green nanomedicine and encourages the investigation of nanovesicles originating from natural materials as scalable and eco-friendly drug delivery platforms.

Keywords: Exosome-mimetic nanocarriers, Synthetic nanoliposomes, Plant-derived bioactives, Targeted drug delivery, Green nanomedicine

THE PREVALENCE OF URINARY TRACT INFECTIONS IN BULGARIAN GENERAL PRACTICE

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ABSTRACT

Introduction: Bacterial infections of urinary tract (UTIs) is one of the most common infections treated in primary outpatient health care. The gold standard for the diagnosis of uncomplicated UTIs is based on the presence of clinical symptoms and the detection of the pathogen via urine culture. In the conditions of electronic health care, timely detection of the bacterial causative agent and prescription of adequate antibiotic therapy ensures fast, high-quality and reliable care of the patient. Materials and methods: A cross-sectional study was conducted from May to December 2024 at Family medicine' practices located in Stara Zagora region, Bulgaria. In the presented research, a set of sociodemographic data and the reported results of a conducted diagnostic test- urine culture of patients and antimicrobial susceptibility test for the mentioned period were selected, described and summarized. Results: The sample included 685 individuals. The percentage of male patients was 27. 73 % (n=190) and the percentage of female patients- 72.26 % (n=495). 53. 13 % (n= 364) of outpatients were referred by the General practitioner without a working diagnosis according to the international classification of diseases. The most frequent used diagnose as a reason for carrying out the microbiological tests was cystitis (from N30.0 to N30.9- 20. 87 %, n= 143). Almost half of the examined urine cultures were positive- 46. 27 % (n=317). Escherichia coli was the dominant isolated uropathogen in 53.31 % (n=169) of the patients with positive urine culture. Gram-negative rod from the family Enterobacteriaceae manifested high rates of sensitivity to the most commonly prescribed antimicrobial chemotherapeutics in the General practice. Gram-positive facultative anaerobic Enterococcus faecalis was the second most frequently detected bacteria causing infection of urinary pathways among respondents (18. 61 %, n= 59). Extremely high levels of resistance of E. faecalis to some of the widely used antibiotics were reported. Conclusions: Significant bacteriuria was detected in nearly half of the patients suspected of urinary tract infections in the general practice. E. coli was the most common identified uropathogen among individuals with positive urine culture. E. faecalis was the second most frequently isolated causative agent of urinary tract infections with alarmingly high rates of resistance to most commercial antibiotics.

Keywords: general practice, urinary tract infections, prevalence

THE EFFECT OF PROBIOTICS ON PATHOGENS RESPONSIBLE FOR VAGINAL INFECTIONS

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ABSTRACT

Bacterial vaginosis and candidal vulvovaginitis are common conditions in women. The vaginal flora, primarily composed of lactobacilli, changes as a result of these infections. The colonisation of probiotic strains allows the restoration of vaginal flora and the reestablishment of protection against pathogenic microorganisms. At the end of this work, infectious bacterial strains were isolated from vaginal samples and then purified. The examination of shape, growth, and biochemical properties helped identify 13 likely strains from the groups Escherichia, Staphylococcus, Proteus, Pseudomonas, and Candida. The antibiotic resistance observed in the pathogenic strains varies from strain to strain across the entire range of antibiotics used. The probiotic strains producing the antimicrobial substances used were isolated from a multispecies probiotic supplement containing different microbial species. Bacillus coagulans Bifidobacterium brevis – Bifidobacterium acidophilus – Lactobacillus casei – Lactobacillus plantarum – Lactobacillus reuteri – Lactobacillus rhamnosus – Saccharomyces boulardii. The results of the physiological characterisation seem interesting, as the majority of the strains withstand hostile conditions (temperature, pH 3, NaCl 0.4%, bile salts 0.3%). The interaction of inhibitory strains (probiotics) and indicator target strains (E. coli, Proteus vulgaris, Staphylococcus aureus, Pseudomonas aeruginosa, and Candida albicans) yielded positive results for only five strains. The appearance of inhibition zones against the pathogenic strains E. coli and Candida albicans during the direct test reflects these results. The indirect method did not yield any positive results.

Keywords: Keywords : vaginal infections, probiotics, antimicrobial substances.

CLINICAL AND HISTOPATHOLOGICAL STUDY BASED ON ENDOSCOPIC EVALUATION OF GASTRIC CANCER IN ALBANIA DURING 2024

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ABSTRACT

Gastric cancer is among the most lethal malignancies due to its insidious onset, histological heterogeneity, and the frequency of late-stage diagnosis. While it represents a significant global health burden, regional epidemiological insights are critical for identifying high-risk populations and guiding timely diagnostic strategies. According to estimates from the International Agency for Research on Cancer (IARC) and GLOBOCAN 2022, gastric cancer ranks as the third most commonly diagnosed malignancy and the second leading cause of cancer-related death in Albania. These statistics highlight a pressing need for targeted clinical surveillance, expanded use of endoscopic screening, and early histopathological assessment to improve patient outcomes.

The present study offers a clinical synopsis of biopsy-confirmed gastric cancer cases diagnosed during 2024 at a gastroenterology center in Tirana, Albania. A total of 2,150 upper gastrointestinal endoscopies were performed, resulting in 41 biopsy-confirmed cases of gastric neoplasia (1.9% detection rate). Histological classification revealed 26 intestinal-type adenocarcinomas, 10 diffuse-type adenocarcinomas (including 2 mucinous and 6 signet ring cell variants), and 5 mixed-type adenocarcinomas (4 of which included signet ring cell components). Demographically, the highest incidence was recorded in patients aged 45–70 (n = 27), followed by those over 70 (n = 9) and under 45 (n = 5). A strong male predominance was observed (30 males vs. 11 females).

Tumor localization was distributed anatomically as follows: cardia with gastroesophageal junction extension (n = 7), corpus with associated cardia involvement (n = 11), corpus along the greater curvature (n = 4), lesser curvature and angulus (n = 3), antrum and pylorus (n = 10), diffuse gastric infiltration characteristic of linitis plastica (n = 4), and post-surgical anastomotic regions (n = 2).

Clinical presentations were dominated by upper abdominal pain (n = 21), anorexia (n = 17), weight loss (n = 15), anemia (n = 12), melena (n = 6), dysphagia (n = 3), and a history of gastric perforation in two cases. Many patients exhibited multiple concurrent symptoms, indicative of advanced-stage disease at the time of presentation.

These findings emphasize the critical importance of timely endoscopic evaluation and histological confirmation, especially in symptomatic adults. This dataset provides valuable real-world insight into the contemporary burden of gastric cancer in Albania. The predominance of intestinal-type adenocarcinoma, together with a significant presence of aggressive diffuse and mixed subtypes, highlights the complexity of managing this disease. Early endoscopic referral, enhanced patient education, and incorporation of histopathological screening into routine gastroenterological care are essential to improving patient outcomes. The contribution of private healthcare practices to cancer surveillance also warrants recognition, as it enhances the national cancer registry and supports evidence-based policy and prevention strategies.

Keywords: Gastric cancer, Albania, Epidemiology, Biomedical screening, Histopathology, Endoscopy, Cancer surveillance

COLORECTAL CANCER IN ALBANIA: EPIDEMIOLOGICAL TRENDS AND DIAGNOSTIC INSIGHTS IN 2024

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ABSTRACT

Colorectal cancer (CRC) is the third most commonly diagnosed malignancy worldwide and the second leading cause of cancer-related mortality according to data from the World Health Organization (WHO) and GLOBOCAN 2022. Despite the implementation of structured screening programs in high-income countries—resulting in improved early detection and outcomes—many low- and middle-income countries, including those in Southeastern Europe, continue to experience rising incidence and mortality. This is largely due to the absence of national screening infrastructure, limited health literacy, and poor access to preventive care. Albania is among the countries lacking both a population-wide colorectal cancer screening program and a national cancer registry. Consequently, diagnostic data from clinical practice becomes essential for understanding epidemiological trends and informing public health policy. A retrospective cross-sectional analysis was conducted on all colonoscopic procedures performed throughout 2024 at a high-volume diagnostic center in Tirana. The final sample included 1,789 procedures. Histologically confirmed CRC cases (n = 92) and colorectal polyps (n = 618) were identified and analysed. Data were stratified by age, sex, tumor location, histological subtype, and presenting symptoms. The polyp detection rate (PDR), CRC prevalence, and symptom distribution were assessed to evaluate diagnostic burden and the potential for preventive impact. The results underscore a substantial CRC burden in Albania in the absence of formalized screening. The predominance of symptom-driven diagnoses—combined with early-onset presentation and a high prevalence of polyps—reflects missed opportunities for timely detection and prevention. These findings reinforce the urgent need to implement national CRC screening initiatives, launch public education campaigns, and integrate structured, risk-based screening protocols into routine care. Moreover, this dataset provides a biomedical foundation for advocacy, healthcare planning, and participation in regional public health collaborations aimed at reducing the burden of gastrointestinal cancers.

Keywords: Colorectal cancer, Epidemiological trends, Albania, Diagnostic endoscopy, Histopathology, Cancer screening, Gastrointestinal oncology, Public health surveillance

CERVICAL CANCER SCREENING BASED ON MOST IMPORTANT LABORATORY TESTS - THE ROLE OF DIET AND NUTRITION ON THIS DISEASE RISK

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ABSTRACT

This study summarizes the anatomical characteristics, pathologies, and etiological factors of the cervix, with a particular focus on cervical cancer, one of the most common and preventable cancers among women worldwide. It shows and explores the link between diet and cervical cancer risk and explains whether some foods can increase or decrease it. The cervix is a cylindrical structure composed of three main parts, playing a key role in fertility and the childbirth process. Pathological changes in the cervix, including viral infections with Human Papillomavirus (HPV), particularly high-risk types (HPV 16 and 18), are the primary causes of cervical cancer development. Persistent HPV infection leads to molecular changes in the cervical epithelial cells, mainly through the activity of the E6 and E7 oncoproteins, which inactivate the tumor suppressor proteins p53 and pRB, thereby contributing to carcinogenesis. The study also discusses other risk factors, including sexual activity, immune deficiencies, oral contraceptive use, and tobacco exposure. Diagnostic methods include colposcopy, biopsy, molecular testing for HPV, and advanced imaging techniques. The global prevalence of cervical cancer and the importance of screening and vaccination programs are emphasized as effective preventive measures. This study provides a comprehensive overview of the anatomical, physiological, etiological, and diagnostic aspects of the cervix and its diseases, offering a valuable foundation for improving health policies and preventive strategies at both national and international levels. The results indicate that the risk of cervical cancer can be affected by the intake of certain food groups. Further longitudinal studies are needed to confirm these findings and determine the underlying mechanism of the influence of dietary components on cervical cancer risk.

Keywords: Cervix, cervical cancer, HPV (Human Papillomavirus), screening

DETAILED CHARACTERIZATION OF MIXED URINARY STONES: TOWARD A BETTER UNDERSTANDING OF LITHOGENIC MECHANISMS

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ABSTRACT

Mixed urinary stones represent a frequent but diagnostically challenging form of urolithiasis, often resulting from intertwined lithogenic processes including infection, metabolic disorders, and dietary factors. Their complex structure requires a multidimensional analytical approach to unravel the various mineral phases involved. In this work, we present a methodological framework combining morphological assessment, Fourier-transform infrared spectroscopy (FTIR), thermal analysis (TG/DSC), and chemometric tools applied to a **targeted set of mixed stones**. The aim is to demonstrate how this integrated approach allows for a better understanding of stone zonal organization and provides insights into the underlying physiopathological pathways. This study lays the groundwork for future predictive models and supports the development of more personalized diagnostic and preventive strategies in complex cases of urolithiasis.

Keywords: mixed stones, FTIR, thermal analysis, chemometrics, pathophysiology, urolithiasis

MULTI-TECHNIQUE ANALYSIS (FTIR–TG–DSC) OF URINARY STONES: TOWARD A RAPID AND RELIABLE DIAGNOSTIC APPROACH

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ABSTRACT

Accurate characterization of urinary stones is essential for etiological diagnosis and effective recurrence prevention. While morphological analysis remains the first step in stone identification, it can be limited in cases of complex or atypical compositions. In this study, we propose an integrated multi-technique approach, combining Fourier transform infrared spectroscopy (FTIR-ATR) and thermal analysis (TG/DSC), applied to a diverse set of urinary stones from patients with varying lithogenic profiles. These techniques enable the detection, confirmation, and differentiation of major and minor components with high sensitivity, even in the presence of spectral overlaps or subtle thermal transitions. This strategy improves diagnostic reliability and reduces interpretation uncertainties. It also paves the way for the standardization of analytical protocols in routine laboratory practices, with promising prospects for automation and time savings.

Keywords: urinary stones, FTIR, TG/DSC, characterization, analytical diagnosis, integrated analysis

MULTI-TECHNIQUE ANALYSIS (FTIR–TG–DSC) OF URINARY STONES: TOWARD A RAPID AND RELIABLE DIAGNOSTIC APPROACH

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ABSTRACT

Accurate characterization of urinary stones is essential for etiological diagnosis and effective prevention of recurrence. While morphological analysis remains the first step in stone identification, it can be limited in cases of complex or atypical compositions. In this study, we propose an integrated multi-technique approach, combining Fourier-transform infrared spectroscopy (FTIR-ATR) and thermal analysis (TG/DSC)**,** applied to a diverse set of urinary stones from patients with varying lithogenic profiles. These techniques allow for the detection, confirmation, and differentiation of both major and minor components with high sensitivity, even in the presence of spectral overlaps or subtle thermal transitions. This strategy enhances diagnostic reliability and reduces interpretation uncertainties. It also opens the way for standardizing analytical protocols in routine laboratory practice, with promising perspectives for automation and time efficiency.

Keywords: urinary stones, FTIR, TG/DSC, characterization, analytical diagnosis, integrated analysis

MODELING RISK FACTORS OF STUNTING IN THE LIANG ANGGANG COMMUNITY HEALTH CENTER

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ABSTRACT

Stunting is one of the main nutritional problems facing Indonesia, with a significant prevalence, especially in South Kalimantan. In 2020, the prevalence of stunting in South Kalimantan reached 44.2%, far above the national figure of only 24.4%. Stunting is a condition of growth failure in children that has a serious impact on physical and cognitive development, and increases the risk of chronic diseases in adulthood. Prevention and treatment of stunting requires a deep understanding of the risk factors involved. This study aims to identify risk factors for stunting and determine the most influential factors in the Liang Anggang Health Center working area. The research design used was analytic observational with a case-control approach. The study population included all toddlers in the Liang Anggang Health Center working area, with a total sample of 168 toddlers, consisting of 84 case groups and 84 control groups. The results showed that several risk factors for stunting included a exclusive breastfeeding ($p = 0.051$), a history of infectious diseases in infants ($p = 0.642$), low birth weight ($p = 0.123$), pregnancy distance with the previous child ($p = 0.642$), maternal age at delivery ($p = 0.008$), maternal education level ($p = 0.064$), maternal employment ($p = 0.589$), sanitation conditions ($p = 0.367$) and cigarette smoke exposure (1.000). From the modeling conducted, it is known that the most influential factor on the incidence of stunting is the mother's age at delivery.

Keywords: Stunting, Epidemiology, risk factors of stunting

CORRELATION BETWEEN THE CUP-LIKE MORPHOLOGY OF ACUTE MYELOID LEUKEMIA AND MUTATIONS IN THE NUCLEOPHOSMIN-1 (NPM1) AND FMS-LIKE TYROSINE KINASE 3 (FLT3) GENES

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ABSTRACT

Introduction: New mutations, such as Nucleophosmin-1 (NPM1) and Fms-like Tyrosine kinase 3 (FLT3) mutations, have been identified in normal karyotype acute myeloid leukemia (AML). These mutations correlate with the presence of a translucent cup-like invagination in the nucleus of blast cells. Recent studies have confirmed the association between this cup-like morphology and NPM1 and FLT3 mutations. However, these two mutations have different prognostic impacts: NPM1 mutations are good prognostic factors, while FLT3 mutations are poor prognostic factors.
The objective is to evaluate the correlation between the “cup-like” morphology of AML and the presence of the NPM1 and/or FLT3 gene mutation.
Methods : This is a prospective study of 41 patients with de novo AML diagnosed at the Hematology Laboratory of the Pierre and Marie Curie University Hospital. For all patients, the diagnosis of AML was established in accordance with FAB criteria. Immunophenotypic analysis was performed using an extensive panel of monoclonal antibodies. The search for NPM1 and/or FLT3 mutations was performed using molecular biology techniques. Results : The Cuplike morphological character of the blasts is identified by observing nuclear invagination affecting more than 25% of the diameter of the blast cell nucleus in at least 10% of blast cells. CLN+ morphology is associated with granular differentiation forms of AML: 93.75% of cases are represented by AML0, AML1, and AML2, and only 6.25% by AML with monocytic differentiation. In terms of immunophenotype, CLN+ LAMs are distinguished not only by the absence or very low expression of the immaturity markers HLA-DR and CD34, but also by a lower intensity of expression of the myeloid markers CD13 and CD117.
The FLT3 gene mutation was identified in 8/41 (19.5%) patients. The NPM1 gene mutation was identified in 15/41 (36.5%) patients. In two patients, the NPM1 gene mutation was associated with the FLT3-ITD mutation.CLN+ blasts were found in 16/21 (76.19%) mutated patients. The proportion of CLN+ leukemias in the NPM1-mutated leukemia population was 92.3% (12/13 cases), 33% (2/6) in the FLT3-mutated leukemia population, and 100% in the 2 NPM1- and FLT3-mutated patients. This suggests a greater involvement of NPM1 mutations in CLN+ morphology. Conclusion : In light of our series of cases, we underline the importance of recognizing this entity of CLN+ AML, due to the diagnostic guidance it can provide.

Keywords: Cup-Like nuclei, acute myeloid, Nucleophosmin-1 (NPM1) and Fms-like Tyrosine kinase 3 (FLT3) mutations

USE OF SEDATIVE HYPNOTIC MEDICATIONS IN INDIVIDUALS WITH PARKINSON'S DISEASE: A SYSTEMATIC REVIEW

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ABSTRACT

Background: Sleep disturbances are among the most common non-motor symptoms in Parkinson's disease (PD), negatively affecting quality of life, cognition, and fall risk. Sedative-hypnotic medications, including benzodiazepines, Z-drugs, and melatonin, are frequently prescribed, yet their efficacy and safety in PD populations remain incompletely understood.
Objective: To systematically review the literature on the use of sedative-hypnotic drugs in individuals with PD, focusing on efficacy, safety, and clinical considerations. **Methods:** A systematic search of PubMed, Embase, and Cochrane Library (2000–2025) was conducted, including studies reporting use of benzodiazepines, Z-drugs, melatonin, or sedating antidepressants/antipsychotics in PD patients. Studies were screened per PRISMA guidelines, and data were extracted on sleep outcomes, adverse events, motor effects, cognition, and falls.
Results: 42 studies met inclusion criteria. Melatonin was generally safe and moderately effective for insomnia and REM sleep behavior disorder. Benzodiazepines improved sleep but were associated with cognitive impairment, fall risk, and dependence. Z-drugs had intermediate efficacy with lower dependence risk but required caution for daytime sedation. Sedating antidepressants and antipsychotics were sometimes effective but posed additional safety concerns. Non-pharmacologic interventions remain underutilized but beneficial adjuncts.
Conclusions: Melatonin and non-pharmacologic strategies should be prioritized for sleep disturbances in PD. Benzodiazepines and Z-drugs may be considered short-term with careful monitoring. Future research should focus on high-quality RCTs, long-term safety, and individualized treatment algorithms.

Keywords: Parkinson's disease, sleep disturbance, melatonin

SPATIAL ANALYSIS OF STUNTING PREVALENCE IN BANJARBARU CITY, SOUTH KALIMANTAN, INDONESIA

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ABSTRACT

Stunting remains a major nutritional problem in Indonesia, with a high prevalence, especially in South Kalimantan. Based on data from the 2024 Indonesian Nutrition Status Survey (SSGI), the prevalence of stunting in this province was recorded at 22.9%, higher than the national average of 19.8%. In Banjarbaru City, there were 3,960 cases of stunting during the 2021–2023 period, with an increasing trend from 1,193 cases in 2021 to 1,450 cases in 2023. This study aims to map the spatial distribution of stunting cases in each sub-district to identify priority areas for intervention. The analysis was conducted using a spatial approach per 100 live births, resulting in a map of the distribution of stunting cases across all sub-districts. The mapping results show that Liang Anggang and Cempaka consistently have the highest prevalence each year, while other subdistricts have lower rates. This mapping highlights areas with a high risk of stunting and supports focused nutrition intervention planning. These findings are expected to form the basis of area-based stunting prevention strategies and assist in decision-making for child nutrition programmes in Banjarbaru City.

Keywords: Mapping, Stunting, distribution map, Banjarbaru, Indonesia

PEDIATRIC CELIAC DISEASE: AGE AT DIAGNOSIS BY TTG-IGA INTENSITY (×ULN) — A RETROSPECTIVE DESCRIPTIVE STUDY

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ABSTRACT

Celiac disease (CD) is characterized by elevated tissue transglutaminase IgA antibodies (tTG-IgA). Emerging evidence suggests that age at diagnosis may relate to antibody intensity, with higher titers often observed in younger children (Trovato, 2023). This study aimed to describe, in a local cohort, the relationship between age at diagnosis and tTG-IgA levels (expressed relative to the upper limit of normal, ULN), and to provide a simple clinical profile of patients. We conducted a retrospective, single-center, descriptive study of 49 children and adolescents diagnosed with CD between 2007 and 2021 in the Pediatric Department of Mustapha Bacha University Hospital in Algiers, Algeria. Extracted data included age, sex, clinical manifestations, weight and height at last visit, and serology. Antibody titers were reported in absolute units ; in line with ESPGHAN recommendations, we used a threshold of 200 U/mL (≈10× ULN) to define comparison groups. In our cohort of 49 patients, 57% were female; mean age at last assessment was 10.5 years, mean weight 33.5 kg, and mean height 134.1 cm. Two had a first-degree family history of CD. Overall, 44/49 (89.8%) were symptomatic, with diarrhea (45.4%) and iron-deficiency anemia (29.5%) being most frequent. The remaining 5/49 (10.2%) were considered asymptomatic and were detected through iron-deficiency anemia screening. Median age at CD diagnosis was 5 years among the 29 patients with tTG-IgA ≥200 U/mL, and 6 years among the 20 patients with titers

Keywords: Keywords : Celiac disease ; pediatrics ; tTG-IgA (×ULN) ; age at diagnosis ; Algeria.

RETROSPECTIVE STUDY OF THE EVOLUTION OF ANTIBIOTIC RESISTANCE IN BACTERIA INVOLVED IN URINARY TRACT INFECTIONS CARRIED OUT AT THE UNIVERSITY HOSPITAL OF ORAN

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ABSTRACT

Urinary tract infection is a common pathology in children, generally caused by enterobacteria. These bacteria show increasing resistance to antibiotics, often linked to empirical and abusive treatments. Therefore, it is essential to monitor this resistance, particularly in hospitalized children, to optimize antibiotic therapy and prevent complications.
Our retrospective study, conducted at the medical analysis laboratory, microbiology unit, of the Specialized Pediatric Hospital Boukhroufa A.E.K - Canastel (EHS Canastel), aims to analyze the evolution of antibiotic resistance of the main bacteria responsible for urinary tract infections, namely E. coli and Enterobacter spp., over the period 2021–2024. The results show a comparable distribution between E. coli and Enterobacter spp.in urinary infections, with opposite trends between 2022 and 2024. E. coli predominantly affects females (70%), whereas Enterobacter spp. is more frequent in males (54%). There is also a predominance in the nephrology department for both germs. Significant resistance to several commonly prescribed antibiotics such as Amoxicillin-Clavulanate, Cefotaxime, and Ciprofloxacin was observed in these two bacteria, indicating a notable decrease in their effectiveness. Conversely, good sensitivity was noted to Fosfomycin for both germs, as well as Imipenem, Cefoxitin, and Chloramphenicol for Enterobacter spp., providing effective therapeutic alternatives. Regarding BLSE production, E. coli and Enterobacter spp. exhibit close frequencies (28% and 30%) with opposite evolutionary trends, reflecting an alternation in predominance.
This study highlights the importance of continuous monitoring of bacterial resistance to antibiotics in children, especially in the face of increasing BLSE production. Rigorous follow-up and treatment adaptation are essential to improve patient management and limit resistance spread.

Keywords: Urinary tract infection – Retrospective study – Antibiotic resistance – E. coli – Enterobacter spp.

EFFICACY OF THE USE OF TOPICAL ATROPINE AS AN ALTERNATIVE THERAPY IN PREVENTING THE PROGRESSION OF MYOPIA IN CHILDREN 0–14 YEARS OLD – A LITERATURE REVIEW

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ABSTRACT

Introduction: The global prevalence of childhood myopia has increased dramatically over recent decades, becoming a major public health concern. Early-onset myopia often leads to higher degrees of refractive error and a higher risk of ocular complications in adulthood. Pharmacological interventions, particularly low-dose topical atropine, have recently gained attention as effective methods to slow myopia progression. **Aim:** This literature review aims to evaluate the efficacy, safety, and clinical applicability of topical atropine as an alternative therapy for preventing myopia progression in children aged 0–14 years. **Methodology:** A comprehensive literature search was conducted using PubMed, Scopus, and ScienceDirect databases for studies published between 2010 and 2024. Randomized controlled trials, cohort studies, and meta-analyses assessing atropine concentrations between 0.01% and 1% were included. The primary outcomes analyzed were spherical equivalent refraction (SER) change, axial length elongation, and reported side effects. **Results and Discussion:** The majority of studies demonstrate that low-dose atropine (0.01–0.05%) significantly reduces myopia progression with minimal side effects such as transient photophobia or blurred near vision. Comparative analyses suggest that lower concentrations maintain therapeutic benefits while minimizing rebound effects upon discontinuation. Variability in outcomes between ethnic groups and treatment durations was also noted. **Conclusion:** Current evidence supports the use of low-dose topical atropine as an effective and safe intervention for controlling myopia progression in children. However, standardized treatment protocols and long-term follow-up studies remain essential to optimize dosage and safety profiles.

Keywords: myopia control, topical atropine, pediatric ophthalmology, literature review, refractive error

PERFORMANCE OF MODERN SELECTIVE MEDIA IN THE PHENOTYPIC DIAGNOSIS OF CAMPYLOBACTER INFECTIONS

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ABSTRACT

This study focuses on the isolation and detection of Campylobacter spp., the bacterium responsible for most cases of primary bacterial foodborne infections worldwide. These bacteria are often associated with gastrointestinal symptoms such as diarrhea, abdominal cramps, fever, and nausea, and are most commonly transmitted through the consumption of contaminated food, particularly undercooked poultry. The study used two main culture media, Carmalie and Campylosil, to isolate and identify Campylobacter spp. bacteria from stool samples taken from patients. Carmalie is known for its ability to inhibit the growth of competing bacteria and selectively promote the growth of Campylobacter spp. bacteria. Campbellosil, on the other hand, is a medium that uses horse blood to stimulate the growth of Campylobacter bacteria, but it increases the risk of contamination by other microorganisms. The study results showed that Carmali allowed for faster detection and higher sensitivity than Campylosil, with a lower risk of contamination by other bacteria such as streptococci and staphylococci. This suggests that Carmali may be preferred in clinical laboratories for effective and reliable isolation of Campylobacter, thereby improving diagnostic capabilities and contributing to better management of foodborne infections.

Keywords: Campylobacter ssp , Karmali, infection , gastroenteritis , Campylosel

ST8SIA2 AS A BIOMARKER OF ER STRESS IN GLYCOSYLATION-DEFICIENT MELANOMA CELLS

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ABSTRACT

Glycosylation is a prevalent post-translational modification influencing protein folding, stability, and intercellular communication. Altered glycosylation is frequently observed in cancer and contributes to tumor growth, metastasis, and immune evasion. Polysialic acid, added to neural cell adhesion molecule (NCAM) by the α-2,8-sialyltransferase ST8SIA2, reduces cell-cell adhesion and enhances migratory potential. However, the impact of N-linked glycosylation disruption on ST8SIA2 expression in melanoma cells remains unclear. Here, human SKMEL-30 melanoma cells were treated with five micrograms per milliliter tunicamycin to inhibit N-linked glycosylation. Six hours post-treatment, RNA was extracted, cDNA synthesized, and relative expression assessed using the ΔΔCt method. Tunicamycin markedly upregulated ST8SIA2 expression (approximately twelve point four-fold, p less than ten to the power of minus five), with ROC analysis showing perfect discrimination between treated and control cells (area under the curve equal to one point zero zero zero). These findings indicate that ER stress–mediated transcriptional reprogramming strongly induces ST8SIA2 in melanoma cells, suggesting its potential as a biomarker of glycosylation stress and as a therapeutic target.

Keywords: Melanoma, Glycosylation, Endoplasmic Reticulum Stress, Sialyltransferase, Cancer Biomarker

PENDRED SYNDROME: A RARE THYROID DYSFUNCTION OF GENETIC ORIGIN

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ABSTRACT

Background and Aims**:** Pendred syndrome is an MAR, to a mutation of the SLC24A4 gene also responsible for isolated deafness (DFNB4). This gene codes for a protein which is Pendrin expressed in the inner ear and the thyroid where it participates in the synthesis of thyroid hormones. This disease is characterized by congenital neurosensory deafness and abnormalities in the functioning of the thyroid gland responsible for a hypothyroid goiter. Methods: 30 families with at least one case of congenital deafness were recruited from the ENT department of Blida University Hospital. All family members underwent blood sampling, and DNA was subsequently extracted at the central laboratory of Frantz Fanon University Hospital. Genetic studies were conducted at the genetic biochemistry laboratory of Babeloued University Hospital and the Pasteur Institute in Paris using exome sequencing. Results: Genetic diagnosis revealed a new missense mutation Homozygous in the SLC24A4 gene in a family with two cases of deafness with goiter and TSH hypersecretion. The mutation was found heterozygous in the parents. Conclusions: Pituitary dysfunction in Pendred syndrome is curable with lifelong thyroxine therapy, a treatment not without complications. Genetic counseling is essential to discourage consanguineous marriages, which increase the risk of MAR.

Keywords: Pendrine, TSH, SLC26A4, deafness

LITERATURE REVIEW OF GROWING CONDITIONS OF NATURAL LINDEN STANDS (Tilia cordata Mill., Tilia platyphyllos Scop. and Tilia tomentosa Moench.) IN BOSNIA AND HERZEGOVINA

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ABSTRACT

The Tilia complex in Bosnia and Herzegovina does not constitute a large percentage of forest trees and their stands in the overall forest ecosystem fund, but it has significant vitality and potential for future commercial production of wood needed for industry and various social needs. In addition, linden trees provide significant shade and nutrients for beneficial insects, which is why the importance of these trees in terms of protecting the local climate of forests and cities and the survival of insect populations is extremely high. This article reviews the literature dealing with the natural conditions of growth and development of linden plant communities in Bosnia and Herzegovina. The basis for selecting the vegetation or phytocoenological areas to be studied was information from the "MOE-Scholarship" - DBU report on the conducted scientific research on linden in Bosnia and Herzegovina, i.e. care was taken to describe the natural habitat conditions of linden forest stands in those localities where the trees described in that report were found and measured. The results of the research indicate that the conditions of natural habitats where Tilia trees grow are very heterogeneous, and that in Bosnia and Herzegovina there are various types of soil, such as mosaic, cambisol and gley soils. In addition, soil moisture conditions and the amount of precipitation are also very different from one part of the country to another, which is why planting forest trees in some parts of Bosnia and Herzegovina is difficult or inadvisable, while in some areas it is better to plant linden trees (forests at all). In terms of rockiness, the natural habitats are also very different, so it is possible to find linden forests on extremely shallow lands on limestone rocks, but also in river canyons, for example on sandstone or as they emerge from the rocks. This research should help in understanding the habitat conditions in which noble tree species grow, but at the same time it can also search for potential solutions for future nursery production of these species, which is why this research can be considered significant from the aspect of forestry production.

Keywords: Growing conditions, Natural stands, Linden, Tilia cordata, Tilia platyphyllos, Tilia tomentosa, Bosnia and Herzegovina

STABILITY OF COMMERCIAL TREE SPECIES WOOD PRODUCTS IN EUROPE ACCORDING TO REPORTS AND STUDIES - REVIEW OF CLIMATE CHANGE AFFECTED FLUCTUATION ON THE MARKET

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ABSTRACT

Forest tree species differ greatly in their technical characteristics, on which their quality for the production of certain types of wood assortments depends, especially furniture, construction materials, and numerous other products within the wood processing industry and forestry as well. The importance of the stability of the wood market, both that needed for heating and wood for the production of other assortments, is great, because the stability of the overall market largely depends on its fluctuations, especially if we take into account the fact that some countries base their national economy on forestry and wood processing, or that forestry and wood processing represent significant potential for the further development of the national economy. In Europe, various Central European countries, such as Germany (with a focus on the Bavaria region), as well as northern countries (Scandinavia) are large producers of wood biomass. This wood biomass is used for the production of some of the most sophisticated wood assortments, and the preservation of sustainable and stable forest production is crucial for these countries. Currently, the greatest threat to countries in Europe, but also on a global level, is the intensification of the climate change process, which brings with it incalculable consequences for drought and pathogen-affected areas. The mortality rate of trees has begun to increase to almost 100% in areas attacked by the calamitous bark beetle insect. This insect, with its invasion, egg laying and forest devastation, is the number one destroyer of coniferous forest complexes, because the inoculum of infection increases very quickly, which is why the bark beetle attacks huge groups of trees. Suspicion of the appearance of bark beetles in areas around the inoculum of infection very often implies the sanitary felling of a large number of trees, which can ultimately cause a very noticeable disruption of the wood biomass market. Namely, enormous sanitary fellings, for example for spruce or pine, cause a large number of these trees to appear on the market and temporarily decrease the price of a cubic meter of wood, because in that case the market becomes overloaded with the arrival of excessive coniferous timber. Of course, there are exceptions, when certain assortments also experience price jumps, however, they are mainly related to periods after forest fires, or if there was a deficit of wood biomass of certain coniferous trees for one or two seasons, because forest stands were destroyed in fires. In this paper, we deal with price fluctuations of commercial tree species, in order to consider some of the problems potentially related to the problem of climate change and the occurrence of long-term droughts in Europe.

Keywords: Climate change, Wild fires, Market stability, Sustainable production, Forest management, Bark beetle, National economy

ALTITUDINAL AND LATITUDINAL SPREAD OF PINE PROCESSIONARY MOTHS (THAUMETOPEA SPP.) IN THE CONTEXT OF CLIMATE CHANGE

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ABSTRACT

This study comprehensively examines the altitudinal and latitudinal distribution changes of the pine processionary moth (Thaumetopoea spp.) populations driven by climate change. Particularly in Turkey, field observations reveal that the species has expanded approximately 200 meters in elevation over the past 25 years in regions such as the Kızılırmak Basin and Western Black Sea. This expansion results in significant ecological and economic impacts, including growth losses, needle defoliation, and increased vulnerability to secondary pests in forest ecosystems. The species also poses dermatological, respiratory, and ophthalmological risks to humans and animals. These findings underscore the necessity of sustainable management strategies such as integrated pest management, biological control, early warning systems, and adaptive forestry practices.

Keywords: Forest health; Biological control; Public health impacts; Sustainable forestry; Türkiye

EFFECTS OF FOREST FIRES ON WILDLIFE

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ABSTRACT

Forest fires are among the most impactful natural disturbances, causing both immediate and lasting effects on biodiversity and ecosystem processes. This review consolidates current understanding of how wildfires affect vertebrate and invertebrate species, focusing on population changes, ecological roles, and recovery pathways after fires. Invertebrates—such as soil microfauna like nematodes and protozoa, mesofauna like Collembola and mites, and macrofauna including earthworms, insect larvae, and ants—are highly vulnerable to the heat from fires and the loss of litter cover. These groups often see sharp population declines within a year or two post-fire, disrupting decomposition and nutrient cycling. However, many invertebrate communities tend to recover within three to five years when vegetation regrows and soil moisture is restored. Conversely, vertebrates face direct death and long-term ecological challenges. Small mammals, reptiles, amphibians, and cavity-nesting birds often experience population drops due to limited movement and the destruction of vital nesting and foraging sites. Larger mammals may escape death initially through dispersal but later encounter increased predation and competition in fragmented landscapes. Unlike invertebrates, vertebrate populations usually take decades to rebound, owing to their reliance on complex habitats and stable food webs. Beyond species-level effects, post-fire declines in animal populations significantly harm ecosystem functions. Decreases in invertebrates' roles in decomposition and soil fertility, along with vertebrates' roles in seed dispersal and pollination, slow down vegetation renewal and weaken ecosystem resilience. Recovery processes differ greatly among ecosystems, influenced by fire severity, habitat features, and climate conditions. Including both vertebrate and invertebrate indicators in monitoring and restoration efforts is crucial for a comprehensive understanding of post-fire ecosystem changes. In the face of accelerating climate change, adaptive management should focus on preserving biological legacies, encouraging habitat diversity, and using native plants that support detrital pathways. These strategies improve the chances of functional recovery, boost ecosystem resistance to repeated fires, and protect biodiversity amid increasing disturbance.

Keywords: Wild fires; forest fauna; ecosystem recovery; biodiversity; ecological restoration.

MORPHOLOGICAL PLASTICITY AND ADAPTION OF PRIMULA VERIS POPULATIONS IN DIFFERENT EDAFIC CONDITIONS

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ABSTRACT

Plant populations often exhibit significant morphological plasticity and local adaption in response to varying environmental conditions, particularly soil type. Serpentine and calcareous soils, which differ substantially in mineral composition and nutrient availability, impose strong selective pressures that drive evolutionary divergence and phenotypic differentiation among populations. This study investigated morphological traits and the flower morph ratio in Primula veris populations growing on calcareous and serpentine soils, to assess the extent of phenotypic plasticity and adaptive differentiation in response to these contrasting edaphic environments. The results revealed significant differences among these two populations groups, particularly in the height of the plant, number and leaf size and flower morph ratio. Primula veris populations grown on serpentine soils had higher plant size and leaf number per individual compared to those grown on calcareous soils. The flower morph ratio (thrum to pin) in serpentine soil populations was 1:1.5, whereas in calcareous soil populations the ratio was balanced at 1:1. Population grown on serpentine substrates may be exposed to a higher degree of stressors due to heavy metal content, which could lead to variation in morphological traits and flower morph ratios as an adaptive strategy

Keywords: Primula veris L, adaption, serpentine soil, morfological traits

FIRST DATA ON THE HABITAT CHARACTERISTICS AND NEST SITE SELECTION OF THE MAGHREB MAGPIE (PICA MAURITANICA) POPULATION IN ALGERIA: A REMOTE SENSING AND GIS APPROACH TO CONSERVATION PLANNING.

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ABSTRACT

Pica mauritanica, commonly referred to as the Maghreb Magpie, is a unique species of corvid that is exclusively found in North Africa. Unfortunately, the survival of the P. mauritanica population is currently under threat due to the fragmentation and destruction of its natural habitats. This critical situation is primarily a result of several factors, including wildfires, land use, deforestation, intensified modern agricultural practices, and the expansion of urban areas. Consequently, the species has been forced into a progressively smaller nesting range, leading to a limited spatial presence in the North African countries. In Algeria, the populations of this species were isolated, and some of them even harbor endangered breeding pairs that were at risk of extinction. In response to this critical issue and make informed decisions a remote sensing and GIS approach were used. By conducting these spatial analyses, a comprehensive map detailing the habitat of P. mauritanica has been created across the characterization and the maping of the observed habitats. The used approach have also enable us to understand and to assess the vulnerability of P. mauritanica habitats, and encompassed eleven locations spanning P. mauritanica's distribution range in Algeria. Furthermore, through spatial analysis of GIS data, the study categorized the eleven sites into four distinct classifications based on their topomorphology and vegetation attributes. This categorization facilitated the identification of specific habitat types for the species using various geospatial indicators. Such categorization greatly contributed to comprehending the diversity and the distribution of suitable habitats for P. mauritanica within the study area.

Keywords: Pica mauritanica, remote sensing, nesting habitat, GIS, topomorphology, Algeria.

PHYSICO-CHEMICAL, NUTRITIONAL AND MICROBIOLOGICAL CHARACTERIZATION OF SAMET (NATURAL GRAPE SYRUP)

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ABSTRACT

Samet, a cooked grape juice, is a typical local product from the Jbala region in northern Morocco. Its production is endemic and also informal, which currently limits its scope in the local market. This product, used in phytotherapy since the middle Ages, is increasingly disappearing from consumption in Jbala households. The objective of the present study was to determine the physicochemical composition (pH, titratable acidity, brix degree, dry matter and color), nutritional composition (mineral matter content, fat, polyphenols, flavonoids and anthocyanins) antioxidant activity and the microbiological quality of Samet. The study was conducted on 23 samples, including 18 samples prepared by the traditional method coming from two cities in the north of Morocco (Chefchaouen and Ouazzane), and 6 commercial samples from Tetouan. The physicochemical and nutritional composition of the samples significantly differs depending on the nature of the syrup (traditional or commercialized) ($p<0.05$), except for the concentration of soluble solids, which remains similar with an average of 85.89 °B. The "collection location" factor has a significant effect on certain parameters of the nutritional analysis of the traditional syrup, particularly the mineral and flavonoid content ($p<0.05$). Samet is identified as a rich source of polyphenols, and assessments of antioxidant activity through DPPH radical inhibition and ferric reducing power (Fe+3) reveal the strong antioxidant capacity of this product. Regarding microbiological quality, all analyzed samples pose no risk to consumer health. Indeed, no colonies for total germs, fungi, yeasts, and molds were detected. Thus, Samet is a terroir product with high nutritional potential and strong antioxidant capacity that can be valorized in food, but which remains variable depending on the method and the region of production, which requires standardization of method of production.

Keywords: Samet, Grape syrup, Local product, Polyphenols, Antioxidant activity, Physicochemical composition, Microbiology quality

ANALYSIS OF VARIATIONS IN MATCHA COMPONENTS ACROSS DIFFERENT BRANDS ON THE TUNISIAN MARKET

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ABSTRACT

Matcha is a powdered green tea from the Camellia sinensis L. plant, intended for both hot and cold drinking. Selecting the right matcha is crucial to its manufacture. This study organoleptically and physicochemically evaluated three types of matcha tea powder, measuring color (Lab*), water content, water solubility index, water holding capacity, pH, ◦Brix, as well as protein and lipid contents. In addition, flavonoids, total polyphenols and antioxidant activity were assessed. Matcha M1 showed the best antioxidant performance and the highest protein content (27,656 ± 0,134%), significantly higher than M2 and M3. It also showed the highest luminosity (L*), followed by M3, while M2 had the lowest luminosity. M1's pH was also the lowest (5,623 ± 0,025), contributing to better microbiological stability. M1 was preferred by consumers in sensory evaluation. This study clarified that matcha can exhibit significant flavor differences between brands and provided a theoretical basis for the selection and application of matcha in tea products.

Keywords: Matcha (Camellia sinensis), Total polyphenols, Organoleptic evaluation, Antioxidant activity, Protein content.

IMPACT OF IRON BIOFORTIFICATION ON IMPROVING THE NUTRITIONAL AND FUNCTIONAL PROPERTIES OF COWPEA

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ABSTRACT

Iron biofortification is a strategy to reduce the incidence of anemia worldwide. Cowpea is a staple food in the North and Northeast regions of Brazil and a target of the biofortification program. It is an important source of protein, energy, iron and bioactive compounds. This study aimed to evaluate whether the biofortification process can affect the nutritional and functional properties of cowpea. The composition of biofortified cowpea (Tumucumaque and Aracê) and Conventional (Pajeú) was analyzed (ash, protein, lipid, dietary fiber, tannins, phytic acid, iron, resistant starch, total phenolics, and amino acids). The antioxidant capacity of the beans was determined by ABTS and FRAP methods. Iron bioavailability and functional properties of the cowpeas were evaluated in 48 Wistar rats fed initially an iron-free diet for 21 days (depletion). Them, they were divided into 4 groups (n=12) and fed a high-fat/high-sugar diet contained 12 ppm iron provided by ferrous sulfate or the cowpeas for 35 days (repletion). Measurements of hemoglobin gain, blood glucose, cholesterol, and insulin, hepatic oxidative stress (Superoxide dismutase - SOD, nitric oxide - NO, Catalase, Total antioxidant capacity - TAC), fecal pH and short chain fatty acids (SCFA) were performed. The results were compared by ANOVA and Tukey´s test ($p<0.05$), using GraphPad Prism, version 9.0. The cowpeas showed similar concentrations of ash, lipids, total and insoluble dietary fiber, and phytate. The iron content in biofortified cowpeas was 39% higher than in the conventional cultivar. The biofortified Aracê had higher protein content and Pajeú had higher levels of soluble dietary fiber, resistant starch, total phenolic compounds, and Phytate:iron ratio. Tannins were not detected in any cowpea. The higher antioxidant capacity measured by ABTS method and lower value by FRAP of the conventional Pajeú may be due to its higher composition in phenolic compounds and lower content of iron. Regarding amino acids, all cowpeas were deficient in methionine and cysteine (Chemical score of approximately 90%). The iron bioavailability of Aracê was higher than that of the conventional Pajeú, but there was no difference in the Hemoglobin Regeneration Efficiency (HRE) and Relative Biological Value (RBV) between the beans and the control group (ferrous sulfate). Total blood cholesterol did not differ between groups, but Aracê showed higher HDL-cholesterol than the control and all the beans had a lower Total-cholesterol/HDL-cholesterol ratio than the control. Aracê also had a lower incremental area under the curve (iAUAC) in the glucose tolerance test, lower insulin levels and higher production of SCFA (acetate, propionate and butyrate) than the control group. Fecal pH did not differ between groups. Regarding hepatic oxidative stress, Aracê and Pajeú had higher levels of SOD and NO than the control. Biofortified cowpeas (Aracê and Tumucumaque) had hither TAC and there was no difference in Catalase between groups. In conclusion, the biofortification process improved the iron content and its bioavailability, and did not alter the amino acid composition of the cowpeas. Biofortified cowpeas, despite the lower content of soluble fiber, resistant starch and phenolic compounds, presented better physiological properties in relation to glucose tolerance test, insulin and lipid profile, higher production of SCFA and improved hepatic oxidative stress, particularly Aracê cowpea. Therefore, biofortification, in addition to increasing iron content, can improve the functional properties of cowpea.

Keywords: Cowpea, Biofortification, Nutritional composition, Functional properties

TECHNOLOGICAL CHARACTERISTICS OF THERMOPHILIC LACTIC ACID BACTERIA ISOLATED FROM DIFFERENT TRADITIONAL FERMENTED MILKS

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ABSTRACT

Lactobacilli are used in numerous dairy products, including fermented milk, cheese, and yoghurt. They contribute to the texture and flavour of foods, as well as to the production of aromatic compounds. Based on their technological characteristics, this study presents a collection of Lactobacillus isolates suitable for use as starter cultures in the dairy industry. This research focuses on lactobacilli by isolating and testing the acid-producing capacity of thermophilic lactobacilli, demonstrating their utility in the agri-food industry. At the end of this work, lactic acid bacteria strains were isolated from raw goat, sheep, and camel milk on acidified MRS medium at 44°C, then purified. The study of morphological, cultural, and biochemical characteristics led to the identification of 19 strains suspected to belong to the genus Lactobacillus, including four different species. The results of physiological characterisation are noteworthy, as most strains are resistant to hostile conditions (temperature, pH, NaCl). Watching how the pH changes and how quickly milk turns sour when mixed with lactobacilli showed that all strains are very good at making the milk acidic. Such behaviour is indicated by a decrease in pH to values of 3.99 and 4.5, as well as acid production reaching 135°D after 24 hours of fermentation. Despite the excellent results of all strains, isolates Lb2 and Lb6 showed remarkable performance with acidity levels of 126 and 135°D and pH values of 3.99 and 4.01, respectively. As regards the proteolytic power, the strains showed a high level of proteolysis that was notable, with a lysis zone of 31 mm. Regarding the lipolytic activity, it was observed that none of the lactobacilli tested expressed lipolytic activity in the presence of butter and olive oil, whereas the results of the strains were different as regards the flavouring activity and the texturing activity. The strains exhibited resistance to all antibiotics tested, except for clindamycin and erythromycin.

Keywords: Lactobacillus, acidifying ability, proteolytic power lactic acid bacteria, milk, lactic acid

ASSESSMENT OF THE IMPACT OF WHEAT GERM INCORPORATIONON BISCUIT SENSORY QUALITY

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ABSTRACT

Although it is often removed during the milling process due to its high lipid content, which may affect flour stability, wheat germ remains a valuable resource. It is particularly recognized as an economical alternative to animal proteins, offering comparable nutritional quality at a lower cost. The aim of this study is to evaluate the impact of incorporating soft wheat germ flour on the sensory quality of biscuits. To this end, five formulations were developed by blending biscuit flour with varying proportions of wheat germ flour. Shortbread-type biscuits were then prepared using these blends. Sensory evaluation of the final product was conducted through scoring tests, triangular tests, and hedonic tests. The resulting biscuits were characterized by a crumbly texture in the control sample, which progressively increased with higher levels of wheat germ flour incorporation. A gradual change in color was also observed: the hue shifted from golden yellow in the control biscuit (score: 6.2) to light brown in sample B1 (3.06), and finally to dark brown in B5 (6.83), reflecting the increasing pigmenting effect of the germ. The sensory evaluation conducted with 30 panelists revealed that a significant proportion perceived a moderate cereal-like aroma in biscuits B1 and B2. This perception became more pronounced with increasing levels of wheat germ flour, with biscuits B3 to B5 exhibiting a distinctly cereal aroma profile. Analysis of the results showed that biscuit crumbliness increased from 6.13 in the control sample (B0) to 7.30 in sample B5. In contrast to the golden hue of the control, the intensity of the brown coloration rose significantly with higher wheat germ flour incorporation, ranging from 0.63 in B0 to 6.83 in B5. Notably, all panelists (30 out of 30) correctly identified the different sample, corresponding to a 100% discrimination rate. The results of the ranking preference test, conducted with a panel of 30 tasters, revealed a clear preference for sample B5.

Keywords: evaluation, wheat germ, incorporation, sensory quality

FOOD INTOLERANCE IN ALBANIA: A PUBLIC HEALTH PERSPECTIVE

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ABSTRACT

Food intolerance is increasingly recognized as a public health issue due to its impact on quality of life and nutrition-related behavior. This study assessed the prevalence, awareness, symptoms, and self-management behaviors related to food intolerance in Albania. It is used a structured questionnaire completed by participants across different regions and from these data analyzed the Demographic analysis showed that most respondents were aged 18–35. The majority is made of female (61%), urban residents (60%), and higher education graduates (54.5%).Approximately 50% of participants reported recurring symptoms after consuming specific foods, yet only 22% had received a formal medical diagnosis. The most common complaints were abdominal bloating (53%), gastrointestinal discomfort (26%), and fatigue (26%). Despite the frequency of symptoms, only 24% of respondents had identified specific trigger foods, and structured self-management strategies—such as food diaries or elimination diets—were rarely applied. Engagement with healthcare professionals was notably low, with just 11% of individuals having consulted a dietitian or gastroenterologist. Furthermore, 44% rated their knowledge of food intolerance as low or very low. Lactose intolerance emerged as the most frequently suspected condition, followed by non-celiac gluten sensitivity and sensitivity to food additives. These findings point to a disconnect between symptom burden and clinical response. They underscore the urgent need for improved public education, clearer diagnostic protocols, and increased involvement of nutrition professionals in addressing food intolerance. The results provide a baseline for shaping future health policy and dietary guidance in Albania.

Keywords: Food intolerance; Gastrointestinal symptoms; Albania; Public health; Nutrition behavior; Lactose intolerance; Gluten sensitivity; Health literacy; Self-care strategies.

INNOVATIVE DEVELOPMENT OF A DIETETIC SPREAD: HARNESSING THE NUTRITIONAL POWER OF SESAME SEEDS AND OIL

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ABSTRACT

This study is part of a broader initiative aimed at the valorization of sesame (Sesamum indicum L.), an oilseed recognized for its exceptional nutritional profile. The primary objective was to develop two organic sesame-based spreads, branded "Nutrisésame" by emphasizing the physicochemical and functional properties of the raw material. An in-depth analysis was first conducted on the composition of the sesame seeds used. The results revealed notable contents of moisture (3.59%), total sugars (11.39%), oil (60.69%), protein (22.48%), fiber (11.64%), and ash (1.85%). Furthermore, the assessment of secondary metabolites demonstrated significant concentrations of polyphenols (5.305 mg GAE/g DM), flavonoids (0.206 mg QE/g DM), and tannins (0.017 mg/g DM), suggesting a high antioxidant potential. Based on these findings, two formulations were developed: a classic sesame spread and a chocolate-flavored variant. Both products were formulated without palm oil and were instead enriched with sesame oil, thereby preserving the nutritional quality and aligning with health and clean-label standards. Physicochemical analyses of the Nutrisésame products revealed moisture contents of 2.24% and 1.83%, respectively; low total sugar levels (3.54% and 7.13%); high protein levels (18.31% and 17.81%); and significant fat contents (49.75% and 50.84%). Additionally, both spreads exhibited a slightly neutral pH (ranging from 6.96 to 7.16), densities of 1.13 and 1.16, acidities of 0.07 and 0.11, and Brix values of 1.49 and 1.50, respectively. Sensory evaluation showed good overall acceptability for both formulations, with a slight preference for the chocolate variant due to its improved texture, ease of spreading, and pleasant flavor profile. In conclusion, the study highlights the technological, nutritional, and sensory potential of sesame as a primary ingredient in the development of healthy, natural, and innovative spreadable products. These results offer promising perspectives for the sustainable and valorization of sesame in the agri-food sector.

Keywords: spread, sesame, formulation, physicochemical analysis, sensory evaluation.

EVALUATION OF THE QUALITY AND POTENTIAL FOR RECOVERY OF THE POT OF ALE – A BY-PRODUCT RESULTING FROM THE WHISKY PRODUCTION PROCESS

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ABSTRACT

Whiskey belongs to the category of spirits made from cereals, being one of the more widely consumed distilled alcoholic beverages globally. The process of producing whiskey can be divided into six main stages: grinding, maching, filtering, fermentation, distillation and maturation. A large number of by-products are generated durring the whisky distillation process, like spent grain, pot ale, or spent lees. Pot ale is a light brownish turbid liquid with a pH of less than 4 and a high concentration of particulates and organic components. About 10 L of pot ale can be obtained for each liter of whiskey produced. Along with other substances including polyphenols, phosphorus, and sulfur, the main ingredients of pot ale include water, complete (but dead) yeast cells, yeast cellular remnants (such as cell wall material), soluble protein, and carbohydrates. Because of the high levels of chemical oxygen demand (COD), biochemical oxygen demand (BOD), phosphorus, ammonia, and copper, pot ale poses serious environmental concerns. Anaerobic digestion, spreading on land as fertilizer, obtaining pot ale syrup, and direct release into the wastewater system are some of the current methods for disposing of or valorizing pot ale. All of these treatment or disposal techniques do, however, have drawbacks. Pot ale and wasted lees contain Cu(II) ions, which are the result of the copper's slow dissolution from the distillation stills. In order to minimize the environmental impact once pot ale is treated and released into watercourses, its composition must be examined. Pot ale is an organic turbid liquid residue that is exceedingly complicated, caramelized, and burdensome. It has been used as cattle feed, but there is urgent demand for development of effective treatment methods for pot ale from whisky distilleries. Treatment methods for pot ale reutilization are:
Anaerobic digestion using up flow anaerobic sludge blanket reactors (for reducing waste volume and producing methane-rich biogas) Evaporation/concentration for obtaining pot ale syrup that can be used as animal feed Membrane filtration for recovery of valuable components Chemical treatment for pH adjustment or precipitation of solids Utilization as organic fertilizer Methods for protein and yeast recovery Integrated biorefinery approaches (digestion, protein extraction, and fertilizer production. By separating these bioactive substances from whisky by-products, significant health advantages and enhanced environmental sustainability could result, promoting a more circular and sustainable economy. A significant amount of protein that is currently underutilized is included in pot ale. To fully understand the nutritional qualities of the pot ale, more research is required.

Keywords: pot ale, by-products, whisky, valorization

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INNOVATIVE USES OF DEPROTEINIZED WHEY IN FUNCTIONAL BEVERAGE PRODUCTION

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ABSTRACT:

Globally, dairy production is expanding, particularly due to cheese production, where up to 90% of milk becomes whey – a by-product. The economic and environmental implications of whey disposal are becoming increasingly critical as dairy production continues to grow, especially in regions such as Europe, which produced almost 148 million tonnes of milk in 2024, half of which is used to make cheese. Only 50% of sweet whey is currently processed for human consumption, although whey has a composition rich in proteins, lactose and minerals, with nutritional and functional benefits, including high-value bioactive proteins and favourable technological properties. A significant portion is frequently discharged with wash water into wastewater treatment systems, a practice that poses environmental risks, such as soil degradation and damage to aquatic ecosystems due to oxygen depletion in water bodies. One way to capitalize on this particularly valuable by-product is the production of whey beverages, both unfermented and fermented. In the last decade, obtaining whey beverages has been an innovative method of using whey for human consumption. These whey beverages can be enriched with nutraceutical, probiotic and prebiotic components, can be combined with fruit juices or vegetable juices, with plant extracts, etc. The paper proposes the valorisation of whey, resulting from the manufacture of curd or ricotta-type cheeses, also called "secondary cheese whey" (SCW), a particularly valuable by-product, in obtaining whey beverages. Deproteinized whey is still insufficiently exploited, although it has a huge potential for the development of alcoholic and non-alcoholic beverages. The paper proposes the transformation of this unused by-product into a raw material with added value, reducing the ecological impact of whey discharge and contributing to the food bioeconomy. Hybrid whey beverage formulations have been proposed, responding to the growing demand for healthy, organic and ethical foods.

Keywords: cheesemaking, environmental impact, sweet whey, valorisation

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EFFECT OF EXTRACTION RATE OF FLOUR ON CONSUMER ACCEPTANCE AND ATTITUDE TOWARDS TWO TYPES OF POCKET – FORMING BREAD

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ABSTRACT

Freshly baked bread, prepared from whole and refined wheat flours, was purchased from a local bakery in Amman / Jordan in the month of September / 2023. Sensory quality of two breads were evaluated by 46 – member trained taste panel for the quality parameters used for evaluation of bread in general and this bread type in particular including general appearance, texture crumb color and grain, crumb grain, taste and flavor, pocket formation, rolling and folding and overall acceptance. The attitude of the panelists towards the two bread types was also evaluated by asking them whether they would by each bread type. Results showed that there was no significant ($P \leq 0.05$) difference between the two bread types with regard to all quality attributes, except the mouthfeel, smoothness and softness of the texture and pocket formation where refined bread had higher scores than whole wheat bread. Whole wheat bread, on the other hand, had a higher score than refined bread with respect to rolling and folding. The panelists showed significantly more favorable attitude towards buying the whole wheat bread as compared to the refined type.

Keywords: Jordan, whole wheat bread, dietary fiber, sensory quality, consumer attitude, flat bread.

CLIMATE CHANGE AND IMPLICATIONS OF HIGH INCIDENCE OF MYCOTOXIN CONTAMINATION IN ALBANIAN MAIZE

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ABSTRACT

The world has been significantly impacted by anthropogenic activity over the past 200 years, mainly through greenhouse gas emissions, the loss of arable land, and the shrinking of forest areas, all of which raise temperatures and are closely related to climate change events. Severe weather phenomena, including intense precipitation and droughts, elevate plant stress, rendering cereals more vulnerable to fungal infections and mycotoxin contamination, hence resulting in diminished yields and economic losses. These issues encompass not only human health but also animal welfare. Climate change has been recognized as a catalyst for emerging food and feed safety challenges globally, and its anticipated influence on the prevalence of mycotoxins in food and feed is a significant worry [1]. Various climate change models forecast a temperature rise of 2–3°C in temperate regions, including Southern Europe, which modifies the distribution of numerous fungal species and genera. Aspergillus flavus, a prevalent fungus in tropical and subtropical regions, is disseminating to southern Europe. This has resulted in aflatoxin contamination of cereals and nuts. Aflatoxin production is suppressed at temperatures between 37 and 40°C. Research conducted during the past decade reveals a significant prevalence of aflatoxin contamination in maize in Albania, along with increased occurrence rates [2,3]. Prompt intervention is essential to resolve this condition [4]. Adopting effective agricultural practices will benefit farmers, and an additional deliberate approach is the application of atoxigenic Aspergillus species during crop cultivation.

Keywords: Climate change, maize, mycotoxins, aflatoxins, Albania

THE ANTIOXIDANT, ANTIMICROBIAL, AND INDUSTRIAL POTENTIAL OF OLIVE LEAF EXTRACT

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ABSTRACT

Olive leaf extract (OLE) is a product rich in polyphenols such as oleuropein and hydroxytyrosol, obtained from the leaves of Olea europaea L. The total phenolic content in the leaves (approximately 1.450 mg/100 g) is much higher than in the fruit (~110 mg/100 g). The oleuropein content varies depending on the variety, harvest season, and extraction method, but it accounts for approximately 9–14% of the dry leaf weight. The hydroxytyrosol content is approximately 11%. OLE's antioxidant effect is powerful thanks to its high phenolic compound content; it demonstrates high radical scavenging capacity in ORAC values and DPPH + genoprotective tests. It is stated in the literature that it activates the Nrf2/ARE pathway at the cellular level, thereby increasing the activity of endogenous antioxidant enzymes (e.g., catalase, superoxide dismutase). In terms of antimicrobial activity, OLE has been found to be effective against pathogens such as Staphylococcus aureus, Listeria monocytogenes, and Salmonella typhimurium, to inhibit biofilm formation, and to have potential for use as a food preservative. In clinical studies, a daily supplement of 500 mg of OLE has been shown to cause significant reductions in HbA1c and fasting insulin in individuals with type 2 diabetes; however, the studies are relatively small in scale and few in number. It has been found that 1,000 mg/day of OLE reduces systolic blood pressure by an average of 11 mmHg and diastolic blood pressure by 4–5 mmHg in individuals with hypertension. With these properties, OLE serves as a natural alternative to synthetic additives; however, for industrial use, optimization of standardization, bioavailability, and cost is necessary. Future research on nanotechnological formulations and hybrid extraction methods is expected to expand the application areas of OLE.

Keywords: Olive leaf extract, Oleuropein, Antioxidant activity, Antimicrobial effect

SENSORY ANALYSIS OF CAMEL MILK FERMENTED WITH KEFIR GRAINS

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ABSTRACT

The aim of this study was to compare the sensory acceptability of two formulations of camel milk fermented with kefir grains: one flavored with date juice, the other with sugar. A sensory test was carried out with 118 participants for each product. The results show that date-flavored kefir obtained a significantly higher mean preference (M = 6.144; SD = 1.997) than sugar-flavored kefir (M = 4.966; SD = 1.987), This confirms a better appreciation of the date-based product. These results suggest that date juice significantly improves the acceptability of camel milk kefir, probably due to its natural organoleptic qualities and sweeter, more aromatic sweetening potential.

Keywords: kefir grains , camel mlk, sensory analysis

SUNFLOWER LECITHIN: PRODUCTION PROCESS, CHEMICAL STRUCTURE, AND INDUSTRIAL APPLICATION POTENTIAL

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ABSTRACT

Lecithin is a natural surfactant composed of phospholipids, glycolipids, and triglycerides, primarily phosphatidylcholine, and has a wide range of applications in food, health, and industrial applications. While soy-based lecithin is currently widely produced, sunflower lecithin stands out as an important alternative due to its low allergenic potential and non-genetically modified status. It is produced by subjecting crude oil obtained from sunflower seeds to processes such as degumming, hydration, centrifugation, drying, and cooling. Sunflower lecithin is rich in phospholipids such as phosphatidylcholine, phosphatidylethanolamine, and phosphatidylinositol, and it is notable for its linoleic acid content of over 50%. It exhibits powerful functional properties as an emulsifier, viscosity regulator, wetting agent, and antioxidant. It is widely used in the food industry in chocolate, margarine, baked goods, emulsions, and prepared foods, and is also valued as an additive in the pharmaceutical, cosmetic, paint, textile, and feed industries. Its functionality can be enhanced through enzymatic modification (phospholipase A1, A2, C, D) and chemical processes (hydroxylation, acetylation). Thanks to its natural structure and functional properties, sunflower lecithin stands out as an important additive in terms of both food safety and sustainable production, and is expected to have broader potential for use in the future.

Keywords: Sunflower lecithin, Phospholipids, Food additive, Industrial use

THE NATURAL ANTIOXIDANT POTENTIAL OF POTATO PEEL EXTRACTS AND THEIR POTENTIAL APPLICATIONS IN FOOD

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ABSTRACT

Potato peels, which are produced in large quantities as waste in the food industry, are a rich source of phenolic compounds and attract attention with their natural antioxidant potential. This study aims to investigate the ability of potato peel extracts (PPE) to slow down lipid oxidation and extend the shelf life of food products. Studies in the literature indicate that the main components of PPE are chlorogenic acid and its derivatives, as well as flavonoids, catechin, epicatechin, and other phenolic acids in significant amounts. These compounds have been found to be effective in preventing oxidative deterioration due to their ability to scavenge free radicals, act as chain breakers, and chelate metal ions. Various extraction techniques (ultrasound-assisted, pressurized liquid extraction, acidified water/ethanol solvents) can be used to obtain phenolic compounds with high efficiency. Studies have shown that PPE, when used in different food matrices such as biscuits, oil-emulsion systems, and freshly cut fruits, increases oxidative stability, reduces color deterioration and softening, and offers a safe and effective alternative to synthetic antioxidants. However, toxicological limitations such as glycoalkaloid content and extraction costs remain areas that require optimization for industrial applications. In conclusion, PPE offers significant opportunities in terms of waste management and sustainable food additives, and future studies should focus on green extraction methods and toxicological safety.

Keywords: Potato peel extract, Natural antioxidants, Lipid oxidation, Sustainable food production

COMPOSITION OF THE PHENOLIC PROFILE OF OLIVE OIL, ITS CONTRIBUTION TO OXIDATIVE STABILITY, AND ITS FUNCTIONAL IMPORTANCE

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ABSTRACT

Extra virgin olive oil (EVOO), unlike other vegetable oils, stands out for its rich phenolic compound content, and these compounds are among the primary factors determining the oil's oxidative stability, sensory properties, and health benefits. The phenolic fraction consists of various subgroups, primarily phenolic acids (caffeic, vanillic, protocatechuic acid, etc.), phenolic alcohols (hydroxytyrosol, tyrosol), flavonoids (luteolin, apigenin), lignans (pinoresinol derivatives), and secoiridoids (oleuropein and ligstroside derivatives). Oleuropein and its derivatives, in particular, are the primary compounds responsible for EVOO's strong antioxidant capacity, preventing free radical formation by interrupting lipid oxidation chain reactions. The presence of phenolic compounds also shapes the typical sensory properties of EVOO, such as bitterness, pungency, and astringency. The concentration of these compounds is influenced by many factors, including olive variety, growing conditions, harvest maturity, and extraction technologies. While mechanical extraction techniques play a critical role in the transfer of phenolic compounds to the oil phase, the use of high temperatures and water in three-phase centrifuge systems results in phenolic losses. The amount of phenolics found in EVOO generally ranges from 50–940 mg/kg; however, only 1–2% of the phenols in olive fruit pass into the oil phase, while the remainder is lost in wastewater and olive pomace phases. Phenolic compounds are not only powerful antioxidants that extend shelf life but also exhibit anti-inflammatory, anti-atherogenic, and chemoprotective properties. For this reason, the phenolic profile of EVOO is accepted as a quality indicator, and its use as a functional ingredient in the food and pharmaceutical industries is rapidly gaining importance.

Keywords: Extra virgin olive oil, Phenolic compounds, Antioxidant activity, Functional food

THE INDONESIAN ULVA LACTUCA GREEN SEAWEED: QUALITY AND PRODUCT DEVELOPMENT POTENCY AS FOOD SEASONINGS

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ABSTRACT

In recent years, the increasing demand for natural and functional food ingredients has led to increased research for the exploration of seaweed as a sustainable alternative food. In this study, Ulva lactuca green seaweed was investigated for its potential in seaweed-based seasonings. This study successfully developed a seasoning product from U. lactuca (sea lettuce) collected from Lombok, Indonesia. U. lactuca exhibited a favourable nutritional profile with high protein (8.67%), dietary fibre (20.78%), and umami-enhancing amino acids, particularly L-glutamic acid (53,109.10 mg/kg). Phytochemical screening confirmed the presence of beneficial compounds such as flavonoids, saponins, and phenolics, enhancing antioxidant potential. Safety analyses showed that heavy metal levels (Hg, Pb, As, Cd) and microbiological counts (TPC, E. coli, Salmonella spp., Staphylococcus aureus) met food safety standards. Shelf-life studies using Accelerated Shelf-Life Testing (ASLT) demonstrated extended stability of up to 9.23 months when packaged with Metallocene film. Color analysis revealed enhanced pigment retention, contributing to visual appeal, while sensory evaluations showed strong consumer preference for application on potato-based snacks. It was demonstrated that the development of U. lactuca is promising as a seaweed-based seasoning that is safe, healthy, and supports sustainability.

Keywords: Ulva lactuca, green seaweed, seaweed-based seasoning, functional food, food safety, shelf life

STUDY OF THE VALORIZATION OF COCOA SHELLS IN FOOD INDUSTRY

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ABSTRACT

The aim of this work is to study the possibility of using cocoa shells in biscuit making; a shell is a by-product of cocoa butter extraction. We used cocoa shell powder in three different recipes: cookies, biscuits, and mini-cakes. In the first recipe, we substituted cocoa powder for cocoa, while in the other two recipes; we used it instead of flour. We carried out physicochemical and microbiological analyses on our raw material as well as on the three formulated recipes (Cookies with 2% shell powder, mini-cake with 14% shell powder, biscuit with 20% shell powder). The results showed that the shell powder had a good physicochemical quality as well as our three products, with a fat content of 19.24, 18.14% and 28.43%, a fiber content of 6.33, 9.08 and 8.54%, a sugar content of 50.25 and 50.75%, a nitrogenous matter content of 10.49, 10.49 and 16.43%, a low mineral matter content with 1.69, 2.69 and 2.90%, a high dry matter rate with 97.46, 65.75 and 93.28, thus, a pH of 6.97, 6.23, and 5.94. The microbiological results showed that our products are of good microbiological quality. The organoleptic test showed that tasters appreciated two out of three products: cookies and mini-cakes. The result of this study showed that cocoa shells, previously considered food waste, but it could be used in the food industry.

Keywords: Valorization, cocoa shell powder, biscuit making, physicochemical analysis, microbiological analysis, organoleptic analysis.

STUDY OF THE QUALITY OF ALGERIAN OLIVE OIL OF THE CHEMLAL VARIETY

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ABSTRACT

Olive oil is a good source of dietary fat in the Mediterranean diet. It is obtained from the fruit of the olive tree (Olea europaea L) by mechanical or other means under specific thermal conditions (Criado et al., 2004). In Algeria, the olive tree has approximately 32 million trees (Bensemmane, 2009) spread over an area of approximately 328,884 hectares (FAOSTAT, 2013), or 34.09% of the national agricultural orchard. Algerian olive growing is mainly found in the northern part of the country, where most orchards (80%) are located in mountainous areas. The quality of olive oil depends on several factors such as maturity, extraction method, soil, climate, variety and also storage conditions. The evaluation of the quality of olive oil involves a series of important physicochemical parameters including acidity, peroxide index, saponification index are part of (Gharbi et al., 2015). The quality of olive oil is also characterized by its particular composition in saturated and unsaturated fatty acids, as well as its minor compounds which belong to the unsaponifiable fraction (tocopherols, chlorophylls, etc.) (Mezghache et al., 2010). Olive oil is called green gold because of the beneficial and nutritional effects it presents such as preventing aging, strengthening the immune system, and preventing cardiovascular diseases (Ghedira, 2008). This work was carried out with the aim of carrying out a study on the physicochemical characteristics of olive oil from the Bouira region, as well as on its fatty acid profile by gas chromatography. The results obtained from the analyzes carried out show that the values of refractive index, saponification index and specific extinction at 232 nm comply with the limits set by the Codex Alimentarius (2017) for extra virgin olive oil. It should be noted that the sample studied presented a K270 coefficient and a relative density slightly higher than the limits established by the Codex Alimentarius (2017). In addition, an acidity of around 0.64 and p a peroxide index of 14 which are an excellent indicator of good quality of olive oil. The results of the present study also show that the fatty acid composition complies with the standards; Oleic acid is the dominant fatty acid in the oil, with a proportion greater than 66% followed by palmitic and linoleic acid. At the end of this study, we note that the olive oil analyzed has a high content of oleic acid as well as a richness in short-chain fatty acids, which allows it to be classified among extra virgin olive oils.

Keywords: Olive oil Chemlal variety, quality, characterization, physicochemical indices, fatty acid composition.

FORMULATION OF FUNCTIONAL SPARKLING DRINKS WITH NATURAL FLAVORS ENRICHED BY VINEGAR

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ABSTRACT

In recent years, increasing consumer demand for healthier beverage options has driven the development of innovative functional drinks. This study aimed to develop a novel series of functional beverages combining apple vinegar with natural flavors, fortified with B6, B12, and biotin vitamins. The new products offer a palatable alternative to conventional sugary carbonated drinks. The main focus is incorporating apple vinegar, known for its bioactive component, acetic acid, which has been associated with potential health benefits, including glycemic control, postprandial blood sugar regulation, digestive support, and antioxidant activity. The formulation targeted optimal bioactive stability, delivering 300 mg acetic acid and low caloric value (30-38 kcal) per serving. Three flavor combinations are guava & kiwi, lemon & melon, and coconut & pineapple, were developed using 3% apple vinegar, stevia, and fruit juice concentrates, targeting a minimum fruit content of 25 %. These combinations were strategically selected in line with current beverage trends. The Guava & Kiwi reflects the 2025 trend of exotic and tropical fruit exploration, appealing to consumers seeking novel and adventurous taste experiences. The Lemon & Melon pairing aligns with the nostalgic beverage trend, delivering a refreshing yet familiar flavor rooted in traditional seasonal fruits. The coconut & pineapple combination the growing in interest in functional and well-oriented beverages, thanks to the natural hydrating and digestive-supporting properties of these tropical fruits and the popularity of non-alcoholic cocktail-inspired drinks. However, sensory evaluations conducted with trained panelists (n=25) and consumers identified Lemon & Melon as the preferred flavor profile, supported by favorable taste, aroma, and appearance scores. Analysis confirmed acceptable acidity (0.48–0.82% as citric acid), pH (3.26–3.5), and Brix levels, aligning with consumer expectations for refreshing sparkling beverages. This project bridges a critical gap in the functional beverage market by offering a shelf-stable, health-promoting alternative to sugar-laden carbonated drinks, supported by scientific and sensory evidence.

Keywords: Functional beverages, Vinegar, Natural Flavors, Sensory Analysis

DISTINCT CRYSTALLIZATION SIGNATURES OF HIGH OLEIC SUNFLOWER, PALM SUPER OLEIN, AND REFINED POMACE OILS REVEALED BY DSC

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ABSTRACT

High Oleic Sunflower Oil (HOSO), Palm Super Olein (PSO), and Refined Pomace Oil (RPO) are widely used in the food industry for frying applications, snack development, and functional food formulations, yet their crystallization behavior has not been comprehensively compared. In this study, the thermal properties of these three oils were evaluated using Differential Scanning Calorimetry (DSC) within the temperature range of +30 °C to -80 °C. Cooling thermograms revealed distinct crystallization profiles that reflected the triacylglycerol composition of each oil. HOSO exhibited two exothermic peaks with onset temperatures (Ton) at -18.09 °C and -40.49 °C, with corresponding enthalpy changes (ΔH) of 0.72 and 47.28 J/g, respectively, indicating a wide crystallization range driven by its high oleic acid content and unsaturated triacylglycerol species. RPO presented a more complex pattern with three peaks at -12.72 °C (ΔH = 2.43 J/g), -30.77 °C (ΔH = 0.39 J/g), and -45.51 °C (ΔH = 11.76 J/g), reflecting its mixed triacylglycerol composition that shares similarities with olive-derived oils but distributes crystallization energy across multiple transitions. PSO, in contrast, showed a strong crystallization event at a higher temperature, with Ton at 0.08 °C (ΔH = 23.64 J/g), along with two additional peaks at -22.24 °C (ΔH = 1.27 J/g) and -54.98 °C (ΔH = 1.50 J/g). The high enthalpy recorded at the near-zero temperature event highlights the influence of palmitic acid–rich triacylglycerols, conferring sharper crystallization and enhanced thermal stability compared with the other oils. The results underline that DSC can provide clear thermal fingerprints for differentiating HOSO, PSO, and RPO, with statistically significant differences observed in Ton and ΔH values among the oils. These findings demonstrate that crystallization behavior is not only determined by overall saturation level but also by the distribution of fatty acids within triacylglycerols, which governs nucleation and crystal growth dynamics. From an applied standpoint, we can utilize such DSC data to verify authenticity, detect adulteration, and classify commercial edible oils. Furthermore, they can inform industrial research and development, particularly in optimizing oil blends for frying performance, extending the shelf life of snacks, and designing functional foods. On a broader level, the characterization of crystallization properties contributes to the establishment of food standards, authenticity policies, and traceability frameworks that support consumer confidence and regulatory compliance in the edible oil sector. By providing comparative reference data for three commercially relevant oils, this study reinforces the value of DSC analysis in bridging fundamental lipid science with practical applications in food technology.

Keywords: Palm Super Olein Oil, High Oleic Sunflower Oil, Refined Olive Pomace Oil, DSC, Cooling Thermograms, Crystallization

PREVENTIVE EFFECT OF KEFIR-FERMENTED COW'S MILK ON INTESTINAL INFLAMMATION INDUCED BY SODIUM DEXTRAN SULFATE IN BALB /C MICE

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ABSTRACT

Inflammatory bowel disease is a major public health problem. For several years a kind of milk fermented by Kefir grains, called «Kefir» is known for its many virtues especially against intestinal inflammatory diseases. The objective of this work is to verify the protective effect of Kefir against intestinal inflammation induced in Balb/c mice by Sodium Dextran Sulfate (SDS). Male Balb/c mice, 6 weeks old and weighing about 25g, are divided into 5 groups. Group 1 consumed raw cow's milk fermented by kefir grain for 5 days then 5 days of SDS, the second group consumed boiled cow's milk fermented by kefir grain for 5 days then 5 days of SDS and the third group consumed sterilized milk fermented by kefir grain for 5 days then 5 days of SDS. The negative control group consumed a standard diet and for the positive control group consumed SDS for 5 days. A histological study was carried out using the standard method. Our results showed an onset of atrophy with the appearance of a lymphoid follicle at the jejunum of the positive control mice. A regular appearance with formation of numerous glove finger projections for the negative control mice. Kefir gave a better result in mice who consumed raw milk-based Kefir compared to other sterilized and boiled milks, where long, fine villi are observed and very well preserved by Kefir in mice that consumed raw milk compared to other groups. **In conclusion**, Kefir appears to have demonstrated ability to reduce the severity of SDS-induced moderate colitis in male Balb/C mice.

Keywords: Intestinal inflammation, Kefir grains, SDS, Fermented milk, Colic

UTILIZATION AREAS OF VINEGAR AND ITS IMPACT ON HUMAN HEALTH

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ABSTRACT

Vinegar has played a significant role in human nutrition and food preservation throughout history and is a valuable food product produced through a two-stage fermentation process. Derived from the French term “vin aigre” (sour wine), vinegar can be produced from a variety of raw materials containing fermentable sugars. The production process consists of two main fermentation stages. In the first stage, sugars are converted into ethanol by yeasts under anaerobic conditions, followed by the aerobic oxidation of ethanol into acetic acid by acetic acid bacteria. The quality of vinegar is directly dependent on the chemical properties of the raw material, such as acidity and sugar content. Traditional vinegars, produced through prolonged fermentation, contain higher levels of bioactive compounds compared to those produced industrially. In particular, traditional vinegars are richer in phenolic compounds, organic acids, and probiotic microorganisms, offering significant nutritional and health advantages. Vinegar is a versatile product widely used both in culinary practices and industrial applications. In the food sector, it functions as a flavor enhancer and balancer in salads, soups, meat, and vegetable dishes, while also serving as an acidity regulator. Owing to its antimicrobial properties, vinegar extends the shelf life of foods and is also applied in the disinfection of kitchen surfaces and vegetables. In agriculture, it plays an important role in sustainable practices by supporting plant growth and providing natural protection against pests. Furthermore, some studies indicate that vinegar exhibits therapeutic potential by acting against certain parasites and microorganisms. These broad applications highlight vinegar not only as a food product but also as a wide-spectrum biological agent. As a functional food enriched with organic acids, phenolic compounds, and antioxidants, vinegar exerts important biological effects on health. Studies have shown that it helps regulate blood glucose levels, contributes to diabetes management, improves lipid metabolism, lowers cholesterol, and reduces cardiovascular risk. In addition, thanks to its antioxidant and anticarcinogenic compounds, vinegar reduces oxidative stress, thereby preventing cellular damage and strengthening the immune system. Research also indicates that vinegar positively affects digestive health by modulating gut microbiota and promoting the growth of beneficial bacteria. More recently, vinegars processed with ultrasound technology have been observed to exhibit enhanced antioxidant and anticarcinogenic properties. Taken together, these findings suggest that vinegar holds significant potential for the prevention of chronic diseases and the promotion of overall health. This study aims to provide a comprehensive evaluation of the production process of vinegar, its various applications, and its effects on health. Scientific findings related to its nutritional and functional properties are discussed, highlighting vinegar as more than a food product—positioning it as a functional ingredient with notable health benefits.

Keywords: Vinegar, fermentation, antimicrobial, antioxidant, health

EVALUATION OF RAW COW'S MILK QUALITY FROM MULTIPLE PRODUCERS IN EASTERN ALGERIA: PHYSICI-CHEMICAL INSIGHTS

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ABSTRACT

The aim of this study is to assess the physico-chemical quality of raw cow’s milk—including pH, density, acidity, fat content, total dry extract, and the presence of starch and antibiotics delivered to the Edough dairy (Annaba) from four different producers and distributed across various cities in Eastern Algeria. A total of 20 milk samples were collected for analytical purposes from four different producers in the Annaba region (5 samples from each producer). The analysis revealed that the raw milk meets acceptable physico-chemical quality standards. No significant differences were observed among the samples, except for pH values. Most of the parameters analyzed complied with the required standards, ensuring an optimal quality of the final product. However, the fat content was found to be slightly below the normative values.

Keywords: Raw cow's milk - physico-chemical quality- Milk composition- Eastern Algeria

VALORIZATION OF FISH PROCESSING BY-PRODUCTS FOR THE PRODUCTION OF HIGH-VALUE PRODUCTS

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ABSTRACT

Fishing by-products play a key role in supporting circular economy initiatives and promoting environmental sustainability. These materials offer significant potential for the extraction of bioactive and industrially valuable compounds. This study aimed to valorize by-products from fish processing in Algeria through a two-phase approach. The first phase involved a national survey of fish processing units to assess the quantity and quality of fish waste. Results indicated that over 66% of processing activities focus on canned tuna and sardines, and 64% of units generate by-products. The second phase focused on developing high value-added products from cannery waste. Between 55% and 60% of by-products from sardine, tilapia, carp, and catfish including heads, bones, viscera, skins, and cooked residues were used to produce fishmeal, collagen, gelatin, and protein hydrolysates. Biochemical analyses revealed high protein content in fishmeal, 48.42% for catfish and 45.88% for sardines. Sardine meal also exhibited a higher fat content (15.45%). Collagen and gelatin extracted from catfish skin showed protein levels of 89.09% and 77.4%, respectively. Infrared spectroscopy confirmed their structural similarity to reference materials and literature data. Moreover, protein hydrolysates derived from fish heads exhibited notable antimicrobial and antifungal activity against Escherichia coli and Mucor ramannianus. In conclusion, Algerian fish processing by-products represent a promising raw material for the development of functional compounds, with potential applications in the pharmaceutical and food industries.

Keywords: fish byproducts, fish meal, bioactive compounds, circular economy

EXTRACTION, CHARACTERIZATION AND ENCAPSULATION OF BIOACTIVE COMPOUNDS FROM ALGERIAN OLIVE OIL PROCESSING BY-PRODUCTS

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ABSTRACT

This study valorizes olive mill wastewater (OMW), a by-product of olive oil production, as a rich source of phenolic compounds with demonstrated biological activities. Using ultrasound-assisted extraction, a high total phenolic content of 121.33 mg GAE/g extract was obtained. Antioxidant activity assessed via the DPPH method revealed an IC_{50} of 43 µg/mL, confirming strong radical scavenging potential compared to ascorbic acid (IC_{50} = 25 µg/mL). The extract also exhibited notable antibacterial activity, particularly against Staphylococcus aureus , Escherichia coli, and Pseudomonas aeruginosa, with performance comparable to standard antibiotics. Toxicity studies in mice (oral administration at doses of 300 and 2000 mg/kg) showed no signs of toxicity or behavioral changes, confirming its safety profile. For improved stability and food integration, the phenolic-rich extract was encapsulated using an alginate–chitosan matrix. FTIR and TGA analyses confirmed chemical interactions and enhanced thermal stability of the microcapsules. When incorporated into fermented milk, these capsules improved pH and acidity stability over 30 days , while enriching the product with bioactives.
This work demonstrates a sustainable strategy for recovering bioactive compounds from OMW and applying them in functional foods, supporting circular bioeconomy and environmental impact reduction.

Keywords: Olive mill wastewater, phenolic compounds, antioxidant activity, antibacterial properties, microencapsulation

FODMAPS FOODS: SURVEY OF SUBJECTS SUFFERING FROM DIGESTIVE DISORDERS BEFORE AND DURING RAMADAN.

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ABSTRACT

The objective of the study. FODMAPs (fermentable, oligosaccharides, disaccharides, monosaccharides, and polyols) are sugars with the common characteristic of being poorly absorbed by the small intestine, highly fermentable.The interest of this study is to highlight the FODMAPs foods most consumed in the dietary habits of Oranese city dwellers and to identify the main digestive disorders and in particular, the irritable bowel syndrome (IBS) before and during Ramadan**.** Population and methods**.** This is a descriptive study, carried out among the inhabitants of Oran between March and May 2022. Recruitment was carried out randomly without residential stratification (rural or urban areas; degree of urbanization of the neighbourhood of residence...) and on the basis of quotas (age, sex, socio-professional category). The survey included 38 subjects, (Women (F)/Men (M): sex ratio F/H 30/8 before Ramadan and 28/10 during Ramadan, all ages combined. The objectives of the study were explained to them and their consent was obtained. An adapted questionnaire was distributed to them concerning health status, symptoms of digestive disorders, physical activity, dietary habits and frequency of Fodmaps foods consumed by the subjects surveyed. Results. Before and during Ramadan, the results show that the prevalence of overweight is 29% and 32% respectively, obesity is 11% and 8% and normopunderal is 55% and 58%. Waist/hip circumference (WC/TH)

Keywords: FODMAPs, IBS, digestive disorders, physical activity, dietary habits, chronic disease, dietary mode.

SUSTAINABLE AGRICULTURAL SUPPLY CHAINS AND GREEN LOGISTICS: A TFN-BASED LOPCOW-RAM MULTI-CRITERIA EVALUATION FRAMEWORK

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ABSTRACT

The transition toward sustainable agricultural supply chains requires the adoption of innovative and environmentally friendly logistics solutions that balance cost efficiency, operational performance, and ecological responsibility. In this study, we develop a comprehensive decision-making framework to evaluate and prioritize green logistics alternatives within sustainable agricultural product supply chains. Seven alternatives, including multimodal transport, electric vehicle-based distribution, renewable energy-powered cold chain systems, and reverse logistics, are examined against twelve realistic criteria covering cost, environmental, technological, and operational dimensions. To address uncertainty and imprecision in expert judgments, Triangular Fuzzy Numbers (TFN) are employed. The LOPCOW method is first applied to determine the relative importance of the criteria objectively, while the RAM method is then utilized to rank the logistics alternatives based on their aggregated performance. An expert panel of four specialists with diverse academic and professional backgrounds provided evaluations to ensure reliability and comprehensiveness. The findings highlight the potential of low-emission, technology-integrated solutions as key enablers of sustainability in agricultural logistics. This research not only contributes to the literature by integrating TFN-based LOPCOW and RAM in a novel context but also offers valuable managerial insights for policymakers, logistics providers, and supply chain stakeholders in promoting greener and more resilient agricultural systems.

Keywords: Sustainable agriculture, Agricultural supply chains, Green logistics, Multi-criteria decision-making, LOPCOW, RAM, Triangular fuzzy numbers, Logistics alternatives, Sustainability evaluation

MULTI-CRITERIA EVALUATION OF COLD CHAIN TECHNOLOGIES FOR PERISHABLE FOOD PRESERVATION: BALANCING QUALITY, SAFETY, AND SUSTAINABILITY

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ABSTRACT

In the logistics operations of international cold supply chains, protecting perishable and sensitive food products is vital for product quality, safety, and sustainability. This study evaluated and prioritized seven different cold chain technologies in the context of ten criteria with the integrated decision-making approach based on p,q-Quasirung Orthopair Fuzzy Set (p,q-ROFS). While the p,q-ROFS-based CRISUS method was used to determine the criterion weights, the p,q-ROFS-RAWEC method was preferred to evaluate the alternatives of technology. According to the results of the analysis, "Preserving food quality" was the most influential criterion. At the same time, IoT Sensor-Based Temperature and Humidity Monitoring technology is the top priority option among the alternatives due to its best preservation of quality, minimizing spoilage, and contributing to sustainable cold chain operations. The proposed p,q-ROFS-based CRISUS & RAWEC integrated model represents a structured decision-making procedure that balances quality, cost, and sustainability for practitioners in the food and cold chain industries to optimize food and cold chain logistics.

Keywords: Food industry, Agriculture cold supply chain, p,q-Quasirung Orthopair Fuzzy Set, CRISUS, RAWEC, MCDM

STUDY OF A MIXTURE OF OLIVE LEAF AND HIBISCUS PETAL EXTRACTS: EXTRACTION PROCESS CHARACTERIZATION AND BIOLOGICAL ACTIVITIES

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ABSTRACT

This work investigated aqueous extracts from olive leaves (Olea europaea) and hibiscus petals (Hibiscus sabdariffa), focusing on their chemical characterization and antioxidant potential. Extracts were prepared using ultrasound-assisted extraction and evaluated for physicochemical parameters (pH, titratable acidity), total polyphenol content, and radical scavenging capacity. The polyphenol content reached 313 mg GAE/g DM in olive leaf extract, 357 mg GAE/g DM in hibiscus extract, and 392 mg GAE/g DM in their mixture. HPLC analysis identified key bioactive compounds, including oleuropein, hydroxytyrosol, and anthocyanins. Antioxidant activity assessed by the DPPH assay demonstrated inhibition rates of 78.3% for olive leaf extract, 85.6% for hibiscus extract, and 89.1% for the combined extract at 1000 µg/mL. Acute oral toxicity testing in NMRI mice (2000 mg/kg) revealed no adverse effects, confirming the extracts' safety. Overall, these results suggest that the combined extract is a promising natural source of antioxidants with potential applications in the development of functional dairy products.

Keywords: Olive leaf extract, Hibiscus extract, Polyphenols, Antioxidant activity.

BIOACTIVE COMPOSITION AND ANTIOXYDANT PROPERTIES OF METHANOLIC EXTRACT FROM COFFEA CANEPHORA GREEN BEANS

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ABSTRACT

Coffee is one of the most consumed beverages worldwide and represents an important source of bioactive compounds, particularly polyphenols, which are known for their antioxidant properties. This study investigated the phytochemical profile and the in vitro antioxidant activity of the methanolic extract of green beans of Coffea canephora. Spectrophotometric analysis revealed a polyphenol content of 93.18 µg GAE/mg and a flavonoid content of 1.84 µg QE/mg, while the DPPH assay showed moderate antioxidant activity with an IC_{50} value of 88.63 µg/mL. These findings highlight the bioactive potential of green beans of Coffea canephora as a natural source of antioxidants and suggest the need for further studies to better characterize their active compounds and assess their potential valorization in nutraceutical and food applications.Coffee is one of the most consumed beverages worldwide and represents an important source of bioactive compounds, particularly polyphenols, which are known for their antioxidant properties. This study investigated the phytochemical profile and the in vitro antioxidant activity of the methanolic extract of green beans of Coffea canephora. Spectrophotometric analysis revealed a polyphenol content of 93.18 µg GAE/mg and a flavonoid content of 1.84 µg QE/mg, while the DPPH assay showed moderate antioxidant activity with an IC_{50} value of 88.63 µg/mL. These findings highlight the bioactive potential of green beans of Coffea canephora as a natural source of antioxidants and suggest the need for further studies to better characterize their active compounds and assess their potential valorization in nutraceutical and food applications.

Keywords: Green beans , methanolic extract , polyphenols , antioxidant activity

RHEOLOGICAL AND SENSORY DESCRIPTION OF TRADITIONAL ALGERIAN CHEESE "ADGHESS"

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ABSTRACT

Milk and dairy products play an important role in our daily diet, and constitute our main source of calcium and protein of animal origin. In Algeria, milk is traditionally transformed into several forms allowing its conservation, notably into fermented products, among which we cite cheeses, which have been the pride of the culinary tradition for a long time. It is clear that these products played a major role in feeding rural communities. Traditional technology plays an important role in the artisanal processing of fresh milk. However, traditional Algerian varieties have not been studied exhaustively and are characterized by traditional production on a family scale (Derouiche et al., 2017). These are products which are not or are poorly known outside their geographical area of origin, some have probably disappeared or are in the process of disappearing. With the exception of certain cheeses such as Klila, Djben and currently Bouhazza and Michouna, the others have not been the subject of study. “Adghess” cheese, cited by a survey carried out in Oum El Bouaghi; its manufacturing diagram deserves to be studied, it is a spontaneously draining and soft farm cheese. It is made from goat, sheep and cow milk. Its preparation is based on the addition of egg yolk with the aim of improving its organoleptic quality, notably the texture of this product according to the results of the investigation;. To this end, the objective of our work aims to study the rheological and sensory description of “Adghess” cheese.

Keywords: Adghess, traditional cheese, milk, rheological characterization, sensory evaluation

HOW CLIMATE CHANGE AFFECTS FOOD SYSTEMS

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ABSTRACT

A serious worldwide danger to food systems, climate change affects not just primary production but also post-harvest processing, preservation, and food safety. The biochemical makeup, microbiological stability, and technological processing features of seafood, especially shellfish and finfish, are directly impacted by ocean acidification, rising seawater temperatures, and variations in water salinity and dissolved oxygen in aquatic food chains. These developments have a major impact on seafood processing technology, posing challenges to current practices and necessitating the creation and uptake of novel, climate-resilient strategies. Accelerated spoilage food rotting is one of the most significant effects of climate-induced stress on food systems. Across a variety of food matrices, lipid oxidation, protein denaturation, variations in water activity, and microbial growth are all accelerated by rising ambient temperatures and changing environmental circumstances. These procedures lead to accelerated degradation of quality, heightened production of dangerous substances including biogenic amines, reduced shelf life, and higher threats to food safety. As a result, it has become increasingly challenging to preserve foods' nutritional content and microbiological safety using only traditional preservation methods. By encouraging microbial growth, oxidation, and enzymatic deterioration, climate change increases the hazards of seafood spoiling and compromising safety. Adaptive preservation techniques are used by contemporary processing technology to overcome these obstacles. Cold plasma, High Hydrostatic Pressure (HHP), and Modified Atmosphere Packaging (MAP) provide efficient non-thermal microbial control without sacrificing product quality. Furthermore, product stability is strengthened by bio-based coatings that contain natural antimicrobials and antioxidants. Beyond preservation, low-carbon processing, digital traceability, cold chain optimization, and the valorization of marine by-products improve the sustainability and resilience of food systems in the face of climate change. This study examines how oxidative and enzymatic deterioration, microbiological hazards, and spoiling are all directly impacted by climate change in seafood processing systems. The safety and quality of products are compromised, and shelf life is shortened by rising temperatures and shifting marine conditions. To maintain resilient food systems under changing climatic scenarios, the seafood industry must respond by implementing sustainable processing methods and cutting-edge preservation technology.

Keywords: Climate change, Food systems, Food safety, Shelf life, Preservation strategies

BIOGENIC AMINES IN FOODS: SIGNIFICANCE, AND TOXICOLOGICAL RISKS

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ABSTRACT

Low-molecular-weight nitrogenous substances known as "biogenic amines" are mostly produced by microorganisms decarboxylating free amino acids. Because of their high protein content and water activity, they are found naturally in a wide range of meals, especially in fermented foods like cheese and fish and fisheries products. While putrescine and cadaverine are not directly poisonous, they amplify the negative effects of histamine and serve as markers of microbial contamination. Histamine and tyramine are the most important of these because of their toxicological relevance. Environmental and technological factors, such as temperature, pH, raw material quality, and hygiene practices, have a significant impact on the production of biogenic amines. Because of their strong decarboxylase activity, lactic acid bacteria, Enterobacteriaceae, and some strains of Pseudomonas and Clostridium are known to contribute significantly to the accumulation of amines during fermentation and storage. Foodborne intoxications like scombroid poisoning, which is marked by symptoms like nausea, vomiting, flushing, headaches, and hypertension, can result from consuming too much biogenic amines. Using starter cultures with minimal decarboxylase activity, implementing good manufacturing practices (GMP), regulating microbial development, and preserving the cold chain are crucial tactics for avoiding such dangers. Furthermore, for the protection of consumers, biogenic amine levels must be regularly monitored and international safety guidelines must be followed. The aim of this review is to provide an overview of the occurrence, formation, and toxicological risks of biogenic amines in foods, with a particular focus on cheese and fishery products. Additionally, it emphasizes management methods and preventative efforts to lessen their buildup, guaranteeing food safety and quality.

Keywords: Biogenic amines, histamine, tyramine, cheese, fishery products, food safety

COMPARISON OF ALVEOGRAPH CHARACTERISTIC OF DOUGH OBTAINED FROM DIFFERENT TYPES OF FERMENTED BREWERS' SPENT GRAIN AND TRITICALE GRAINS

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ABSTRACT

The aim of this study was to analyze the effect of two brewer's spent grain (BSG), in a fermented form on triticale dough rheological properties during extension. The BSG were fermented with triticale flour until the dough reached an acidity of 8–10 degrees and a pH of 3.78 ± 0.01. To analyze the extension behavior of dough an Alveograph device (KPM, Tripette et Renaud, Paris, France) was used according to ICC 121, at a 14% moisture basis. The fallowing parameters had been analyzed: dough extensibility (L), maximum pressure (P), baking strength (W), index of swelling (G) and configuration ratio of the Alveograph. The amount of BSF used in triticale dough recipe was of 10% addition level in different triticale flours varieties (Ingen 35, Ingen 40, Ingen 54, Ingen 93, Fanica and Costel) from Republic of Moldova. Two types of fermented brewers' spent grain light (BSGL) and dark (BSGD) from beer industry have been used. All the Alveograph parameters decreased by BSG addition in triticale flour. Dough tenacity decreased more when BSGL were added in triticale flour than when BSGL were incorporated whereas for dough extensibility and index of swelling the highest decreased was obtained for triticale dough with BSGD addition. These data indicate a higher extensibility for dough samples with BSGL addition in triticale flour. Baking strength did not present high variation between dough samples with BSG addition function on its type. The lowest data was obtained for Costel variety, which also presented the lowest extensibility values. The Alveograph does not recommend of using triticale flour with BSG addition in a fermented form for bread making without some exogen addition such as vital gluten one.

Keywords: triticale varieties, dough extension, dark brewers' spent grain, light brewers' spent grain

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FUNCTIONAL HUMMUS ENRICHED WITH HEMP CANNABIS SATIVA L. OILSEED CAKE WITH TECHNOLOGICAL, NUTRITIONAL AND SENSORY INSIGHTS

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ABSTRACT

Hummus, a traditional dish originating from the Eastern Mediterranean region, has gained remarkable popularity worldwide, particularly among health-conscious consumers. The increasing demand for plant-based functional foods has stimulated the incorporation of alternative protein and bioactive-rich ingredients into conventional formulations. In this context, the present study aimed to develop a novel hummus enriched with hemp (Cannabis sativa L.) oilseed cake, a byproduct of oil extraction, to enhance its nutritional and functional value while supporting sustainable food production. Six experimental formulations were designed by replacing boiled chickpea with hemp oilseed cake at concentrations of 0%, 5%, 10%, 15%, 20%, and 30%. The technological process followed a standardised scheme, integrating boiled chickpeas (or partial substitution with oilseed cake), tahini, sunflower oil, garlic, lemon juice, and salt. The physicochemical, nutritional, and organoleptic characteristics of the products were evaluated in comparison with the control samples (0% substitution). The results indicated significant compositional modifications induced by the gradual incorporation of hemp oilseed cake. Protein content increased from 7.90 g/100 g in the control to 12.20 g/100 g in the 30% variant, confirming the role of hemp by-products as a high-quality protein source. Similarly, fibre content rose markedly from 6.00 g/100 g to 14.00 g/100 g with only 5% substitution, maintaining values above 12.90 g/100 g across higher levels of enrichment. Polyphenol concentration exhibited a progressive increase from 212.62 mg GAE/kg (control) to 382.89 mg GAE/kg (30% variant), paralleled by an enhancement of antioxidant activity (DPPH inhibition from 18.80% to 78.00%). These findings demonstrate that hemp enrichment confers superior bioactive and functional properties to hummus. The substitution also influenced acidity and pH, with acidity values rising from 3.8 to 5.4 degrees and pH values ranging between 5.51 and 5.80, slightly above the typical threshold of classical hummus (5.1). Lipid content exhibited moderate variation (7.0–13.3 g/100 g), while carbohydrate levels showed a slight decreasing trend (14.8 g/100 g to 12.3 g/100 g). From a technological perspective, the formulations remained stable, and no syneresis was observed. Sensory evaluation revealed that hummus samples containing 5–15% hemp oilseed cake were highly acceptable, scoring between 8 and 10 out of 10 for colour, taste, odour, texture, and overall appearance. These formulations preserved a visual and sensory resemblance to traditional hummus while providing enhanced nutritional benefits, suggesting strong potential for commercialisation. However, products containing 20% and 30% substitution were less accepted, primarily due to darker colouration, coarse texture, and flavour notes perceived as undesirable by consumers. Overall, the results indicate that partial substitution of chickpea with hemp oilseed cake (5–15%) represents a promising strategy for developing functional hummus with improved protein, fibre, and polyphenolic profiles, alongside enhanced antioxidant activity. Beyond nutritional advantages, the use of hemp by-products supports circular economy principles and environmental sustainability by valorising an agro-industrial residue with high added value. This research highlights the dual potential of hemp-based hummus: as a nutritious, consumer-acceptable product and as a sustainable solution in the context of modern functional food development. The research was supported by the Project 23.70105.5107.06T "Valorization of vegetable proteins from secondary products of the local fat and oil industry", being implemented at the Technical University of Moldova.

Keywords: hummus, Cannabis sativa L., hemp oilseed cake, functional foods, protein enrichment, polyphenols, antioxidant activity, sensory evaluation, sustainability

FORMULATION AND EVALUATION OF QUINCE AND SEA BUCKTHORN JELLY CANDIES WITH ENHANCED FUNCTIONAL PROPERTIES

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ABSTRACT

The formulation of confectionery products using underexploited fruit resources has gained increasing attention in functional food science, offering opportunities to diversify nutrient intake and promote sustainable practices. In this context, the present work investigated quince-based jelly candies (QSb) fortified with sea buckthorn (Hippophae rhamnoides L.) powder, intending to improve their proximate composition, enhance bioactive compound retention, and evaluate the effects on texture, colour characteristics, and consumer sensory perception. Proximate composition analysis revealed that progressive incorporation of sea buckthorn powder significantly modified the nutritional profile of the candies. Carbohydrate content increased from 9.81 g/100g in the control sample (QSb0%) to 13.25 g/100g in QSb4%, aligning with previous findings on fruit-based confections. Protein levels rose from 0.32 g/100g to 0.68 g/100g due to the contribution of protein-rich sea buckthorn powder, although remaining moderate compared to tropical fruit confections. Fat content also increased slightly with substitution, reflecting the lipid-rich matrix of sea buckthorn. In contrast, fibre content decreased from 7.19 g/100g to 6.61 g/100g, a dilution effect associated with the proportional reduction of quince puree during formulation. These nutritional modifications highlight the role of sea buckthorn in enhancing proteins and lipids while partially compromising fibre contribution. The bioactive profile of the candies was strongly influenced by processing. The ascorbic acid content declined with increasing enrichment, from 7.03 mg/100 g in QSb0% to 5.24 mg/100 g in QSb4%, reflecting thermal degradation of vitamin C. Despite high polyphenol levels in the raw materials (920 mg GAE/100 g in quince puree and 2618 mg GAE/100 g in sea buckthorn powder), final candies exhibited slightly reduced polyphenol content, decreasing from 633 to 597 mg GAE/100 g. This suggests possible interactions with the gel matrix and reduced extractability during processing. Antioxidant activity, however, remained robust, with DPPH radical scavenging increasing to 91.71% in QSb4%, indicating a preserved and even enhanced capacity compared to control samples. Physicochemical and textural analysis demonstrated that hardness increased significantly, from 373.97 g in the control to 502.60 g in QSb4%, consistent with the water-binding capacity of fibre-rich sea buckthorn powder. Adhesiveness rose initially and stabilised at higher incorporation levels, while cohesiveness and elasticity decreased, indicating fibre interference with gel network formation. Chewiness increased progressively, particularly in QSb2% and QSb3%, highlighting the potential of moderate enrichment for desirable texture. Water activity values remained below 0.6 across all formulations, ensuring microbial stability, while titratable acidity rose from 3.26 to 5.18 degrees, reflecting the intrinsic acidity of sea buckthorn and contributing to tangy flavour perception. Colourimetric evaluation revealed a progressive decrease in lightness (L*), from 53.33 in QSb0% to 40.38 in QSb4%, while yellowness (b*) increased due to carotenoid enrichment. The total colour difference (ΔE) surpassed 10 units in higher formulations, indicating visually perceptible changes, and the browning index (BI) increased markedly, linked to polyphenol oxidation.

Sensory evaluation using the Check-All-That-Apply (CATA) method revealed that moderate enrichment levels (1–2%) were associated with favourable descriptors such as “smooth,” “glossy,” and “honey-like taste.” The QSb3% formulation balanced fruitiness and tartness but showed reduced sweetness, while QSb4% was negatively associated with “sour,” “rubbery,” and “grainy” attributes, limiting consumer acceptance. Optimal formulations were identified at 1–2% enrichment, achieving a balance between enhanced bioactivity, textural quality, and sensory appeal.Quince-sea buckthorn jelly candies represent a promising functional confectionery product. While high enrichment levels may compromise sensory acceptance, moderate incorporation of sea buckthorn powder significantly improves antioxidant capacity, protein levels, and textural complexity.

Keywords: quince, sea buckthorn, jelly candies, functional confectionery, bioactive compounds, antioxidant activity, texture, sensory evaluation, sustainability

Acknowledgments. The research was supported by Institutional Project 020405 “Optimizing food processing technologies in the context of the circular bioeconomy and climate change”, Bio-OpTehPAS, being implemented at the Technical University of Moldova

SUSTAINABLE VALORIZATION OF AGRI-FOOD BY-PRODUCTS IN THE FORMULATION OF NOVEL FUNCTIONAL READY-TO-EAT BREAKFAST CEREALS: OPTIMIZATION VIA MIXTURE DESIGN

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ABSTRACT

Breakfast cereals are among the most consumed processed foods worldwide due to their convenience, sensory appeal, and nutritional positioning. However, conventional formulations based on refined wheat flour and white sugar have been increasingly criticized for their high energy density and limited nutritional contribution, being strongly associated with the rise of diet-related chronic diseases such as obesity, type 2 diabetes, and cardiovascular diseases. In parallel, consumer demand has shifted towards healthier, natural, and sustainable alternatives, emphasizing products enriched with fibers, proteins, and bioactive compounds. The main objective of this study was to develop novel functional ready-to-eat (RTE) breakfast cereals enriched with wheat bran, date flour, and peanut butter, and to identify optimal ingredient combinations that maximize nutritional quality while maintaining desirable sensory properties. In this study, a mixture design approach was employed to optimize ingredient proportions, using four variables: white flour (F1), wheat bran (F2), super fine semolina (SFS) (F3), and peanut butter (F4). The formulations were evaluated for nutritional composition (protein, fat, fiber, ash, and moisture content) and sensory attributes (color, texture, taste, aroma, and appearance). Results showed that formulations enriched with wheat bran and date flour exhibited significantly higher fiber (reaching up to 5%) and mineral contents (1.54%) compared to traditional breakfast cereals, while maintaining acceptable sensory profiles. The inclusion of peanut butter improved the protein content, reaching up to 20%, and contributed to a more favorable lipid profile, particularly with the addition of unsaturated fatty acids. Moreover, the application of mixture design allowed the identification of optimal blends that balanced nutritional enhancement with desirable textural and sensory properties. In conclusion, the development of functional breakfast cereals through the incorporation of wheat bran, SFS, date flour, and peanut butter, optimized by mixture design, demonstrates both technological feasibility and nutritional relevance. This innovative approach highlights the potential of agri-food by-product valorization as a pathway to deliver healthier, sustainable, and consumer-oriented cereal products. Future work will focus on industrial scale-up, shelf-life stability, and large-scale consumer acceptance.

Keywords: Breakfast cereals, Functional food, Agri-food by-products, Food trends, Mixture design, Food innovation.

HARNESSING BIOACTIVE COMPOUNDS FROM ALTERNATIVE PLANT SOURCES FOR FUNCTIONAL FERMENTED FOOD INNOVATION

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ABSTRACT

In recent years, functional foods have emerged as a central focus in food science, reflecting a growing consumer demand for products that not only provide essential nutrients but also deliver health-promoting benefits. Among the most dynamic categories are fermented foods, which combine the traditional advantages of microbial transformation with the enrichment of bioactive compounds naturally present in plant matrices. Fermentation improves digestibility, enhances bioavailability of phytochemicals, and modulates sensory properties, positioning it as a key technology for the valorization of alternative plant resources. A wide range of plant-based substrates, including cereals, pseudocereals, legumes, and underutilized fruits, have been investigated as promising raw materials for fermentation. These matrices contain proteins, complex carbohydrates, fibers, polyphenols, flavonoids, and other phytochemicals with documented biological activities. However, their nutritional potential is often reduced by the presence of antinutritional factors such as phytic acid, tannins or enzyme inhibitors. Fermentation has been shown to decrease these compounds while simultaneously releasing bioactive metabolites, such as short-chain fatty acids, bioactive peptides, and antioxidant phenolics. Studies highlight that lactic acid bacteria (Lactobacillus, Bifidobacterium) and yeasts (Saccharomyces) play central roles in driving these biochemical transformations, producing metabolites that contribute to gut health, immune modulation, and cardiometabolic protection. Polyphenols and flavonoids represent particularly relevant compounds in the context of fermented plant-based foods. Their antioxidant, anti-inflammatory, and antimicrobial activities are well documented, and fermentation enhances their solubility and absorption by converting bound phenolics into more bioavailable forms. Recent evidence suggests that fermented products from legumes such as chickpeas and lentils exhibit significantly higher antioxidant activity compared to their unfermented counterparts. Similarly, pseudocereals like quinoa and amaranth not only provide high-quality proteins but also serve as carriers of phenolic acids and flavonoids that are metabolically activated during fermentation. Another important dimension of functional fermented foods is their contribution to improving protein digestibility and mineral bioavailability. Enzymatic activities during fermentation degrade complex protein structures, increase the release of essential amino acids, and reduce interactions that limit mineral absorption. This is particularly relevant for populations adopting plant-based diets, where deficiencies in bioavailable iron, zinc, or calcium are common. Furthermore, microbial fermentation can lead to the synthesis of vitamins from the B-complex, which further enhances the nutritional quality of the final products. Consumer acceptance of fermented plant-based foods depends not only on their health-promoting potential but also on sensory and technological attributes. The reduction of bitterness and beany flavors, improvement in texture, and development of desirable aromas are direct consequences of microbial activity. Functional beverages, yogurt-like alternatives, bakery products, and snack bars enriched with fermented plant ingredients are among the most promising product categories, demonstrating both market potential and alignment with sustainability goals.

The valorization of alternative plant sources through fermentation represents a multidisciplinary approach combining food chemistry, microbiology, and nutrition science. It provides a pathway to address global challenges related to health, sustainability, and food security. Current evidence confirms the ability of fermentation to enhance bioactive compound availability, reduce antinutritional factors, and improve sensory qualities, while future research should focus on optimizing fermentation conditions, identifying novel microbial strains, and validating health claims through clinical studies.

Keywords: alternative plant sources, fermentation, bioactive compounds, polyphenols, digestibility, probiotics, functional foods, sustainability

Acknowledgment: The research was supported by Moldovan Government within State project of Young Researchers no. 25.80012.5107.11TC "Valorization of bioactive compounds from alternative plant sources for the development of functional fermented foods" running at Technical University of Moldova.

HEMP CANNABIS SATIVA L. INFLORESCENCE AS A BIOACTIVE SOURCE FOR NOVEL FUNCTIONAL BREAD

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ABSTRACT

Industrial hemp (Cannabis sativa L.) has recently attracted considerable attention as a source of bioactive compounds and functional ingredients for food applications. While hemp seeds and oil have been extensively studied, the inflorescence remains underexplored despite its rich phytochemical profile. This research aimed to characterize hemp inflorescence flour from compositional and functional perspectives, and to evaluate its incorporation into bread formulations as a partial substitute for wheat flour. The organoleptic properties of hemp inflorescence flour were assessed according to international standards, confirming its homogeneous texture, light brown-green coloration, and characteristic herbal aroma and taste, free from foreign impurities. Proximate composition analysis revealed a substantial content of dietary fiber (27.6%), protein (14.5%), and lipids (17.0%), with minimal carbohydrates (0.58%). High levels of polyphenols (296.36 mg GAE/kg) and flavonoids (260.97 mg GAE/kg) were detected, accompanied by notable antioxidant activity. UV-Vis spectrophotometry confirmed the presence of carotenoids, chlorophylls, and flavonoid derivatives, validating the inflorescence as a promising functional ingredient. Bread formulations were developed by substituting wheat flour with hemp inflorescence flour at levels of 5–30%. Sensory evaluation conducted with a trained panel revealed that low to moderate substitution (5–15%) produced loaves with acceptable appearance, aroma, and taste, while higher incorporation (25–30%) resulted in darker coloration, plant-like aroma, and slightly bitter flavor, which reduced consumer acceptance. The colorimetric analysis confirmed a progressive decrease in crumb and crust lightness (L*) and whiteness index, associated with Maillard reactions and the intrinsic pigments of hemp flour. Physicochemical analyses demonstrated a gradual increase in acidity, ranging from 1.2 in the control to 3.6 degrees in the 30% variant, yet remaining within the permissible limits for bakery products. Moisture content remained stable (35–38%), while weight loss during baking decreased at higher substitution levels. The incorporation of hemp inflorescence flour significantly enhanced polyphenol content, increasing from 108.8 mg GAE/kg in the control to 264.9 mg GAE/kg at 30% substitution, while antioxidant activity rose sharply from 13.8% to 72.1%. These findings emphasize the potential of hemp inflorescence to enrich bakery products with bioactive compounds and antioxidant capacity. Textural analysis revealed that low-level substitution (5%) produced softer bread compared to the control, while higher incorporation (10–30%) progressively increased hardness, gumminess, and chewiness due to the high-water absorption and fiber content of hemp flour. Elasticity and resilience were less affected, though cohesiveness declined at higher substitution levels, indicating partial disruption of the gluten network. The decrease in loaf volume and porosity at high substitution levels was consistent with literature reports on bread enriched with protein- and fiber-rich non-traditional flours. Thus, hemp (Cannabis sativa L.) inflorescence flour is a valuable functional ingredient capable of enhancing the nutritional and bioactive profile of bread while supporting sustainability through the valorization of hemp by-products. Substitution levels of 5–15% offer an optimal balance between improved antioxidant potential, polyphenol enrichment, and consumer acceptability. Higher substitution levels, though nutritionally advantageous, require technological adjustments to improve texture and flavor. This study highlights the feasibility of incorporating hemp inflorescence flour into staple foods as a strategy to promote dietary diversification and sustainable food innovation.

Keywords: hemp inflorescence, Cannabis sativa L., bread, functional ingredients, polyphenols, antioxidant activity, texture, sensory evaluation, sustainability

Acknowledgment: The research was supported by Moldovan Government within State project of Young Researchers no. 24.80012.5107.06TC "Waste sustainable utilization from the oil industry" running at Technical University of Moldova.

PHYSICOCHEMICAL, ANTIOXIDANT, AND NUTRITIONAL STUDY OF SNAIL SLIME FROM THE ORANIE REGION (SIG AND MAGHNIA)

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ABSTRACT

Introduction: Helix aspersa is a farmed snail known as a powerful bio-Indicator and bio-accumulator of ecological pollutants and is necessary to monitor the bioecology of this species and the influence of different diet on its development and the effect of its drooling. Materials and methods**:** An inventory of terrestrial gastropods was conducted in the region of Oranie, (Sig and Maghnia) from March to April 2023. Physico-chemical, microbiological and nutritional assays were carried out on drool, flesh and snail droppings. Result: The results obtained show that the pH values of the slime and the flesh are almost similar and tend towards the value of 7 which means neutral in the region of GIS and MAGHNIA simultaneously, on the other hand, the pH value of the excreta is acidic in the region of MAGHNIA but moderately neutral to GIS. The various moisture levels of the samples are obtained thanks to the desiccant action of aqueous solutions which show that only the moisture levels of the flesh and excrement of the GIS region are high compared to those of the MAGHNIA region simultaneously. The values after the determination of vitamin E and tells us that the value of the latter is high at the level of slime of 1.5-times and the pulpit 1.8-times in the region of MAGHNIA versus the region of GIS, on the other hand, vitamin E is decreased by -1.8 times at the level of excrement in the region of MAGHNIA and which is 4 mg / kg, thanks to its richness in vitamin E and C that allow it to beautify the appearance of the skin, facial and body care. The antioxidant activity of slime and snail droppings in the GIS region is drastically reduced compared to the MAGHNIA region, only the snail flesh is decreased by 1.2 times at the GIS level. The percentage rate of protein on drool, flesh and feces shows a significant decrease in the MAGHNIA region compared to those in the GIS region of (0.40 vs 0.60); (0.12 vs 0.93) and (0.43 vs 0.75) respectively. On the other hand, the lipid content in snails is very poor in both regions of our study Maghnia and Sig. No microbiological activity was recorded on the 4 strains studied (Escherichia coli, Staphylococcus aureus, yeast and fungus). Conclsion**:** Indeed, the snail has an indisputable nutritional value. Its flesh is rich in protein, magnesium, calcium, copper, zinc and iodine. Snails are characterized by the secretion of slime containing glycolic acid, collagen, vitamins, natural antibiotics, elastin and allantoin. This natural substance is perfect for the treatment of skin diseases. The Snail slime is suitable for the manufacture of certain drugs and cosmetics for skin care. Snail droppings can be a range of colors, depending on what the gastropod eats and where it lives.

Keywords: Heliciculture snail Helix aspersa; drooling; physico-chemical,

EVALUATION OF PHYSICO-CHEMICAL PROPERTIES OF WASTE COOKING OIL AND ITS TRANSFORMATION IN BIODEGRADABLE PRODUCTS

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ABSTRACT

Frying is one of the most popular and traditional process used in the food industry and food services. During this process the oil is exposed to heat, oxygen and water causing significant changes in physico-chemical properties which can lead to adverse health effect for the consumers. On the other hand, inadequate management of waste cooking oil (WCO) can result in environmental pollution. The aim of this study was evaluation of physico-chemical parameters of deep fried oil as an effective way to prevent the use of harmful oil and to transform the oil into eco-friendly product. The samples were collected in local fast foods. The physico-chemical properties of analysed samples were evaluated through the odor, color, density, specific density, saponification and acidity value. Analysed samples showed that waste cooking oil had different colour, density, and aroma compared to control sample. The acid value of analysed WCO range from 0.92 to 0.99 mgKOH/g oil meanwhile, the saponification values range from 202.03 mg KOH/g oil to 212.2 mg KOH/g oil and 144.31 mg NaOH/g oil to 151.27mg NaOH/g oli. Transformation of WCO into bar soap was done using different concentrations of lye solutions. The soap was tested for its washing power and the pH. The washing process showed that the soap prepared by WCO had satisfactory washing power.

Keywords: fast-food oil, biodegradable soap, circular economy, waste

DEVELOPMENT AND CHARACTERIZATION OF FUNCTIONAL PLANT-BASED MILK FROM BITTER LUPIN: A NUTRITIONAL AND SUSTAINABLE ALTERNATIVE TO CONVENTIONAL MILK.

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ABSTRACT

The growing popularity of vegetarian and vegan lifestyles has sparked increased interest in plant-based (PB) protein substitutes. Consumers' rising awareness of the environmental and health impacts of their dietary choices, along with the declining consumption of dairy products in certain regions, has fueled demand for innovative PB alternatives. In response, PB foods and beverages have been developed to replace animal-derived products. These dairy substitutes are especially beneficial for individuals with dietary restrictions, lactose intolerance, or allergies to cow's milk proteins or soy and are valued for their environmentally sustainable production methods. Among promising legumes, bitter lupin (Lupinus luteus L.) stands out for its high protein content, dietary fiber, and bioactive compounds and is well adapted to Mediterranean agro-climatic conditions. However, its naturally high alkaloid content requires detoxification to ensure food safety. This study aims to develop a plant-based milk from bitter lupin and evaluate its physicochemical, microbiological, and sensory properties. Bitter lupin seeds underwent a detoxification protocol involving prolonged soaking and rinsing to reduce alkaloid levels to safe thresholds. The PB milk was produced through wet grinding, filtration, and homogenization. The formulation was adjusted to 8–10% dry matter, with the addition of natural stabilizers to enhance texture. Physicochemical analyses included pH, titratable acidity, density, dry matter, protein content, lipids, total carbohydrates, crude fiber, fatty acid profile, total phenolic content (TPC), total flavonoid content (TFC), and antioxidant activity (DPPH). Microbiological tests targeted total flora, coliforms, yeasts, and molds before and after mild pasteurization. Sensory evaluation was conducted with a semi-trained panel (n = 30) using a 9-point hedonic scale to assess color, odor, texture, taste, and overall acceptability. Dynamic viscosity was measured using an imposed shear rate rheometer (Modular Compact Rheometer, MCR 302) at a controlled temperature (4°C) to assess fluidity and colloidal stability of the beverage. In addition, a 28-day cold storage study at 4°C was conducted to monitor the evolution of pH, titratable acidity, and microbial load, with periodic sampling (days 0, 7, 14, 21, and 28) to assess shelf life and product stability. The resulting PB milk showed good outstanding stability and an attractive nutritional profile: protein (4.2 ± 0.04% in dry matter), lipids (4.65 ± 0.06% in dry matter), and ash (0.55 ± 0.02% in dry matter). The fatty acid profile was complete, with high levels of oleic acid, linoleic acid, and methyl palmitate. Antioxidant activity was significant, indicating the presence of residual phenolic compounds. Mild pasteurization (85°C, 2 mn) ensured microbial safety and a shelf life of 28 days at 4°C. Sensory results revealed satisfactory overall acceptability (mean score > 7/9). The dynamic viscosity ranged from approximately 10^2 Pa·s at low shear rates to below 1 Pa·s at high shear rates, while shear stress increased proportionally. Plant-based milk from bitter lupin offers a promising alternative to animal-derived dairy products, combining nutritional quality, microbial safety, and technological viability. It valorizes a locally adapted legume and meets consumer expectations for health, ethics, and sustainability.

Further research will focus on studying colloidal interactions and developing flavored variants. Industrial feasibility studies and life cycle assessments are also planned to evaluate its commercialization potential.

Keywords: Plant-based milk, Bitter lupin, Functional beverage, Detoxification, Plant protein, Sensory acceptability, Food sustainability.

INTEGRATED ANALYTICAL AND BIOLOGICAL STUDY OF CITRUS SINENSIS AND CITRUS PARADISI ESSENTIAL OILS: FROM GC/MS TO ENCAPSULATION

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ABSTRACT

Essential oils, derived from various parts of aromatic plants, particularly citrus peels, are used for their numerous valuable properties in medicine, food preservation, and aromatherapy. In this work, we opted for the extraction of essential oils from two citrus species (orange/grapefruit) using the hydrodistillation method from dry and fresh peels, where the best yield calculated was 1.5% for fresh grapefruit peels and 2% for dry orange peels. We then identified their chemical composition; these essential oils are rich in compounds with strong antioxidant and antibacterial properties, such as limonene. The refractive indices of the orange and grapefruit essential oils are respectively (1.4726/1.4722). Their relative densities range between 0.8610 g/cm³ and 0.8731 g/cm³, and their viscosities between 0.85 mPa.s and 1 mPa.s. These two essential oils have significant antioxidant effects and can be used in various fields, particularly as natural preservatives and flavors, especially in the agri-food sector. The recorded IC50 values for the DPPH and ABTS tests are respectively (909.12/909.33) for orange essential oil and (1568.56/1596.94) for grapefruit essential oil. Antibacterial analysis shows that the essential oils of both species have a strong inhibition zone against Gram-positive microorganisms, particularly Staphylococcus aureus and Bacillus subtilis. In contrast, Gram-negative microorganisms are resistant to these oils. Finally, the chosen encapsulation method allows preserving the efficacy and stability of essential oils, prolonging their shelf life and therapeutic potential. Two techniques were used: simple coacervation, with a yield of 57.22% for orange essential oil and 50% for grapefruit essential oil, and complex coacervation, with a yield of 52.63% and 63.15% respectively.

Keywords: Citrus Sinensis, Citrus Paradisi, essential oils, GC/MS, FTIR, TGA, IC50, antibiogram, encapsulation.

EXPLORING THE USE OF AMARANTHUS WHOLE-STALK MEAL AS A FUNCTIONAL INGREDIENT IN WHEAT-BASED BISCUITS

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ABSTRACT

The growing demand for novel sources of nutrients and bioactive compounds has increased interest in pseudocereals such as Amaranthus spp., which offer gluten-free, nutrient-rich, and drought-tolerant alternatives to conventional cereals. In many regions, amaranths are cultivated mainly for seed production, and the remaining stalk biomass is often treated as agricultural waste. This study investigates the feasibility of incorporating meal obtained from the whole stalks of Amaranthus spp. as a functional additive in staple bakery products. Biscuits were produced by partially replacing wheat flour with varying proportions of Amaranthus whole-stalk meal. The impact of this substitution on key physicochemical, geometric, color, and spectral characteristics of the flour blends, dough, and final baked products was evaluated. Out of 39 analyzed parameters, 19 were identified as statistically informative. Principal Component Analysis (PCA) was applied to reduce data dimensionality, revealing that the relationship between the proportion of amaranth meal and the first two principal components explained up to 99% of the variance. Based on these findings, the optimal substitution level of Amaranthus whole-stalk meal in biscuits was determined. The results highlight the potential of Amaranthus whole-stalk material as a sustainable, nutrient-enriching ingredient for developing innovative bakery products with improved functional and sensory properties. Further studies should explore the effects of whole-stalk meal derived from different Amaranthus species and genotypes cultivated under diverse environmental conditions.

Keywords: Amaranth green powder, Butter biscuits, Functional additives, Physico-chemical characteristics, Sensory characteristics, Nutritional enhancement

EXPLORING SAMET: A TRADITIONAL GRAPE SYRUP ROOTED IN THE MEDITERRANEAN DIET OF NORTHERN MOROCCO

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ABSTRACT

Samet, a syrup extracted from grapes, is a traditional practice that has been present since the Middle Ages in the Jbala region of northern Morocco, where its production continues to this day. This original product, made from grapes of various local varieties such as Fekkas and Taferialte, is renowned for its numerous culinary and medicinal virtues, according to its makers' descriptions. Its production is currently in decline, and unfortunately, it is disappearing more and more from Moroccan cuisine. Since as this type of product has not yet been the subject of a thorough study, the main objective of this work is was to conduct a diagnosis aimed at identifying and characterizing the traditional systems of Samet production in the northern region. To achieve this, surveys were conductedcarried out with 30 farmers who preserve this knowledge. These investigations focused on the history of Samet, the preparation method, the marketing channels, its uses and benefits, the vine varieties, ands well as the equipment used throughout the different stages of production. The survey results facilitated the development of a protocol for preparing Samet. In conclusion, preserving the ancestral knowledge related to the preparation of Samet is essential to safeguarding the intangible cultural heritage of the Jbala region.

Keywords: local product, vine, local varieties, traditional knowledge, Jbala region. Mediterranean diet, Food security

INCORPORATION OF VANILLA ESSENTIAL OIL INTO FOOD FORMULATIONS VIA PLANT-BASED OLEOGELS

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ABSTRACT

This study aimed to investigate the potential of edible oleogels as functional carrier systems to enhance the applicability of vanilla essential oil in food formulations. Due to its high volatility and oxidative sensitivity, the direct use of essential oils in foods often leads to reduced sensory and chemical stability. Therefore, both the free and oleogel-entrapped forms of vanilla essential oil were evaluated, focusing on their application as solid fat replacers in cookie production. A fully plant-derived wax was used as the structuring agent in oleogel preparation. Experimental cookie formulations included vanilla essential oil oleogels (VOLEC), oleogels without essential oil (KOLEC), and liquid canola oil systems (KVEYC). Cookies were analyzed for baking performance, moisture and hardness, oil absorption, ash, protein, caloric, and peroxide values. Results demonstrated that oleogel-based formulations retained moisture more effectively than liquid oils, which significantly reduced cookie hardness. Furthermore, the incorporation of essential oils in liquid or gel form caused statistically significant differences in oil absorption ($p < 0.05$). Cookies prepared with oleogels exhibited higher spread ratios after baking, which was attributed to the gluten-diluting and lubricating properties of the oleogel matrix. No significant variations were observed in ash, protein, or caloric contents, indicating that the inclusion of essential oils did not alter the basic nutritional composition. During storage, moisture retention and textural stability were better preserved in oleogel-based cookies, while peroxide values remained within acceptable limits, suggesting improved oxidative stability.
In conclusion, vanilla essential oil oleogels demonstrated strong potential as natural, plant-based alternatives to conventional solid fats in bakery applications. Their ability to enhance product texture, reduce moisture loss, and maintain oxidative stability supports their use as multifunctional ingredients combining structural, preservative, and flavoring functions. These findings highlight oleogel systems as promising and sustainable fat replacers that can improve both the quality and shelf life of baked products.

Keywords: Vanilla essential oil, canola oil, oleogel, phyto wax, cookie

COMPARATIVE STUDY OF PHYTOCHEMICAL COMPOUNDS AND ANTIMICROBIAL ACTIVITY OF ESSENTIAL OIL OF Citrus limon FROM TWO REGION OF ALGERIA

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ADSTRACT

Our work aims to study the biodiversity of essential oils from fresh peels of Citrus limon L. harvested in two different regions, Blida and Tizi-Ouzou in Algeria. The extraction of essential oils from Citrus limon L. was carried out by hydrodistillation method. The chemical composition of the extracted EOs was analyzed by GC/MS. The antimicrobial activity was tested against *Escherichia coli, Pseudomonas aeruginosa, Streptococcus faecalis, Staphylococcus aureus, Aspergillus niger, and Candida albicans*. Chromatographic analysis by GC-MS revealed that the essential oils from both regions are a mixture of volatile compounds consisting mainly of monoterpene hydrocarbons with the same major compound, limonene. 49 compounds were identified for the Tizi-Ouzou region, with the major constituents being limonene (62.08%) and β-pinene (10.43%), along with several other constituents in lower concentrations. For the Blida zone, 43 compounds were identified, with two major ones: limonene (58.66%) and β-pinene (10.56%), and other components in low concentrations. The lemon essential oil showed strong inhibition against six strains, the highest was against Candida albicans with inhibition zone diameters of 26.5±0.5 mm and 21.5±0.5 mm for Tizi-Ouzou and Blida zone, respectively and against Escherichia coli with inhibition zone diameters of 18.5±0.5 mm and 16.5±0.5 mm. It seems, then, that Citrus EOs could be considered suitable alternatives to chemical additives for use in the food industry.

Keywords: Citrus limon, Essential oils, Hydrodistillation, Limonene, CG/MS

ROLE OF PRESERVATIVES AND ANTIOXIDANTS IN MAINTAINING THE STABILITY OF WINE

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ABSTRACT

Wine stability is one of the most critical factors determining product quality, safety, and shelf life. This study investigates the influence of different preservatives and antioxidants on the physicochemical and microbiological stability of wine during storage. The experimental design focused on the comparative effects of sulfur dioxide (SO_2), sorbic acid, ascorbic acid, and selected natural extracts with antioxidant properties. Key quality parameters, including pH, total acidity, color intensity, total phenolic content, and oxidative stability, were monitored under controlled storage conditions. The findings demonstrated that an appropriate combination of preservatives and antioxidants effectively delayed oxidation processes, maintained color and aroma, and inhibited the growth of spoilage microorganisms. The application of natural antioxidants showed promising potential in reducing the use of synthetic additives while preserving product stability. Overall, the results highlight the essential role of antioxidant and preservative balance in achieving high-quality and safe wine, offering valuable insights for sustainable wine production and storage practices.

Keywords: Wine stability, preservatives, antioxidants, oxidation, quality, storage, phenolic compounds

BLENDING TUNISIAN GRAPE LEAVES EXTRACT WITH CORN OIL DURING HEATING: EFFECT ON STABILITY AND FATTY ACID COMPOSITION

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ABSTRACT

The antioxidative effects of grape leaves (GLE) extract on corn oil (CO) stability, heated for 0, 4 and 8 hours at 180 °C were investigated. Grape leaves extracts were separately prepared by dissolving 20 g of dried, grounded and sieved samples into 200 ml of methanol for three days. The methanol GLE was then added separately at varying concentrations (200–1000 ppm) to CO. Another sample of CO which contained 200 ppm BHT as well as CO that contained no additive were also studied. Oxidation was followed by determining free fatty acid value (FFA), peroxide value (PV), p-anisidine value (p-AV), conjugated dienes (CD), trienes (CT) as well as TOTOX values. Furthermore, total phenolic content and DPPH radical scavenging activity were measured before and after heating. According to the obtained results, there was no significant difference at TO in FFA, PV and p-AV of CO containing GLE, BHT and CO containing no additive. During heating for 4 and 8 hours, FFA, PV, p-AV and TOTOX values increased in all samples, while those of polyphenols content as well as DPPH scavenging activities decreased. The FFA, AV, p-AV and TOTOX values of CO containing GLE were lower than those of CO containing BHT followed by CO with no additive. It is concluded that the antioxidant activities of GLE were high and retarded the oil oxidation and can be used in the food industry for commercial purposes.

Keywords: Grape, leaves, oxidative stability, corn oil, phenolic

FOOD SAFETY AWARENESS AND BEHAVIOR: TOWARD INTEGRATED APPROACHES FOR SUSTAINABLE PUBLIC HEALTH

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ABSTRACT

Introduction: Food safety represents a vital dimension of sustainable public health, closely linked to nutrition, environmental hygiene, and consumer behavior. Despite improvements in food systems, limited awareness and inconsistent practices among consumers continue to contribute to foodborne diseases. An integrated approach combining education, regulation, and behavioral insight is essential to promote safe food practices and public health resilience. Aim: This study explores consumer awareness, attitudes, and behaviors toward food safety, emphasizing the need for integrated and preventive health strategies. Methodology: A cross-sectional mixed-method design was applied, combining a structured survey of 500 consumers with focus group discussions in Tirana. The data explored knowledge, hygiene practices, risk perception, and socio-demographic influences. Quantitative analyses identified behavioral predictors, while qualitative findings provided contextual understanding. Results and Discussion: Results reveal high awareness but gaps between knowledge and practice. Education level, access to food safety information, and post-pandemic behavioral changes emerged as key determinants of safe practices. Findings support the need for community-based and interdisciplinary interventions that integrate food safety into broader health and sustainability agendas**.** Conclusion: Enhancing food safety awareness through integrated health education and behavioral interventions can foster safer consumer practices and sustainable public health outcomes.

Keywords: : food safety, consumer behavior, integrated health, sustainability, public health

EFFECTS OF AIR POLLUTANTS ON THE HUMAN RESPIRATORY SYSTEM: ARTIFICIAL NEURAL NETWORKS ANALYSIS

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ABSTRACT

Air pollutants, such as fine particulate matter (PM2.5), ozone, and toxic gases, have a significant impact on the human respiratory system. These substances, from natural or anthropogenic sources, can penetrate deep into the airways and cause or aggravate various respiratory diseases, including asthma, chronic obstructive pulmonary disease (COPD), and lung cancer. Prolonged exposure to these pollutants is also associated with increased risks of acute respiratory distress and premature mortality. Fine particulate matter (PM2.5) is of particular concern due to its ability to penetrate the lung alveoli, leading to chronic inflammation and oxidative stress. Ozone, on the other hand, causes irritation of lung tissue and exacerbates the symptoms of pre-existing diseases such as asthma. These pollutants can also impair immune function, increasing susceptibility to respiratory infections. To better understand and predict the effects of pollutants on respiratory health, analysis systems based on artificial neural networks (ANNs) are used. These models integrate environmental data (PM2.5 concentration, ozone levels, etc.) as input variables to assess the risk of respiratory diseases based on various individual factors such as age or medical history. ANNs offer greater accuracy than traditional statistical models, particularly in scenarios where data are incomplete or complex. These systems help identify at-risk populations and improve the management of air pollution episodes. They are a valuable tool for public health decision-makers to implement effective policies to reduce exposure to pollutants and their health impacts. The use of artificial neural networks to model the effects of air pollutants on the respiratory system represents a major advance in understanding pollution-related health risks. This paves the way for better prevention and management of respiratory diseases in a context of increasingly deteriorating air quality.

Keywords: Air pollutants, respiratory system, Intelligent modeling, ANN

HISTORICAL DEVELOPMENT OF ENVIRONMENTAL LAW IN TURKIYE ACCOMPANIED BY INTERNATIONAL AGREEMENTS

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ABSTRACT

Environmental law in Turkey has developed gradually since the declaration of the Republic. Between 1923 and 1970, environmental protection was mostly addressed through indirect regulations such as urban planning, health, and forestry laws. During this period, there was no specific branch of law dedicated to the environment, and environmental issues were generally addressed through local administrative measures. In the 1970s, environmental awareness grew, and as a result of the 1972 Stockholm Conference, environmental policies were brought to the state agenda. In 1978, the concept of "environment" was included in the five-year development plans, and in 1983, the Environmental Law was enacted, formally establishing environmental law as an independent field. This law includes fundamental provisions on combating environmental pollution, conserving natural resources, and environmental management. In the 1990s, relations with the European Union played a significant role in shaping environmental policies. Turkey's participation in global environmental summits such as the 1992 Rio Summit and the 1997 Kyoto Protocol contributed to the integration of international environmental norms into domestic law. In the 2000s, the EU accession process accelerated the renewal of environmental legislation, with many regulations aligned with EU standards, covering issues such as air, water, and soil quality, waste management, and environmental impact assessments (EIA). In 2006, comprehensive amendments to the Environmental Law included the principles of "polluter pays" and sustainable development, and strengthened environmental inspections and sanctions. In 2021, Turkey ratified the Paris Agreement, marking an important step in the fight against climate change. Following this, the Climate Change Presidency was established, and in 2023, a draft Climate Law was prepared. However, the effectiveness of environmental law is still limited due to structural deficiencies, fragmented legislation, and coordination issues between institutions.

Keywords: Environmental law, Legal regulations, Intternational agreements, Paris agreement

NEGATIVE EFFECTS OF UNCONSCIOUS PESTICIDE USE ON PUBLIC HEALTH AND PROPOSED SOLUTIONS

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ABSTRACT

Pesticides have played a significant role in enhancing agricultural productivity in Turkey and in controlling disease-carrying pests. However, improper or uninformed use poses serious risks to human health and the environment. In developing countries, limited knowledge and training often results in the misuse of pesticides, including the application of excessive amounts or the use of banned substances. This leads to environmental pollution, ecosystem degradation, and severe health problems. Although many farmers follow label instructions, there remain gaps in the use of personal protective equipment and safe handling practices, indicating a disconnect between knowledge and behavior. Misuse of pesticides has been linked to various health issues, ranging from skin irritation and dizziness to hormonal disorders and even fatalities. The detection of banned pesticide residues in food products highlights the critical importance of legal regulations and enforcement in protecting public health. Overall, pesticide use requires professional knowledge and careful management to avoid detrimental effects on both human health and the environment.

Keywords: pesticide, agricultural productivity, hormonal disorders, legal regulations

ANTIBIOTIC RESISTANCE IN E.COLI ISOLATED FROM THE VJOSA RIVER AND ITS TRIBUTARIES:AN ASSESSMENT OF WATER QUALITY AND PUBLIC HELTH RISK

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ABSTRACT

One of the Europe's wild rivers, the Vjosa River and its tributaries extends for over 270 km; originating in the Greek mountains, it flows without obstacle down to the Adriatic coast of Albania. As a dynamic and complex riverine ecosystem, it is important for supporting ecological diversity and water dynamics in the region; yet it faces the growing impact of human activities, such as the spread of uncontrolled antibiotic-resistant bacteria (ARB). The main purpose of this study is to investigate both microbial water contamination and antibiotic resistance in Escherichia coli strains obtained from the Vjosa River and its tributaries. This study is conducted between October 2024 and June 2025, where 13 sampling sites were monitored (8 on the main river and 5 on its tributaries) in agreement with microbiological analysis standards (ISO 19458). The methods performed were, the Most Probable Number method in order to determine the concentration of fecal coliforms (E. coli) and Kirby-Bauer test, where a total of 182 E. coli strains were isolated and analyzed to detect their resistance to antibiotics. The results achieved based on the microbial indicators, showed that Vjosa River and its tributaries has moderate levels of fecal pollution (100–1000 CFU/100 ml). From the isolated E. coli strains tested, the antibiotics with the highest resistance were: β-Lactam antibiotics like Cephalothin (KF), Amoxycilin(AX) and broad-spectrum tetracycline antibiotic, wich is Ocytetracycline (T). Based on this investigation and outcomes, it highlight the role of the Vjosa river in transmitting antimicrobial-resistance bacteria in surface water, and the need for a long-term monitoring process and management in order to reduce environmental and public health impacts.

Keywords: Antibiotic resistance, water quality, Vjosa River, Escherichia coli, surface water, Oxytetracycline, Amoxicillin, Cephalothin.

MICROBIOLOGICAL AND WATER QUALITY STATUS OF VJOSA RIVER.

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ABSTRACT

The Vjosa river plays an important role in maintaining biodiversity and aquatic organisms, also human livelihoods in southern Albania. The main aim of this study was to examine quality of water and microbiological status by analyzing the concentration of Fecal Coliform (FC), Escherichia coli, Enterococcus faecalis, and Heterotrophic Bacteria in accordance with microbiological analysis standards (ISO 19458). Water sampling was conducted at 13 sampling sites-8 along the Vjosa river and 5 on its tributaries for a period from October 2024 to June 2025. The Most Probable Number (MPN) method was used to analyze the water quality status. Results obtained showed a moderate microbiological pollution of Vjosa River. Fecal coliform concentrations ranged from >100 to 1000 CFU/100 ml, intestinal enterococci (E. faecalis) ranged from >40 to 400 CFU/100 ml, and heterotrophic plate counts at 22°C were found between >500 and 10,000 CFU/ml. Based on these findings, a microbial load is detected mostly in downstream and tributary sites due to human activity. The overall findings highlight the necessity for stricter requirements and improved wastewater infrastructure to achieve sustainability of water quality and ecological integrity of the Vjosa river. The extent of microbial pollution resulting from anthropogenic activities—particularly those originating from urban settlements—was investigated across specific segments of the Vjosa River. These microbiological findings were then evaluated in relation to accompanying biological and chemical parameters, allowing for a more comprehensive understanding of the river’s ecological condition. Key factors impacting microbiological water quality included raw sewage, effluents from wastewater treatment plants, polluted tributaries, and diffuse sources. The frequent detection of anthropogenic influence based solely on microbiological data highlights their value in water quality monitoring programs.

Keywords: water quality, microbiological analysis, Vjosa river, Fecal Coliform (FC), Escherichia coli, Enterococcus faecalis, Heterotrophic Bacteria.

SUSTAINABILITY AND MULTIFUNCTIONALITY URBAN AND PERIURBAN AGRICULTURE IN CASABLANCA METROPOLIS: A GOVERNANCE PERSPECTIVE

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ABSTRACT

The rapid urbanization of Moroccan cities is exerting growing pressure on fertile agricultural lands, intensifying challenges related to food security, social inequality, and environmental degradation. In this context, urban and peri-urban agriculture (UPA) offers promising pathways toward ecological resilience and inclusive urban development. This study examines UPA dynamics in the metropolitan area of Casablanca, based on field surveys, statistical analysis, and territorial case studies. Our findings highlight the multifunctional role of UPA in providing fresh food, creating employment, supporting agroecological practices (e.g., crop diversification, composting, water-saving irrigation), and contributing to the recycling of urban organic waste. Despite these benefits, several structural and institutional constraints remain, including insecure land tenure, water scarcity, and the limited integration of UPA into formal urban planning frameworks. The study calls for improved governance through crosssectoral coordination and participatory policy mechanisms that strengthen UPA's place in the urban fabric. Finally, we outline concrete strategies to scale up sustainable practices, such as smart irrigation systems, digital monitoring tools, and farmer-led innovation platforms, while safeguarding the ecological and productive functions of peri-urban spaces.

Keywords: Urban and peri-urban agriculture, agroecology, ecological transition, urban resilience, food security, sustainable development

COMPARATIVE ANALYSIS OF AQUATIC MACROPHYTE-BASED PHYTOREMEDIATION FOR HEAVY METAL REMOVAL FROM APPAREL INDUSTRY EFFLUENTS

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ABSTRACT

The apparel industry, a globally influential manufacturing sector, contributes significantly to employment, export earnings, and industrial development. Apparel dye wastewater (ADWW) is a complex and highly variable effluent stream characterized by the presence of synthetic dyes, surfactants, salts, organic load, suspended solids, and, critically, toxic heavy metals like cadmium (Cd), copper (Cu), nickel (Ni), and zinc (Zn), which pose a serious risk to human health and the environment. Present day treatment techniques, including chemical precipitation, membrane filtration, and ion exchange, are often costly and energy-intensive, producing secondary pollutants such as toxic sludge. Green technologies like phytoremediation offer a promising, economical, and ecologically acceptable substitute as global activities increasingly turn to nature-based and sustainable solutions. Thus, the present study aimed to assess and compare the species-specific efficacy of selected aquatic macrophytes in eliminating heavy metals and improving water quality, as well as to identify the optimal harvesting period for maximum pollutant removal and minimal re-leaching. Four fast-growing aquatic macrophytes, Salvinia molesta, Lemna minor, Pistia stratiotes, and Eichhornia crassipes were used in this study as a field-implementable phytoremediation technique to purify untreated ADWW from an industrial site in Sri Lanka. Plants were maintained in diluted ADWW (1:4 ratio) according to the Complete Randomized Design (CRD) with three replicates under control conditions for 21 days. Heavy metal concentrations in ADWW were analyzed once a week using Flame Atomic Absorption Spectroscopy (FAAS). Two-way ANOVA and Tukey's HSD test confirmed highly significant reductions ($p < 0.001$) in most heavy metals across treatments**.** By the third week, Eichhornia crassipes was the most successful hyperaccumulator out of four macrophytes, with the highest removal efficiency for Cu (93.85%), Cd (94.23%), and Zn (92.18%). In addition, Lemna minor was responsible for complete removal of Ni within 14 days. Therefore, Eichhornia crassipes was identified as the most superlative macrophyte of heavy metal reduction in terms of Cu, Cd, and Zn, while Lemna minor was highly recognized for the removal of Ni effectively, offering a sustainable and cost-effective detoxification solution for the apparel industry. Furthermore, Pistia stratiotes also exhibited a moderate capacity for the reduction of Ni (55.77%). This study also addressed aspects often overlooked by previous research, including scalability, interspecies comparisons, and optimal harvesting time. The present study concluded the high potential of macrophytes-assisted phytoremediation as a unique, economically viable, and environmentally compatible solution that aligns with the global green transition. It represents significant advancements in environmentally friendly wastewater treatment, shifting away from expensive and polluting technologies towards nature-based, circular methods that support industry while restoring ecosystems.

Keywords: Apparel wastewater industry, Aquatic macrophytes, Heavy metals, Phytoremediation

VALORIZATION OF CHESTNUT BARK AS A NATURAL BIOSORBENT FOR CATIONIC DYE REMOVAL FROM WASTEWATER

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ABSTRACT

The valorization of biomaterials for the treatment of colored wastewater offers a sustainable and environmentally friendly approach. This study investigates the potential of chestnut bark as a natural biosorbent for the removal of cationic dye, widely used in the textile industry. Physicochemical characterization by infrared spectroscopy (IR), scanning electron microscopy (SEM), and energy-dispersive X-ray spectroscopy (EDX) revealed the presence of active functional groups and a porous structure favorable for adsorption. The effects of operational parameters, including pH, initial dye concentration, contact time, and adsorbent dosage, were systematically studied. Results showed that adsorption follows a pseudo-second-order kinetic model and fits the Langmuir isotherm model, suggesting monolayer chemisorption onto homogeneous sites. Chestnut bark thus emerges as an efficient, low-cost, and sustainable biosorbent for cationic dye removal, with strong potential for large-scale applications.

Keywords: : Biosorption, Chestnut bark, cationic dye, Wastewater treatment, Adsorption isotherms and Adsorption kinetics

BIOACCUMULATION OF LEAD AND CADMIUM IN COMMERCIAL FISH FROM LAKE TEMPE: IMPLICATIONS FOR FOOD SAFETY AND ENVIRONMENTAL MONITORING

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ABSTRACT

Lake Tempe is home to many types of fish such as nile tilapia, armored catfish, silver barb, and striped snakehead. These fish are important as sources of food and animal protein. However, human activities around the lake can lead to contamination by lead (Pb) and cadmium (Cd), which may affect these fish. This study examined the levels of lead and cadmium in four types of fish from Lake Tempe, South Sulawesi: nile tilapia, armored catfish, silver barb, and striped snakehead. Fish samples were collected from local fishermen. The samples were tested using Atomic Absorption Spectrophotometry (AAS). The results were then compared with the Indonesian National Standard (SNI). The study found that lead levels in nile tilapia, armored catfish, silver barb, and striped snakehead exceeded the safe limit established by the Indonesian National Standard (SNI 7387:2011), which is 2.0 mg/kg. The lead content ranged from 1.13 to 2.29 mg/kg for nile tilapia, 2.16 to 3.01 mg/kg for armored catfish, 2.03 to 2.86 mg/kg for striped snakehead, and 2.27 to 3.02 mg/kg for silver barb. Nonetheless, cadmium levels in all fish were below the safety threshold. These findings indicate that consumption of these fish may pose health risks, making it important to continue monitoring the environmental conditions in Lake Tempe.

Keywords: Oreochromis niloticus; Pterygoplichthys pardalis; Barbonymus gonionotus, Channa striata; Lake Tempe; Cadmium; Lead

TRACE ELEMENT DISTRIBUTION IN RESERVOIR SEDIMENTS: A COMPARATIVE STUDY OF ATIKHISAR AND ALIBEY DAM LAKES

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ABSTRACT

Reservoirs are of great importance for drinking water supply, irrigation, energy production, and flood control in the Marmara Region, where population density and anthropogenic pressures are high. Among these, Atikhisar Dam Lake, the main drinking water source of Çanakkale, and Alibey Dam Lake, serving Istanbul, are two strategically important reservoirs. Understanding the sediment quality of such water bodies is essential, since sediments act both as sinks and secondary sources of pollutants, influencing ecological health and water quality. In this study, selected trace elements (Li, Mn, Ni, Ba) were measured in surface sediments collected from both reservoirs during dry and wet seasons. The results demonstrated spatial and temporal variations, with Atikhisar Dam generally showing lower lithium and manganese concentrations compared to Alibey Dam, where markedly higher levels were detected, especially for manganese. Nickel values were comparable between the reservoirs, while barium concentrations were higher in Atikhisar. These findings indicate that local geology, catchment characteristics, and possible human activities contribute to the observed differences between the two lakes. Overall, the study emphasizes the necessity of regular monitoring of reservoir sediments to safeguard water resources and ecosystem health. By providing baseline information on trace metal levels, this research contributes to sustainable water management strategies for the Marmara Region, where the preservation of dam lakes is critical for meeting the growing demand for clean water and ensuring long-term ecological balance.

Keywords: Marmara Region Reservoirs, Trace elements, Seasonal variation

INVESTIGATING SEDIMENT CONTAMINATION USING GEOACCUMULATION AND POLLUTION LOAD INDICES: A CASE STUDY OF ATIKHISAR AND ALIBEY DAM LAKES

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ABSTRACT

Atikhisar and Alibey Dam Lakes are crucial water resources in the Çanakkale and Istanbul regions of Türkiye, respectively, serving purposes from drinking water to irrigation, thus making their sediment quality a direct indicator of ecosystem health and human exposure risk. This study evaluates the extent of heavy metal pollution (Li, Mn, Ni, Ba) in the sediments of these reservoirs by employing two fundamental environmental indices: the Geoaccumulation Index (Igeo), which assesses metal enrichment by comparing current concentrations to background levels, and the Pollution Load Index (PLI), providing a simple, comparative measure of overall site contamination. Sediment samples were collected from two specific sites (inlets and outlets of reservoirs – AH1, AH2; AB1, AB2) in each lake during dry and wet seasons, with mean Igeo and PLI values calculated from the analysed metal concentrations. The results from Atikhisar Dam Lake (mean Igeo: -2.218 to -2.759; mean PLI: 0.099 to 0.143) and Alibey Dam Lake (mean Igeo: -1.969 to -2.094; mean PLI: 0.168 to 0.172) consistently yielded negative Igeo values and PLI values significantly below 1. This uniform classification across all sampling points indicates that the sediments are unpolluted with respect to the analysed elements Li, Mn, Ni, and Ba. The findings conclusively demonstrate that there is no significant ecological risk or pollution burden from these specific metals in the sediments of either dam lake. This study provides a critical baseline for future monitoring efforts and underscores the current effectiveness of watershed management practices in preventing heavy metal contamination in these vital water bodies.

Keywords: Atikhisar and Alibey dam lakes, Geoaccumulation Index, Pollution Load Index

INTRASPECIFIC VARIATION AND PHENOTYPIC PLASTICITY OF OLIVE VARIETIES IN RESPONSE TO CONTRASTING PEDO-CLIMATIC CONDITIONS

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ABSTRACT

We assessed the intraspecific variability of 83 olive varieties from different Mediterranean countries, maintained in the worldwide olive germplasm bank of Marrakech (WOGBM), Morocco, and the French germplasm bank of Porquerolles Island (FOGB), France, by screening leaf (area, width, length to width ratio, leaf mass per area, leaf dry matter content and thickness) and stem traits (stem specific length, Huber value and wood density) involved in plant water-use. The phenotypic plasticity of traits was determined by Phenotypic Dissmilarity index (PhD), while the multivariate plasticity index was used to evaluate varietal plasticity in the multidimensional trait space. Our results showed considerable phenotypic variability between sites, with a consistent trend for common varieties in terms of leaf mass per area, leaf dry matter content and wood density. Varieties grown in WOGBM Morocco were more conservative, showing denser leaves and wood. We also found contrasting phenotypic plasticity among common varieties, and that a plastic variety is not necessarily plastic for all traits. Varieties cultivated in FOGB with conservative trait values showed less plasticity in terms of leaf length to width ratio, leaf dry matter content and Huber value. Our study brings new insights as to how traits of olive trees vary according to variations in pedo-climatic conditions, and highlights the complexity of multivariate trait plasticity.

Key words: Environment, functional traits, *Olea europaea* L., phenotypic plasticity, plant economic strategies.

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POTENTIAL USE OF SIMPLE BIOMARKERS TO DETECT METAL TOXICITY UNDER DIFFERENT PH IN LABORATORY STUDY

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ABSTRACT

The research on a simple mussel biomarker, Perna viridis, was conducted to detect the toxicity of Lead under different pH in laboratory studies. This research was performed by exposing green mussels with a serial dilution of lead (Pb) concentration which was 0,008; 0.08; 0.8 mg/l and control combined with variations of pH which were 6.2; 7.7 and 8.2. The exposure period was 96 hours. To determine the differences in treatment and interaction among the treatments factorial ANOVA was used. The results demonstrated that the simple biomarker, condition index (CI), could statistically detect the effect of pH on Pb toxicity at a concentration of 0.8 mg/l for 96 h exposure under pH 8.2. Evidence supported by another biomarker i.e hemocyte classification based on color and the typical hematological staining and Ca concentration analysis in green mussel's shell. The potential use of this simple biomarker for categorizing pollutant status in marine ecosystems is discussed.

Keywords: Simple biomarker, Condition Index, Perna viridis, Ocean acidification, Lead

DEVELOPMENT AND OPTIMIZATION OF SODIUM ALGINATE-ZINC OXIDE HYBRID NANOCOMPOSITE BEADS FOR ENHANCED ADSORPTION OF DYES IN WASTEWATER TREATMENT

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ABSTRACT

This study aims to screen and optimize of a novel hybrid nanocomposite beads elaboration based on sodium alginate and zinc oxide for Basic Blue 41 (BB 41) adsorption by using sequential optimization approaches, based on both statistical experimental designs, a 2-level Plackett–Burman and Reduced Central Composite CCF. Hybrid nanocomposite beads were prepared by ionotropic and chemical cross-linking extrusion method. The most important parameters affecting BB 41 adsorption were found to be, sodium alginate and zinc oxide concentrations. The optimal conditions for maximizing the BB 41 adsorption were 6 % w/v, 3% w/v, 1 % w/v and 8 cm for sodium alginate, zinc oxide and $CaCl_2$ concentrations and fall distance, respectively. Several techniques were used to describe the structural, crystallographic, morphological, spectral and thermal characteristics of the prepared hybrid beads namely; X-ray diffractometry (XRD), scanning electron microscopy (SEM), attenuated total reflectance (ATR), thermogravimetric, and differential (ATG/DTG) analysis, before and after the BB 41 adsorption. Characterization results show that the presence of ZnO has significantly affected both the morphology and the stability of the nanocomposite.

Keywords: Screening, Optimization, Alginate, SNZnO, Ionotropic and Chemical encapsulation, hybrid nanocomposite beads, adsorption, Characterization.

EVALUATION OF THE EFFECTS OF ETHANOLIC EXTRACT OF RUTA CHALPENSIS RUTACEA ON THA PUPATION PROCESS OF DROSOPHILA MELANOGASTER (DIPTERA DROSOPHILIDAE)

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ABSTRACT

Ruta chalepensis is an aromatic plant belonging to the Rutaceae family, commonly known by the local population as “Fidjel.” It grows spontaneously and is widely distributed in North Africa, particularly in Algeria. As part of the research conducted in our laboratory, we developed a protocol aimed at evaluating the effects of ethanolic extracts of Ruta chalepensis on the pupation behavior of the fruit fly Drosophila melanogaster, a model organism widely used in biological research. This experiment involved monitoring pupation in fertilized females of D. melanogaster, assessing their choice of pupation site between treated and control substrates, and determining the impact of the plant extract on insect development. The results indicate that the plant extract influences the females' choice of pupation site. A significant decrease in the number of pupae was recorded in both the treated and control environments, with a difference of up to 20%. This suggests a notable effect of the extract on the developmental process.

Keywords: Biological control, Drosophila melanogaster, Ruta chalepensis, pupation, development.

A SOCIOSCIENTIFIC ANALYSIS OF HOUSEHOLD WASTE OILS IN RENEWABLE ENERGY CONVERSION

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ABSTRACT

Increasing consumption habits accelerate environmental pollution and adversely impact nature's self-regeneration capacity. In this context, the management of household waste, in particular, has become increasingly critical. Municipal waste includes recyclable materials such as paper, glass, and plastic, as well as household hazardous substances like detergents, cleaning agents, and waste oils. These wastes contribute to environmental problems such as water pollution, the greenhouse effect, and global warming. The recycling and conversion of waste vegetable oils into energy, in particular, contributes to environmental sustainability and holds significant importance for the national economy. This research aims to evaluate the contribution of oils derived from household waste to renewable energy and to assess public awareness on this subject. As the objective is to gather opinions to obtain a societal perspective on this current issue, a case study methodology has been deemed appropriate for the nature of the research. Accordingly, data will be collected via a survey questionnaire distributed through social networks (Facebook, Instagram, WhatsApp, X, etc.) to reach audiences across Turkey's seven distinct regions. Additionally, individuals residing abroad with connections to Turkey will be eligible to participate. It is anticipated that 1000 individuals will participate in the survey over a 4-week period. All data obtained during the research will be collected and stored via an email address integrated with the Google Drive platform. The survey, comprising 20 items, will consist of multiple-choice questions. The raw data obtained will be analyzed using descriptive analysis methods.

Keywords: Household waste, Oil, Renewable energy, Socioscientific issue

HOUSEHOLD WASTE TRENDS IN TURKEY AND EUROPE: A COMPARATIVE ASSESSMENT

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ABSTRACT

In Turkey, household waste generation has shown a steady increase over the past two decades. The total amount of household waste, which was approximately 25 million tons in 2000, rose to 36 million tons in 2024. During the same period, per capita daily waste generation increased from 1.1 kg to 1.4 kg. Population growth, urbanization, and changing consumption habits have been the main drivers of this increase. Household waste is generally classified into organic waste, recyclable waste, hazardous waste, and bulky waste. Nearly half of household waste in Turkey consists of organic waste (45–50%), while recyclable materials (paper, plastic, glass, metal) account for around 36%. The proportion of textiles and other residual waste is about 8%, whereas hazardous household waste remains below 2%. Used vegetable and animal oils generated in households and the food sector constitute a significant share of household waste. When disposed of directly into sewage systems or household trash, waste oils can cause severe environmental damage; they contaminate water resources and clog sewage infrastructure. Therefore, the collection, recovery, and conversion of household waste oils into energy products such as biodiesel are becoming increasingly important. In Turkey, only 10–15% of waste oils are collected and recycled regularly, compared to more than 50% in European countries. Several differences are evident when comparing Turkey with Europe. In European countries, organic waste accounts for about 34% of household waste, while paper and plastic waste ratios are higher than those in Turkey (paper 19%, plastic 17%). The recycling rate in Europe hovers around 48–50%, whereas it remains at 27% in Turkey. These figures indicate that waste separation systems and recycling infrastructure are more widespread in Europe. The relatively high share of organic waste and waste oils in Turkey highlights the need to develop composting practices and waste oil collection systems. In 2005, the recycling rate in Turkey was only 5%, but by 2024 it had risen to 27%. Nevertheless, this figure still falls short of the European average. The findings suggest that despite progress in household waste management, there remains a continued need for infrastructure enhancement and policy development. In conclusion, the increase in household waste poses a significant risk to environmental sustainability. More effective waste management requires the expansion of separation systems, strengthening of municipal recycling infrastructure, collection and recovery of waste oils, reduction of single-use products, and increased public environmental awareness. In this respect, the "zero waste" approach is of critical importance, not only through legal regulations but also by fostering social participation and education.

Keywords: Household waste, environmental management, recycling

TAXONOMIC DIVERSITY AND TOXICOLOGICAL ASSESSMENT OF CYANOBACTERIA IN A DRINKING WATER RESERVOIR (KAYALIKÖY RESERVOIR, EDIRNE, TÜRKIYE)

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ABSTRACT

Introduction and Objectives**:** Rapid global population growth, industrialization, and agricultural activities exert intense pressures on freshwater ecosystems, leading to water quality deterioration and threatening ecosystem sustainability. These pressures particularly enhance the frequency of toxic cyanobacterial blooms, posing significant risks to ecological balance and human health. Cyanobacteria play a crucial role in primary production and biogeochemical cycles, while producing highly toxic secondary metabolites such as microcystins, nodularins, anatoxins, and saxitoxins. These cyanotoxins can cause mortality in aquatic organisms, impair water quality, restrict recreational activities, and pose serious threats to drinking water safety. This study aimed to investigate the taxonomic diversity, frequency, and dominance of cyanobacterial communities in Kayalıköy Dam, which supplies drinking and utility water to Edirne province. In addition, the vertical distribution and concentration of cyanotoxins were determined, and the influence of environmental factors on cyanobacterial development was assessed. The presence of potentially toxin-producing species was confirmed, highlighting associated ecological and human health risks. Materials and Methods: Periodic sampling was conducted at Kayalıköy Dam between March and October 2022 to identify cyanobacterial species and assess their toxicity potential. Water and plankton samples were collected from various depths up to 20 m using a Nansen-type sampler. Temperature, dissolved oxygen, conductivity, pH, salinity, and total dissolved solids (TDS) were measured in situ with a multiparameter probe, and lake depth and Secchi disk transparency were recorded. Water samples were transported to the laboratory in 2 L Plexiglas bottles at +4 °C for further chemical analyses. Cyanobacterial cell counts were performed using an Zeiss Axio Observer 5 inverted microscope following standard protocols as described by Utermöhl. The final abundance of each species was calculated as the average of three replicate counts. Species identification was based on a wide range of taxonomic references. Based on the obtained data, water quality classes of Kayalıköy Dam were evaluated according to the Surface Water Quality Management Regulation. Results and Conclusions**:** The findings provide a scientific basis for maintaining water quality, mitigating toxin risks, and developing sustainable water management strategies in Kayalıköy Dam. This study contributes to the limited regional research on cyanobacteria and cyanotoxins and offers guidance for similar aquatic ecosystems.

Keywords: Kayalıköy Reservoir, Cyanobacteria, Cyanotoxins

DUAL ENVIRONMENTAL ROLE OF BIOSURFACTANTS IN PETROLEUM SYSTEMS: HYDROCARBON BIODEGRADATION AND MITIGATION OF MICROBIALLY INFLUENCED CORROSION

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ABSTRACT

Biosurfactants are microbial amphiphilic compounds increasingly recognized as sustainable alternatives to chemical surfactants due to their low toxicity, biodegradability, and stability under extreme conditions. This study highlights the dual functionality of biosurfactants in hydrocarbon bioremediation and microbiologically influenced corrosion (MIC) mitigation under laboratory-controlled conditions, providing valuable insights for environmental applications. A hydrocarbonoclastic bacterial strain, isolated from hydrocarbon contaminated marine sediment, was exploited for the production of a lipopeptide biosurfactant for these dual applications. Cultivation under aerobic batch conditions at 30 °C, using olive oil and ammonium nitrate as sole carbon and nitrogen sources, yielded a compound with high activity, as indicated by an oil displacement diameter of 70 mm, a surface tension reduction to 28 $mN \cdot m^{-1}$, and an emulsification index (E24) of 75% after 48 h. For soil remediation, gravimetric and GC–MS analyses demonstrated that biosurfactant treatment removed 98% of hydrocarbons from contaminated soil, compared to 39% in the untreated control, with pronounced degradation of low molecular weight alkanes. In addition, the biosurfactant effectively mitigated MIC caused by sulfate reducing bacteria (SRB), an environmentally relevant process contributing to infrastructure deterioration and pollutant release. SEM observations revealed significantly reduced biofilm formation on metal surfaces, limiting bacterial adhesion and localized sulfate reduction, while EDX confirmed decreased sulfur deposition compared to the untreated control after 30 days. The treatment achieved 81.3% efficiency in iron preservation and 91.2% in sulfur reduction, confirming significant corrosion inhibition. Collectively, these results highlight the multifunctional environmental potential of biosurfactants as eco-friendly agents for both soil bioremediation and MIC mitigation. Their high efficiency in hydrocarbon removal and corrosion inhibition, combined with stability under environmental stress conditions, underscores their potential for practical, scalable applications in sustainable environmental management and infrastructure protection.

Keywords: Biosurfactants; Soil bioremediation; Hydrocarbon biodegradation; Sulfate-reducing bacteria (SRB); Microbiologically influenced corrosion (MIC); Biofilm inhibition

BIOACTIVITY EVALUATION OF TWO MEDICINAL PLANT ESSENTIAL OILS TOWARD ONE OF THE STORED-GRAIN INSECTS : THE CASE OF BROAD BEAN WEEVIL BRUCHUS RUFIMANUS BOH.

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ABSTRACT

This study evaluates the insecticidal activities of two essential oils in order to suggest their potential application as biopesticides in stored grain protection. The essential oils used are Eucalyptus globulus (Labille, 1800) and Laurus nobilis (L., 1753). The toxicity of these oils is evaluated by contact and inhalation, as well as their repellent effect on adults of broadbean weevil Bruchus rufimanus (Boheman, 1833). The toxicity results reveal significant insecticidal activity by contact and inhalation against B. rufimanus, causing mortality in adults, depending on the concentration and oil used. E. globulus essential oil is more effective by contact than L. nobilis oil; the LC 50 values recorded for these two oils are 1.54 µl/ml and 2.08 µl/ml, respectively. The results of inhalation tests showed that mortality rates increased as the dose of essential oil increased. E. globulus essential oil also proved to be the most effective and very interesting in this application method. Indeed, this oil exerts a very rapid insecticidal effect on B. rufimanus adults, the LC 50 calculated for this oil is 0.4 µl/ml, while the oil of L. nobilis (LC 50 = 0.9 µl/ml) Essential oil repellency tests show that L. nobilis oil is the most repellent (80%) to B. rufimanus adults, compared to E. globulus essential oil, which is moderately repellent (50%).

Keywords: Toxicity, Repellency, Bruchus rufimanus, Essential oils, Eucalyptus globulus, Laurus nobilis,

POST-MORTEM STUDY OF MALE FERTILITY PARAMETERS IN RAMS OF ALGERIAN LOCAL SHEEP BREEDS

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ABSTRACT

Background and Aim: This study aims to evaluate fertility parameters in rams from two Algerian local sheep breeds, Rembi and Ouled Djellal. A combined approach integrating morpho-spermiological, hormonal, and molecular analyses was used to better understand the determinants of male fertility in these populations. Materials and Methods: A total of ten rams were selected, equally divided between the two breeds: five Rembi and five Ouled Djellal. The animals were chosen at slaughterhouses in the Oran region using convenience sampling. All selected animals were yearlings showing no clinical signs of disease. After slaughter, blood samples and testicles were collected from each ram and immediately transported to the laboratory under appropriate conditions to preserve their biological integrity. Results: Spermiological analyses revealed higher sperm motility and concentration in the epididymis of Rembi rams compared to Ouled Djellal rams, along with a significantly lower rate of abnormal sperm forms. These findings suggest a potential breed-related difference in reproductive performance. Hormonal assays showed variable levels of testosterone and estradiol despite very low levels of LH and FSH, which may be due to specific hormonal regulation or limitations in assay sensitivity.
At the molecular level, polymorphism analysis of the DAZL gene, involved in spermatogenesis, was performed using the PCR-RFLP technique with the AluI restriction enzyme. All individuals displayed an undigested profile (133 bp), indicating allelic homogeneity (genotype AA), which may reflect low genetic variability in this genomic region among the studied breeds. Although preliminary, these results highlight the value of integrated approaches for characterizing animal fertility and pave the way for marker-assisted selection programs aimed at the genetic improvement of local sheep breeds. Further large-scale studies are needed to confirm these findings and to expand our understanding of the genetic mechanisms involved in reproduction.

Keywords: Male fertility · Rams · Rembi · Ouled Djellal · Spermatogenesis · Sex hormones · DAZL gene.

EFFECTS OF INFESTATION BY THE PARASITE VARROA DESTRUCTOR ON HEMOLYMPH METABOLITES OF RESISTANT HONEY BEE WORKERS (APIS MELLIFERA INTERMISSA)

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ABSTRACT

The ectoparasite Varroa destructor is the main threat responsible for the collapse of bee colonies. Thus, several methods of combating this mite exist, but they are not sustainable. Hence the importance of naturally resistant colonies. Several resistance mechanisms have been developed by the bee. In Algeria, strains of Tellian bees (Apis mellifera intermissa) are naturally resistant to varroa by exhibiting more pronounced delousing behavior than in susceptible bees. This study aims to elucidate the possible physiological mechanisms underlying this resistance. We therefore chose parameters that represent the global organism health. In this part of the study, we aimed to determine whether the Varroa infestation affected protein, lipid, and sugar titers in workers from resistant honey bee colonies. To do this, we divided our sample into two groups: non-infested workers (control) and workers infested by Varroa during their embryonic development. We therefore measured the metabolite titers at three different ages: 0, 7, and 14 days. Bees came from Apis mellifera intermissa resistant colonies. Concerning the protein and lipid content, there were no significant differences between infested and non-infested bees at the ages of 0 and 14 days. But we noted a significant difference between the two groups of 7 days age. With a main protein concentration of 0.651 ± 0.05 µg/µl in the non-infested group, against 0.384 ± 0.05 µg/µl in the infested group, and a main lipid concentration of 0.77 ± 0.07 µg/µl in the non-infested group against 0.428 ± 0.07 µg/µl in the infested group. Otherwise, we didn't note any significant difference between the two groups in sugar levels at the three ages.
According to these results, the infestation of bees from resistant colonies by Varroa did not present a negative effect on their protein, lipid, and sugar levels in hemolymph at emergence (0 days). There was no significant impact on sugar content in adult life, but it had a significant impact on protein and lipid contents during the nursing period (7 days), which were settled a week later (14 days). This shows a physiological resistance to the Varroa infestation by the ability to regulate some of its damage. Further related research is underway to understand the physiological mechanisms linked to resistance to the ectoparasite varroa destructor.

Keywords: Apis mellifera intermissa, Varroa destructor, resistance, hemolymph, metabolites.

EFFECT OF USING BLACK SOLDIER FLY LARVAE MEAL ON THE PRODUCTIVITY CHARACTERISTICS OF LAYING HENS

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ABSTRACT

As the global population rises, projected to reach approximately 9 billion by 2050, a significant increase is expected in the demand for animal protein, especially for poultry products, which have the lowest carbon and water footprint compared to other sources of animal protein. FAO estimates show that the demand for poultry meat and eggs is set to increase by 70% and 58%, respectively, by 2050. Using insects in animal feed could reduce the demand for the production of soya, while limiting deforestation and the loss of natural resources, and significantly reducing greenhouse gas emissions. The study was carried out at the 'Andrejevu Gundegas' farm in Iesalnieki, Jersika Rural Territory, Līvāni Municipality, on cross Brown Nick laying hens. Two equivalent groups of laying hens were assembled for the trial: a control group and a test group, with 100 laying hens at 30 weeks of age in each group (n=200). The trial took place between 24 March and 11 May 2025. Adding black soldier fly larvae meal to the feed of laying hens improved their productivity. In the test group, egg production was 1.81% higher than in the control group. The 5% inclusion of black soldier fly larvae meal in the diet of the trial group of hens resulted in a 1.0% ($p>0.05$) increase in laying intensity. The inclusion of black soldier fly larvae meal in the feed mixture did not significantly affect average egg mass ($p>0.05$). In line with the higher laying intensity of the trial group hens, the consumption of feed per production unit tended to decrease. In the trial group, hens consumed an average of 2.59 kg of feed to produce 10 eggs: that is, 0.05 kg or 1.89% less than in the control group. During the trial, the amount of feed converted to produce 1 kg of egg mass was equivalent in both groups, at 1.88 kg·kg-1. The addition of black soldier fly larvae meal increased the cost of feed in the production of 10 eggs by EUR 0.61. In terms of feed costs, the feed consumed to produce 1 kg of egg mass in the control group cost EUR 0.73 kg-1, while in the trial group, it cost EUR 1.18 kg-1. That is, the cost was EUR 0.45 kg-1 less in the control group than in the trial group.

Keywords: Black soldier larvae meal, laying hens, productivity, costs

CROSS-SECTIONAL STUDY ON THE REASONS FOR SEIZURE RECORDED IN CATTLE , SHEEP AND CAMELS AT TWO SLAUGHTERHOUSES IN ALGERIA

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ABSTRACT

In Algeria, meat production is essential for meeting human needs for animal protein. Meat is also considered a reservoir for germs that threaten human health. The objective of this study was to determine the prevalence of seizure cases in two slaughterhouses (Ain Salah, Khemis Meliana) in Algeria. For this purpose, our study was conducted over a period of four months and focused on three animal species : cattle, sheep and camels. A post-mortem examination of carcasses and viscera was carried out by slaughterhouse veterinarians. At Ain Salah slaughterhouse, a total of 72 cattle, 1253 sheep, and 820 camels were inspected. Among these, 73 sheep carcasses were condemned, with a hydatidosis prevalence of 8.21% (6/73). In camels, 4 carcasses were condemned, with a hydatidosis prevalence of 50% (2/4). Pulmonary lesions, including pulmonary emphysema and abscesses, were observed in 91.78% (67/73) of the examined sheep and 50% (2/4) of the camels. In Khemis Meliana abattoir, a total of 270 cattle and 1448 sheep were inspected. Among these, 25 cattle and 103 sheep carcasses were condemned. Hydatidosis was highly prevalent in cattle, affecting 92% (23/25) of the cases, and in sheep, it was detected in 98.09% (101/103) of the cases. In contrast, fasciolosis was identified in only one sheep case, corresponding to a prevalence of 0.95%. Additionally, tuberculosis was observed in 2 cattle cases (8%) and one sheep case (0.95%). In conclusion, this study has made us aware of the crucial role of the veterinary inspector in controlling the hygienic quality and safety of meat intended for human consumption, preventing the transmission of serious diseases to consumers. Health control measures will be necessary to limit the dissemination of zoonoses in particular.

Keywords: Algeria; animal; carcass; lesion; slaughterhouse;Zoonosis

MAPPING URBAN EXPANSION AND AGRICULTURAL LAND TRANSFORMATION IN THE CASABLANCA METROPOLITAN AREA: A SPATIAL APPROACH TO ENVIRONMENTAL SUSTAINABILITY

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ABSTRACT

The accelerated urbanization of North African metropolitan areas represents a critical threat to agricultural ecosystems, land-use equilibrium, and food security. This study analyzes the spatial dynamics of land cover change in the Casablanca region, within a 40-kilometer peri-urban buffer zone, using multi-temporal satellite imagery (Landsat) and geospatial processing techniques. A supervised classification method was applied to detect the progression of artificial surfaces and the retreat of agricultural land over a ten-year period. To evaluate both the magnitude and spatial intensity of urban expansion, the analysis incorporates spatial indicators such as the Average Urban Expansion Rate (AUER) and the Urban Expansion Intensity Index (UEII). These indicators, combined with GIS mapping, enabled the classification of communes based on their degree of exposure to urban pressure. The results reveal a pronounced fragmentation of agroecosystems and the emergence of critical urban-agricultural interfaces, particularly in zones where governance structures remain weak or absent. By exposing the uneven territorial impacts of unregulated sprawl, this research contributes to current debates on reconciling urban growth with environmental preservation. It advocates for inclusive, evidence-based planning approaches that integrate remote sensing data, safeguard strategic farmland, and enhance the resilience of peri-urban systems. Ultimately, this work underscores the power of geospatial tools to inform sustainable land-use transitions in rapidly evolving urban landscapes.

Keywords: Urban expansion, land-use change, peri-urban agriculture, GIS, spatial indicators, remote sensing

SULFIDE MINE WASTE TREATMENT VIA PYRITE FLOTATION FOR ENVIRONMENTAL PROTECTION, MINE OF ALGERIA

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ABSTRACT

The Chaabet El Hamra mining site in Algeria generates waste with high sulfur content, largely due to the presence of pyrite. Other minerals, such as sphalerite, galena, and chalcopyrite, are also present in the ore. Given the high sulfur content (greater than 9%), there is a considerable risk of acid mine drainage (AMD), which can lead to significant environmental pollution. To mitigate this risk, we employed a flotation method aimed at separating pyrite from the other minerals, focusing on its desulfurization potential. The flotation process utilizes the distinct wetting characteristics of pyrite compared to the other minerals in the ore. A series of reagents were tested to enhance the separation, including Potassium Amyl Xanthate as a collector (140 g/t), pine oil as a frother (10 g/t), and copper sulfate ($CuSO_4$) as an activator (60 g/t), with flotation conducted at a pH of 5 for a period of 12 minutes. The results showed a marked decrease in sulfur levels, with the flotation process effectively removing a large proportion of the pyrite, and therefore a substantial portion of the sulfur. This method provides an efficient solution to managing sulfur-rich mining waste and reducing environmental hazards such as acid mine drainage

Keywords: Chaabet El Hamra-pyrite flotation-environmental desulfurization-acid mine drainage-sulfide mining waste management

SYNTHESIS AND CHARACTERIZATION OF MESOPOROUS CHROMOSILICATES MATERIALS

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ABSTRACT

Zeolites posses a uniform pore size distribution, have a high catalytic activity and are widely used as catalysts in the industry as heterogeneous catalysts, especially as the solid acid catalysts in the fields of oil refining and petrochemistry. However, their pore sizes restrict the contact between their small size of the channels (less than 0.8 nm) and cavities (typically <1.5 nm) imposes diffusional limitations on reactions that can cause high back pressure on flow systems. The industrial applications of the mesoporous materials such us (SBA-15, MCM-41) are hindered by their amorphous wall structure, which result in lower hydrothermal stability than those of microporous zeolites. During the past decade, significant efforts have been devoted to synthesize a new kind of composite materials, which should combine the advantages of microporous and mesoporous molecular sieves. In this work, we report the synthesis of mesoporous chromosilicates (MCrS) by the assembly of Cr-MFI nanoclusters with triblock copolymers (of the Pluronic type (P123)) in strongly acidic media. Various techniques including BET, diffuse reflectance UV-vis, FT-IR spectroscopy and TPR were employed for the materials characterization. MCrS materials have a hexagonal structure with uniform mesopores, the mesoporous walls contain the MFI structure building units.

Keywords: Zeolite precursors; Cr-MFI; mesoporous; SBA-15

A PHOTOCATALYTIC STUDY OF A CATIONIC DYE DEGRADATION VIA COBALT MONOXIDE

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ABSTRACT

Currently, water contamination represents a significant ecological hazard for numerous countries worldwide due to population growth and ongoing industrial expansion. There is a significant focus on creating sustainable, environmentally friendly technologies to adhere to stringent environmental standards. The utilization of standard approaches has achieved little success in addressing the obstinate characteristics of industrial wastewater from dye-based effluents.Advanced oxidation process (AOPs) generate reactive radical species like hydroxyl radicals and superoxide anions, which effectively oxidize organic materials. Photodegradation of organic pollutants offers advantages like complete mineralization, low concentration of pollutants, and no by-products. This process is proposed as a new technology in wastewater treatments due to its advantages. AOPs can be classified into many varieties based on their generating principles and the oxidizing agents utilized, including Fenton, ozonation, ultrasonic, electrochemical oxidation, H2O2/UV, and photocatalysis. Photocatalysis is an efficient and environmentally sustainable therapy within AOPs, generating highly reactive hydroxyl radicals upon exposure to light while maintaining low operational costs. Cobalt monoxide (CoO) is a notable semiconductor with an energy band gap ranging from 2.4 eV to 2.7 eV . It crystallizes in two forms: the cubic rock salt structure and the hexagonal wurtzite phase. Despite the thermodynamic stability of the cubic close-packed structure, the hexagonal form of CoO exhibits intriguing electrical, optical, magnetic, and electrochemical properties that are advantageous for various potential applications, including catalysis, gas sensors, magnetic data storage devices, and lithium-ion batteries.This study has designed the structural chracterization of CoO particles utilizing FT-IR, and Raman Spectroscopy. Reactive methylene blue(MB) was chosen as dye employed in the textile sector, namely for cotton dyeing and and is classified as a wastewater pollutant. The photocatalytic degradation MB has been assessed under solar-simulated light irriadition. Additionally, the photocatalytic test conditions, such as catalyst dose (0.25 g/L, 0.50 g/L, and 0.75 g/L) and initial MB concentration (10 mg/L, 20 mg/L, and 30 mg/L), were also investigated. The photocatalytic test results indicated that the maximum decolorization efficiency of MB was observed with the decreased initial dye concentration.

Keywords: Photocatalysis, Methylene Blue, Cobalt Oxide, Photocatalytic Degradation

SILICA NANOPARTICLES AND THEIR CURRENT BIOMEDICAL APPLICATIONS

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ABSTRACT

Silica, or silicon dioxide (SiO2), is among the most extensively researched substances in science and engineering. It is commonly found as quartz or sand, although it exists in numerous crystalline and amorphous forms. Crystalline silica has been utilized for millennia in the manufacture of glass and concrete, while contemporary applications encompass high-temperature ceramics and refractory materials. In crystalline silica, silicon is coordinated by four oxygen atoms, with each oxygen atom bonding to two silicon atoms. This constitutes a cohesive network of tetrahedra featuring core silicon atoms and bridging oxygen atoms. The Si─O─Si bond denotes the siloxane functional group. Various processes for silica nanoparticle preparation are utilized, including plasma synthesis, chemical vapor deposition, microemulsion processing, combustion synthesis, sol-gel processing, and hydrothermal procedures. Recent endeavors in silica nanoparticle synthesis concentrate on regulating size, shape, and surface reactivity. The sol-gel method is extensively utilized and preferred for nanoparticle synthesis due to its advantages, including the ability to conduct synthesis at low temperatures, achieve desired pH levels for high purity, and control reaction kinetics by adjusting the composition of the reaction mixture. Silica-based nanoparticles (SNPs) have garnered significant interest in biomedical applications over the past decades owing to their exceptional biocompatibility and controlled architectures. They have been utilized in various biomedical domains, including diagnostics, biosensing, and medication delivery. The medical applications of SNP in anti-cancer, anti-microbial, and theranostic contexts are particularly notable due to their remarkable efficacy in delivering various small compounds and, more recently, biologics to specified locations. The physical and chemical characteristics of SNP, including a substantial specific surface area, adjustable particle size and porosity, as well as exceptional biodegradability and biocompatibility, render them an optimal platform for drug delivery and diagnostics.In this study, brief information about silica nanoparticles and recent research examples will be given.

Keywords: Silica Nanoparticles, Nanotechnology, Biomedical Applications

SYNTHESIS AND CHARACTERIZATION OF TOSYLCARBAMATES WITH A PHOSPHONATE MOIETY

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ABSTRACT

The development of novel molecules incorporating heteroatoms such as nitrogen (N), sulfur (S), oxygen (O), and phosphorus (P) continues to expand, driven by the unique physicochemical and biological properties these elements confer. Among the broad range of heteroatom-containing compounds, tosylcarbamates and phosphonates featuring the (Me–SO_2–NH–COO–R1) and (R–PO(OR')2) moieties, respectively have garnered significant interest. Sulfonylcarbamates constitute an important class of compounds, especially in the field of pharmacology, due to their distinct three-dimensional architecture, capacity to form hydrogen bonds, structural rigidity, and their role as non-cleavable amide surrogates. They are widely used as bioisosteres of carboxylic acids in drug discovery and development, notably as ligands for the angiotensin II type 1 receptor (AT1R), as well as in herbicides and lipid regulators. [1] On the other hand, phosphonates represent a versatile class of organophosphorus compounds composed of phosphorus, carbon, oxygen, and hydrogen. Their broad range of applications in industrial, agricultural, and medicinal chemistry, as well as their utility as synthetic intermediates, has made them highly attractive to researchers. Among them, **α-**hydroxyphosphonates and their derivatives have received particular attention due to their diverse biological activities and potential as key building blocks in organophosphorus chemistry. Recent studies have demonstrated their promise as antibiotics, pesticides, and anticancer agents. [2] In medicinal chemistry, the introduction of heteroatoms into molecular scaffolds can profoundly affect the physicochemical and pharmacological properties of the resulting compounds. Within this framework, the combination of sulfonylcarbamate and phosphonate motifs in a single molecular entity is expected to enhance biological activity through synergistic effects. In this context, our research focuses on the synthesis of novel sulfonylcarbamates bearing a phosphonate moiety. The synthetic strategy employed follows a two-step pathway: first, a Pudovik reaction between an aldehyde and triethyl phosphite yields the corresponding α-hydroxyphosphonate. This intermediate then undergoes an addition reaction with p-methylbenzylsulfonyl isocyanate**,** chosen for its ability to efficiently introduce the (Me–SO_2–NH–CO–OR1) fragment into the target structure.

Keywords: tosylcarbamates, phosphonates, p-methylbenzylsulfonyl isocyanate, biological Activity

SYNERGISTIC EFFECTS OF MN/SBA-15 NANOCOMPOSITES ON THE PHOTOCATALYTIC DEGRADATION OF MALACHITE GREEN

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ABSTRACT

Synthetic dyes are extensively used in various industries such as textiles, leather, paper production, and food technology to color products. Among them, malachite green (MG) is commonly applied for dyeing cotton, silk, paper, leather, and in the manufacture of paints and printing inks. In the present study, nanocomposites synthesized at neutral pH were employed for the photocatalytic degradation of malachite green under visible light irradiation. The synergistic effects between mesoporous manganese silicate Mn/SBA-15 (n = 20) and Mn/SBA-15 (n = 60) were investigated. The results revealed that Mn doping significantly enhanced the photocatalytic efficiency of SBA-15. Furthermore, the use of magnetic nanoparticles in photocatalysis for water disinfection effectively inactivated natural enteric bacteria present in municipal wastewater effluents under white light and neutral pH. The morphology of the synthesized nanocomposites was examined by transmission electron microscopy (TEM), showing particle sizes in the range of 50–60 nm. Structural characterization by X-ray diffraction (XRD), Raman spectroscopy, and Fourier transform infrared spectroscopy (FTIR) confirmed the successful formation of the expected nanocomposites. All Mn/SBA-15 samples exhibited superior photocatalytic performance compared to pure SBA-15, demonstrating that Mn incorporation at (n = 20) notably improved the photocatalytic activity. The Mn/SBA-15 (n = 20) nanocomposite achieved a maximum degradation efficiency of 86% for malachite green under visible light within 60 minutes, compared with 60% for Mn/SBA-15 (n = 60). Since malachite green released into aquatic systems can cause severe toxic effects on the liver, gills, kidneys, intestines, and gonads of aquatic organisms, the removal of synthetic dyes from industrial effluents has become an essential environmental concern.

Keywords: depollution, Wastewater, Photo-Fenton, Magnetic nanoparticle, Mesoporous silica, SBA-15.

PERFORMANCE AND EMISSION CHARACTERISTICS OF A SINGLE-CYLINDER DIESEL ENGINE FUELED WITH A 10% OLIVE POMACE OIL–DIESEL BLEND

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ABSTRACT

This study investigates the effects of using a 10% olive pomace oil–diesel blend on the performance and emission characteristics of a single-cylinder diesel engine under varying load conditions. The blend was prepared by volumetrically mixing 10% olive pomace oil with standard diesel fuel. The engine was tested under four different load conditions: 25%, 50%, 75%, and 100% of full load capacity.The experimental results revealed that the engine power output decreased by a maximum of only 0.1 kW across all load conditions when compared to standard diesel. This minor reduction indicates that the blend maintains comparable engine performance. Fuel consumption increased by a maximum of 16 ml/h, which is a relatively small difference and within acceptable limits for alternative fuel use. In terms of emissions, carbon monoxide (CO) levels decreased slightly by approximately 0.01% across all load conditions, suggesting improved combustion efficiency. However, the reduction in CO was minimal. On the other hand, nitrogen oxides (NO_x) emissions showed an increase, particularly at higher loads. A maximum increase of 160 ppm was recorded at 75% load, while other conditions showed moderate increases ranging from 55 to 65 ppm. Despite the slight rise in NO_x emissions, the findings suggest that blending olive pomace oil with diesel at a 10% volumetric ratio can be a viable and sustainable alternative fuel option for diesel engines, with minimal impact on performance and moderate changes in emissions.

Keywords: Energy, Olive pomace oil, Engine performance, Exhaust emissions

IMPACT OF A 5% SOYBEAN OIL AND 5% LINSEED OIL BLEND ON THE PERFORMANCE AND EMISSION CHARACTERISTICS OF A DIESEL ENGINE

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ABSTRACT

In this study, the effects of a biodiesel blend composed of 90% standard diesel fuel and a volumetric mixture of 5% soybean oil and 5% linseed oil on engine performance and exhaust emissions were experimentally investigated in a single-cylinder diesel engine. The engine was tested under load conditions of 25%, 50%, and 75%, which are commonly encountered in industrial applications. The results obtained were compared with those of commercially available standard diesel fuel in Turkey. Experimental results showed no significant change in engine power across all load conditions, indicating that the addition of 10% biodiesel did not affect engine power output. Regarding fuel consumption, no difference was observed between the biodiesel blend and standard diesel at 25% load, whereas increases of 65 ml/h and 105 ml/h were recorded at 50% and 75% loads, respectively. This suggests that the biodiesel blend leads to higher fuel consumption, particularly at higher engine loads. In terms of exhaust emissions, carbon monoxide (CO) levels remained unchanged at 25% and 50% loads, while a slight increase of 0.03% was observed at 75% load with the biodiesel blend. Nitrogen oxide (NO_x) emissions increased across all load levels. The findings indicate that the biodiesel diesel blend containing 5% soybean oil and 5% linseed oil maintains engine power and is viable in terms of performance. However, increased fuel consumption and elevated levels of certain harmful exhaust emissions, particularly CO and NO_x were noted at higher loads. These results are generally consistent with similar studies reported in the literature regarding vegetable oil based biodiesel usage and emphasize the need for careful evaluation of such blends.

Keywords: Energy, Biodiesel blend, Soybean oil, Linseed oil, Engine performance

HYBRID METAHEURISTIC OPTIMIZATION OF PERMANENT MAGNET SYNCHRONOUS MACHINE DESIGN USING GREY WOLF AND TEACHING–LEARNING-BASED ALGORITHMS

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ABSTRACT

Permanent magnet synchronous machines (PMSMs) are highly efficient, less noisy, and have long life spans. In this work, one optimization approach, based on tow meta-heuristic called (GWO & TLBO), is applied to find the machine's optimal geometric characteristics. Our methodology is based on coupling an analysis program using the finite element method to build the machine's geometric model using COMSOL and MATLAB Software. The results of the proposed method have been compared and validated with well known references published recently. The results are promising and show the effectiveness and robustness of the proposed approach.

Keywords: Permanent magnet synchronous machines, Finite element method, coupling algorithm, GWO, TLBO.

ETHNOBOTANICAL SURVEY OF MEDICINAL PLANTS USED FOR SKIN DISORDERS IN ARID REGIONS OF ALGERIA: A STEP TOWARD SCIENTIFIC VALIDATION

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ABSTRACT

Skin diseases are among the most common health issues traditionally treated with folk medicine in Algeria, particularly in arid and semi-arid regions where access to modern healthcare is limited. This ethnobotanical study aims to document and assess the medicinal plants traditionally used by local populations to treat skin diseases in the Tebessa region, located in southeastern Algeria. The fieldwork was conducted through structured interviews with traditional healers, elderly individuals, and experienced herbalists. Collected data included the plant species used, plant parts utilized, methods of preparation, modes of application, and the perceived effectiveness of the treatments. A total of 43 plant species belonging to 23 botanical families were identified, with the Asteraceae and Lamiaceae families being the most represented. Among the most commonly treated skin conditions were eczema, burns, wounds, and skin infections. The most frequently cited species were Pallenis hierochuntica, Artemisia herba-alba, and Calendula officinalis. This study highlights the richness of traditional knowledge among local communities and underscores the importance of scientifically evaluating these treatments to validate their efficacy and promote the sustainable use of local plant resources.

Keywords: Ethnobotany, Skin diseases, Medicinal plants, Traditional knowledge, Arid regions, Algeria, Pallenis hierochuntica

THE ROLE OF UNIVERSITY BOTANICAL GARDENS IN PLANT BIODIVERSITY CONSERVATION

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ABSTRACT

Botanical gardens are an increasingly important factor in plant research and conservation. University botanical gardens play a key role in the conservation of plant biodiversity by serving as living repositories of rare, endangered, and ecologically significant plant species. These gardens contribute to conservation efforts through: Ex situ conservation, research and education, restoration and reintroduction, global collaboration, and networks for the conservation of genetic diversity.
Good practices for biodiversity conservation are achieved by raising public awareness. By integrating conservation, research, and education, university botanical gardens serve as vital centers for maintaining plant diversity in an era of rapid environmental change. Plant conservation strategies are important to support the development of livelihoods based on the sustainable uses of plants and promote the understanding and sharing of the benefits and functions of plants. Botanical gardens allocate most of their resources to plant conservation and the development of educational activities such as making plant species diversity known to the public. These gardens can also play an essential role in human well-being and provide for human needs.

Keywords: botanical gardens, plant biodiversity

ALTERNATIVE TREATMENTS FOR THYROID DISORDERS IN THE WILAYA OF BLIDA IN ALGERIA

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ABSTRACT

Thyroid dysfunctions encompass all functional disorders of the thyroid gland, with hypothyroidism and hyperthyroidism being the most common forms. These conditions are widespread, significantly impact quality of life, and require long-term management. While conventional treatment relies on hormone replacement therapy or antithyroid drugs, it presents certain limitations related to side effects and treatment adherence. In a context marked by renewed interest in natural medicine, this work aims to explore the use of phytotherapy as an alternative or adjuvant to conventional treatment. The study was conducted in the wilaya of Blida and was based on a survey involving 100 patients with thyroid disorders, along with 20 pharmacists, 10 physicians, and 15 herbalists. The objective was to identify the main medicinal plants used, describe their preparation methods, and assess users' perceptions regarding their effectiveness and safety. The most commonly used medicinal plants include earth almond (Cyperus esculentus), Indian costus (Saussurea costus), arroche halime (Atriplex halimus), and black seed (Nigella sativa). Patients often combine these remedies with other practices such as cupping, specific diets, or nutritional supplements such as selenium, zinc, or vitamin D. While herbalists emphasize the symptomatic benefits of these remedies, pharmacists remain more cautious, stressing the risks of interactions and self-medication. Physicians, meanwhile, adopt a more rigorous approach, only accepting alternatives under medical supervision. This study highlights the growing interest in integrative medicine, as well as the need for strict medical supervision, better patient education, and a strengthening of scientific knowledge surrounding these approaches. It also underscores the importance of interprofessional collaboration and the rational inclusion of traditional knowledge in line with the principles of evidence-based medicine.

Keywords: Ethnobotanical study, Medicinal plants, Thyroid, Thyroid dysfunctions, Hypothyroidism, Hyperthyroidism

HERBAL MEDICINE IN PREGNANT WOMEN: AN ETHNOBOTANICAL SURVEY

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ABSTRACT

Herbal medicine is one of the oldest methods of alternative and complementary medicine used worldwide. However, its use is not without risk, especially when it is not properly supervised. These risks appear to be more significant in pregnant women. We chose to shed light on the use of herbal medicine among pregnant women, whether through self-medication or upon advice from professionals. In this context, surveys were conducted with 100 women, 12 herbalists, 50 pharmacists and pharmacy assistants, and 21 gynecologists and midwives in the wilayas of Blida and Chlef and their surroundings. Our investigation revealed that although the use of herbal medicine during pregnancy is not a frequent phenomenon, it still persists in traditional practice and is largely based on the transmission of ancestral knowledge and know-how. A wide variety of plants are used and recommended during pregnancy. On their part, healthcare professionals remain very cautious when advising pregnant women, due to a lack of knowledge about the properties and safety of medicinal plants during pregnancy, as well as the diversity and sometimes contradictory nature of the reference sources. Our study identified 51 plants and 43 phytomedicines used by pregnant women. Of these, 37% are discouraged during pregnancy according to their product information leaflets, 41% are considered usable, and 4% are strictly contraindicated. For 18% of the products, no information regarding use during pregnancy was found. To ensure proper guidance and minimize associated risks, it is essential that all healthcare professionals improve their knowledge of herbal medicine, in order to prevent potential harm resulting from self-medication or poor guidance, affecting either the mother or her child.

Keywords: Alternative medicine, pregnancy, medicinal plants, phytomedicines.

ETHNOBOTANICAL SURVEY OF ANTIDIABETIC PLANTS IN THE THENIET EL HAD REGION ,TISSEMSILT PROVINCE

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ABSTRACT

An ethnobotanical survey was conducted on 260 individuals (men and women, both diabetic and non-diabetic, aged over 18) in the Theniet El Had region (Tissemsilt province) over two months (January and February 2019) to document medicinal plants used in traditional phytotherapy as antidiabetics. Data was collected using questionnaires, and plant identification was based on the Algerian floras of Quezel and Santa (1962-1963) and **O**zenda (2004). The data was processed using Excel**.** The survey identified 52 medicinal plants, both native and imported, belonging to 24 families, with a total of 261 citations. Among them, 21 plants were mentioned only once, while 6 plants received more than 10 citations. These popular plants are: Artemisia herba-alba (45 citations), Cinnamomum verum (33), Olea europaea (27), Trigonella foenum (20), Tecrium polium (17), and Marrubium vulgare (12). Their popularity appears to be linked to their effectiveness, traditional use, and low cost. The most commonly used plant parts in the study, in descending order, are: **leaves** (25 times), seeds (8 times), stems (2 times), and fruits**,** fruit juice**,** flowers**,** floral buds**,** bulbs**,** sap, rhizomes**,** bark**,** and scales (each mentioned once). The main preparation methods are decoction or infusion of the leaves, seeds, and aerial parts. This research highlights the diverse range of plants used in traditional medicine for diabetes treatment in the region and underscores the importance of these plants in local healthcare practices, often attributed to their accessibility and traditional knowledge.

Keywords: Survey-antidiabetic-plants

HISTOLOGICAL EFFECTS OF PRUNUS AMYGDALUS VAR AMARA ON PANCREATIC TISSUE IN DIABETIC RATS

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ABSTRACT

This study evaluates the histopathological impact of Prunus amygdalus var amara (bitter almond) on pancreatic tissue in diabetic rats, contextualizing its ethnobotanical use for diabetes management against potential toxicity. Despite traditional applications, concerns persist regarding cyanogenic compounds in the plant, necessitating a histological assessment of pancreatic damage. Pancreatic samples from alloxan-induced diabetic rats (four groups: healthy control, diabetic untreated, glibenclamide-treated, and plant-treated) underwent paraffin-embedding histology. Tissues were fixed in 10% formalin, dehydrated via ethanol gradients, cleared in toluene, embedded in paraffin, and sectioned (5 µm). Hematoxylin-eosin (H&E) staining distinguished cellular structures. Microscopic analysis (Leica) assessed histoarchitectural changes, focusing on islets of Langerhans, acini, and ducts.Control group (A): Normal pancreatic structure with intact acini, islets, and ducts. Diabetic groups (B, C): Partial beta-cell destruction in islets, sparing acini. Plant-treated group (D): Severe necrosis of endocrine/exocrine pancreas, lymphocytic infiltration, vascular inflammation, and ductal destruction. The partial beta-cell loss in diabetic groups aligns with alloxan's pancreatotoxicity. However, group D's extensive damage suggests synergistic toxicity from cyanogenic compounds in P. amygdalus, exacerbating alloxan effects. Notably, hypoglycemia observed in plant-treated rats likely stems from extra-pancreatic mechanisms (e.g., intestinal malabsorption), not insulin secretion. These findings caution against using cyanogenic plants in diabetes despite transient glycemic benefits. Future studies should quantify cyanogens, assess multi-organ toxicity, and compare almond varieties' safety profiles. P. amygdalus var amara exhibits antidiabetic potential but induces severe pancreatic toxicity at 28 mg/kg, underscoring risks of traditional use. Comprehensive toxicological profiling and exploration of non-pancreatic mechanisms are imperative for safe therapeutic development.

Keywords: diabetes- pancreatic tissu -bitter almond

MACROSCOPIC AND MICROSCOPIC BOTANICAL STUDY OF THE TUBER OF THE SPECIES BUNIUM FONTANESII (PERS.) MAIRE

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ABSTRACT

Bunium fontanesii (Pers.) Maire (= B. mauritanicum Batt.) is a perennial herbaceous species belonging to the Apiaceae family, widely distributed across the Mediterranean regions of North Africa. Locally known in Algeria as "Talrhouda (تالغودة)", it is traditionally used for its nutritional and medicinal properties. Despite its ethnobotanical interest, this species remains poorly studied from a botanical point of view. The underground tuber represents the main part used; however, it is poorly documented in the scientific literature, and few references exist on the tuberization process in this species, a process that differs depending on the organ of origin of the tuber and therefore of the plant. This study aims to characterize the macroscopic (morphological) and microscopic (histo-anatomical) structures of the tuber of Bunium fontanesii in order to better understand its ecological adaptations, ethnobotanical interest, and potential for valorization. Samples were collected from the Tenes region in northern Algeria. The macroscopic analysis focused on the tuber's shape, size, color, and texture. Microscopic analysis was performed on transverse sections stained with methyl green/Congo red (double staining technique) and Lugol's iodine solution, then observed under an optical microscope. Macroscopic observations revealed tubers with variable morphology (globular, subglobular, or slightly elongated) sometimes highly tortuous, with diameters ranging from 2 to 4 cm. The external surface is dark brown to blackish with a rough, sometimes fibrous texture, and the interior is white. Fine secondary roots (radicels) were observed on the surface, along with an easily detachable apical cap. Microscopically, the tuber exhibits, with minor differences, the histo-anatomical features typical of a dicotyledonous root with secondary structure. It is surrounded by a thick periderm that serves a protective function against biotic and abiotic stresses. Internally, it displays a typical storage organ organization, with large parenchymatous cells densely packed with starch grains, spherical to ovoid in shape. The storage parenchyma tends to occupy most of the tuber's volume relative to the central cylinder. These observations confirm that the tuber exhibits a simple but functionally efficient underground structure, allowing the species to thrive spontaneously in semi-arid Mediterranean environments. It shows morpho-anatomical adaptations characteristic of xerophytic plants, such as a predominance of internal storage tissues and a thick covering tissue. The high starch content supports its traditional use as an energy food source. The results provide a useful botanical database for future research aimed at the agro-food and pharmacological valorization of Bunium fontanesii.

Keywords: Bunium fontanesii, tuber, Apiaceae, plant anatomy, plant morphology, ethnobotany

ETHNOBOTANICAL STUDY OF THE GENUS BUNIUM (APIACEAE) IN ALGERIA: TRADITIONAL USES AND PROSPECTS FOR VALORIZATION

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ABSTRACT

The genus Bunium includes herbaceous species that are among the few truly perennial Apiaceae. These plants are characterized by a tuberous underground root system producing a single flowering stem. Taxonomically, the genus has a complex and controversial history. While Emberger and Chadefaud (1960) reported around 30 species, mostly Mediterranean, Shah et al. (2019) identified nearly 166. In Algeria, the flora of Quézel and Santa (1963) describes seven species, some of which are still used locally for their medicinal properties. Despite a long history of traditional use across the Mediterranean region, Bunium species remain understudied and largely unknown. This study aims to document the ethnobotanical knowledge related to these species in various regions of Algeria and to analyze their potential for valorization. The methodology combines a review of scientific and ethnobotanical literature, field surveys, and interviews conducted with traditional healers and local stakeholders. The results highlight a significant lack of bibliographic data, particularly concerning ethnobotanical, phytochemical, and pharmacological studies of this genus, both nationally and internationally. Fieldwork indicates that the underground tuber is the most commonly used part. Reported uses include both dietary applications and traditional medicinal treatments for a range of conditions such as diabetes, allergies, asthma, cough, bronchitis, diarrhea, and thyroid disorders. Several traditional preparation methods and recipes were recorded, considered effective and non-toxic at empirically used doses. These findings emphasize the importance of integrating Bunium species into programs focused on the conservation and valorization of local plant genetic resources, in connection with traditional knowledge. Their potential applications in healthcare, food systems, and sustainable rural development in Algeria warrant further investigation.

Keywords: Bunium, Apiaceae, ethnobotany, traditional knowledge, Algeria

THE GENUS CIRSIUM MILL. IN AZERBAIJAN

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ABSTRACT

The family Asteraceae Dumort., known as one of the largest plant families worldwide, is represented in the flora of Azerbaijan by about 120 genera. Among its most widespread representatives is the genus Cirsium Mill. (thistles). The taxonomy of this genus in the flora of Azerbaijan was first studied in 1961 by the prominent botanist A. Kh. Kharadze. Later, Y. Menitsky, who made significant contributions to the preparation of the Conspectus Florae Caucasi, re-examined this genus and, based on long-term research, prepared a comprehensive conspectus for the Caucasus region. Since the genus has not been studied in Azerbaijan for the last 60 years, a revision has become necessary. In accordance with global nomenclatural changes, we have initiated new taxonomic investigations of the genus. In the modern era, the conservation and study of biodiversity are considered priority directions of fundamental scientific research. These issues encompass a comprehensive analysis of polymorphic taxa and the investigation of floristic richness, which has great ecological and scientific importance. The Karabakh region, as the most characteristic part of the Lesser Caucasus natural province, possesses the richest biodiversity in Azerbaijan, distinguished by its unique and rare climatic and vegetation conditions. In terms of the emergence of new species, Karabakh ranks first not only in Azerbaijan but also throughout the Caucasus region. Representatives of the family Asteraceae Giseke (or Compositae) are widely distributed in the Karabakh area. As one of the largest and most evolutionarily advanced families of dicotyledonous plants, it comprises over 1,400 genera and up to 24,000 species worldwide. To date, the boundaries of polymorphic and geographically widespread taxa, including those of the genus Cirsium Mill., remain unclear and taxonomically controversial. A. L. Kharadze identified 32 species of Cirsium distributed in the flora of Azerbaijan. However, for more than 50 years, the genus has not undergone comprehensive revision, and its taxonomy, systematics, bioecological characteristics, and precise distribution areas have not been studied in detail. A review of the relevant literature has revealed that at present, the genus Cirsium is represented in the flora of Azerbaijan by 34 species.

Keywords: Systematics, Azerbaijan, Cirsium, Taxonomy

BIOECOLOGICAL CHARACTERISTICS OF THE GENUS VERONICA L.

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ABSTRACT

In the modern era, ecological monitoring of vegetation cover and the state of phytobiota is of great importance. Therefore, studies related to the protection of the ecological environment are considered to be of high research priority. The investigation and conservation of biodiversity—particularly phytodiversity—remain among the major challenges faced by contemporary science. It is evident that the taxonomic units of many families and genera, which play a crucial role in the composition of the flora, need to be re-evaluated. One of these groups is the genus Veronica L. (speedwell) of the family Scrophulariaceae Juss., which forms a part of various plant communities. A review of literature sources has revealed that many authors hold differing opinions regarding the systematic composition of the genus within the Caucasus region. The genus name Veronica has two possible etymological interpretations, one of which associates it with Saint Veronica. The genus Veronica belongs to the family Scrophulariaceae. The plants included in this family are predominantly perennial herbs according to their life forms. However, a few shrub species, and in rare cases, small trees and lianas, are also encountered. Some species exhibit a semi-parasitic mode of life. One of the key diagnostic features of Veronica species is the presence of complex glandular hairs. The leaves are alternate or opposite, and petioles are usually absent. The flowers are bisexual and zygomorphic, only rarely actinomorphic. The perianth consists of five parts and is usually united, though in some cases divided. The calyx is generally five-lobed, while the corolla may vary in shape and size. The genus Veronica is among the most widely distributed genera of the family Scrophulariaceae in Azerbaijan. Globally, the genus comprises about 200 species, of which 53 occur in the Caucasus and approximately 40 in Azerbaijan. The genus was first studied in the flora of Azerbaijan by I. I. Karjagin (Flora of Azerbaijan, Vol. 7, p. 484, 1957). Later, in the monograph The Plant World of Azerbaijan, A. Asgarov reported 42 species of Veronica distributed throughout the country. Based on recent taxonomic revisions in the global flora, we have examined the species composition of the genus distributed in the northern part of Karabakh. Currently, 17 species have been identified within this region.

Keywords: Bioecology, Azerbaijan, Veronica, Systematics

PHYTOCHEMICAL PROFILE OF IN VITRO PROPAGATED SALVIA AETHIOPIS L PLANTS

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ABSTRACT

Plants of the genus Salvia (Lamiaceae family) have long been recognized for their medicinal properties and widely used in traditional medicine. Among them, Salvia aethiopis L. (Mediterranean or African sage) synthesizes several types of valuable secondary metabolites, amongst which are abietane diterpenoids like aethiopinone salvipisone and sesterpenes. It also produces phenolic acids like rosmarinic and caffeic acid, which contribute to its broad spectrum of bioactivities—antimicrobial, antifungal, antimycobacterial, antioxidant, anti-inflammatory and anti-cholinesterase effects. The optimal seed sterilization scheme was established after using of immersion in 70% ethanol for 2 min, and in 0.1% $HgCl_2$ for 10 min, at which the 80 % of the seeds were germinated. The number variants of nutrient media based on Murashige and Skoog (MS) supplemented with different growth regulators (Kinetin, BAP, zeatin, NAA, IBA) were used for micropropagation. The best media combination for shoot proliferation was MS containing 1 mg/l kinetin and 0.1 mg/l IBA, where the mean number of shoots per explant was 4.0, with a mean height of 3.6 cm. Efficient in vitro rooting was induced on half-strength MS with the addition of 1.5 mg/l IAA. The in vitro obtained plants was successfully acclimatized and adapted in experimental field. In vitro cultivated plants and wild species showed a high content of total polyphenols and flavonoids. The total polyphenol content in water freeze –dried extract was 11002.8 ± 69.7 mg GAE/100 g, flavonoid - 787.5 ± 25.0 mg QE/100g. LC-MS/MS analysis detected 21 phytochemical compounds, as dominant compounds were salvianic acid C, gluconic acid, malic acid, citric acid isopropylmalic acid. The elaborated in vitro propagation protocol of S. aethiopis could be of great value for the sustainable conservation and secondary metabolite production of this medicinal plant.

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Keywords: Mediterranean sage, micropropagation, LC-MS/MS

INFLUENCE OF MUTAGENS ON PHYSIOLOGICAL PARAMETERS OF BEAN PLANT

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ABSTRACT

Beans (Phaseolus vulgaris) is a major legume plant with high nutritional and economic importance. The aim of the study is the influence of treatments with physical and chemical mutagens on the plant of Phaseolus vulgaris, to improve its physiological features influencing the length and width of the bean leaves, as well as the size of the stem of the bean plants. Selected seeds of Phaseolus vulgaris variety Shijak were prepared for treatment with mutagens after their selection. For the treatment of bean seeds, both physical and chemical mutagenesis are used. The protocols recommended by the IAEA were used for the treatment of the Shijak bean seeds. Irradiation of biological seed materials was carried out at the Institute of Applied Nuclear Physics. Bean seeds are irradiated with Cs-137 gamma radiation, in three doses: 50 Gy, 100 Gy, 150 Gy and in addition to them, the control. Bean seeds were also treated with chemical mutagens and we used four mutagens: EMS (Ethyl methanesulfonate), dES (Diethyl sulfate), dMS (Dimethyl sulfate), MMS (Methylmethane sulphonate). For each of them, we did the treatment with three doses: Diethyl sulfate - dES 0.0025M, 0.005M, 0.010M; Ethyl methanesulfonate - EMS 0.1%, 0.2%, 0.3%; Dimethyl sulfate - dMS 0.001M, 0.0015M, 0.0025M; Methylmethane sulphonate - MMS 0.05M, 0.075M, 0.1M. Bean seeds treated with these mutagens based on IAEA protocols have been placed in various experiments in the laboratory, greenhouse and field plot. The treatment with physical mutagens presents a higher average value for the length of the stem and the root. The use of mutagenesis on Phaseolus vulgaris seeds has had an influence on the change of leaf morphology depending on the type of mutagen and the doses used. For the plant materials treated with chemical mutagens, it was observed that the three compound leaves have different impacts, but there was a positive correlation and the leaves were longer in length compared to the control. Leaves appear elongated compared to leaves of plants treated with physical mutagens at all three doses. For the physical mutagen we had plants that the mutagen affected both leaf length and width values leading them to a circular leaf shape.

Keywords: Phaseolus vulgaris, Physical mutagen, Chemical mutagen

INFLUENCE OF CHEMICAL MUTAGENS ON THE TULIP PLANT

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ABSTRACT

Tulip, being an important ornamental plant, generally requires lengthy and laborious procedures to develop new varieties using traditional breeding methods requires. The high popularity of tulips has led to the need to cultivate new varieties with new shapes and colors, which is also suitable for production. The use of induced mutagenesis techniques is one of the most important methods for the creation of new varieties. The impact and influence of chemical mutagens on ornamental plants is quite important, specifically in our study on the tulip plant (Tulipa L.). In our treatments we used chemical mutagens EMS (Ethyl methanesulfonate) and MMS (Methylmethane sulphonate) with three doses each of them. The treatments of the tulip bulbs were done according to the protocols described by the IAEA. Bulbs after treatment with chemical mutagens were planted in the greenhouse in the M1 generation. Treatment with the second dose of chemical mutagen EMS resulted being the most positive, influencing the leaf length of tulip plant compared to the control. The second dose of the chemical mutagen MMS has the greatest influence on the width of the tulip petals. In the materials obtained from treatment with chemical mutagens MMS and EMS, in general the average value of plant height was positively affected and was higher than the untreated control. Treatments with chemical mutagens MMS second dose, MMS third dose, EMS second dose and EMS third dose influenced the height growth of tulip plant.

Keywords: Chemical mutagens, Mutations, Tulip

YABBY TRANSCRIPTION FACTORS IN CHICKPEA: EVOLUTIONARY FOOTPRINTS AND FUNCTIONAL CLUES UNDER DROUGHT STRESS

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ABSTRACT

Chickpea (Cicer arietinum L.) is a vital legume crop for global food security, especially in arid regions. Despite the known roles of YABBY transcription factors in plant development and stress responses, their characterization in chickpea has remained unexplored. In this study, we conducted the first genome-wide analysis of the YABBY gene family in chickpea, identifying eight CaYABBY genes distributed across four chromosomes. Comprehensive bioinformatics analyses revealed conserved domain architectures, motif compositions, and phylogenetic groupings consistent with known YABBY subfamilies. Promoter and miRNA target predictions uncovered multiple cis-elements and miRNAs (e.g., miR2109, miR408) linked to hormonal signaling and drought stress pathways**.** Notably**,** RNA-seq expression profiling under drought stress demonstrated that CaYABBY-04 and CaYABBY-08 were significantly upregulated, while CaYABBY-02 and CaYABBY-01 showed moderate induction—suggesting a direct involvement in drought stress adaptation. These findings not only illuminate the evolutionary and regulatory landscape of YABBY genes in chickpea but also highlight specific gene candidates (e.g., CaYABBY-04) for future functional studies and potential genetic improvement of drought tolerance in legumes.

Keywords: Chickpea (Cicer arietinum L.), Drought stress, Genome-wide analysis, Gene expression profiling, YABBY gene family

BIOACTIVE POTENTIAL OF MOROCCAN RHUS TRIPARTITA: ANTIOXIDANT AND ANTIMICROBIAL ACTIVITIES OF METHANOLIC EXTRACTS

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ABSTRACT

Rhus tripartita has been traditionally used to treat various aliments, yet many of its medicinal applications remain scientifically unverified, particularly for the species growing in Morocco. This study aims to fill that gap by evaluating the bioactive properties of methanolic extracts from the aerial parts and bark of Moroccan Rhus tripartita. Antioxidant activity was assessed using DPPH and ABTS assays, while antimicrobial potential was investigated through disc diffusion, minimum inhibitory concentration (MIC), and minimum bactericidal concentration (MBC) tests against three reference strains and several isolated foodborne pathogens. The results demonstrated strong antioxidant activity from the aerial parts extract, with IC50 values of 45 µg/mL (DPPH) and 51 µg/mL (ABTS), outperforming ascorbic acid in the DPPH assay. The bark extract showed slightly lower antioxidant activity, with IC50 values of 49 µg/mL (DPPH) and 55 µg/mL (ABTS). Antimicrobial tests revealed significant activity, particularly from the bark extract, which exhibited MIC values of 1.25, 10.31, and 20 µg/mL against S. aureus, P. aeruginosa, and an isolated multi-resistant strain of S. capitis, respectively. These findings highlight the potential of Moroccan Rhus tripartita as a valuable natural source of antioxidants and antimicrobials, with promising applications in the pharmaceutical and food preservation sectors.

Keywords: Rhus tripartita, Antimicrobial activity, Antioxidant activity, Foodborne pathogens.

GREEN NANOTECHNOLOGY: AN EFFECTIVE STRATEGY FOR BIOFILM INHIBITION

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ABSTRACT

Biofilms formed by various bacterial pathogens have become a significant healthcare challenge. These biofilms can develop on living tissues, medical systems, and various other surfaces. The efficacy of conventional treatment methods is often compromised due to the increased resistance conferred by the biofilm matrix. To address this challenge, nanotechnology has provided innovative solutions for preventing and treating biofilms. A novel strategy for nanoparticle synthesis, known as green synthesis, is being explored for its potential to eradicate biofilms. In this context, our present work suggests a green, cost effective and physical synthesis approach of nanoparticles using Rosmarinus officinalis leaves extract under UV irradiation to assess their antibiofilm activity. The results show a fast change of color in just a minimal time at 30 s, which indicates a rapid formation of nanoparticles, which further confirmed by UV-Visible spectrophotometry, exhibiting a characteristic band at 446 nm. and with other advanced techniques including FTIR, XRD, SEM.Furthermore, the antibiofilm activity of synthetized nanoparticles was evaluated against several bacterial strains, including Escherichia coli, the results exhibit an antibiofilm activity with 63% for the removal of biofilms produced by Escherichia coli when compared to the negative and positive control at 98 mg/ml. The findings suggest that green-manufactured nanoparticles offer a potential alternative to treat bacterial infections and eradicate biofilm formation.

Keywords: Antibiofilm activity; Biofilm; Nanoparticles; Escherichia coli; Rosmarinus officinalis.

DEVELOPMENT OF A SACCHAROMYCES CEREVISIAE-BASED WHOLE-CELL OR GATE BIOSENSOR FOR THE DETECTION OF AFLATOXIN AND OCHRATOXIN CONTAMINATION

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ABSTRACT

Mycotoxins such as Aflatoxin B1 (AFB1) and Ochratoxin A (OTA) produced by Aspergillus and Penicillium species are potent carcinogens and immunosuppressants that contaminate foods under improper storing conditions. Around 25% of agricultural production in Sri Lanka is significantly affected by mycotoxin contamination leading to postharvest losses that become a serious health risk to consumers. Techniques like High Performance Liquid Chromatography (HPLC) and Enzyme Linked Liquid Assay (ELISA) are unattainable due to the cost and complexity. Synthetic biology offers a comprehensive transformative pathway through the development of low-cost, field-deployable whole-cell biosensors. This study presents, in silico design, modeling and simulation of a genetic OR gate in the chassis organism Saccharomyces cerevisiae**.** A gene circuit was designed to produce a single fluorescent reporter protein called mCherry in the presence of either AFB1 or OTA, or both. The sensor relies on toxin specific riboswitches that control the translation of the reporter mRNA. Detailed biochemical model of the gene circuit constructed using CellDesigner (v. 4.4.2) and performed simulations using COPASI (v. 4.44). Time Course simulations validated the OR logic, demonstrating reporter expression only when at least one toxin was present. Dose-response analysis was conducted by simulating mCherry production across a range of toxin concentrations, characterizing the sensitivity and dynamic range of each input pathway. Sensitivity analysis identified toxin activated translation rates are critical for the overall circuit performance. The logical behaviour of the OR Gate was validated using deterministic time-course simulations. Testing with zero toxin concentration is critical negative control to avoid false-positive results. The initial concentrations of AFB1 (1.6 nM) and OTA (200 nM) were selected based on physiologically relevant contamination levels found in food samples. These values align with the respective aptamer dissociation constants, enabling realistic simulation of biosensor activation under low (AFB1) and mid-range (OTA) toxin exposure. The kinetic laws and parameters values were chosen from typical values found in Saccharomyces cerevisiae synthetic biology literature. For Transcription, mRNA degradation, protein maturation and protein degradation, Mass action (irreversible) was used as the kinetic law. For the Toxin induced Translation, k1* [mRNA] * [Toxin] function was used. 1.0, 0.1, 0.5, 0.001, 0.0001 were detected as the k values for the above five parameters respectively. Zero mCherry production was observed in the absence of both toxins. In the presence of either AFB1 or OTA alone the circuit was activated, 0.00038435nM, and 0.0393125nM were detected as mCherry matured (mCherry_m) concentration when only AFB1 and OTA existence correspondingly. When both toxins were present the output was 0.039627nM, confirmed OR Gate function accurately. Further, it can be observed that the mCherry degradation starts immediately after the peak level. A sensitivity analysis was performed to identify the parameters which most significantly affect the circuit output. The analysis revealed that output is predominantly controlled by the rate of Toxin-Activated Translation, which demonstrated the highest sensitivity. The rates of transcription and mRNA degradation also exerted significant influence. In contrast, post-translational parameters, including protein maturation and degradation, had a markedly smaller effect on the peak reporter signal. A clear identical dose-dependent activation can be seen for both AFB1 and OTA due to the identical kinetic parameters used for both pathways. A genetic OR gate for Aflatoxin and Ochratoxin detection validated its logical function and dynamic behaviour through computational modeling and simulation. Stability analysis confirmed circuit robustness while sensitivity analysis offered insights into experimental optimization. Hence, this study concluded, that the gene circuit serves as a robust concept and provides a validated blueprint for the physical construction of a simple, effective biosensor for mycotoxin detection.

Keywords: Biosensor, Gene circuit, In-silico simulation, Mycotoxin Detection, Riboswitches

BIOSTIMULANT EFFECT OF TRICHODERMA ALGINATE BEADS FORMULATION ON WHEAT GROWTH

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ABSTRACT

Trichoderma spp. are recognized as effective biostimulants that promote plant growth and reduce reliance on chemical fertilizers. However, their application in an unformulated or fresh state may compromise viability and field efficacy. This study aimed to develop an alginate bead formulation of an Algerian isolate of Trichoderma and evaluate its efficacy in stimulating seed germination and promoting the growth of two durum wheat (Triticum durum) varieties. A spore suspension was first prepared and encapsulated in alginate beads. For the germination test, surface-sterilized seeds from both varieties were placed in Petri dishes containing the formulation. Germination rates were assessed after four days of incubation. In the last part of this study, conducted in a greenhouse, the germinated seeds in the first part were transplanted into pots containing soil mixed with Trichoderma-encapsulated beads. After four weeks of growth, agronomic parameters were measured. Beads prepared with sterile distilled water (without spores) were used to conduct the control assays folowing the same steps. The results showed that treatment with Trichoderma alginate beads significantly improved seed germination in both varieties, reaching 100% compared to 92% and 80% in the respective controls (V1 and V2). In addition to improved germination, treated seeds developed longer radicles with more abundant root hairs than the controls. In greenhouse assays, the treatment enhanced multiple growth parameters, particularly in variety 2 (V2). Aerial part length increased in V1 under treatment, while root length improved in both varieties (V1: 30 vs. 23 cm; V2: 24 vs. 20 cm, treatment vs. control). Moreover, V2 exhibited increased biomass, with a dry aerial part weight of 0.51 g versus 0.42 g in the control, and a root fresh weight of 0.195 g compared to 0.117 g. These findings demonstrate that the alginate bead formulation of Trichoderma enhances seed germination and early vegetative growth in wheat, particularly in variety 2. The encapsulation approach effectively preserves Trichoderma viability and ensures its biostimulant action under controlled conditions. This formulation holds promise for sustainable agriculture by reducing dependency on synthetic inputs while promoting crop vigor.

Keywords: Trichoderma sp; Formulation; Triticum durum; Biostimulant; Sustainable agriculture.

ANTAGONISTIC POTENTIAL OF ENDOPHYTIC FUNGI AGAINST PYRENOPHORA SPP., PATHOGENS OF DURUM WHEAT AND BARLEY

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ABSTRACT

Durum wheat (Triticum durum) and barley (Hordeum vulgare) are essential cereals for human and animal nutrition.However, their cultivation is severely threatened by fungal diseases, notably those caused by Pyrenophora teres(Pt) and Pyrenophora tritici-repentis(Ptr), leading to significant economic losses. This study evaluated the potential of two endophytic fungi, strain TTR5F10 and strain BKR6F2.1, as biocontrol agents against these pathogens. The method employed was direct confrontation in vitro where the endophytes and pathogens were cultured face-to-face on PDA growth medium. Antagonistic activity was quantified by measuring the colony diameter of the pathogens in the presence of the endophytes, compared to a control (pathogen alone). The percentage of growth inhibition (PGI) was then calculated. The results of analysis of variance (one-way ANOVA) revealed a highly significant difference between treatments showing that both endophytic strains, TTR5F10 and BKR6F2.1, significantly reduced the mycelial growth of both pathogens (P. teres and P. tritici-repentis) compared to the control. Although no significant difference was observed between the antagonistic efficacy of the two endophytic strains, both demonstrated strong inhibitory potential. This study highlights the strong biocontrol potential of these endophytic strains against the major pathogens Pyrenophora teres and Pyrenophora tritici-repentis and integrating these endophytic fungi into biological control strategies represents a sustainable and promising alternative to chemical pesticides.

Keywords: Biocontrol , antagonistic activity, Durum wheat , Barley, endophytic fungi.

INFLUENCE OF TWO VITRIFICATION SOLUTIONS FOR CRYOPRESERVATION PRETREATMENT OF SHOOT TIPS OF AETHIONEMA RHODOPAEUM.

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ABSTRACT

Aethionema rhodopaeum is a local endemic species found in the Rhodopes, a mountain range which spans across Southern Bulgaria and Northern Greece. The known populations of the species are fragmented and its habitat, which is on dry and sun-exposed slopes, is under high anthropogenic impact – high risk of wild fires and trampling. As a result, urgent measures are required for the ex situ conservation of this species. In vitro methods, and cryopreservation in particular, are the most suitable methods for long-term ex situ preservation of threatened species. The first step of cryopreservation involves the preliminary preparation of the plants in order to increase the percentage of living plants after the process of cryopreservation.
This study examined the influence of two plant vitrification solutions for dehydration (PVS2 and PVS3), the treatment duration (15, 20, and 30 minutes) and the temperature of the solutions (0°C and 23°C) during the treatment of the shoot tips of the species.
The aim of the study was to evaluate the conditions under which the highest percentage of growing shoot tips could be achieved.
At a temperature of 0°C, the highest percentage of surviving shoot tips and growing tips were observed after 20 minutes of treatment with both PVS2 and PVS3 – 100% surviving tips and 83% growing tips with PVS3 and 75% for each group dehydrated with PVS2.
At 23°C, 100% of the shoot tips were viable after 15 minutes of treatment with PVS3. However, as the treatment duration increased, the percentage of growing shoot tips decreased.
In terms of the treatment with PVS2 at 23°C, the highest success was achieved at 30 minutes (83% surviving tips and 67% growing tips). At the other two treatment durations the percentage of surviving tips was 50% or less.
We can conclude that the most suitable combination of factors for the preliminary treatment of shoot tips is dehydration with PVS3 for 15 minutes at 23°C.

Keywords: Cryopreservation pretreatment, PVS, endemic species

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IDENTIFICATON OF GENE REGIONS RELATED TO DROUGHT IN EGGPLANT USING MOLECULAR MARKERS

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ABSTRACT

The eggplant (Solanum melongena L.) is an economically important vegetable species that is widely cultivated around the world. However, its sensitivity to abiotic stress factors, particularly drought, has serious adverse effects on yield and quality. Global climate change and the resulting depletion of water resources have made developing drought-resistant eggplant varieties an unavoidable necessity. This research examines the morphological, physiological, biochemical, and molecular responses of eggplants to drought stress, as well as molecular marker technologies used to identify genotypes that are resistant to this stress factor. Literature data highlight that reliable molecular markers, such as simple sequence repeats (SSR), are important tools for identifying drought-associated gene loci and introducing resistant genotypes into breeding programs. Furthermore, wild eggplant species stand out as a valuable genetic resource due to their high proline accumulation and strong antioxidant enzyme activities. Therefore, the molecular evaluation of native eggplant genotypes is crucial for sustainable agriculture and food security. This research aims to contribute to the development of drought-resistant eggplant varieties.

Keywords: Eggplant, drought stress, moleculer marker

COMPARATIVE AND QUALITATIVE STUDY OF SOME PASTA AND SEMOLINA USED IN THE AGRO- FOOD INDUSTRY IN EASTERN ALGERIA ANNABA REGION

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ABSTRACT

Durum wheat, a cultural symbol of the Mediterranean region, is primarily used to produce semolina and pasta. In Algeria, a large portion of cereal production is still carried out using traditional farming methods, which fail to mitigate the effects of variable climatic conditions. This leads to The objective of this study is to ensure quality control of pasta produced by MAHBOUBA BARAHAL ANNABA using physicochemical analyses of the raw material (semolina). Subsequently, assays will be performed on the finished products to confirm their nutritional quality. significant variations in yields from one year to the next. The analyses revealed that all the parameters studied, such as semolina ash content and dry and wet gluten content, showed a certain stability and complied with established standards. This stability can be attributed either to the quality of the semolina used in pasta production or to insufficient control of the drying process.

Keywords: Semolina , Pasta , Physicochyimecal Analyses

EVALUATION OF SALT STRESS TOLERANCE IN ENDOPHYTIC FUNGI

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ABSTRACT

Endophytic fungi, microorganisms living symbiotically inside plants, play a crucial role in protecting their hosts against various abiotic stresses, particularly salt stress. The latter disrupts their growth and functionality, thereby limiting their ability to support plants in saline environments. This study aims to evaluate the salt stress tolerance of different endophytic fungal isolates by measuring their mycelial growth on PDA medium enriched with increasing concentrations of NaCl. Each concentration was tested in triplicate. Mycelial growth was assessed by measuring the average colony diameter for each saline concentration and comparing them with the salt-free control. The results reveal slight variability in tolerance among the strains. For instance, isolate TTRF10 exhibits high salt tolerance, while BKR6F2.1 shows slightly reduced growth with increasing salt concentration. These observations suggest that certain endophytic fungi can adapt to saline environments, opening promising prospects for their use in agricultural biotechnology, particularly to enhance the resilience of crops grown in saline soils.

Keywords: Endophytic fungi, abiotic stress, salt stress , mycelial growth, NaCl.

ANTI-PHYTOPATHOGENIC AND CYTOTOXIC BROMINATED SESQUITERPENES FROM THE INDONESIAN RED SEAWEED LAURENCIA INTRICATA

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ABSTRACT

Marine natural products have been providing structurally novel bioactive substances, some of which were developed as medicines or were promising leads for new drugs. During the search for bioactive substances from marine organisms, we detected anti-phytophatogenic (an oomycete of Phytophthora) activity for extracts of the Indonesian red seaweed Laurencia intricata. The active hexane and 90% methanol extracts were combined and separated on silica gel and then purified by HPLC to obtain four related compounds. Based on 2D NMR and MS analysis, they were identified as aplysistatin, palisadin A, palisol, and 5b-hydroxypalisadin B, which are all known brominated sesquiterpenes. The minimum doses to inhibit Phytophthora capsici are 100, 300, 300, and 300 mg/disk, respectively. Cytotoxic activity of these compounds was also evaluated against human epidermoid carcinoma A431 cells, showing the IC50 values of 0.15, 1.42, 0.59, and 0.45 mg/ml, respectively. Based on these biological data, aplysistatin may probably play a role for the anti-Phytophthora and cytotoxic activity.

Keywords: Laurencia intricata; Anti-phytophatogenic; Cytotoxicity; Bioactivity

BIOSYNTHESIZED NANOMATERIALS FOR THE INHIBITION AND DISRUPTION OF BACTERIAL BIOFILMS

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ABSTRACT

Biofilms formed by various bacterial pathogens have become a significant healthcare challenge. These biofilms can develop on living tissues, medical systems, and various other surfaces. The efficacy of conventional treatment methods is often compromised due to the increased resistance conferred by the biofilm matrix. To address this challenge, nanotechnology has provided innovative solutions for preventing and treating biofilms. A novel strategy for nanoparticle synthesis, known as green synthesis, is being explored for its potential to eradicate biofilms. In this context, our present work suggests a green, cost effective and physical synthesis approach of silver nanoparticles using Rosmarinus officinalis leaves extract under UV irradiation to assess their antibiofilm activity. The results show a fast change of color in just a minimal time at 30 s, which indicates a rapid formation of nanoparticles, which further confirmed by UV-Visible spectrophotometry, exhibiting a characteristic band at 446 nm. And with other advanced techniques including FTIR, XRD, SEM. Furthermore, the antibiofilm activity of synthetized nanoparticles was evaluated at different concentrations (34,42,38,98, and 282 mg/ml) against several bacterial strains, including Escherichia coli, the results exhibit an antibiofilm activity with 74 % for the removal of biofilms produced by Escherichia coli when compared to the negative and positive controls at 98 mg/ml of silver nanoparticles. The findings suggest that green-manufactured nanoparticles offer a potential alternative to treat bacterial infections and eradicate biofilm formation.

Keywords: Nanotechnology, Biofilm, Antibiofilm activity, green synthesis, Rosmarinus officinalis.

APPLICATIONS OF ARTIFICIAL INTELLIGENCE ALGORITHMS FOR PREDICTING EGG QUALITY

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ABSTRACT

Egg quality is a crucial factor influencing both the economic efficiency of poultry production and consumer preference in the market. Traditionally, egg quality evaluation has depended on physical, chemical, and sensory analyses; however, these methods are often labor-intensive, time-consuming, and susceptible to subjective errors. In recent years, artificial intelligence (AI) has emerged as a transformative tool in animal science, offering non-invasive, rapid, and highly accurate alternatives for predicting egg quality parameters. This review outlines current AI-based approaches employed in the prediction of egg quality. A variety of machine learning algorithms and deep learning models have been utilized to assess both internal and external quality attributes. Additionally, advanced image processing techniques have facilitated the automatic detection of structural defects such as shell cracks. The successful application of these methods across different poultry species underscores their versatility and potential for wide-scale adoption in various production systems. The integration of AI technologies into egg quality assessment not only enhances precision and operational efficiency but also contributes to the advancement of precision livestock farming through real-time monitoring and decision-support systems. Future directions include the development of standardized datasets, validation studies across different species, and integration with Internet of Things (IoT) technologies. Overall, AI-based models represent a paradigm shift towards more sustainable, efficient, and data-driven poultry production systems.

Keywords: Artificial Intelligence Algorithms, Egg Quality, Machine Learning, Deep Learning, Precision Livestock Farming

EXOSOMES AND PLANT NANOVESICLES AS CELLULAR MESSENGERS: BIOTECHNOLOGICAL PERSPECTIVES

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ABSTRACT

Exosomes and plant-derived nanovesicles (PDNVs) are nanoscale structures that mediate intercellular communication and regulate a wide range of biological processes. Exosomes encapsulate proteins, RNAs, DNAs, and lipids, thereby enabling both local and systemic signaling, and have been widely investigated as diagnostic biomarkers and therapeutic platforms. However, their application is hindered by limited scalability, high production costs, and safety concerns, as they may carry hazardous or tumor-derived molecules. Plant-derived nanovesicles (pEVs/PDNVs), which share many physicochemical features with mammalian exosomes, offer distinct advantages. Being naturally present in edible sources, they are abundant, biocompatible, non-toxic, and cost-effective to produce on a large scale. Fruits and vegetables serve as rich sources of PDNVs that encapsulate bioactive molecules such as antioxidants, lipids, proteins, and nucleic acids. These vesicles can deliver therapeutic cargos—including drugs, nucleic acids, and antibodies—across biological barriers, including the blood–brain barrier, thereby broadening their biomedical applicability. Accumulating evidence has demonstrated that PDNVs exert therapeutic potential in various pathological contexts, including inflammation, tumorigenesis, and infectious diseases. Moreover, PDNVs participate in cross-kingdom communication by transferring plant-derived small RNAs into mammalian cells, modulating host gene expression and cellular processes. In conclusion, while human exosomes remain central to understanding disease biology and regenerative processes, their clinical translation is limited by production and safety issues. In contrast, plant-derived nanovesicles stand out as promising next-generation nanocarriers due to their natural abundance, scalability, and safety profile. Beyond medical applications, PDNVs hold promise in nutraceutical, cosmetic, and regenerative medicine fields. The development of standardized isolation and characterization methods will be essential to fully exploit their diagnostic and therapeutic potential. Ultimately, the complementary integration of human exosomes and plant-derived nanovesicles may open novel avenues in biotechnology to improve human health at a global scale.

Keywords: exosomes, plant-derived nanovesicles (PDNVs), biocompatibility

EFFECT OF CHAPERONE PROTEIN OVEREXPRESSION ON RECOMBINANT TRANSGLUTAMINASE ENZYME PRODUCTION

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ABSTRACT

Recombinant protein production technique is generally used to produce various proteins, hormones, food enzymes, and drug precursors. In recombinant protein production, different host systems have been used, such as bacterial, yeast, mold, and mammalian cells. Many factors affect the quantity and quality of recombinantly produced protein. The chaperone proteins are the proteins that mediate protein folding in a proper form. These protein groups have crucial roles, especially in post-translational modifications. In this study, the Protein Disulfide Isomerase (PDI) chaperone protein, which is mainly responsible for the formation of disulfide bonds was overexpressed in Pichia pastoris, and the effect of homologous overexpression of the PDI protein was investigated. For this aim, the double auxotroph P. pastoris GS200 (arg4 his4) and JC304 (ade1 his4) strains were used, and PDI chaperonin and transglutaminase enzyme were co-expressed by constitutively. Firstly, the expression vector was constructed that contains the PDI gene and transformed into the electrocompetent P. pastoris GS200 and JC304 strains. The PDI gene copy number was detected in selected clones by Southern Blot analysis, and extra copies of the PDI gene containing clones were selected for each strain. Then, chosen clones were used as hosts for transglutaminase expression. The pGAPZa-MTG expression vector was linearized within the promoter region and transformed into the constructed competent host cells. The integration of the expression cassette into the genome was checked, and the protein expression was performed with positive clones at erlenmayer scale for 96 hours. It was found that the overexpression of PDI chaperone protein increased the extracellular enzyme production by 4.2% and 2.7% for P. pastoris GS200 and JC304 strains, respectively. As a result of this study, it was shown that the enzyme production has been increased in auxotroph strains of P. pastoris; however, further optimization studies are required.

Keywords: Chaperone protein, Overexpression, Pichia pastoris, Recombinant protein

GENERAL VIEW TO CYTOGENETIC STUDIES IMPORTANCE FOR PLANT GENOME ANALYSES

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ABSTRACT

The plant researches have wide range of the studies to enlight the plant genome structure and organization using different approaches such as molecular marker analysis, cytogenetic studies, new generation sequencing, and breeding programmes. Since the fundamental contributions to in-depth chromosome and genome analyses, cytogenetic studies is crucial and well known area in plant science for a long time. Cytogenetics involves comprehensive chromosome analyses, including: determination of chromosome number, morphology and the detection of the chromosomal distribution of various repetitive sequences or, more recently, oligo painting probes, to provide insights into genome organization at the chromosomal level. Plant species have broad range of chromosome number (from n = 2 to n = 320). The high diversification in chromosome numbers was driven by two mechanism: polyploidy and dysploidy. Besides the high interspecific diversification of A chromosome numbers, supernumerary B chromosomes, which contribute to intraspecific variation, are found in numerous plant species. Chromosomal changes (both structural and numerical) play an important role in plant genome evolution and speciation. Broad range of cytogenetic methods e.g. karyotyping, fluorescense in situ hybridisation, genomic in situ hybridisation and flow cytometry have been applied to various plant species. The application of the cytogenetic methods have been performed for various purposes including clarification of phylogenetic relationships, sorting of specific chromosomes, detection of chromosomal rearragements, providing physical maps based on identification of various chromosomal markers along chromosomes. For instance, cytogenetic studies have revealed high polymorphism in rDNA loci chromosomal distribution among diploid Onobrychis species or and have enabled tracing the reorganisation of repetitive sequences accompanied the speciation and diversification of Crepis species. These approaches also contribute significantly to plant breeding programs. Cytogenetic methods provide advanced tools for understanding genome structure and organization. Therefore, this review provides a general overview of cytogenetic methods, highlights their significance, and demonstrates how the diverse approaches make cytogenetic analyses powerful and invaluable tools for studying plant chromosomes and genome organization.

Keywords: Cytogenetic, Chromosome, Genome, Plant

CHARACTERIZATION AND BIOLOGICAL EVALUATION OF COLD-PRESSED PINE SEED OIL

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ABSTRACT

Pinus pinea, commonly found in the northern Mediterranean, produces seeds rich in oil with significant anti-inflammatory and antioxidant properties, making it valuable for cosmetic and pharmaceutical applications. This study aimed to extract and characterize the vegetable oil from Algerian pine nuts. The oil was extracted by cold pressing using an oil press, with an extraction yield of approximately 15.54%. The physical properties of the oil were assessed by measuring various indices typical of vegetable oils. The oil has an acidity index of 3.9 mg KOH/g, confirming its "virgin" status according to the food codex. Its peroxide (6.25 meq O2/kg) and saponification (181.65 mg KOH/g) values suggest high antioxidant content. The refractive index (1.47821 at 20°C) identifies it as a semi-drying oil, rich in linoleic acid (16%), confirmed by GC-MS analysis, which detected 46 constituents, including 2,4-Decadienal (11%), beta-sitosterol (8%), and behenic acid (7%). Microbiological analysis revealed the oil's inhibitory effects against the three tested microbial strains. The anti-inflammatory activity was evaluated using a xylene-induced ear edema model in mice, where the oil demonstrated a significant reduction in edema (75%).

Keywords: Pinus Pinea; Vegetable oil; Cold pressing; Microbiology; Anti inflammatory

CHARACTERIZATION OF ELECTROACTIVE BACTERIA FROM DIFFERENT TYPES OF WASTE

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ABSTRACT

The aim of this study was to isolate and characterize electroactive bacterial isolates from Algerian waste sources and evaluate their potential in generating electricity through microbial fuel cells (MFCs).
To achieve this, environmental samples were collected from wastewater, sludge, leachate, and lake water in the Oran region. Bacterial isolates were isolated using selective media and characterized through macroscopic and microscopic methods. Their electrogenic capabilities were tested in both single- and dual-chamber MFCs, and voltage outputs were monitored over several days. The synergistic effects of mixed cultures were also examined, alongside power density analysis and electrochemical performance evaluation.
The findings revealed the presence of multiple electroactive bacterial genera, with Shewanella isolates demonstrating the highest electrogenic potential, followed by Escherichia, Bacillus, and Pseudomonas. Mixed cultures showed enhanced electricity generation compared to individual isolates, achieving up to 0.8 V and 21 mW/m² without optimization. These results confirm the untapped potential of local bacterial communities for bioelectricity generation and sustainable waste valorisation.
This study demonstrates, that in Algeria, local organic waste environments are a promising source of electroactive bacteria. It offers new insights into microbial diversity and supports the development of cost-effective, decentralized energy solutions through MFC technology.

Keywords: electroactive bacteria, microbial fuel cells, Shewanella, bioelectricity, waste valorisation

CURRENT APPROACHES in THE UTILIZATION of VEGETABLE OIL BY-PRODUCTS

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ABSTRACT

The production of vegetable oils generates substantial quantities of by-products, which represent significant resources for economic and environmental sustainability. This review addresses the current applications of these by-products across various industrial sectors. By-products from oilseed processing including meals (soybean, sunflower, cottonseed), seed hulls, soapstocks from oil refining, biodiesel derivatives, as well as residues from olive oil production such as olive pomace, leaves and olive mill wastewater are considered valuable raw materials. Their high protein and fiber contents, bioactive compounds, organic matter richness, and energy potential enable their use in animal nutrition, biodiesel production, food, cosmetic and pharmaceutical industries. Oilseed meals, containing 15–45% crude protein, are widely used in the feed industry as inputs for compound feed production. Seed hulls serve as fiber sources in ruminant diets and contribute to biomass energy production. Low-quality oils and press cakes are utilized in energy generation through biodiesel and biogas. Organic-rich liquid wastes such as olive mill wastewater can be treated or processed biotechnologically to produce energy. Glycerol, a by-product of biodiesel production, is applied in food, cosmetics, chemical industries, and as an energy source in livestock feeding. Phenolic compounds in olive leaves and pits, due to their antioxidant properties, are exploited in cosmetic and pharmaceutical applications. In the food industry, protein hydrolysates and functional additives derived from these residues are gaining increasing importance. In agriculture, their use as compost and soil amendments contributes to improved soil fertility. However, limitations such as nutrient bioavailability, antinutritional factors, storage and transportation costs, and regulatory restrictions constrain broader utilization. In conclusion, vegetable oil industry by-products should not be considered waste, but strategic resources for feed, energy, agriculture, food, and cosmetic sectors. In countries like Türkiye, which rely on imported oilseeds, promoting efficient utilization of these resources represents a strategic approach that can meet industrial raw material needs, enhance sustainable agricultural production, and deliver both economic and environmental benefits.

Keywords: Bioactive and functional compounds, Biodiesel residues, Food Industry, Oilseed meals, Vegetable oil industry by-products

STRESS BIOMARKES IN PERNA PERNA MUSSELS: SENSITIVE TOOLS FOR ASSESSING COASTAL POLLUTION IN CENTRAL ALGERIA

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ABSTRACT

The Algerian coastline is subjected to intense anthropogenic pressures due to the presence of multiple industrial activities, which represent a potential source of contamination for coastal waters and their biological resources. Industrial discharges and urban effluents frequently contain xenobiotic compounds, both organic and inorganic in nature, capable of altering the physiological balance of aquatic organisms. Such stressors are known to induce oxidative disturbances that can be measured through specific biochemical and molecular biomarkers, thereby providing valuable information on the ecological status of marine environments. Methodology : The present study aimed to investigate the temporal variability of selected biomarkers in the African mussel Perna perna, a sentinel species widely used in biomonitoring programs. The biomarkers examined included the activity of key antioxidant enzymes, catalase (CAT) and superoxide dismutase (SOD), the level of lipid peroxidation as indicated by malondialdehyde (MDA) content, and the concentration of total proteins (TP) in soft tissues. Mussel specimens were collected monthly over a one-year period (September 2023–August 2024) from two coastal sites subject to anthropogenic influence: Figuier (Boumerdes Province) and Bateau cassé (Algiers Province). To establish an environmental baseline, parallel analyses of seawater were conducted. Physico-chemical parameters (temperature, dissolved oxygen, and salinity) were systematically recorded, and nutrient concentrations (nitrites, nitrates, ammonium, and phosphates) were determined as indicators of potential nutrient enrichment and pollution pressure. Results: The results revealed distinct seasonal variations in biomarker responses. Mussels exhibited relatively low enzymatic activity during winter (January–March), indicative of reduced oxidative stress (CAT ranging from 0.82 to 3.39 mmole/mg protein; SOD ranging from 25 to 48 U/ml). By contrast, elevated biomarker responses were detected in spring, with maximum stress levels recorded at Figuier in May (CAT: 24.81 mmole/mg protein; SOD: 74 U/ml) and at Bateau cassé in April–May (CAT: 17 and 13 mmole/mg protein; TP: 57 and 63 mg/ml, respectively). These findings strongly suggest that environmental fluctuations, combined with pollutant exposure, contributed to the observed biochemical alterations. Conclusion: This investigation confirms the sensitivity and reliability of the studied biomarkers—CAT, SOD, MDA, and TP—as effective indicators of coastal pollution. Their application as complementary monitoring tools provides a robust scientific basis for assessing ecological risks and contributes to the development of sustainable management strategies for Algerian coastal ecosystems.

Keywords: Biomarkers, oxidative Stress, Monitoring, marine pollution

FROM MARINE BY-PRODUCTS TO BIOACTIVE COMPOUNDS: ANTIMICROBIAL POTENTIAL OF PROTEIN HYDROLYSATES FROM SCYLIORHINUS CANICULA

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ABSTRACT

The present study aimed to evaluate the antimicrobial activity of a protein hydrolysate obtained from by-products of the small-spotted catshark (Scyliorhinus canicula, Linnaeus 1758) caught off the coast of Oran. Antimicrobial activity was determined using the agar well diffusion method against two pathogenic bacterial strains, Bacillus subtilis and Pseudomonas aeruginosa. The results, expressed as inhibition zone diameters, demonstrated a remarkable antibacterial effect. Bacillus subtilis showed the highest sensitivity to the hydrolysate (22 mm ± 1.4 inhibition zone), while Pseudomonas aeruginosa exhibited a moderate response (6.5 mm ± 2.12 inhibition zone). These findings indicate that protein hydrolysates derived from S. canicula by-products possess promising antimicrobial properties and could be considered as potential natural preservatives against foodborne pathogens in the agri-food industry.

Keywords: Scyliorhinus canicula, antimicrobial activity, protein hydrolysate, by-products valorization, Oran.

OPTIMIZATION OF HERMETIA ILLUCENS PRODUCTION : THE DETERMINING INFLUENCE OF TEMPERATURE ON LARVAL GROWTH

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ABSTRACT

The optimization of Hermetia illucens (black soldier fly) rearing conditions is essential for sustainable protein production. This study evaluates the critical parameters influencing its complete life cycle. The results demonstrate that temperature is the primary determining factor, surpassing the effect of substrate quality. In adults, a temperature of 35°C inhibits reproduction, necessitating corrective humidification and artificial lighting. The analysis of larval growth over 15 days reveals a significant interaction between temperature and substrate. At 32°C (87% RH), a rich substrate (100% poultry feed) allows for optimal growth with a final weight of 800 g. Conversely, at 34°C, a weight decrease is observed for all substrates, with losses reaching -318 g and 100% larval mortality. These results indicate that beyond 33°C, heat stress becomes inhibitory and cannot be compensated for by nutrition. Strict temperature control below this threshold is therefore essential for the viability of the farming system.

Keywords: Larval feed, Biomass, Growth, Hermetia illucens, Heat stress, Temperature

GENETIC DIVERSITY AND CONSERVATION OF THE ENDEMIC THYME FROM SOUTHEAST MOROCCO USING ISSR MOLECULAR MARKERS

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ABSTRACT

Understanding the genetic diversity of aromatic and medicinal plants is essential to protect these valuable natural resources. The genus Thymus, which naturally grows in several regions of Morocco, is highly valued for its many uses but is currently threatened by overexploitation and habitat degradation. To better preserve this plant, it is crucial to study its genetic variation in detail. In this context, our study focuses on an endemic thyme from the Southeast region of Morocco, using ISSR molecular markers. Our objective is to identify the different genetic entities present and to measure the diversity within this population. For this purpose, DNA was extracted from lyophilized leaves and analyzed by PCR using ISSR markers. The amplified fragments were separated by electrophoresis and coded into binary data to calculate various diversity indices. These results will serve as a foundation for developing tailored conservation and valorization strategies for this endemic medicinal plant, taking its genetic richness into account.

Keywords: Genetic diversity,Thymus, endemic plant, Morocco, ISSR markers, conservation,aromatic and medicinal plants.

MOLECULAR CHARACTERIZATION OF ARBUSCULAR MYCORRHIZAL FUNGI ASSOCIATED WITH AN ENDEMIC AROMATIC PLANT IN THE MIDDLE ATLAS, MOROCCO

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ABSTRACT

In the Middle Atlas of Morocco, arbuscular mycorrhizal fungi (AMF) are crucial symbiotic partners that enhance plant mineral nutrition, increase tolerance to environmental stresses, and strengthen ecosystem resilience. This study investigates the diversity and structure of AMF communities associated with an endemic aromatic and medicinal plant (AMP) from this region, whose biotechnological potential remains largely unexplored. Using a high-throughput metabarcoding approach targeting the ITS region of rhizospheric soil samples, we revealed a remarkably diverse AMF assemblage. The genera Glomus and Rhizophagus were predominant, indicating the existence of specialized mycorrhizal associations that may be critical for the adaptation and persistence of this AMP under the challenging conditions of the Middle Atlas. These beneficial symbioses not only support plant survival but also open new perspectives for the development of sustainable agricultural practices based on native mycorrhizal inocula. By uncovering the hidden diversity and ecological significance of AMF linked to an endemic aromatic plant, our findings emphasize the importance of conserving these plant–fungus interactions as a key component of biodiversity preservation and sustainable land management in fragile Mediterranean and arid ecosystems.

Keywords: Arbuscular mycorrhizal fungi; metabarcoding; endemic aromatic plant; fungal diversity; microbial ecology; sustainable agriculture; Middle Atlas.

EVALUATION OF PLANT GROWTH-PROMOTING TRAITS OF BACTERIAL ISOLATES FOR SUSTAINABLE AGRICULTURE

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ABSTRACT

Plant growth-promoting bacteria (PGPB) represent a vital biological resource for sustainable agriculture. These microorganisms exert diverse effects, including enhancing nutrient uptake, improving plant tolerance to stress, and promoting overall growth, providing an eco-friendly alternative to chemical fertilizers. In this study, bacterial isolates from various environmental sources were evaluated for their plant growth-promoting traits, including nitrogen fixation, phosphate solubilization, chitinase activity, 5-aminolevulinic acid (ALA) production, 1-aminocyclopropane-1-carboxylic acid (ACC) deaminase activity, siderophore production, hydrogen cyanide (HCN) production, and exopolysaccharide (EPS) production. Among the isolates, Citrobacter freundii PB149 exhibited the highest nitrogen fixation capacity, while Serratia liquefaciens PB41 was the most effective in phosphate solubilization. Bacillus cereus PB136 showed notable chitinase activity, and Stenotrophomonas rhizophila PB4 was the most efficient ALA producer. ACC deaminase activity was particularly prominent in Bacillus cereus PB136, while siderophore production was observed in Stenotrophomonas maltophilia PB25. HCN production was detected in Pseudomonas sp. PB90 and Enterobacter ludwigii PB72 showed significant EPS production. Moreover, S. maltophilia PB25, S. liquefaciens PB41, and Pseudomonas sp. PB90 exhibited antifungal activity against the fungal pathogens Phytophthora infestans, Botrytis cinerea, and Monilinia laxa. These findings suggest that the tested bacterial isolates may be potential candidates for use as biofertilizers and biocontrol agents. Overall, the study underscores the ability of environmentally derived microorganisms to enhance agricultural productivity while reducing chemical fertilizer usage, highlighting their pivotal role in sustainable farming practices.

Keywords: PGPB, Plant growth promotion, Phytohormone, Biofertilizer, Biocontrol

CHEMICAL AND BIOLOGICAL SYNTHESIS OF ZNO NANOPARTICLES: EFFECTS ON ANTIBACTERIAL ACTIVITY

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ABSTRACT

Zinc oxide nanoparticles (ZnO-NPs) are among the most promising antimicrobial agents due to their biocompatibility, low toxicity, and unique physicochemical properties. In this study, ZnO-NPs were synthesized from a zinc acetate precursor via both chemical and biological methods. During biological synthesis, *Rhodopseudomonas palustris* RPA1 was employed, and the cell, supernatant, dried, and calcined biomass fractions were separately evaluated. The structural and morphological characteristics of the nanoparticles were analyzed using FESEM, FTIR, EDX, and UV–Vis spectroscopy. The synthesized NPs exhibited spherical, rod-shaped, and irregular morphologies. Antibacterial activities were investigated against *Escherichia coli*, *Bacillus subtilis*, and *Staphylococcus aureus* using agar diffusion, minimum inhibitory concentration (MIC), minimum bactericidal concentration (MBC), and triphenyl tetrazolium chloride (TTC) assay. The ZnO nanoparticles synthesized by the chemical process (KS) exhibited the strongest antibacterial inhibition against *S. aureus*, with an inhibition zone diameter of 2.1 cm and MIC/MBC values of 25 µg/mL. In contrast, biologically synthesized nanoparticles obtained from dried cells (KHA) showed the most pronounced antibacterial activity against *B. subtilis*, displaying an inhibition zone of 1.3 cm and MIC/MBC values of 25 µg/mL. Other nanoparticle groups demonstrated comparable effects, with inhibition zones of approximately 1.0 cm and MIC/MBC values ranging between 25 and 50 µg/mL. The TTC assay results corroborated these findings. Meanwhile, calcined nanoparticles derived from the cell fraction (YHA) exhibited no detectable antimicrobial activity. These findings indicate that both the synthesis method and the morphology of the nanoparticles are critical determinants of antibacterial efficacy. The observed differences in inhibitory effects among *E. coli*, *B. subtilis*, and *S. aureus* suggest variations in the interactions between zinc oxide nanoparticles and bacterial cell wall structures. Furthermore, the biosynthesis approach utilizing *R. palustris* RPA1 represents an environmentally friendly and innovative production method. Overall, this study highlights the high potential of zinc oxide nanoparticles as alternative antibacterial agents and provides valuable scientific insights for the development of targeted strategies against different bacterial groups.

Keywords: Zinc Oxide Nanoparticle, Biological Synthesis, Rhodopseudomonas palustris, Antimicrobial Activity, Escherichia coli, Bacillus subtilis

THE ASSESSMENT OF GENETIC VARIATION AND RELATIONSHIPS OF CULTIVATED BARLEY CULTIVARS

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ABSTRACT

Hordeum vulgare L, is one of the most important cereals cultivated worldwide. Genetic variation in cultivated barley (Hordeum vulgare L) is essential in breeding for programs aimed at improving resilience, productivity, and adaptability to changing environmental conditions. Therefore, the knowledge of genetic diversity is crucial for designing appropriate selection criteria in the breeding programs. In this context, the present study assesses the level of the genetic diversity and genetic relationships among six barley cultivars in Albania by means of 11 RAPD molecular markers. A total of 138 polymorphic bands were generated in the analysis, and the mean marker index (MI) was 0.56. The expected heterozygosity (He) ranged from 0.28 to 0.5, with an average of 0.48. Cluster analysis using the UPGMA method grouped cultivars into two main clusters. The genetic similarity coefficient ranged from 15% to 85 %, with a mean of 52%, indicating a moderate level of genetic diversity within the cultivated barely germplasm. The results observed in this study reflects the reduction of genetic diversity caused by intensive selection, a well-documented phenomenon in cereal crops. As the first assessment of genetic variation within barley cultivars grown in Albania, these results are crucial for aiding future breeding efforts.

Keywords: Genetic diversity, RAPD

PREDICTION OF ANTIMICROBIAL PEPTIDES EFFECTIVE AGAINST IMPORTANT PLANT PATHOGENIC FUNGI

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ABSTRACT

Plant pathogenic fungi cause devastating crop losses worldwide and pose major challenges for sustainable agriculture. Conventional fungicides often suffer from resistance development and environmental concerns, underscoring the urgent need for novel antifungal agents. Antimicrobial peptides (AMPs) have emerged as promising candidates, yet the accurate classification of active versus inactive sequences against plant pathogenic fungi remains limited. Machine learning provides an opportunity to exploit sequence- and physicochemical-based descriptors for predictive modeling of antifungal activity. Methods: We compiled a dataset of peptides with known activity against major plant pathogens (Fusarium spp., Botrytis cinerea, Verticillium dahliae, Rhizoctonia solani, and Sclerotinia sclerotiorum) from the GRAMPA database. After removing highly similar sequences (>95% identity), we classified peptides as active or inactive by clustering their continuous antimicrobial activity scores using a Gaussian Mixture Model (GMM). Physicochemical properties were computed in silico using the DBAASP and Pfeature tools. The final curated dataset integrated position-specific one-hot encoding (P1–P140) with 693 numerical descriptors. Multiple ML algorithms—including Random Forest (RF), Extreme Gradient Boosting (XGB), and Support Vector Machines (SVM)—were trained and optimized via grid search cross-validation. Model performance was assessed using ROC-AUC, PR-AUC, F1-score, and threshold-optimized accuracy. Results**:** The Random Forest model achieved strong baseline performance (CV ROC-AUC = 0.858; test ROC-AUC = 0.943; accuracy = 0.88). XGB yielded comparable performance with improved calibration (test ROC-AUC = 0.936; F1 = 0.939 at optimal threshold). Feature importance analysis revealed that both physicochemical descriptors (e.g., QSO1_SC_Y, AAC_Y, SEP, CeTD_22_PO) and specific sequence positions (notably P22, P25–P31) strongly contributed to classification. Amino acids such as lysine (K), alanine (A), and valine (V) emerged as key residues associated with antifungal activity, alongside physicochemical features reflecting secondary structure and hydrophobicity. Conclusion: Our integrated sequence–descriptor machine learning framework successfully discriminated antifungal peptides with >0.93 ROC-AUC and highlighted critical amino acids, positions, and physicochemical traits underpinning activity. This study demonstrated that combining position-specific encoding with physicochemical features improved model interpretability and predictive power. Future work would focus on expanding dataset diversity and benchmarking deep learning architectures to surpass 90% accuracy across independent validation sets.

Keywords: Antimicrobial peptide; Antifungal peptide; Plant pathohens; Pathogenic fungi

NANOBIOTECHNOLOGY APPROACH: COMPARATIVE STUDY OF STABILITY, ANTIMICROBIAL ACTIVITY AND BIOCOMPATIBILITY OF SILVER NANOPARTICLES SYNTHESIZED BY ENDOPHYTIC AND INDUSTRIAL MICROORGANISMS

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ABSTRACT

Silver nanoparticles (AgNPs) have attracted focus in recent years due to their superior antibacterial and antifungal properties. However, the environmental adverse effects and high costs of traditional physical and chemical synthesis methods have led researchers to environmentally friendly approaches such as green synthesis. In this study, silver nanoparticles were produced and characterized using both industrially derived microorganisms (Bacillus subtilis, Escherichia coli, Staphylococcus aureus, Candida albicans) and endophytic Bacillus cereus isolated from plants. DLS and zeta potential analyses revealed differences depending on the microorganism species used. In particular, AgNPs synthesized with B. cereus were found to be smaller (109 nm) and more stable. Disk diffusion tests demonstrated that these nanoparticles have potent antimicrobial activity across a broad microbial spectrum. Biocompatibility analyses on L929 cells indicated high cell viability at low concentrations, while toxicity was detected at higher concentrations. The results reveal that endophytic bacteria are promising biological sources for the green synthesis of silver nanoparticles.

Keywords: Silver nanoparticles, Green synthesis, Bacillus cereus, Endophytic bacteria, Nanobiotechnology, Cytotoxicity, Sustainable synthesis

MICROPROPAGATION OF GOJI BERRY (LYCIUM BARBARUM L.)

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ABSTRACT

Native to Asia, the wolfberry (Lycium barbarum, L.) is a species in the Solanaceae family that grows in tropical and subtropical regions worldwide. Goji berries offer a high economic value. Furthermore, as a medicinal and aromatic plant, they can be used in a wide variety of applications. This study aimed to micropropagate goji berries using tissue culture and develop a high-yield propagation protocol. For this purpose, 10 goji berry genotypes were used. BA (Benzyl Adenine) was used at three different concentrations, 0, 1, 2 mg/L, in micropropagation experiments, and IBA (Indole Butyric Acid) was used at three different concentrations, 0, 1, 2 mg/L, in rooting experiments. In the micropropagation experiments, data on micropropagation coefficient and plant height (cm) were examined for the genotypes, while plant height, root length, and root number parameters were examined for the rooting medium. In this study, preliminary findings of the project numbered 'FBA-2025-17081' titled 'Micropropagation of Goji Berry (Lycium barbarum L.) and Investigation of its Resistance to Drought Stress In Vitro' are included.

Keywords: MS, plant tissue culture, BA

INVESTIGATION OF MICROPROPAGATION POSSIBILITIES OF THE "GEMLIK" OLIVE CULTIVAR THROUGH IN VITRO TECHNIQUES

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ABSTRACT

Olive (*Olea europaea* L.) is an economically important plant species that is widely cultivated in many countries, particularly in the Mediterranean region. Although it has a wide range of uses, its propagation efficiency through conventional methods remains quite limited. Micropropagation, as one of the *in vitro* techniques, provides an important alternative to overcome these production limitations. In the present study, the "Gemlik" olive cultivar, which is widely cultivated in Turkey and has high commercial value, was used as plant material, and nodal explants were employed as the explant source. At the initiation of the culture, the effects of fifteen different nutrient media were evaluated in terms of tissue browning percentage, number of shoots per explant, and culture success rate. The highest browning rate was observed in explants cultured on MS medium. When the plant growth regulators 6-Benzyladenine and Zeatin were compared, Zeatin was found to produce better results. The best shoot development was obtained from WPM media supplemented with 1 and 2 mg/L Zeatin.

Keywords: Olive, "Gemlik", Micropropagation, Plant Tissue Culture

INVESTIGATION OF MICROPROPAGATION POSSIBILITIES OF THE "GEMLIK" OLIVE CULTIVAR THROUGH IN VITRO TECHNIQUES

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ABSTRACT

Olive (Olea europaea L.) is an economically important plant species that is widely cultivated in many countries, particularly in the Mediterranean region. Although it has a wide range of uses, its propagation efficiency through conventional methods remains quite limited. Micropropagation, as one of the in vitro techniques, provides an important alternative to overcome these production limitations. In the present study, the "Gemlik" olive cultivar, which is widely cultivated in Turkey and has high commercial value, was used as plant material, and nodal explants were employed as the explant source. At the initiation of the culture, the effects of fifteen different nutrient media were evaluated in terms of tissue browning percentage, number of shoots per explant, and culture success rate. The highest browning rate was observed in explants cultured on MS medium. When the plant growth regulators 6-Benzyladenine and Zeatin were compared, Zeatin was found to produce better results. The best shoot development was obtained from WPM media supplemented with 1 and 2 mg/L Zeatin.

Keywords: Olive, "Gemlik", Micropropagation, Plant Tissue Culture

APPLICATIONS OF ESCHERCHIA COLI GENOME SCALE METABOLIC MODELS IN BIOTECHNOLOGY

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ABSTRACT

Genome-scale metabolic models (GEMs) provide a computational framework linking genes, proteins, and reactions across an organism's entire metabolism and can be used to simulate metabolic fluxes for diverse systems-level analyses. Since the first GEM was created for Haemophilus influenzae in 1999, significant progress has been made in developing and simulating GEMs for an expanding range of organisms, including bacteria, archaea, and eukaryotes. GEMs have applications, such as engineering strains for chemical and material production, identifying drug targets in pathogens, predicting enzyme functions, analyzing pan-reactomes, modeling interactions between multiple cells or species, and investigating human diseases (Gu et al., 2019). The genome-scale metabolic model (GEM) of Escherichia coli K-12 has been under development for more than ten years and is now widely utilized. Research using GEMs in E. coli has largely focused on six main areas: (1) metabolic engineering, (2) model-guided discovery, (3) prediction of cellular phenotypes, (4) analysis of biological network characteristics, (5) investigations of evolutionary dynamics, and (6) modeling interspecies interactions (McCloskey et al., 2013). This study summarizes these applications, evaluating both their achievements and limitations, while offering insight into potential future directions. Collectively, studies over the past decade have built a genome-scale mechanistic understanding of the links between genotype and phenotype in E. coli metabolism, serving as a foundation for similar work in other microorganisms. Future challenges involve expanding GEMs to incorporate additional cellular processes beyond metabolism, identifying critical constraints from emerging data types, and developing computational approaches capable of accurately managing such large-scale network models.

Keywords: genome scale metabolic model, Escherchia coli

ADVANCES IN GENOME SCALE METABOLIC MODELING OF CHLAMYDOMONAS REINHARDTII

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ABSTRACT

Algae and marine microorganisms contribute nearly half of global inorganic carbon fixation. As atmospheric CO_2 levels increase, understanding how photosynthetic organisms convert CO_2 into essential metabolites and biomolecules is becoming increasingly important. These organisms not only capture CO_2 but can also serve as sustainable platforms for producing bulk chemicals, since their key inputs—light and CO_2—are freely available. To exploit this potential, a detailed understanding of photosynthetic metabolism is required (Boyle and Morgan 2009). Flux Balance Analysis (FBA) is a computational approach used to study the flow of metabolites through metabolic networks. It models metabolism as a set of stoichiometric equations representing the balance between reactants and products in each biochemical reaction, forming a stoichiometric matrix (S). By applying mass balance and thermodynamic constraints, FBA defines the feasible space of possible metabolic flux distributions. A biological objective, such as maximizing biomass or metabolite production, is then optimized using linear programming to predict cellular phenotypes like growth rates or product yields. Unlike kinetic models, FBA does not require rate constants, allowing rapid and large-scale simulations of genome-scale networks. It has been widely applied to predict metabolic behavior under genetic or environmental perturbations, identify essential genes, and guide metabolic engineering strategies for improved production of desired compounds (Orth et al. 2010). Flux balance analysis (FBA), a constraint-based modeling approach, enables prediction of metabolic fluxes using stoichiometric information and physiological constraints. It has been successfully applied to multiple model organisms to predict gene knockout viability, theoretical yields, and metabolic bottlenecks. Previous studies have used FBA to investigate photosynthetic metabolism in Synechocystis and Arthrospira platensis (Boyle and Morgan 2009). In this study, the green alga Chlamydomonas reinhardtii was selected as a representative eukaryotic model for photosynthetic metabolism due to its well-characterized genome, experimental tractability, and relevance as an intermediate between cyanobacteria and higher plants. Developments of genome scale metabolic models for Chlamydomonas reinhardtii are summarized in this study.

Keywords: Genome scale metabolic model (GEM), Chlamydomonas reinhardtii

CHEMICAL PROFILING AND ANTIOXIDANT POTENTIAL OF JUNIPERUS EXTRACTS

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ABSTRACT

Juniperus oxycedrus and Juniperus thunifera are traditionally valued for their medicinal properties, particularly their antioxidant potential. However, comparative studies on their chemical composition and bioactivity remain limited. In this study, extracts from both species were prepared and their antioxidant activity was evaluated using the DPPH assay, with IC50 values determined. The chemical composition of the extracts was analyzed by GC-MS to identify the major bioactive compounds. The results showed that Juniperus thunifera tar extract (J.t) exhibited strong antioxidant activity with an IC50 of 8.6 µg/mL, while the Juniperus oxycedrus tar extract (J.o) had an IC50 of 55.23 µg/mL. For comparison, ascorbic acid, used as a reference, had an IC50 of 61 µg/mL. GC-MS analysis revealed that J.o was mainly composed of cis- and trans-Calamenene, whereas J.t tar was rich in 1H-3a,7-Methanoazulene, 2,3,4,7,8,8a-hexahydro-3,6,8,8-tetramethyl. These findings suggest that the high antioxidant activity observed in GPP1 may be associated with its major compounds. Further investigations are planned to evaluate the anticancer potential of the major compounds through in silico molecular docking studies on cancer-related targets. These analyses aim to provide insights into possible mechanisms of action and to guide future experimental validation. Overall, the results highlight the promise of Juniperus species as natural sources of bioactive compounds with potential pharmacological applications

Keywords: Juniperus oxycedrus; Juniperus thunifera; antioxidant potential; chemical composition

BEYOND AESTHETICS: THE ENVIRONMENTAL, HEALTH AND CULINARY *USES OF ORNAMENTAL PLANTS*

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ABSTRACT

Beyond their aesthetic value, ornamental plants hold significant importance in social, cultural, and environmental health dimensions. They facilitate the reconnection of urban populations with nature while also contributing substantially to rural development. The use of ornamental plants has traditionally been recommended primarily to enhance the aesthetic quality of indoor and outdoor human environments. However, beyond aesthetics, ornamental plants serve multiple purposes, including the restoration of degraded vegetation, regulation of high temperatures, reduction of soil and water pollution, erosion control, treatment of physical and mental health conditions, and even as food sources. Ground-covering plants play a prominent role in erosion control, while broad-canopy ornamental plants provide shade, creating cooler areas in urban centers. Shrub and tree groups are employed in large cities to protect and purify drinking water reservoirs. Once limited to decorative purposes, edible flowers are now gaining popularity as both aesthetic and nutritious culinary components in restaurants. The use of flowers as food is not a recent innovation but rather a revival of ancient ethnobotanical traditions. Historically, numerous civilizations across Asia and Europe have utilized flowers not only to add distinct decorative appeal to dishes but also to enhance the organoleptic synergy between the flavors of traditional foods—such as vegetables, meats, and fish—and floral aromas. Furthermore, studies have demonstrated that many ornamental plants exert beneficial effects on human health due to their secondary metabolites. A well-known characteristic of edible flowers is their pronounced antioxidant activity, observed in nearly all studied species.
Incorporating ornamental plants into urban and residential design offers benefits that extend beyond aesthetics, including support for human nutrition, environmental conservation, and overall human health.

Keywords: decorative vegetables, floriculture, landscape

IMPROVEMENT OF PLANT MORPHOLOGY AND QUALITY IN IN-VITRO PROPAGATION OF *FICUS LYRATA* THROUGH PACLOBUTRAZOL APPLICATION

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ABSTRACK

Ficus lyrata (fiddle-leaf fig), belonging to the Moraceae family, is a plant species of significant commercial value among indoor ornamentals due to its large, glossy leaves and attractive appearance. Its durability and decorative quality have made it highly demanded in both domestic and international markets. However, conventional vegetative propagation methods exhibit low rooting rates, slow multiplication, and considerable morphological variation among the produced plants. Therefore, in-vitro propagation through tissue culture offers an important alternative for producing large quantities of genetically uniform and disease-free plant material. One of the common problems observed in Ficus lyrata plants propagated under in-vitro conditions is the development of thin and weak stems accompanied by excessive elongation. This imbalance negatively affects the overall plant form, reduces seedling quality, and decreases acclimatization success. To address these issues, this study investigated the effects of different concentrations of the growth regulator Paclobutrazol on plant development. The experiments were conducted using Woody Plant Medium (WPM) solidified with 6 g/L agar. Four Paclobutrazol concentrations (0.05, 0.1, 0.25, and 0.5 mg/L) were tested. Cultures were incubated for four weeks at 25 ± 1 °C under a 16-hour photoperiod. At the end of the culture period, plants were evaluated based on stem length, stem thickness, leaf width, color intensity, and overall morphological form. According to the findings, the 0.1 mg/L Paclobutrazol treatment resulted in the most balanced growth. At this concentration, plants exhibited a compact structure with improved stem thickness and leaf texture, and the leaves displayed a darker and more vivid coloration. The lowest dose (0.05 mg/L) had limited effects, while higher concentrations (0.25–0.5 mg/L) significantly suppressed growth, causing leaf deformation and chlorosis. In conclusion, the optimal use of Paclobutrazol is an effective strategy for enhancing plant quality in the in-vitro propagation of Ficus lyrata. The 0.1 mg/L treatment provides compact, balanced, and visually superior seedlings, making it a valuable biotechnological improvement method for increasing both production efficiency and market quality in the ornamental plant industry.

Keywords: tissue culture, Ficus lyratta, micropropagation, paclobutrazol

THE VALORIZATION POTENTIAL OF VEGETABLE OIL INDUSTRY BY-PRODUCTS IN THE REPUBLIC OF MOLDOVA

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ABSTRACT

The valorization of residues from the vegetable oil industry represents a strategic direction in the transition toward a circular economy and ecological agriculture. Their integration into agricultural systems can enhance fertilization efficiency and crop protection while reducing dependence on synthetic agrochemicals. Such practices contribute to the establishment of sustainable production systems, improve soil quality, and promote the responsible use of natural resources. The principal by-products obtained from oilseed processing, particularly sunflower, include press cakes rich in proteins and fibers, hulls, and bran containing considerable amounts of cellulose, lignin, residual oils, and polyphenols. In the Republic of Moldova, these materials are currently used mainly as animal feed, compost, or biofuel. Recent findings on the chemical composition of these residues confirm their potential as valuable sources of bioactive compounds with antifungal and biostimulant properties relevant to sustainable agriculture. This highlights the need for increased investments in research and in modern technologies aimed at the comprehensive valorization of vegetal by-products. The present study analyzes the potential for generation and utilization of waste from the vegetable oil industry at the national level. The Moldovan vegetable oil sector exhibits an oligopolistic structure, dominated by a major producer (Floarea Soarelui SA, Trans-Oil Group) and several medium-sized enterprises with limited market visibility. Approximately 90% of the total oil production is exported, reflecting the sector's strategic orientation toward external markets rather than domestic consumption. In 2023, Moldova's exports of oil-cake and other solid sunflower residues reached $55.12 million (214,340 metric tons). In terms of global export share, Moldova (1.45%) ranks among the top three exporters of sunflower seed oil-cake and related solid residues, alongside Ukraine (2.3%) and Bulgaria (0.54%). Conversely, the cold-pressed oil segment is highly fragmented and dominated by small-scale artisanal producers and startups offering oils derived from sunflower, pumpkin, flax, sesame, almond, milk thistle, and black cumin. These oils are distinguished by superior quality and high nutritional value due to the preservation of bioactive compounds and thermolabile vitamins. Nevertheless, the lack of official production data limits the accurate assessment of this segment's economic potential and hinders the planning of its large-scale development. Although the growing consumer demand for natural and organic products stimulates market growth, production volumes remain modest compared to refined industrial oils. In the absence of a public registry of cold-pressed oil producers, available information originates mainly from private sources (company websites, e-commerce platforms, and social media), suggesting a dynamic but insufficiently documented market still in the process of consolidation. The integration of advanced biotechnologies and circular bioeconomy principles offers a promising avenue for the efficient valorization of vegetable oil residues, potentially reducing the environmental footprint of production while generating additional economic and ecological value. In conclusion, the by-products of the vegetable oil industry in the Republic of

Moldova represent an underexploited yet valuable resource with significant potential for the development of bioactive compounds applicable in sustainable agriculture.

Keywords: vegetable oil industry, sunflower by-products, bioactive compounds, eco-agriculture

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THE EFFICACY OF PROBIOTICS IN THE PREVENTION OF HELICOBACTER PYLORI

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ABSTRACT

Helicobacter pylori, a Gram-negative, microaerophilic bacterium, remains one of the most prevalent human pathogens worldwide, infecting nearly half of the global population. It is classified by the World Health Organization as a Group 1 carcinogen and is a major etiological agent of peptic ulcer disease, chronic gastritis, and gastric adenocarcinoma. Despite significant advancements in eradication strategies, conventional antibiotic-based therapies, such as the proton pump inhibitor (PPI)-based triple therapy, have seen diminishing success rates owing to the alarming rise of antibiotic resistance, particularly to clarithromycin, and frequent treatment-related side effects. The increasing global challenge of antibiotic resistance and the consequent decline in eradication rates have driven the need for alternative or complementary therapeutic approaches that can enhance treatment efficacy while minimizing adverse reactions. Within this context, probiotics, live microorganisms that confer health benefits when administered in adequate amounts, have gained prominence as potential adjunctive agents in H. pylori eradication therapy. The findings presented demonstrate that probiotic supplementation offers significant advantages in H. pylori management through multifactorial mechanisms. Probiotics exert direct antimicrobial activity by producing bacteriocins, organic acids, and hydrogen peroxide, which inhibit H. pylori growth and interfere with urease activity, an essential enzyme for bacterial survival in the acidic gastric environment. Besides, probiotics compete with H. pylori for adhesion sites on the gastric mucosa, effectively reducing bacterial colonization. Beyond their antimicrobial action, probiotics modulate the host immune system by balancing pro- and anti-inflammatory cytokine levels, thus attenuating gastric inflammation and supporting mucosal healing. Certain strains, like Lactobacillus rhamnosus, L. reuteri, Bifidobacterium longum, and Saccharomyces boulardii, have been found particularly effective in reducing virulence gene expression, such as cagA and vacA, and inhibiting toxin-mediated cellular damage. The primary objective of this paper is to evaluate the efficacy and mechanisms of probiotic supplementation in preventing and managing H. pylori infection, both as a monotherapy and as an adjunct to conventional eradication regimens. This article synthesizes data from recent large-scale randomized controlled trials (RCTs) and meta-analyses that explore the therapeutic potential of probiotics in enhancing eradication rates, reducing antibiotic-induced dysbiosis, and improving patient compliance. The article also aims to identify the most effective probiotic strains, optimal dosage forms, and administration durations for maximizing therapeutic benefit and ensuring safety. In conclusion, probiotics represent a promising adjunctive strategy for overcoming the limitations of conventional H. pylori eradication therapies. Their dual ability to enhance treatment efficacy and minimize side effects offers a viable path toward improved clinical outcomes and patient adherence. Given the escalating problem of antibiotic resistance and the global prevalence of H. pylori infection, the integration of specific probiotic formulations, particularly multi-strain preparations combining

Bifidobacterium, Lactobacillus, and Saccharomyces species, should be considered a key component in future therapeutic protocols.

Keywords: Helicobacter pylori, Probiotics, Antibiotic resistance, Eradication therapy, Gut microbiota

SOME BASIC MOLECULAR ANALYSES IN L.USITATISSIMUM

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ABSTRACT

Linum usitatissimum L. (flax) is a herbaceous, annual and self-pollinated species and which is member of the genus Linum belonging to Linaceae family. Linum genus includes approximately 180 species. Linum usitatissimum is the economically important species both oil and fibre source. Since its economically significant, there are number of the studies from different perspectives such as molecular markers, cytogenetic and breeding. In this research, two main steps were performed which are genomic DNA isolation in 15 different samples and preliminary trials about phylogenetic relations in seven sample (variety and six genotypes) based on nuclear internal transcribed spacers (partial). For molecular studies good quality and high concentration genomic DNA extraction is fundamental prior step. In this research CTAB procedure with modifications were performed in 15 different L. ustatissimum individuals to obtain high and good quality DNA. Young and healthy leaves of L. usitatissimum were used as sample. The genomic DNA concentration and purity was measured and agarose gel electrophrosis was performed to assess DNA quality. The nuclear ITS sequences were amplified using polymerase chain reactions in seven samples. PCR samples were sequenced and analyzed. As a result, high concentration and good quality DNA were performed successfully in all analysed samples. In phylogenetic tree especially one of genotypes may suggested closely related with the variety comparing the others. This study was financially supported by Ondokuz Mayıs University (Project number:PYO. ZRT.1904.23.026).

Keywords: L. usitatissimum, molecular analyses, genomic DNA isolation, polymerase chain reaction, nrITS

MOLECULAR IDENTIFICATION OF THE WHEAT PATHOGEN PUCCINIA TRITICINA (LEAF RUST)

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ABSTRACT

In the developing world, the detection of plant pathogens has become crucial for preventing problems in the agricultural sector and reducing economic losses caused by ecosystem issues and the increasing human population. When fungal pathogens cannot be detected at an early stage, they become one of the major factors leading to significant yield losses in agriculture. Wheat is both a nutritionally and economically valuable crop. The Thrace region, accounting for 12% of national production, is one of the most important agricultural areas in our country. Rust diseases, which are commonly observed in Turkey, cause approximately 200 million TL (Türkish Liras) of economic loss each year due to delayed detection. *Puccinia triticina* (leaf rust) is the most prevalent rust pathogen causing major yield losses in wheat in the Thrace region. Early diagnosis is essential to prevent these yield losses. Moreover, it enables the timely use of effective and appropriate doses of pesticides, which is important both economically and environmentally. Molecular diagnostic methods are highly successful in the early identification of pathogens. PCR technology is widely used for the detection of diseases. This study aims to develop a PCR-based diagnostic method for the molecular identification of *Puccinia triticina* (Pt). For this purpose, the β-tubulin and ITS gene regions of the pathogen will be designed and used as targets. In this way, the target primer to be used for early diagnosis will be determined.

Keywords: Puccinia triticina, Leaf rust, Pathogen detection, Wheat pathogen, Polymerase Chain Reaction (PCR)

DEVELOPMENT OF THE MULTIPLE CLONING SITE (MCS) WITHIN THE pUC19 CLONING VECTOR

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ABSTRACT

pUC19 is a plasmid vector widely used in cloning studies. Containing multiple restriction enzyme (RE) recognition sites within its multiple cloning site (MCS), this vector provides high flexibility for genetic engineering applications. However, the MCS regions of the pUC19 vector and the TAGZyme pQE-2 expression vector used in our laboratory are not sufficiently compatible. Therefore, within the scope of this project, it was aimed to increase the multiple cloning capacity of pUC19 and make the two vectors compatible by introducing the NdeI and SacII restriction enzyme recognition sites from the pQE-2 vector into the MCS region of pUC19. For this purpose, the MCS regions of pQE-2 and pUC19 were compared, and the NdeI and SacII restriction sites to be added to pUC19 were identified. Using bioinformatic analyses, the integration of these enzyme sites into the MCS located within the lacZ gene was designed in a way that would not disrupt the open reading frame (ORF). The designed DNA fragment was synthetically produced, then cloned into the pJET1.2/blunt vector via ligation and propagated in *E. coli* cells. The obtained pJET.pUC20MCS and pUC19 plasmids were digested with the appropriate restriction enzymes, purified from gel, ligated, and transformed into *E. coli* cells. Consequently, a new vector named pUC20 was constructed, and its modified MCS region was verified by Sanger sequencing.

Keywords: pUC19, Multiple Cloning Site (MCS),Restriction Enzyme, Vector Modification

EVALUATION OF COMMERCIAL SAGE AND SAGE PRODUCTS USING DNA BARCODING METHOD

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ABSTRACT

The *Lamiaceae* family is a widely distributed plant group represented by 224 genera and approximately 5,600 species worldwide. One of its prominent members, *Salvia officinalis* (sage), has long been valued for its medicinal and aromatic properties and is used in food, tea, essential oils, and pharmaceutical industries. In recent years, the risk of adulteration and species misidentification in commercially valuable herbal products has increased, emphasizing the need for reliable quality control methods.DNA barcoding is a modern molecular approach that provides accurate species identification and taxonomic classification. This study aimed to verify the authenticity of sage (*Salvia officinalis*) products sold in herbal stores and markets using DNA barcoding and to detect possible adulterations.A total of eight samples (including four herbal store products, three market products, and a reference sample obtained from the Biology Department of Trakya University) were analyzed. Among the tested barcode regions, the ITS locus showed the highest amplification efficiency and was selected for sequencing. The obtained sequences were analyzed using the BLAST tool in the NCBI database. Most samples showed high genetic similarity (92–99%) with *Salvia officinalis*.These results demonstrate that DNA barcoding is an effective and reliable tool for species authentication and quality assessment of commercial sage products.

Keywords: Keywords: DNA Barcoding, Sage, Salvia officinalis, ITS

PCR-BASED MOLECULAR DIAGNOSIS OF THE RICE PATHOGEN PYRICULARIA ORYZAE

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ABSTRACT

Rice is one of the key pillars of global food security and a strategically important agricultural crop for the Turkish economy. However, rice blast disease caused by the fungus Pyricularia oryzae leads to severe yield losses both worldwide and in Türkiye. Traditional diagnostic methods rely on visual inspection and culturing processes; however, the absence of early symptoms and the rapid spread of the pathogen limit the effectiveness of these approaches. In Türkiye, a reliable molecular diagnostic method for P. oryzae has not yet been widely established. Polymerase Chain Reaction (PCR)-based techniques offer the advantage of rapid and highly sensitive detection of target DNA even at low concentrations. In this study, a reliable PCR-based molecular diagnostic method was developed, and its efficiency was evaluated by comparing three previously reported primers (MoT3, mif23, and Pot2) with a newly designed Internal Transcribed Spacer (ITS) primer targeting a 268 bp specific DNA fragment unique to P. oryzae. The results demonstrated that, in addition to the ITS primer, the MoT3 and mif23 primers showed high specificity, whereas the Pot2 primer was found unsuitable for diagnostic use due to amplification observed in the negative control. This study contributes to the reliable PCR-based detection of P. oryzae and provides a solid foundation for the future application of the developed diagnostic methods in field monitoring, seed certification, and quarantine inspections.

Keywords: Pyricularia oryzae, Rice blast disease, Molecular diagnosis/detection, Polymerase Chain Reaction (PCR), Internal Transcribed Spacer (ITS), MoT3, mif23, Pot2.

UHPLC/MS ANALYSIS, ANTIOXIDANT AND ANTI-INFLAMMATORY ACTIVITY IN VIVO OF MARRUBUM VULGARE

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ABSTRACT

Introduction: The knowledge of herbal remedies in traditional cultures has contributed significantly to the development of the use of drugs derived from plants, considering their widespread use, with 80% of the world's population relying on such medicines for their health care. Marrubium vulgare L. (M. vulgare), originated in the region between the Mediterranean Sea and Central Asia, has become a ubiquitous species, currently inhabiting all continents. It is one of the medicinal plants that has been used in the treatment of inflammatory and immune disorders. In this study, we aim to firstly decipher the phytochemical constituent of M. vulgare ethanolic extract (MVEE), investigate its antioxidant effect as well as its anti-inflammatory activity in vivo. Material and methods: The chemical profile of MVEE was conducted using ultra-high-performance liquid chromatography (UHPLC) coupled with high-resolution mass spectrometer. The antioxidant effect was examined using four antioxidant methods DPPH• radical scavenging assay, nitric oxide radical inhibition, total antioxidant capacity and ferric reducing antioxidant potential, through spectrophotometric methods. Furthermore, different doses of MVEE (100, 200 and 300 mg/Kg), were administered to Swiss Albinos mice in order to assess its ability to reduce inflammation in Carrageenan-induced air pouch, while assessing the leucocyte count (LC) and protein quantity in mice exudate. Results: 3-caffeoylquinic acid, chlorogenic acid and ursolic acid were the most abundant compounds in MVEE with a percentage of area under curve of 35.59%, 31.67% and 13.19%, respectively. The extract demonstrated a notable antioxidant effect with IC50 ranging from 0.259 mg/mL to 2.541 mg/mL. After inducing the air pouch inflammation in mice, we first carried out a LC in all treated group which showed an interesting and significant difference ($p < 0.005$). The number of leucocytes in NaCl-administred group is shown to be aproximatly 20 folds greater than that of 300 mg/Kg group (1.75x106 ±0.31 cells/mL). Also, the protein quantity followed the same pattern, with a significant difference between NaCl-administred group and 300 mg/Kg-administred group. Conclusion: Since anti-inflammatory diseases count as one of the main issues in society, the quest to find safe drugs is necessary. Therefore, many researchers found hope in medicinal plants and their active compounds. M. vulgare thus showed a significant antioxidant and anti-inflammatory effect in vivo, considering that further studies are needed to understand the bioactive compounds and the signaling pathways behind their activities.

Keywords: Medicinal plants – Marrubium vulgare - UHPLC/MS – antioxidant effect – immunomodulatory effect – anti-inflammatory effect – immunity.

TRIGONELLA FOENUM-GRAECUM SEEDS: IN VITRO EVALUATION OF THE PHYTOCHEMICAL CONTENT, ANTIOXIDANT POTENTIAL, AND IMMUNOMODULATORY EFFECT OF HUMAN POLYMORPHONUCLEAR NEUTROPHILS

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ABSTRACT

Introduction: Medicinal plants in Morocco offer alternative active compounds for complementary medicine. Moroccan Trigonella foenum-graecum (T. foenumgraecum), commonly known as fenugreek, traditionally used in various cultures for its nutritional and medicinal properties to treat various inflammatory conditions. Therefore, we focused on analyzing the phytochemical profile of its aqueous extract, as well as its effect on in vitro antioxidant properties and its immunomodulatory effect of Polymorphonuclear Neutrophils (PMNs). Material and methods: Colorimetric assays were used to investigate and quantify different compounds in the aqueous extract of T. foenumgraecum seeds (TFAE), while the antioxidant activity was estimated in vitro using different tests such as 2,2-diphenyl-1-picrylhydrazyl-hydrate (DPPH) and total antioxidant capacity (TAC). The immunomodulatory effect was studied through PMNs degranulation. Human polymorphonuclear cells were isolated from blood of healthy volunteer donors using the Dextran-Ficoll technique, then pretreated with increasing concentrations of TFAE followed by stimulation with fMLP (10^{-6} M). Results: The qualitative phytochemical screening revealed the presence of various bioactive compounds such as phenols, flavonoids, alkaloids, coumarins, saponins, and terpenoids. Quantitative analysis revealed a total phenolic content of 3,98 ± 0,024 mg GAE/g DM, a flavonoid content of 3,86 ± 0,01 mg QE/g DM. The DPPH assay demonstrated an IC50 of 10,5 ±0,24 mg/mL, while TAC showed an IC50 of 4,91 ± 0,149 mg/mL. Regarding the degranulation test, the extract interestingly, showed a highest inhibition at low concentrations (0.1 mg/mL). Conclusion: While our findings provide insights into potential antioxidant and immunomodulatory properties of TFAE, further studies regarding its active principle are needed to evaluate its mechanisms of action to validate its effects.

Keywords: Trigonella foenum-graecum, PMNs, aqueous extract, antioxidant, immunomodulatory effect.

EXTRACTION AND CHARACTERIZATION OF NARINGIN FROM GRAPEFRUIT PEELS USEFUL IN CHRONIC DIABETIC WOUNDS

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ABSTRACT

Non-healing wounds are one of the most significant side effects of type 2 diabetes, which has been associated with a high prevalence of bacterial infections worldwide, ultimately leading to limb amputation [1]. The aim of this study was to obtain and preliminary characterize naringin from grapefruit peels, as a valuable ingredient in a hydrogel system used for chronic wound healing. Naringin is known to be a flavonoid compound with numerous biological activities, including antibacterial and antioxidant potential. Methods: The grapefruit peels were dried, ground and subjected to extraction by two different methods. The first method was based on the ultrasound-assisted extraction (UAE) of grapefruit peels in 70% ethanol, in a ratio of 1:10 (w/v), at room temperature, for 60 min, followed by centrifugation at 5000 g, for 10 min. The second approach was an enzymatic extraction of grapefruit peels in 20% ethanol in phosphate buffer, pH 7.4, in a ratio of 1:30 (w/v) using 1% cellulose (w/v), at 40 ˚C, for 60 min, followed by centrifugation at 5000 g, for 10 min. The identification of naringin in each extract was performed using the HPLC method. The antioxidant activity of naringin extracts was determined using TEAC and DPPH methods [2]. Results**:** The naringin extracts had an antioxidant activity defined by the following values: 0.20 mM Trolox equiv./mg and IC50 DPPH of 7.59 mg/mL, in the case of UAE, and 0.0216 mM Trolox equiv./mg and IC50 DPPH of 27.15 mg/mL, in the case of enzymatic extract. The results showed that the naringin extract obtained through ultrasonication had significantly higher antioxidant activity. The HPLC method was suitable for the quantitative determination of the naringin compound in the grapefruit peels extracts. Thus, the concentration of naringin was 94.79 µg/mL in UAE and 22.83 µg/mL in the enzymatic extract. Conclusions: This study showed that UAE was the biotechnology to be chosen for the valorization of grapefruit peels as a value-added product, providing a good yield of naringin extract with high antioxidant activity and potential for applications in the medical field.

Keywords: naringin, flavonoid, grapefruit peels, diabetic wounds, biotechnology

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VARIATION IN CHLOROPHYLL CONTENT AND STOMATAL INDEX IN PRIMULA VERIS ACROSS THREE LOCATIONS IN ALBANA

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ABSTRACT

Understanding the variation of chlorophyll content and stomatal traits within a species across different environments offers valuable insights into plant adaptive strategies. This study investigates chlorophyll content and stomatal index in Primula veris populations from three ecologically distinct regions in Albania: Tropojë (601 m a.s.l.), Kukës (561 m a.s.l.) and Librazhd (1146.2 m a.s.l.). Chlorophyll content, an indicator of photosynthetic potential, was measured using the CCM-200 chlorophyll content meter. Stomatal index on both adaxial (upper) and abaxial (lower) leaf surfaces was assessed using the EVOS XL Core Imaging System, following epidermal membrane removal to expose the stomatal layer for microscopic observation. Statistical analysis revealed significant interpopulation differences. Kukës specimens exhibited the highest median chlorophyll content (17.0), while Tropojë recorded the highest individual value (30.3). Librazhd plants showed the highest stomatal index on the adaxial surface (16.4), indicating a potential adaptive response to microclimatic or altitudinal stress. The observed variation is likely determined by elevation-related environmental factors. Librazhd, at the highest altitude, exhibited increased stomatal index, likely indicating physiological adjustment to reduced atmospheric CO_2 availability and increased stress variability. In contrast, the mid-elevation site of Kukës supported higher chlorophyll accumulation, suggesting more favorable conditions for photosynthetic activity. These findings highlight how differences in elevation can influence physiological strategies in P. veris, with chlorophyll content and stomatal traits acting as useful indicators of the species ability to adapt to different environmental conditions.

Keywords: Primula veris; chlorophyll content; stomatal index; chlorophyll meter CCM-200

MORPHOLOGICAL ANALYSIS OF PRIMULA VERIS FROM THREE DIFFERENT LOCATIONS IN ALBANIA

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ABSTRACT

Albania's diverse climate and rich natural landscapes provide favorable conditions for the growth of wild medicinal and aromatic plants. Primula veris, commonly known as cowslip, is one of the most widespread medicinal species in Europe and Albania. This herbaceous plant from the Primulaceae family typically grows in mountain meadows and forest edges. In this study, we analyzed P. veris populations collected from three regions in Albania—Tropojë (601 m a.s.l.), Librazhd (1146 m a.s.l.) and Qafë-Shtamë (1114.8 m a.s.l.)—to evaluate potential phenotypic differences related to environmental conditions. Morphological traits including leaf length, leaf width, number of flowers per plant, and root length were compared across the three sites. To better understand the influence of habitat characteristics, soil temperature, pH, moisture, and fertility were also measured at each location. The number of flowers per plant differed significantly among populations, with Qafë-Shtamë and Tropojë plants producing more flowers than those from Librazhd. The longest roots were recorded in Tropojë (mean = 19.2 cm), although root differences were not statistically significant. Leaf size varied notably, with Qafë-Shtamë specimens exhibiting the longest and widest leaves, followed by Librazhd, while Tropojë plants had the narrowest leaves. Although Qafë-Shtamë and Librazhd are located at similar elevations, they showed clear differences in both leaf morphology and flower production, likely due to contrasting local environmental conditions. Qafë-Shtamë supported both larger leaves and more flowers, potentially linked to higher soil fertility (319 µS/cm) and greater moisture availability. Tropojë, at a lower elevation, exhibited high flower output and longer roots but narrower leaves. These findings suggest that phenotypic variation in P. veris is influenced not solely by altitude, but by the interaction between elevation and site-specific ecological factors, underscoring the species adaptability across different habitats.

Keywords: Primula veris; morphological variation; phenotypic traits; environmental factors

EFFECT OF AQUEOUS EXTRACTS OF PERGULARIA TOMENTOSA (GENTIANALES, ASCLEPIADACEAE) AGAINST APHIDS IN VEGETABLE CROPS IN THE ALGERIAN SAHARA

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ABSTRACT

Chemical control of agricultural pests, although rapid and effective, poses significant risks to the environment and human health, particularly through pollution and the development of insect resistance. As an alternative, the use of natural plant extracts from the Saharan flora, such as Pergularia tomentosa, a medicinal plant, appears promising for sustainable and ecological biological control of greenhouse aphids, especially Brevicoryne brassicae. In this study, we tested the effect of three aqueous extract concentrations of Pergularia tomentosa (100%, 60%, and 20%) on aphids infesting vegetable crops. The results show that aphid mortality increases with both concentration and exposure time. After 72 hours, the 100% and 60% doses resulted in near-total mortality (97% to 100%), while the 20% dose remained ineffective. The lethal time 50 (LT50), the time required to kill 50% of the insects, was shortest for the highest concentration (approximately 24 hours). The lethal doses 50 (LD50) and 90 (LD90) indicate that the aqueous extract of Pergularia tomentosa is effective at low concentrations (LD50 = 0.0032 g/ml; LD90 = 0.036 g/ml), confirming its strong insecticidal potential. These findings support the use of Pergularia tomentosa extracts as a natural and effective alternative to chemical treatments in the fight against aphids. The application of such extracts can help reduce environmental impacts and contribute to the sustainable development of Saharan regions.

Keywords: Biological control, extract, Pergularia tomentosa, pests, vegetable crops, Sahara, Algeria.

USE OF SPONTANEOUS PLANT EXTRACTS IN THE CONTROL OF PESTS IN VEGETABLE CROPS IN THE ALGERIAN SAHARA

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ABSTRACT

Pests pose a significant threat to vegetable crops due to their early establishment and rapid reproductive capacity, causing damage at all stages of plant development. While chemical insecticides offer effective pest population control, their prolonged use leads to undesirable effects, including the decline of natural enemies and the emergence of resistance. In this context, interest in ecological alternatives such as biological control has grown considerably.
Recent studies have highlighted the potential of plant extracts, which contain natural insecticidal properties and can be integrated into strategies aimed at reducing chemical pesticide use in agriculture. This research aims to identify spontaneous (wild) plants that can be used in biological control of crop pests in the northern Sahara. It also examines the main aqueous extraction methods—maceration, decoction, and infusion—used to enhance the value of these plants. A review of previous research on the use of plant extracts against pests in vegetable crops—including aphids, flies, leafminers, and mites—was conducted. The findings show that more than 25 plant species from 15 botanical families are used in the region. Among these, the Asteraceae family stands out for its specific richness, with five recorded species. This dominance is attributed to their ability to produce various secondary metabolites, such as phenolic compounds, triterpenes, steroids, and alkaloids, which play a crucial role in plant defense against pests. Finally, this study emphasizes the importance of plant extracts as a promising alternative to chemical methods for pest management in Saharan agriculture.

Keywords: Biological control, extract, wild plants, pests, vegetable crops, Sahara, Algeria.

EVIDENCE FOR TWO PLOIDY LEVELS IN A RELICT OLIVE POPULATION OF HOGGAR (ALGERIA)

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ABSTRACT

Polyploidy was recently reported in two endangered olive subspecies from North-West Africa. The origin of this phenomenon remains unclear. In the present study, 107 genotypes of a relic Laperrine’s olive population form Hoggar (Algeria) were analysed using eight nuclear microsatellites. Diploid and triploid genetic profiles were observed. A flow cytometry analysis confirmed that trees displaying three alleles at several loci are effectively triploid. This report constitutes the first evidence for the coexistence of two ploidy types in an olive population. The triploid genotypes, probably in mean more vigorous than diploid trees, may be positively selected in the absence of sexual regeneration since a very long time, explaining their relative high frequency (2.8%) in the investigated population.

Keywords: Hoggar, Laperrine’s olive, Microsatellite, Polyploidy

GENERAL DISTRIBUTION AND MAJOR RECEPTION SITES FOR WINTERING WATERBIRDS IN THE ECO-COMPLEX OF WETLANDS IN THE SETIF REGION

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ABSTRACT

Analysis of the distribution of different wintering populations of waterbirds on natural and artificial wetlands in the Setif region (Algeria) through a presentation of its geographical distribution. To identify the major host sites, we plot the locations of the 17 wetlands surveyed during the period 2014 to 2021 on a base map of the Setif region, with a total species richness of 47 species. This represents an average regional population of 31921 individuals/year. For each species, the average number of individuals per site was calculated by dividing the sum of the annual numbers surveyed by the number of years (between 2014 and 2021) that the site was visited. The waterbirds counted were subdivided according to their feeding behavior and use of the aquatic environment into five guilds: Anatidae, Rallidae, Laridae, Waders and Cormorants. The results show that the wetlands surveyed are of great importance for the reception and conservation of wintering waterbirds, providing information on the ecological conditions associated with them.

Keywords: Waterbirds, Wetlands, Spatial distribution, Setif region.

INTERACTION OF ECONOMIC, SOCIAL AND ENVIRONMENTAL PILLARS OF BIODISTRICTS FOR BIODIVERSITY AND SUSTAINABILITY PROMOTION

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ABSTRACT

A biodistrict is a functional, non-administrative territory where voluntary cooperation is established among farmers, local governments, entrepreneurs, residents, and other stakeholders with the aim of managing local resources sustainably, developing organic farming, and strengthening local communities. The essence of the biodistrict concept is an integrated and participatory approach to territorial development that simultaneously embraces agriculture, environment, culture, economy, and society. This synergy creates territories where biological, socio-economic, and cultural values are preserved and enhanced, where sustainable production and consumption practices are introduced, and where local biodiversity and stakeholder interests are respected and balanced. As a result, biodistricts serve as platforms for the production of high-quality agricultural products, the strengthening of local identity, and the development of socially responsible economies. The biodistrict concept is based on three interrelated pillars – economic, social, and environmental, whose synergy ensures sustainable territorial development and contributes to achieving global sustainability goals. The economic pillar includes organic farming as the central production model, the establishment of short food supply chains, and the strengthening of local economies, simultaneously reducing the ecological footprint and promoting a circular economy. The social pillar focuses on community participation in decision-making, preservation of cultural heritage, and the enhancement of social cohesion, thereby strengthening local community resilience. The environmental pillar focuses on ecosystem protection, maintaining soil and water quality, and placing biodiversity conservation at the core, as it underpins the sustainability of food systems and climate resilience. The aim of this research is to identify and analyze these pillars and their interactions in Latvia, with a particular emphasis on biodiversity conservation, in order to develop a conceptual framework for implementing the biodistrict approach. Additionally, the study evaluates the capacity of biodistricts to generate economic and social benefits, such as local employment, improved availability of organic products, and the development of short food supply chains. The synergy of these elements can transform biodistricts into integrated platforms that simultaneously strengthen local economies, ensure social well-being, and foster biodiversity restoration, steering regions towards a sustainable future. This approach supports the implementation of the UN Sustainable Development Goals – particularly SDG 2 (Zero Hunger), SDG 12 (Responsible Consumption and Production), and SDG 15 (Life on Land) – as well as the European Green Deal and the EU Biodiversity Strategy. This research was carried out as part of the fundamental and applied research project No. lzp-2022/1-0519 "Bio-regions as an Integrated Strategy for the Sustainable Development of Rural Areas in Latvia" (in Latvian: Bio-reģioni kā integrēta stratēģija ilgtspējīgai lauku teritoriju attīstībai Latvijā).

Keywords: Biodistrict; sustainable development, biodiversity conservation, organic farming

ECTOPARASITE SPECIES ASSEMBLAGE AND THEIR INFESTATION LEVEL ON JUVENILE SEAHORSES (HIPPOCAMPUS BARBOURI) REARED IN LABORATORY SETTING

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ABSTRACT

Seahorses in Indonesia, locally known as tangkur horses, are a unique small fish different from other kinds of fish. Diseases attacks on fish might cause to death due to parasite infestations. Parasites found outside the body are called ectoparasites whereas found inside the body are called endoparasites. This study aimed to identify the species assemblage of ectoparasites infestated on juvenile seahorses (Hippocampus barbouri) reared in a controlled laboratory setting, and determine their infestation rates. The research was conducted at the Breeding and Ecosystem Rehabilitation Laboratory, Faculty of Marine Science and Fisheries, Hasanuddin University, for a month (November-December 2023). Using descriptive analysis based on tables and figures, the results found four species of ectoparasites: Grupfecacion sp., Epistylis sp., Urbnema sp., and Pseudodactylogyrus sp. These parasites were found on various parts of the body of juvenile seahorses, with the highest infection rate (41%) observed in the tail fins. This study is expected to provide more insights on ectoparasite species of juvenile seahorses and highlights the importance of monitoring and managing parasite infestations in aquaculture settings.

Keywords: ectoparasites, seahorse juveniles, Hippocampus barbouri, infestation rate

ASSESSMENT OF THE MYCORRHIZAL STATUS OF THE ENDEMIC AND THREATENED SUBSPECIES THYMUS BROUSSONNETII SUBSP. BROUSSONNETII IN THE TETRACLINIS WOODLAND OF ESSAOUIRA, MOROCCO.

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ABSTRACT

The objective of this study was to assess the mycorrhizal potential of an endemic subspecies,Thymus broussonnetii subsp. Broussonnetii, within the dune ecosystem dominated by Tetraclinis articulata in Essaouira, Morocco, by evaluating its contribution to soil mycorrhizal potential and the diversity of arbuscular mycorrhizal fungi. The study site is located along the Atlantic coast near Essaouira. Spore extraction and counting revealed 18 distinct morphotypes of arbuscular mycorrhizal fungi, displaying chromatic diversity ranging from black and dark brown to golden, beige, and white. The rhizospheric soil was particularly rich, with an average density of about 1,500 spores per 100 g of soil. Root examination showed a colonization rate exceeding 55% of the root system. Statistical analyses estimated approximately 1,000 infectious propagules per 100 g of soil. The most probable number method confirmed that this subspecies significantly contributes to soil enrichment with fungal propagules, thereby enhancing the mycorrhizal potential of the ecosystem.

Keywords: Arbuscular mycorrhizal fungi, Endemic, Essaouira, Morocco, Thymus broussonnetii subsp. Broussonnetii, Tetraclinis woodland,Threatened.

LITERATURE REVIEW ON THE APOCYNACEAE FAMILY: DIVERSITY, PHARMACOLOGICAL POTENTIAL, AND PERSPECTIVES FOR VALORIZATION

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ABSTRACT

La famille des Apocynaceae, comprenant plus de 5 000 espèces réparties dans près de 400 genres, représente un groupe végétal d'une remarquable diversité morphologique et écologique, principalement présent dans les régions tropicales et subtropicales. Riches en métabolites secondaires tels que les alcaloïdes, les flavonoïdes, les glycosides et les cardénolides, ces plantes suscitent un intérêt scientifique considérable en raison de leurs diverses propriétés pharmacologiques, notamment anticancéreuses, antimicrobiennes et anti-inflammatoires. Au-delà de leur potentiel thérapeutique, certaines espèces jouent un rôle écologique essentiel en contribuant à la stabilisation des sols et en développant des mécanismes d'adaptation remarquables aux environnements arides et aux stress abiotiques. Cependant, la toxicité intrinsèque de plusieurs espèces, principalement associée à la présence de cardénolides, reste un facteur limitant pour leur valorisation directe et nécessite des approches rigoureuses d'évaluation et de sécurité. Cette revue de la littérature propose ainsi une synthèse des connaissances actuelles sur les Apocynaceae, mettant en évidence leur potentiel médicinal et écologique, tout en identifiant des perspectives de recherche futures pour une exploitation rationnelle et durable de cette famille botanique.

Keywords: Apocynaceae ; secondary metabolites ; pharmacological properties ; ecology ; toxicity ; sustainable valorization.

COMPARATIVE MORPHOLOGICAL AND PHYTOCHEMICAL ANALYSIS OF WILD AND CULTIVATED SIDERITIS RAESERI POPULATIONS

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ABSTRACT

The increasing demand for Sideritis raeseri Boiss. & Heldr,, known also as mountain tea, widely used for its medicinal properties, has led to significant overexploitation and reduction of its wild populations addressing the need for effective ex situ and in situ conservation approaches and sustainable use strategies. This study presents a comparative analysis of wild and cultivated populations of S. raeseri in Albania, focusing on morphological traits and essential oil composition. A set of 18 quantitative morphological traits were assessed to evaluate the variation of these traits across the populations. In addition, the essential oil compositions from natural and cultivated populations were analyzed through GC-MS to determine chemical profiles and investigate corresponding phytochemical differences. Results revealed significant differences between wild and cultivated populations particularly in traits as plant and inflorescence height, traits that influence in the yield of essential oils, while no significant differences were observed in the chemical components identified in the essential oils profiles among analyzed populations, however a variation of the amount of the chemical components within essential oils varied among populations. These variations are likely influenced by environmental conditions and cultivation practices. The results confirm the potential of cultivated populations as sustainable alternative to wild harvesting, while also contributing to conservation strategies by providing data for the selection of genotypes for cultivation, thereby reducing the pressure on natural populations and supporting long term preservation of this endangered species.

Keywords: Sideritis raeseri, Morfological traits, Essential oil composition

NEW DATA ON ORCHIDS OF THE JIJEL REGION (NORTHEASTERN ALGERIA).

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ABSTRACT

The knowledge of orchids in Algeria has made significant progress in recent years, but some regions, such as Jijel, remain under-surveyed. For this purpose, a series of field surveys in search of orchids at the level of the said region has been carried out since 2019. The present study has proved to be very fruitful both in terms of the number of taxa recorded and the number of stations surveyed. 34 species to 11 genera (4 Anacamptis, 2 Androrchis, 1 Cephalanthera, 1 Dactylorhiza, 1 Epipactis, 1 Himantoglossum, 1 Limodorum, 2 Neotinea, 13 Ophrys, 4 Orchis et 3 Serapias) were identified in the study area and distributed across five localities, including Taza National Park. 5 species are early they were observed in the first half of January. The stations studied present a very high number of individuals per taxon. Some species have a wide distribution across the study area (Ophrys bombyliflora, O. lutea subsp. lutea and Serapias parviflora), while others are highly localized (Androrchis patens, Anacamptis pyramidalis, Dactylorhiza elata, Ophrys omegaifera subsp. haykeii, O. pallida). Of the species inventoried, 10 are protected by Algerian law and 6 species are endemic. Orchids in the Jijel region often grow on siliceous soils, in a humid to subhumid bioclimate. This variety of species highlights the taxonomic richness and confirms the interest in exploring this region neglected by orchidologists.

Keywords: Orchidaceae, Conservation, Endemism, Jijel, Northeastern Algeria.

MORPHOLOGICAL CHARACTERIZATION OF SUMAC SPECIES NATURALLY DISTRIBUTED IN KAHRAMANMARAŞ, MERSIN AND ADANA REGIONS

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ABSTRACK

Türkiye is a country with a high level of biodiversity, located at the intersection of three main phytogeographic regions (Europe-Siberian, Mediterranean and Irano-Turanian), thanks to its different climate types and topographic diversity. The rate of endemism is quite high in Turkey, where approximately 12,000 plant taxa are found. Sumac (Rhus spp.), which naturally spreads within this rich flora, is one of the prominent plants both economically and ecologically. Sumac is the name given to nearly 150 plants, including the Rhus genus, belonging to the Anacardiaceae (Pistachio) family. The two main species naturally growing in Turkey are *Rhus coriaria* L. (derici sumac) and *Rhus cotinus* L. (boyacı sumac). Of these, *R. coriaria* L. is mostly used as a spice and is widespread in the temperate and subtropical regions of the Mediterranean basin. Sumac species naturally occurring in Turkey are utilized in many areas, including food, medicinal and aromatic plants, ornamental plants, and the healthcare sector. The aim of this study was to identify local sumac (*Rhus coriaria* L.) genotypes with high yield potential and visually superior morphological characteristics. In this regard, two years of field work covering location determination, sampling and morphological observations within the framework of the planned field activities in Kahramanmaraş, Mersin and Adana provinces have been successfully completed. The plant materials obtained as a result of the study were evaluated based on the "Sumac Variety Characteristics Certificate" published by the Ministry of Agriculture and Forestry (2024). Morphological and technological characterization of the genotypes was conducted, taking into account their potential for ornamental use. A total of 10 morphological traits were measured and observed. Key traits examined included tree branching structure, plant growth form, cluster density per plant, fruit density per cluster, fruit color, leaf length, leaf width, cluster length, cluster width, and cluster weight. This variation offers significant potential for the selection of ornamental plant candidates with high aesthetic value; it also constitutes a strategic resource for the protection of local genetic resources and the development of sustainable production systems. The study reveals the importance of sumac species not only in terms of food and industry, but also in terms of biodiversity conservation and its use as a landscape plant.

Keywords: Rhus coriaria L., morphological characterization, ornamental plant, biodiversity, sustainable production

EXPLORING THE CULTURE-DEPENDENT MICROBIAL DIVERSITY IN A HIGHLY MINERALIZED ENVIRONMENT OF ZAHREZ EL GHARBI

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ABSTRACT

The purpose of this current study is to explore the microbial diversity of a highly mineralized environment in the Zahrez El Gharbi basin. This extreme environment, which appears hostile to animals and plants, can nevertheless harbor a wide variety of microorganisms belonging to the three domains of life: Bacteria, Archaea, and Eukarya. Given the importance of studying microbial diversity in both fundamental and applied microbiology, seven water samples were randomly collected for physico-chemical and microbiological analyses. The rock salt water samples were slightly acidic to neutral in pH (6.55–7.36), with salinity values ranging from 258.68 g/L to 493.91 g/L. Microbiological analyses of the water samples yielded a considerable number of halophilic strains. Eleven strains were randomly selected for identification using a polyphasic approach and were tested for enzyme production. Phenotypic, biochemical, taxonomic, and phylogenetic characterization indicated that all isolates belonged to the family Halobacteriaceae. Based on comparisons of partial 16S rRNA gene sequences, seven strains were affiliated with the genus Haloarcula, three with Halobacterium, and one with Haloferax. The production of various enzymes—such as protease, amylase, esterase, lipase, lecithinase, gelatinase, and cellulase—was evaluated on solid media. Two strains (S2-2 and 2.1) produced amylase, esterase, and lecithinase, whereas no strain exhibited cellulolytic or lipolytic activity. Gelatinase activity was observed in all tested strains. This report represents the first preliminary study of the culture-dependent microbial diversity in a hypersaline environment of the Zahrez El Gharbi basin, revealing a promising enzymatic potential for various biotechnological applications.

Keywords: microbial diversity, culture-dependent techniques, exploring, extreme environments, exploring, Zahrez El Gharbi.

RED SNAPPER SCALES AS A CHITIN SOURCE: COMPARATIVE ANALYSIS OF DIFFERENT SOLUTIONS IN THE EXTRACTION METHOD

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ABSTRACT

By-products derived from the scales of red snapper fish (Lutjanus campechanus), particularly from household-scale fish processing industries, are frequently underutilized. These scales represent a potentially valuable source of chitin, a natural polymer that ranks second only to cellulose in abundance. This study aimed to characterize the properties of chitin extracted from scales of red snapper fish (Lutjanus campechanus). An experimental approach was employed, utilizing a factorial completely randomized design (CRD) with two factors, NaOH and KOH, at extraction temperatures of 65°C and 70°C, each conducted in triplicate. Twelve experimental units were evaluated in this study. The parameters assessed included yield, FTIR spectrophotometry, and chemical characteristics, such as moisture content, ash content, and nitrogen content. Data were analyzed using ANOVA and Duncan’s test. The results showed that KOH at 70°C yielded the highest output (33.29%), with the lowest moisture content (3.68%), ash content (3.18%), and nitrogen content (2.76%), thereby identifying it as the optimal treatment. NaOH at 65°C resulted in the lowest yield (24.08%) and highest ash content (3.75%). ANOVA and Duncan's test confirmed significant differences among the treatments for all parameters. FTIR analysis demonstrated that the primary chemical structure of chitin remained intact across all treatments, as evidenced by the presence of the characteristic absorption bands. Consequently, KOH at 70°C was identified as the optimal condition for extracting high-quality chitin with potential applications in the bioindustry.

Keywords: Fish by-product, chitin, red snapper, fish scale

EFFECT OF PROCESS PARAMETERS ON α-AMYLASE PRODUCTION UNDER SOLID-STATE FERMENTATION

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ABSTRACT

α-Amylase is a key hydrolytic enzyme that breaks down starch and is widely used across various industries. Solid-state fermentation (SSF) stands out as a cost-effective, efficient, and environmentally sustainable method for its production. In this study, the Bacillus amyloliquefaciens NRRL B-645 strain was employed to produce α-amylase in a packed-bed bioreactor. The operating conditions of the bioreactor system, including air flow rate, temperature, and substrate amount, were evaluated in terms of their effects on enzyme yield and optimized using the Central Composite Design (CCD) method. Experimental design and statistical modeling were applied to determine the optimal levels of each variable and to assess their individual and interactive effects. The optimization of operating parameters led to an increase in α-amylase production.

Keywords: α-Amylase, Solid-state fermentation, Packed-bed bioreactor, Process optimization, Agro-industrial wastes

OPTIMIZATION OF CELLULASE PRODUCTION IN A PACKED BED BIOREACTOR

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ABSTRACT

Cellulase enzymes play a critical role in the bioconversion of lignocellulosic waste into fermentable sugars, making them essential for sustainable biotechnological processes. Submerged fermentation is widely used for microbial enzyme production, but it has notable disadvantages such as high energy demand and wastewater generation. As an alternative, solid-state fermentation (SSF) offers advantages in terms of cost efficiency, enzyme yield and environmental impact. In this study, cellulase production was carried out in a packed bed bioreactor operating under solid state fermentation conditions using Bacillus amyloliquefaciens NRRL B-645. Three key operational variables including air flow rate, temperature and substrate amount were selected and optimized using the Central Composite Design (CCD) method. The findings indicated that CCD was an effective statistical approach for evaluating and optimizing cellulase production under bioreactor conditions.

Keywords: Cellulase, Solid-state fermentation, Packed-bed bioreactor, Process optimization, Agro-industrial wastes

GREEN SYNTHESIS AND CHARACTERIZATION OF METAL OXIDE NANOPARTICLES, AND THEIR APPLICATION TO CONTROL TOMATO LEAF CURL NEW DELHI VIRUS (TOLRNDV) IN TOMATO CROP

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ABSTRACT

Solanum lycopersicum (tomato) is a nutritionally important crop, highly vulnerable to Tomato Leaf Curl New Delhi Virus (ToLCNDV) which is a begomovirus and transmitted by Bemisia tabaci, and it can often cause complete yield loss. This study aims to investigate the antiviral potential of Cannabis sativa extract mediated iron and zinc oxide nanoparticles in tomato plants. The synthesized nanoparticles were characterized via UV-Vis, FTIR, XRD, SEM, and EDX, confirming their stability, nanoscale size, crystallinity, and bio-functional properties. Tomato plants were treated with pre- and post-inoculation treatments with a concentration of 200 ppm of each nanoparticle in a controlled greenhouse condition. Characterization studies revealed the characteristic features of synthesized nanoparticles with crystalline size in nanoscale range. Experimental studies revealed that pre-inoculation treatment of NPs is more effective, with improved plant growth with enhanced antioxidant enzymes activities i.e. CAT, SOD, and POD. Molecular studies of virus responsive genes Ty-1, TYNBS-1, and PI-II showed a significant upregulation. TY-1 expression is linked with the activation of RNA silencing mechanisms, important for degradation of viral RNA and halting its replication. Similarly, TYNBS-1 and PI-II genes are linked to the recognition of pathogen and induction of stress response, also showed a robust upregulation under the application of nanoparticles, indicating their pivotal role in priming plant defense pathways. The dual function of nanoparticles as oxidative stress mitigators and augmenters of molecular defense mechanisms is highlighted in this study. Iron oxide and zinc oxide nanoparticle application offers a viable environmentally benign method of preventing plant viral stressors and promoting sustainable agriculture.

Keywords: Nanoparticles, Characterization, Tomato Leaf Curl New Delhi Virus

EFFECTS OF HERBAL MEDICINE ON HEMATOLOGICAL PARAMETERS IN WOMEN WITH BREAST CANCER IN THE TÉBESSA REGION (ALGERIA)

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ABSTRACT

Breast cancer remains one of the most complex and common oncological conditions affecting women worldwide. Its treatment, particularly chemotherapy, is often considered a major treatment due to its significant side effects and impact on patients' quality of life. This is why many patients are turning to alternative or complementary therapies, such as herbal medicine, in the hope of reducing side effects, improving immunity, or even slowing tumor progression.
Our work consists of a cross-sectional epidemiological case-control study, carried out on a group of women with breast cancer following co-treatment of herbal medicine in parallel with chemotherapy (CO-TCP), in comparison with a group of women following conventional medical chemotherapy treatment (CT). The main objective of this study is to evaluate the impact of the use of medicinal plants, particularly on the side effects of chemotherapy and hematological parameters. The results show that women using herbal medicine are distinguished by a tumor profile at early stages T1N0M0 or T1N1M0, characterized by positive hormone receptors, and negative Her2, with grade I or II according to the SBR classification, and a Ki-67 index of 10-20% reflecting intermediate tumor proliferative activity. The majority of these patients used herbal medicine to reduce tumor size, treat the disease or boost immunity. In this study, we identified 11 medicinal plants most used by CO-TCP women, the most frequently cited of which are Ephedra alata (32%), followed by Artemisia herba-alba (27%) and Nigella sativa (26%). The biological study shows that herbal medicine has a marked impact on the average hematological parameters of the patients, including white blood cells, red blood cells, platelets, hematocrit, and some immune cells (granulocytes, monocytes), which suggests a more active inflammatory or immune state in this group. The comparative analysis showed a significant improvement in Co-TCP patients regarding normocytosis (72% vs 58%, $p = 0.029$), normochromia (60% vs 45%, $p = 0.046$), and normal hematocrit values (75% vs 60%, $p = 0.038$). The lack of a link with other biological parameters does not mean the absence of an effect. A more in-depth and broader study will allow us to study the effect of medicinal plants on various parameters, both biological and clinical, as well as anthropometric. These results suggest that herbal medicine could significantly influence blood homeostasis. Therefore, its use, although derived from a complementary medicine approach, cannot be considered risk-free. An uncontrolled alteration of hematological parameters can have serious clinical consequences, particularly in an oncological context. It therefore appears essential to emphasize the need for rigorous medical supervision when using medicinal plants, particularly in immunocompromised patients or those undergoing cytotoxic treatment. In conclusion, herbal medicine could represent a promising therapeutic complement, without however replacing conventional medical treatments. Its use must be done empirically and supervised.

Keywords: Phytotherapy, Breast cancer, Chemotherapy, Side effects, Hematological parameters.

ANTIFUNGAL EFFICACY OF POMEGRANATE PEEL EXTRACT AGAINST FUSARIUM OXYSPORUM F. SP. ALBEDINIS IN DATE PALMS FROM SOUTHWEST ALGERIA

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ABSTRACT

Fusarium oxysporumf.sp. albedinis is a highly destructive fungus responsible for significant losses in date palm plantations in Algeria and Morocco, causing Bayoud, a severe vascular disease. In this context, the purpose is to develop the valorization of pomegranate peels, a common agricultural by product, presents a promising strategy for both biological control and economic sustainability. This study explores the physicochemical characteristics and antifungal properties of Punica granatum L. peel extracts, evaluating their potential as natural antifungal agents against Fusarium oxysporumf.sp. albedinis. Pomegranate peel extracts were obtained using shaking maceration with four solvents: distilled water, methanol, ethyl acetate, and chloroform. The extracts were tested against ten selected strains of Fusarium oxysporumf.sp. albedinis using both dilution and direct contact methods. The minimum inhibitory concentration (MIC) and minimum fungicidal concentration (MFC) were determined. The physicochemical analysis of the peel extracts revealed a density of 1.25, a refractive index of 1.34, an acidic pH of 5.03, and a dry matter content of 46.27%. Extraction yield results indicated that distilled water and methanol were the most efficient solvents, yielding 50% and 16.25%, respectively, compared to the lower yields from chloroform (2.25%) and ethyl acetate (2.10%). The antifungal activity of these extracts, tested on both solid (PDA) and liquid (PDB) media, demonstrated significant inhibitory effects against all the tested fungal strains, with fungicidal activity observed for all solvent extracts.

Keywords: Punica granatum Lextract, Maceration, Fusarium oxysporumf.sp. albedinis, antifusarial activity.

In vitro ANTIFUSARIAL ACTIVITY OF THE EXTRACTS OF Punica Granatum L OBTAINED BY DIFFERENT METHOD; AGAINST Fusarium Oxysoprum f.sp Albedenis; IN THE SOUTHWEST OF ALGERIA

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ABSTRACT

The biological activities of medicinal plants have been recognized for centuries. Among them, Punica granatum L is very commonly used for its medicinal virtues and has many therapeutic properties and targets various diseases such as cardiovascular disorders, diabetes, etc. It also has several properties due to its richness in phytochemicals at high concentrations, such as polyphenols against vegetable and palms diseases. Fusarium oxysporum f.sp. albednis is one of the most dangerous fungi that causes Bayoud disease, causing significant losses of date palms in Algeria. The aim of the present study is focused on the evaluation of the in vitro antifungal activity of a Punica granatum L fruit extracts obtained by the Soxhlet method, considered as a hot method using heating with the following solvents: distilled water, methanol, ethyl acetate, and chloroform. The evaluation of antifusarial activity of Punica granatum L. was carried out by using the dilution and the direct contact method to determine the minimum inhibitory concentration (MIC). The results of the extraction yield show that distilled water and methanol are the two best solvents which give a good yield compared to chloroform and ethyl acetate; 52% for methanol, but the low yield is 3.96% for chloroform and 3.33% for ethyl acetate. The antifungal activity results of these extracts on the solid and liquid medium, the PDA and the PDB, respectively, show that they have good inhibitory activity against all the tested fungi. According to the results obtained in the solid medium, the extracts tested have an inhibitory activity against Foa, with different MIC values ranging from 0.6 mg/ml to 5.5 mg/ml. The result of growing on liquid medium, shows that with each increase in the concentration of the extracts in the culture medium, there is a decrease in the fungal biomass, and there is a fungicide activity for all extracts used.

Keywords: Punica granatum L, Fusarium oxysporum f.sp. albedinis, antifusarial activity, date palm

QUALITATIVE-QUANTITATIVE COMPOSITION OF MACROZOOBENTHOS AS ECOLOGICAL INDICATORS IN RIVER BUNA, BOSNIA AND HERZEGOVINA

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ABSTRACT

This study investigates the biodiversity of macroinvertebrate communities in the River Buna, a karstic river in southern Bosnia and Herzegovina, with the aim of assessing ecological conditions and water quality. Macroinvertebrates are widely recognized as effective bioindicators due to their varying sensitivity to pollution and habitat changes. Field sampling was conducted at multiple locations along the river during the spring and summer of 2024, using standard collection and identification methods. A diverse range of taxa was recorded, with representatives from several key aquatic insect orders, including Ephemeroptera, Trichoptera, and Plecoptera. The composition and distribution of macroinvertebrates varied between sites, reflecting differing levels of human impact, particularly in areas downstream from urban and agricultural zones. The results underscore the ecological value of the River Buna and support the need for ongoing conservation and monitoring efforts to maintain its biodiversity and ecological integrity.

Keywords: macrozoobenthos, conservation, ecological condition, river Buna

DISTRIBUTION OF MEDICINAL PLANTS IN THE MOSTAR VALLEY AREA AND SUSTAINABLE DEVELOPMENT

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ABSTRACT

The Mostar Valley is located in the south of Bosnia and Herzegovina. It is located on the banks of the Neretva River, and has specific ecological conditions that are favorable for the growth of diverse plant species. In the Mostar Valley area, research was conducted in the period May - June 2024, with the aim of determining the distribution of medicinal plant species, which includes the identification of medicinal plant species, their affiliation to life form and floral element. In the research area, 65 medicinal plant species were identified, classified into 29 families, of which the most numerous are Lamiaceae (11 plant species, i.e. 14%), Asteraceae (13 plant species, i.e. 14%), Rosaceae (7 plant species, i.e. 9%), Malvaceae (6 plant species, i.e. 8%). The spectrum of life forms in the research area is a total of 13 with transitional forms. Hemicryptophytes (H) have the largest number of taxa (25 plant species, i.e. 45%). Phanerophytes (P) are the second most numerous life forms (9 species, i.e. 16%), followed by hamephytes (Ch) (4 plant species, i.e. 7%), therophytes (T), geophytes (G) and the transitional form H (Ch) with 3 plant species each, i.e. 5%. Transitional forms are also present: H (Ch); Ch (Pn); Pn; T, H; G (H); Ch (H); Ch, H and Ch, P with one or two plant species each. The represented medicinal plant species show great diversity in terms of flora elements, which amount to 45. The most numerous flora elements are: med (5 plant species, i.e. 9%), subatl-smed i osmed (4 plant species, i.e. 7%), no-euraassubozean (3 plant species, i.e. 5%). Most human activities lead to the rapid disappearance of plant species and the fragmentation of their habitats. Environmental protection ensures comprehensive preservation of environmental quality, rational use of natural resources in the best way for the environment, as a basic condition for healthy and sustainable development.

Keywords: Mostar basin, medicinal plant species, flora element, life form, sustainable development

ANTICANCER PROPERTIES OF ALGERIAN PROPOLIS: EXPERIMENTAL EVIDENCE, MECHANISM OF ACTION, CHALLENGE AND LIMITATION

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ABSTRACT

Cancer is a major cause of death. Lung, colon, breast and prostate cancers are the most prevalent types of cancer. Current therapies involve surgery, radiotherapy and chemotherapy. The growing tumor resistance to the available treatment has become a problematic issue. Therefore, there is a lot of interest in efforts to discover novel anticancer drugs with less toxic effect and more sensitive to cancer cells. Propolis is a natural hive product possessing a large spectrum of therapeutic activity and its us as a complementary and alternative medicine in several diseases is growing all over the world. Many researches have reported its effectiveness in the treatment of cancer by acting on different signaling pathways involved in the regulation of different cellular possesses. However Little is known about Algerian propolis. Algerian propolis's anticancer properties have recently been investigated in a variety of cell lines, including breast, pancreatic, lung adenocarcinoma, colorectal cancer cell lines, and Melanoma. We reported in the present presentation Experimental evidence of the reported anticancer properties, mechanisms of action, challenge and limitation. Our results showed that Algerian propolis possesses an interesting cytotoxic activity. The tested propolis probably induced an intrinsic pathway of apoptosis through caspase cascade and activation of pro-apoptotic proteins, such as BAX, p53, and 21(CDKN1A). In addition, cell proliferation was found to be inhibited by the diminution of CYCLIN2 and CDK4 activities associated with the increase in p21 acting as a protein inhibitor. Further research to isolate and characterize active constituents using a bio guided approach and evaluate their efficacy and safety in vivo are in need

Keywords: Algerian propolis, anticancer properties, mechanism of action, challenge, limitation

PHYTOCHEMICAL CHARACTERIZATION AND BIOACTIVITY ASSESSMENT OF ATRIPLEX HALIMUS L. EXTRACTS AGAINST BACTERIAL PATHOGENS AND SITOPHILUS ORYZAE

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ABSTRACT

Natural plant extracts are known to contain a wide range of biologically active compounds. In this study, we focused on Atriplex halimus L., a plant commonly used in traditional herbal medicine, with the aim of performing both phytochemical and physicochemical characterizations, as well as evaluating its antibacterial and insecticidal properties. Phytochemical screening of the aerial parts of Atriplex halimus revealed the presence of flavonoids, tannins, gallic tannins, glycosides, phenols, and saponins. In contrast, anthocyanins, free quinones, and coumarins were not detected. Quantitative analysis of total polyphenol content indicated that the ethanolic extract of Atriplex halimus L. is particularly rich in polyphenols, with a concentration of 22.1 ± 0.01 mg GAE/g of dry matter. Physicochemical analyses revealed a low moisture content (10%), high ash content (25%), a neutral pH (6.8), and an acidity level of 5.11%. Antibacterial activity tests showed that the extract exhibited inhibitory effects against Staphylococcus aureus ATCC 25923 and Pseudomonas aeruginosa ATCC 27853, while no significant activity was observed against Escherichia coli ATCC 25922.Furthermore, the insecticidal activity of the ethanolic extract was assessed against Sitophilus oryzae, a common pest of stored grains. The results demonstrated a toxic effect, with a 30% mortality rate observed in the inhalation test, and a repellency rate of 40%.

Keywords: Atriplex halimus, phytochemical screening, physicochemical analysis, antibacterial activity, insecticidal activity, Sitophilus oryzae.

INHIBITION OF ANGIOGENESIS BY EXTRACTS FROM CANTHARELLUS CIBARIUS

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ABSTRACT

Angiogenesis is a complex physiological process that cannot be treated with single agent therapy. Several edible fungi have been known to encompass bioactive compounds, andare promising sources of multi-component drugs. One such widely consumed edible fungi is Cantharellus cibarius, which has been explored for its biological activities. The presentstudy focused on assessing the anti-angiogenic activity of petroleum ether and ethanolextracts of C. cibarius using chick chorioallantoic membrane (CAM) assay. Both the extracts showed a dose-dependent response which was compared with the anti-angiogenic activity of the positive controls silibinin, and lenalidomide. The extracts were also studied for their lipoxygenase (LOX) inhibitory potential and compared to ascorbic acid as the positive con trol. The IC50 values of the petroleum ether extract, ethanol extract, and ascorbic acid for LOX inhibition assay were 135.4, 113.1, and 41.5 mg/mL, respectively. Although both the extracts showed similar responses in CAM assay, ethanol extract proved to be more potent in LOX inhibition assay. Finally, the extracts were investigated for their chemicalcomposition using GC-MS. A correlation between LOX inhibition and anti-angiogenic potential was estab lished at the molecular level. A meticulous literature search was carried out to correlate the biochemical composition of the extracts to their anti-angiogenic activity

Keywords: Angiogenesis ,cantharellus ,LOX,s-ilibinin,

EVALUATION OF THE ANTI-ANGIOGENIC PROPERTIES OF SUMMER MUSHROOMS

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ABSTRACT

Mushrooms represent a vast source of unexplored bioactive compounds. Due to their biological activities, several mushrooms have demonstrated commercial applications in the health industry. Tuber aestivum Vittad. is one such edible mushroom with immense potential for practical biological applications. In the present study, the anti-angiogenic activity of petroleum ether and ethanol extracts of T. aestivum was investigated using the chicken chorioallantoic membrane (CAM) assay and compared to positive controls silibinin and lenalidomide. The extracts showed a dose-dependent anti-angiogenic response. The extracts were also evaluated for their anti-inflammatory potential using a lipoxygenase inhibition assay. The IC50 values for the LOX inhibition assay, calculated by Boltzmann plotting, were 368.5, 147.3, and 40.2 µg/mL, respectively. T. aestivum extract exhibited higher anti-angiogenic and anti-inflammatory activity compared to the petroleum ether extract. GC-MS analysis of the extracts revealed the presence of various bioactive compounds.

Keywords: Mushrooms, anti-angiogenic, lenalidomide.

REPRODUCTIVE CHARACTERISTICS OF GLOSSOGOBIUS GIURIS: FECUNDITY AND EGG DIAMETER IN LAKE SIDENRENG, SOUTH SULAWESI

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ABSTRACT

Bungo fish (Glossogobius giuris) is one of the important fishery resources in Lake Sidenreng, which has experienced a decline due to continuous fishing. The capture of both mature and immature gonads can reduce the number of spawners available to produce juvenile fish, thereby disrupting the reproduction and sustainability of the bungo fish population. Therefore, biological information is essential for the sustainable management of this species. This study aimed to analyze the fecundity and egg diameter of bungo fish (G. giuris) as baseline data on the reproductive potential and spawning type of the species to support sustainable fishery resource management. The research was conducted over three months, from September to November 2020. Samples were obtained from two bungo fishers operating in Lake Sidenreng, Sidenreng Rappang Regency, South Sulawesi. A total of 235 specimens were collected, comprising 163 males and 72 females. Of the female fish, 35 individuals with gonadal maturity stages (GMS) III and IV were analyzed. Fecundity ranged from 32,982 to 153,611 eggs, with total body lengths ranging from 121 to 360 mm, body weights from 0.80 to 5.10 g, egg diameters from 0.22 to 6.93 µm, and gonad weights from 0.04 to 0.43 g. The species exhibits a partial spawning pattern, where mature eggs are released gradually.

Keywords: Glossogobius giuris, bungo fish, fecundity, egg diameter, spawning pattern, Lake Sidenreng

NATURAL ALTERNATIVES TO ANTIBIOTICS: A STUDY ON JUNIPERUS COMMUNIS ESSENTIAL OIL

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ABSTRACT

The limited effectiveness of conventional antibiotics against resistant bacterial strains has raised global concern and underscored the urgent need for alternative therapeutic strategies. One promising area of investigation involves essential oils derived from medicinal plants, which have shown significant antimicrobial potential due to their rich and diverse phytochemical composition. Juniperus communis, commonly known as juniper, is one such plant valued for its traditional medicinal applications and bioactive properties. This study examines the antibacterial activity of its essential oil, aiming to contribute to the development of effective, plant-based alternatives for combating multidrug-resistant (MDR) infections. The antibacterial potential of Juniperus communis essential oil was evaluated against four MDR bacterial strains: Staphylococcus aureus (MRSA), Escherichia coli, Klebsiella pneumoniae, and Enterococcus faecalis. The plant material was collected in 2023 from the Sétif region in northeastern Algeria. Essential oil was extracted from the aerial parts by steam distillation and stored at 4 °C. Antibacterial activity was assessed using the disc diffusion method against clinically isolated strains obtained during an epidemiological study conducted at the Military Hospital of Constantine. The essential oil demonstrated notable antibacterial activity, with inhibition zones ranging from 8 mm to 30 mm. The most significant effects were observed against E. faecalis and S. aureus. These findings suggest that Juniperus communis essential oil may serve as a promising natural antibacterial agent, particularly as part of complementary approaches targeting MDR pathogens. Further research is needed to evaluate potential synergistic effects with conventional antibiotics, as well as toxicity and formulation for therapeutic use.

Keywords: Juniperus communis, Essential Oil, Multidrug Resistant Bacteria, Antibacterial Activity

INTEGRATED ASSESSMENT OF THE ECOPHYSIOLOGICAL RESILIENCE AND BIOACTIVE POTENTIAL OF VACHELLIA TORTILIS SUBSP. RADDIANA IN MOROCCO'S ARID ECOSYSTEMS

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ABSTRACT

In a global context marked by climate change, Vachellia tortilis subsp. raddiana, an emblematic species of Morocco's arid regions, demonstrates a remarkable ability to adapt to water stress. This study explores its ecophysiological responses to drought and highlights the valorization of its bioactive compounds. Under water deficit conditions, a significant decrease in relative water content is observed (from 62 ± 3 % to 38 ± 2 %), accompanied by a notable accumulation of proline (2.8 ± 0.3 µmol/g DW) and soluble sugars (32.8 ± 2.1 mg/g DW), indicating an efficient osmotic adjustment that helps maintain cellular homeostasis. In parallel, chlorophyll a and b contents decrease by 46% and 30% respectively, suggesting a regulation of the photosynthetic apparatus aimed at optimizing light efficiency and reducing energy losses under stress. Phytochemical analysis reveals a high content of polyphenols and flavonoids in the leaves (281 ± 1.2 mg GAE/g DW and 57.5 ± 0.9 mg QE/g DW), significantly higher than in the gum. These leaf extracts show significant antibacterial activity against Escherichia coli (9 ± 1.1 to 12 ± 1.4 mm) and Staphylococcus aureus (12 ± 1.4 to 17 ± 1.3 mm), suggesting a positive correlation between the richness in phenolic compounds—particularly flavonoids—and their antimicrobial effectiveness. These results highlight the dual value of V. tortilis subsp. raddiana: on one hand, its ecological role in the resilience of arid ecosystems, and on the other, its sustainable valorization potential in the pharmaceutical, agro-industrial, and cosmetic sectors.

Keywords: Vachellia tortilis, water stress, arid ecosystems, polyphenols, antibacterial activity, physiological adaptation, sustainable valorization

HYPOGLYCEMIC EFFECT OF MORINGA OLEIFERA

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ABSTRACT

Excessive consumption of sugar and high-calorie foods is a major global concern, as it contributes to the increasing prevalence of metabolic disorders such as type 2 diabetes. At present, about 11.1% of the world's adult population (approximately 589 million people) suffer from this disease. One of the experimental models commonly used to reproduce the onset of type 2 diabetes in laboratory animals is the cafeteria diet, which is characterized by a high intake of fat, sugar, and salt, mimicking the unbalanced Western lifestyle. In recent years, medicinal plants have received growing scientific interest as alternative or complementary strategies for managing metabolic diseases. Among them, Moringa oleifera is widely recognized for its antioxidant, anti-inflammatory, and antibacterial properties, and has been suggested to possess potential hypoglycemic activity. The present study was conducted to investigate the hypoglycemic and protective effects of the aqueous extract of Moringa oleifera in Wistar albino rats with diabetes induced by a cafeteria diet. Thirty healthy male rats, weighing 130 ± 30 g, were divided into six groups: a healthy non-diabetic control group, an untreated diabetic group, two groups receiving different doses of Moringa oleifera aqueous extract (10 g/kg and 20 g/kg), and one group treated with glimepiride (1 g/kg) as a reference antidiabetic drug. After induction of diabetes through prolonged exposure to a hypercaloric cafeteria diet, treatments were administered, and the animals were monitored for changes in body weight, blood glucose levels, and metabolic markers. In addition, biochemical analyses of hepatic and renal function were performed, and histological examinations of liver and kidney tissues were carried out to assess structural alterations and possible protective effects. The results demonstrated that administration of Moringa oleifera aqueous extract led to a significant reduction in blood glucose levels compared to untreated diabetic rats. Furthermore, treated animals showed lower body weight gain, improved markers of liver and kidney function, and reduced tissue damage upon histological examination, highlighting the plant's protective role against diabetes-induced metabolic and structural alterations. These effects were found to be dose-dependent and in some cases comparable to the standard drug glimepiride. In conclusion, the findings of this study suggest that the aqueous extract of Moringa oleifera may represent a promising phytotherapeutic agent for the management of type 2 diabetes. By reducing hyperglycemia, improving metabolic parameters, and protecting hepatic and renal tissues, Moringa oleifer demonstrates potential as a natural alternative or complement to conventional antidiabetic treatments.

Keywords: Diabetes, Moringa oleifera, Cafeteria diet, Wistar albino rats, Phytotherapy

DETERMINATION OF ANTIBIOTIC RESISTANCE PROFILES AND EFFECTIVE ANTIBIOTICS IN SALMONELLA ISOLATES FROM TURKIYE

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ABSTRACT

Salmonella species are foodborne pathogens that cause various infections in humans and animals, such as gastroenteritis, typhoid fever, and paratyphoid fever. Increasing antibiotic resistance in recent years poses a major threat to public health and limits current treatments. In this study, the antibiotic resistance profiles of six different Salmonella serovars (Enteritidis, Typhimurium, Virchow, Infantis, Kentucky, and Thompson) isolated from Turkiye were examined using disk diffusion and microdilution methods, and the most effective antibiotics were determined. In the trial, which was conducted using a total of 19 different antibiotics, the antibiotic resistance profiles of the isolates were determined, and the resistance patterns between serovars were compared. Our research revealed that resistance levels to some antibiotics showed significant differences between serovars. Typhimurium and Virchow showed susceptibility to sulfonamide antibiotics, while other isolates were found to be highly resistant. All serovars remained susceptible to trimethoprim and ciprofloxacin antibiotics, while widespread resistance to vancomycin was detected. All isolates were found to be resistant to at least one antibiotic, and multidrug resistance was common. Following resistance analysis, the data were normalized, and the three most effective antibiotics were selected to determine the minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) values. Ciprofloxacin showed susceptibility in all isolates, with only S.Virchow and S. Infantis (0.19 µg/mL) and S. Kentucky (0.3 µg/mL) exhibiting low MIC values. The lowest MIC values for neomycin ranged from 1.5 to 3.1 µg/mL, while a marked resistance was observed in S. Infantis at 50 µg/mL. While most isolates were susceptible to trimethoprim at 0.19 µg/mL, only S. Infantis showed high resistance at 12.5 µg/mL. MBC results supported the MIC findings. Ciprofloxacin showed very low MBC values of 50 µg/mL was found in S. Infantis. For trimethoprim, all serovars showed an MIC value of 12.5 µg/mL, with only S. Infantis having a higher bactericidal threshold value of 50 µg/mL. The data obtained show that Salmonella enterica serovars from cheese sources are multidrug resistant, but ciprofloxacin and trimethoprim retain their effectiveness against most isolates. In contrast, the high resistance of S. Infantis to both neomycin and trimethoprim emphasizes that serovar-level differences are critical in resistance monitoring. Our study shows that the different Salmonella serovars isolated have high resistance rates to important antibiotics, which may pose a risk in terms of economics and public health. Therefore, the resistance rates determined in our data should be considered in both epidemiological surveillance and treatment strategies.

Keywords: Salmonella, isolates, antibiotic resistance, ciprofloxacin, neomycin, trimethoprim.

SALMONELLA AS A FOODBORNE PATHOGEN: GENERAL CHARACTERISTICS, VIRULENCE FACTORS, AND HOST-PATHOGEN INTERACTION

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ABSTRACT

Salmonella is a Gram-negative, facultative anaerobic pathogen that can cause severe illness in humans and animals. This bacterium, accountable for approximately 93.8 million foodborne infections and 155,000 deaths worldwide year, poses a considerable public health risk, particularly its Salmonella enterica species and subspecies. Salmonella pathogenicity islands (SPI-1 and SPI-2), Type III secretion systems (T3SS-1 and T3SS-2), virulence plasmids, adhesion structures, and invasion mechanisms are critical factors contributing to Salmonella's pathogenicity. SPI-1 is crucial for adherence to and invasion of the intestinal epithelium, whereas SPI-2 facilitates the survival of macrophages within cells and their dissemination throughout the organism. Proteins facilitating these actions regulate signaling pathways in host cells, thereby inhibiting the immune response and promoting pathogen dissemination. Fimbrial adhesins and invasion proteins are crucial for the attachment to and entry into host cells. Salmonella may circumvent the host's defense mechanisms and induce infections in the gastrointestinal tract and systemic circulation due to its varied virulence strategies. A comprehensive understanding of the virulence variables presented in the study forms an essential foundation for diagnostic, therapeutic, and vaccine development strategies.

Keywords: Salmonella, Virulence factors, Adhesion, Invasion

THE ANTIBACTERIAL EFFECTS OF COPPER SULFATE AND SILVER NITRATE ON CLINICAL ISOLATES

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ABSTRACT

Increasing antibiotic resistance is limiting treatment options, particularly for bacteria capable of forming biofilms, and reducing clinical success. Metal ions are attracting attention as alternative or adjunctive agents to antibiotics in this context. In this study, copper sulfate ($CuSO_4$) and silver nitrate ($AgNO_3$) were evaluated against Gram-positive (Staphylococcus aureus, Corynebacterium striatum, Bacillus cereus) and Gram-negative (Escherichia coli, Klebsiella aerogenes, Salmonella Typhimurium, Serratia marcescens) clinical strains. Copper sulfate showed significant activity against Gram-positive bacteria. B. cereus was the most susceptible species with MIC and MBC values of 3.906 M, while C. striatum showed moderate susceptibility with MIC and MBC values of 7.813 M. S. aureus was found to be susceptible with MIC and MBC values of 7.813 M. Among Gram-negative species, E. coli and K. aerogenes exhibited susceptibility with MIC 7.813 M and MBC 15.625 M, while S. Typhimurium and S. marcescens required higher concentrations with MIC and MBC 15.625 M. In silver nitrate, B. cereus showed susceptibility with the lowest MIC (7.813 mM) and MBC (31.25 mM) values. S. marcescens, K. aerogenes, and E. coli were found to be moderately susceptible with MIC 15.625 mM and MBC 31.25 mM, while C. striatum and S. Typhimurium were moderately susceptible with MIC 31.25 mM and MBC 62.5 mM. S. aureus was the most resistant species, with an MIC of 62.5 mM and an MBC of 125 mM. Both metal compounds inhibited bacterial growth, exhibited bactericidal effects, and significantly reduced biofilm formation in all tested strains. These findings suggest that copper and silver ions may be potential antimicrobial agents, particularly against strains with high antibiotic resistance. Future studies should evaluate the combination effects of these compounds, their efficacy in different clinical isolates, and their in vivo safety profiles.

Keywords: Copper sulfate, Silver nitrate, Antimicrobial effect, Clinical isolates, Biofilm

COMPOSITION OF FRESH ALGERIAN ROYAL JELLY AND ITS ANTIOXIDANT EFFECT

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ABSTRACT

Royal jelly (RJ) has been identified as a high-quality functional food with health benefits. This study was conducted to examine the composition of fresh Algerian royal jelly as well as its role as a potential antioxidant in a β-lactoglobulin (β-Lg)-sensitized mouse model. Materials and Methods**:** Initially, fresh royal jelly was evaluated for its physicochemical characteristics. Twenty-four female Balb/c mice at 4 weeks of age were allocated to three groups. Two groups were treated with RJ orally for 7 days with doses of 0 g/kg (positive control) and 1 g/kg, respectively, and were sensitized with β-Lg adsorbed on $Al(OH)_3$. One group remained unsensitized as a negative control. Samples were collected for catalase activity and TBARS for lipid peroxidation. Results**:** Physicochemical analysis showed that Algerian RJ has a pH of 3.78 ± 0.08 and total acidity of 417.5 ± 2.5 meq/kg. It contains water (65.78 ± 2.5%), ash (1.62 ± 0.1%), proteins (14.05 ± 0.07%), carbohydrates (8.9 ± 0.01%), lipids (3.40 ± 0.04%), polyphenols (44 ± 3.27 mg GAE/100 g), and 10-hydroxy-2-decenoic acid (10-HDA) at 2.11 ± 0.3%. No significant variation in catalase activity was observed, but β-Lg sensitization increased intestinal lipid peroxidation ($p < 0.05$). RJ pretreatment significantly reduced TBARS levels ($p < 0.01$). Conclusion: These findings suggest that Algerian royal jelly, due to its rich composition in bioactive molecules such as polyphenols and 10-HDA, exerts protective antioxidant effects that may help counteract oxidative damage associated with allergic sensitization.

Keywords: Royal jelly; composition; antioxidant activity; β-Lg; 10-HDA.

VENLAFAXINE'S ANTICANCER POTENTIAL VIA DRUG REPURPOSING

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ABSTRACT

Cancer is a complex group of diseases encompassing various subtypes with distinct molecular and genetic characteristics. Despite significant advances in surgery, radiotherapy, and immunotherapy, the effectiveness of pharmacological treatments remains limited due to drug resistance and adverse side effects. Therefore, there is an ongoing need for more effective and safer therapeutic alternatives. The strategy of drug repurposing, which investigates new therapeutic uses for clinically approved drugs, has emerged as a cost-effective and rapid approach. In this study, the potential anticancer effects of the antidepressant agent Venlafaxine were investigated. Four human cell lines were used in this study, all obtained from the American Type Culture Collection (ATCC): the highly aggressive glioblastoma cell line T98-G (CRL-1690), the moderately aggressive glioblastoma-like cell line U-87 MG (HTB-14), breast adenocarcinoma cell line MCF-7 (HTB-22), and the non-tumoral human embryonic kidney epithelial cell line HEK-293 (CRL-1573).

The cells were exposed to seven different concentrations of Venlafaxine (ranging from 1 to 200 µM/ml) for 24 hours, and cell viability was assessed using the MTT assay. The calculated IC_{50} values were 17 µM/ml for T98-G, 21 µM/ml for U-87 MG, 30 µM/ml for HEK-293, and 0.9 µM/ml for MCF-7 cells ($p < 0.05$). Venlafaxine reduced cell viability in cancer cell lines in a dose-dependent manner, while significant toxicity in normal cells was observed only at higher concentrations. These findings suggest that Venlafaxine may exert cell-type-specific antiproliferative effects, indicating its potential as an anticancer candidate that warrants further investigation through advanced in vitro and in vivo studies.

Keywords: Venlafaxine, Anticancer activity, Drug repurposing, MTT assay

STUDY OF RISK FACTORS FOR BREAST CANCER AMONG WOMEN IN TEBESSA

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ABSTRACT

Recent years have been marked by a significant increase in the number of cases of breast cancer, particularly in developing countries, making this pathology a real public health issue. The objective of this study is to identify the main risk factors associated with breast cancer in women in the province of Tébessa. To this end, we conducted a case-control epidemiological study involving 200 women aged 23 to 82 years, including 100 women with breast cancer and 100 healthy women. The sample was randomly selected. The data collected concerned several socio-demographic, hormonal, reproductive and nutritional variables. The results show that family history of breast cancer, both first and second rank, are major determinants of the disease. Advanced age is also associated with an increased risk of breast cancer. Low social status, resulting in limited access to information, care and screening, as well as the use of antiperspirants containing aluminum salts, are significantly associated with the pathology. On the hormonal level, taking oral contraceptives for more than 5 years and hormone replacement therapy for more than one year were significantly associated with an increased risk of cancer. This confirms the role of prolonged hormonal exposure, suggesting a cumulative effect of certain exogenous hormonal factors. Other reproductive variables, such as low parity and a history of spontaneous abortions, also showed a significant link with the onset of cancer. Nutritionally and dietaryly, habits such as frequent consumption of red meat, processed meats, and processed and sugary products, particularly soft drinks and juices, have been linked to an increased risk of breast cancer. Frequent consumption of margarine and pastries made with white flour also constitute a risk factor. These results highlight the multifactorial and complex nature of breast cancer, which results from a tangle of genetic, hormonal, socioeconomic, behavioral, and dietary factors. This complexity makes a comprehensive approach essential in prevention strategies.

Keywords: breast cancer , women, risk factors

SERPENTINES OF TÜRKIYE AND THEIR PHYTO-POTENTIAL

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ABSTRACT

Ultramafic soils of serpentine origin present challenging edaphic conditions due to their elevated concentrations of nickel (Ni), cobalt (Co), and chromium (Cr), coupled with deficiencies in essential nutrients. These characteristics restrict plant growth to a narrow ecological niche, allowing the survival of only highly specialized species. Türkiye possesses one of the largest distributions of serpentine soils in the Mediterranean Basin, which host both a remarkable number of endemic taxa and numerous hyperaccumulator species. Recent studies have identified more than 59 Ni hyperaccumulator plants in Türkiye, positioning the country, alongside Cuba and New Caledonia, as one of the world's foremost centers for Ni hyperaccumulation. Within Türkiye's serpentine flora, the Brassicaceae and Asteraceae families are particularly prominent. The genera *Odontarrhena* (formerly *Alyssum*), *Noccaea*, and *Bornmuellera* include many serpentine endemics and hyperaccumulators, while over 13 species of *Centaurea* have also been reported to accumulate Ni. Notable examples include *Centaurea ensiformis*, restricted to Mount Sandras; *C. ptosimopappa* from the Amanos Mountains; and the strictly endemic *Bornmuellera kiyakii* and *Noccaea camlikensis*. These species stand out not only for their restricted distributions but also for their high biomass production and Ni accumulation capacities. Globally, Ni is a strategically critical metal, essential for stainless steel production and electric vehicle batteries. However, high-grade primary Ni deposits are being depleted at a rapid pace. Newly discovered reserves are increasingly composed of low-grade laterites, which raise extraction costs and impose significant environmental burdens. Forecasts suggest supply gaps emerging by the 2040s, with recycling and alternative supply streams expected to dominate after the 2060s. In this context, phytomining (or agromining) has emerged as an innovative biotechnological approach: metals are recovered by cultivating hyperaccumulator plants on Ni-rich serpentine soils and processing their biomass. Beyond enabling the extraction of metals from low-grade substrates, phytomining also contributes to the rehabilitation of degraded ecosystems and offers a carbon-negative production model. Particularly within the framework of "green nickel," this approach could support the development of environmentally sustainable supply chains. Recent experimental research in Türkiye has highlighted the substantial potential of combining hyperaccumulator plants with plant growth-promoting bacteria (PGPB) and mycorrhizal fungi. These microorganisms enhance root development, increase metal tolerance, and improve biomass yields. Moreover, they accelerate metal translocation from roots to shoots, thereby significantly improving phytomining efficiency. Consequently, it is now recognized that not only plants themselves, but also plant–microbe interactions, play a strategic role in optimizing phytomining systems. In conclusion, Türkiye's serpentine flora represents more than a reservoir of biodiversity; it also holds critical potential for sustainable Ni production. Serpentine endemics and hyperaccumulators form a strategic bridge between dwindling primary resources and the growing need for recycling, while biotechnological approaches supported by PGPB and mycorrhizal fungi position Türkiye as a strong candidate for global leadership in phytomining.
Keywords: Agromining, Hyperaccumulator, Phytomining, Phytoremediation, Serpentine

EFFECT OF ESSENTIAL OIL FROM THYMUS VULGARIS ON BLOOD CELLS RED

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ABSTRACT

Plant extracts contain a variety of biologically active molecules. In this context, we have tried to evaluate the anti-hemolytic activity of essential oil prepared from Thymus vulgaris EO was obtained by hydro distillation using a Clevenger type apparatus.NAntihemolytic activity was evaluated on red blood cells in the presence of hydrogen peroxide (H2O2), an oxidizing agent that disrupts the membrane structure. Our results show the presence of an anti-hemolytic effect at low concentrations for the essential oil of Thymus vulgaris. This opposite effect anti-hemolytic depends on its antioxidant activity by trapping free radicals and preventing the propagation of chain peroxidation, essentially, of phospholipids while maintaining membrane integrity, and subsequently inhibiting hemolysis of the cell.

Keywords: Hydro distillation ,anti-hemolytic activity, red blood cells ,Essential oil, Thymus vulgaris,

PROTECTIVE EFFECTS OF DYSPHANIA AMBROSIOIDES EXTRACTS AGAINST CFA-INDUCED ARTHRITIS AND OXIDATIVE STRESS IN MICE

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ABSTRACT

Rheumatoid arthritis (RA) is a chronic autoimmune disorder characterized by joint inflammation, pain, and functional disability. This study evaluated the anti-arthritic potential of methanolic (MeOH) and dichloromethane (DCL) extracts of Dysphania ambrosioides, a plant used in traditional Moroccan medicine. Arthritis was induced in mice via complete Freund's adjuvant (CFA) injection. Clinical and locomotor arthritis scores, as well as paw volume, were measured to assess inflammation severity. CFA injection significantly increased clinical and locomotor scores and paw edema compared to healthy controls, confirming successful arthritis induction. Treatment with Dysphania ambrosioides extracts at doses of 100, 200, and 300 mg/kg resulted in a dose-dependent reduction in inflammation and improved mobility. Both MeOH and DCL extracts significantly decreased paw swelling, particularly at higher doses, approaching the efficacy of Mobic (0,2mg/kg). Additionally, ex vivo oxidative stress biomarkers were evaluated in the liver, including superoxide dismutase (SOD), catalase (CAT), malondialdehyde (MDA), and glutathione. Treatment with Dysphania ambrosioides extracts significantly reduced oxidative stress markers, indicating a protective antioxidant effect contributing to the anti-inflammatory activity observed. These findings highlight the significant anti-inflammatory and antioxidant potential of Dysphania ambrosioides extracts, suggesting they could serve as promising natural agents for managing rheumatoid arthritis. Further pharmacological investigations are needed to elucidate their mechanisms of action and to assess their clinical relevance.

Keywords: Rheumatoid arthritis, Dysphania ambrosioides, Anti-inflammatory, Oxidative stress, Complete Freund's adjuvant, Antioxidant enzymes

COMPARATIVE STUDY OF HYDROMETHANOLIC EXTRACTS OF RHAMNUS ALATERNUS AND RHAMNUS LYCIOIDES SUBSP. ATLANTICA: PHYTOCHEMICAL RICHNESS AND ANTIOXIDANT POTENTIAL

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ABSTRACT

Medicinal plants of Morocco represent a rich yet underexplored botanical and pharmacological heritage. In this study, we focused on two endemic species from the High Atlas, selected based on ethnopharmacological data. The main objective was to characterize these species through detailed phytochemical screening and the evaluation of their antioxidant activity. Qualitative phytochemical screening of the hydromethanolic extracts revealed the presence of flavonoids, tannins, steroids, and saponins in both species, while coumarins were detected only in Rhamnus lycioides subsp. atlantica. Alkaloids were absent in both extracts. Quantitative analysis showed higher contents of polyphenols (125.196 mg GAE/g DW), flavonoids (44 mg QE/g DW), tannins (43 mg CE/g DW), and saponins (1.02 mg OE/g DW) in R. lycioides subsp. atlantica, compared to R. alaternus (111.768 mg GAE/g DW; 26 mg QE/g DW; 15 mg CE/g DW; 0.66 mg OE/g DW). Antioxidant activity assays (DPPH and FRAP) also revealed stronger activity for R. lycioides subsp. atlantica (IC_{50} = 41.439 µg/ml for DPPH and 40.054 µg/ml for FRAP), compared to R. alaternus (IC_{50} = 61.712 µg/ml for DPPH and 45.44 µg/ml for FRAP). The study of Rhamnus alaternus and Rhamnus lycioides subsp. atlantica reveals a notable diversity of phytochemical compounds and measurable antioxidant activity. The results obtained underscore the need for further investigations to better understand the chemical composition and potential biological roles of these endemic species, particularly through complementary studies aimed at identifying active constituents.

Keywords: Keywords: Rhamnus alaternus, Rhamnus lycioides subsp. atlantica, phytochemical screening, antioxidant activity, polyphenols, endemic plants, High Atlas.

ANTI-INFLAMMATORY POTENTIAL OF DYSPHANIA AMBROSIOIDES (L.): A REVIEW OF PHARMACOLOGICAL EVIDENCE

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ABSTRACT

Dysphania ambrosioides (L.), also known as Chenopodium ambrosioides L. and commonly referred to in Morocco as "Mkhinza," is a medicinal plant with a long history of use in traditional medicine. Among its diverse pharmacological properties, its anti-inflammatory potential is particularly significant. Nonsteroidal anti-inflammatory drugs (NSAIDs) remain the standard therapy for inflammatory disorders but are often limited by severe side effects. In this context, the exploration of plant-derived natural alternatives has gained increasing attention. Phytochemical analyses of D. ambrosioides have identified bioactive metabolites, including terpenes, flavonoids, alkaloids, and polyphenols, many of which are associated with anti-inflammatory activity. Experimental studies have demonstrated its ability to modulate both acute and chronic inflammatory responses, notably through the reduction of joint swelling, pain, and synovial inflammation, as well as the promotion of tissue healing. Mechanistically, these effects are related to the inhibition of pro-inflammatory mediators such as cytokines, prostaglandins, and nitric oxide, along with the regulation of oxidative stress pathways. The relevance of D. ambrosioides is further reinforced by its recognition by the World Health Organization (WHO) as one of the plants most widely used in traditional medicine worldwide. While promising, its dose-dependent toxicity necessitates careful evaluation and standardization. This review highlights the anti-inflammatory potential of D. ambrosioides, bridging traditional knowledge and modern pharmacological perspectives, and supporting its candidacy as a natural source for future development of safe and effective anti-inflammatory agents.

Keywords: Dysphania ambrosioides; anti-inflammatory; inflammation; medicinal plants; phytotherapeutics

"MODULATION OF VOLTAGE-GATED SODIUM CHANNELS REDUCES GRANULOCYTE INFILTRATION IN THE TUMOR MICROENVIRONMENT"

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ABSTRACT

Chronic inflammation is a key driver of lung cancer progression. Granulocytic infiltration, reflected by myeloperoxidase (MPO) and eosinophil peroxidase (EPO) activity, sustains a pro-oxidant tumor microenvironment. Voltage-gated sodium channels (VGSCs) have been implicated in cancer cell proliferation and invasion, making them attractive therapeutic targets. This study aimed to evaluate the effect of AahII-loaded chitosan nanoparticles (AahII-CNPs) on granulocyte-associated peroxidase activity in a murine model of lung adenocarcinoma. Methods. Lung adenocarcinoma was induced by intraperitoneal injection of urethane in male BALB/c mice. AahII-CNPs were prepared by ionic gelation, with an average size of ~300 nm, a positive zeta potential, and FTIR spectra confirming AahII encapsulation. After tumor development, treated mice received intranasal administration of AahII-CNPs . At the end of the experiment, lung tissues were collected for biochemical quantification of MPO and EPO. Results. Urethane-induced mice showed a marked increase in MPO and EPO activity compared with healthy controls, consistent with strong granulocyte infiltration. Treatment with AahII-CNPs significantly reduced both MPO and EPO levels ($p < 0.05$) . Conclusion Intranasal administration of AahII-CNPs attenuates granulocyte infiltration and reduces peroxidase activity in urethane-induced lung adenocarcinoma. These findings suggest that VGSC modulation may limit the pathological involvement of neutrophils and eosinophils in tumor development, contributing to a less inflammatory tumor microenvironment.

Keywords: Lung cancer, chitosan nanoparticles, inflammation, VGSCs

TRADITIONAL USES, BIOACTIVE COMPOUNDS, AND PHARMACOLOGICAL POTENTIAL OF THE GENUS RHAMNUS: A COMPREHENSIVE REVIEW

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ABSTRACT

The genus Rhamnus (Rhamnaceae), comprising approximately 137 species, is traditionally used in folk medicine across East Asia, the Americas, and subtropical regions of Africa. Various species have been employed to manage conditions such as cancer, jaundice, hepatitis, hypertension, malaria, gastrointestinal disorders, and wound healing. Phytochemical investigations have revealed the presence of diverse secondary metabolites, notably anthraquinones and flavonoids, with polyphenols being particularly abundant. These compounds are associated with significant antioxidant, anti-inflammatory, and wound-healing properties. Pharmacological studies of Rhamnus extracts and isolated molecules have demonstrated a broad spectrum of biological activities, including antioxidant, anti-inflammatory, antibacterial, antimalarial, hepatoprotective, anticancer, anti-mutagenic, and anti-proliferative effects. Moreover, several bioactive compounds such as 6-methoxysorigenin (anti-tyrosinase), prinoidin (cytotoxicity), kaempferol-3-O-β-rhamninoside, rhamnetin-3-O-β-isorhamninoside, and isotorachrysone (antioxidant activity) have been identified as promising drug leads. This review provides an updated synthesis of traditional uses, phytochemistry, and pharmacological activities of the genus Rhamnus, offering valuable insights to support its relevance in alternative medicine and highlighting its potential for future drug discovery.

Keywords: Rhamnus, anthraquinones, flavonoids, pharmacological activities.

STUDY OF THE ANTI-DIABETIC ACTIVITY OF A TRADITIONAL HERBAL PREPARATION

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ABSTRACT

This study aims to evaluate three preparations used in Algerian pharmacopoeia known for their therapeutic properties against diabetes by studying their inhibitory effect on the enzyme α-amylase, which catalyses the breakdown of starch. The first preparation (P1) is composed of several plants: Punica granatum L., Citrus limon L. and Sygium aromaticum L. The second preparation (P2) used combines: Trigonella foenum-graecum L., Rosmarinus officinalis L., Origanum vulgare L., Olea europaea sylvestris Miller., Juniperus phoenicea L., Eucalyptus globulus Labill., and Artemisia herba alba Asso. The third (P3) contains only Quercus ilex L. This biochemical study is based on two extraction techniques (infusion and maceration) to test the inhibitory activity of these extracts on α-amylase. In addition, the total phenol content of our extracts was measured. The results obtained show that the extract from the first preparation (P1) has the highest yield (27.17%), and the third preparation (P3) has the lowest yield (9%). Regarding the concentration of polyphenols in the three preparations, we recorded a rate of 86.12 mg EAG/g in the first (P1), 27.22 mg EAG/g in the second (P2) and 9.19 mg EAG/g in the third (P3). The study of the inhibitory effect of α-amylase revealed that the third preparation had the highest effect with a rate of (49.9%).

Keywords: Pharmacopoeia, diabetes, α-amylase, aqueous extract, total phenols, Algeria.

INVESTIGATION OF BODY COMPOSITION AND HEAVY METAL LEVELS OF TWO FRESHWATER FISH SPECIES SOLD IN KÜTAHYA PROVINCE

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ABSTRACT

The aim of this study was to determine the body composition and heavy metal levels of common carp (Cyprinus carpio) and silver carp (Carassius gibelio) fish sold in Kütahya Province. A total of 30 fish, 15 from each species, were used in the study. Dry matter, ash, fat and protein ratios and aluminum (Al), arsenic (As), lead (Pb), cadmium (Cd), copper (Cu), zinc (Zn), iron (Fe), cobalt (Co), manganese (Mn) and nickel (Ni) amounts of the fish used in the study were determined. When the obtained data were examined, the dry matter ratio of C. carpio was found to be 19.30%, ash ratio was 5.96%, fat ratio was 1.95% and protein ratio was 90.20%. The dry matter ratio of C. gibelio species was found to be 20.29%, ash ratio was 6.12%, fat ratio was 1.66% and protein ratio was 91.27%. In the study, it was observed that the analyzed metals in both species were below the criteria of the Turkish Food Codex and the World Health Organization (WHO). Cd element, which is toxic to living things even at the lowest doses, was found to be below the limit values. As a result of this study, it can be said that both species are safe for human consumption and do not pose any risk.

Keywords: Common carp, silver carp, heavy metal, body composition, Kütahya.

ISOLATION AND IDENTIFICATION OF BACTERIA ANTAGONISTIC TO MULTI-RESISTANT PATHOGENIC STRAINS

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ABSTRACT

The ever-increasing emergence of resistant bacteria, coupled with the depletion of therapeutic resources and the lack of progress in the field of antibiotics, highlights the importance of finding new solutions. We find ourselves in such a critical situation that even so-called “rescue” antibiotics are becoming ineffective. Lactic acid bacteria have been an effective means of preserving many food products for thousands of years, thanks to their metabolism. However, their role has now been extended to other sectors, such as the clinical environment. Among the metabolites of lactic acid bacteria are antimicrobial substances called bacteriocins, which are highly sought-after for a variety of applications, helping to overcome problems of resistance to various pathological infections. 200 lactic bacteria were isolated from milk (camel and goat) and traditional fermented dairy products (Jben and kamaria) from southern Algeria and phenotypically identified, including Enterococcus, Streptococcus, Lactococcus and Leuconostoc. Antibacterial activity was evaluated against multi-resistant pathogenic strains, which were isolated from patients suffering from infections in intensive care units. The most antibiotic-resistant strains were selected. The lactic isolates with the best antagonistic activity were chosen for characterisation in order to select the bacteriocin producers. These were the strains Lactococcus raffinolactis and Leuconostoc mesenteroides subsp.cremoris. The physico-chemical characterisation Lactococcus raffinolactis and Leuconostoc mesenteroides bacteriocins revealed their thermo-resistance, and in general their activity was not affected by the presence of basic acids. The antibiofilm activity of these strains was demonstrated against biofilms of Staphylococcus aureus and Pseudomonas aeruginosa.The results obtained are encouraging, but show the need for further research before these molecules can be prescribed for human use.

Keywords: Dairy products- Lactic acid bacteria- Pathogenic bacteria- Multiresistance-Bacteriocin-MIC-CMB-Biofilm

ANTITUMOR ACTIVITY OF IN VITRO CULTIVATED AND WILD MARRUBIUM VULGARE PLANTS IN HUMAN CANCER CELL LINES

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ABSTRACT

Marrubium vulgare (white horehound or common horehound) is a plant species widely distributed in Europe, North Africa, Southwest and Central Asia that is commonly used in folk medicine for treatment of pulmonary, respiratory, digestive and other diseases. The aim of the present study was to analyze the phytochemical composition of water extracts obtained from different anatomical parts of wild and in vitro cultivated Marrubium vulgare plants and to assess their and antiproliferative activity against human cancer cells. The MCF-7, HeLa and HT-29 cell lines were used in the study as models of some of the most common types of human malignances. The effects of the extracts on the viability and proliferative activity of the cancer cells were examined by the standard colorimetric MTT assay. The alterations in the cancer cell morphology induced by the Marrubium vulgare extracts were investigated using fluorescent microscopy to obtain additional information about the mechanisms of the anticancer activity. The total polyphenols content of the tested extracts varied between 2100.5 mg GAE/100 g DW and 274.5 mg GAE/100 g DW (leaves of cultivated plants/stems of wild plants). The highest polyphenol content was found in the leaf extract from cultivated plants, followed by the leaf extract of wild plants. The Marrubium vulgare flower and leaf extracts showed the highest antiproliferative activity, while the stem extracts were significantly less active. The cancer suppressive effects induced by the extracts of in vitro cultivated and wild plants were very similar. Cervical carcinoma cells were found to be the most susceptible to the antiproliferative activity of the Marrubium vulgare extacts. Fluorescent microscopy analysis indicated that the observed anticancer effects are associated with induction of cancer cell death via the apoptosis pathway. Presented results reveal the potential of Marrubium vulgare plants for application in the cancer therapy.
Funding: This research was funded by BULGARIAN NATIONAL SCIENCE FUND; Grant number KP-06-N56/16.

Keywords: white horehound, cultivated plants, antitumor activity, fluorescent microscopy

ANTIOXIDANT AND ANTIPROLIFERATIVE ACTIVITIES OF WATER EXTRACT FROM IN VITRO CULTIVATED SALVIA AETHIOPIS PLANTS

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ABSTRACT

Salvia aethiopis L (Mediterranean sage or African sage) is known for its rich phenolic composition, and various therapeutic properties. The aim of this study was to evaluate the antioxidant activity and to assess the cytotoxicity and antiprolifarative potental of the water extract from aerial parts of in vitro cultivated S. aethiopis plants. The effects of the extract on the viability of cancer and non-cancer cell lines were evaluated by MTT assay. Cytopathological alterations induced by the extract and effects on the migration capacity, cell cycle progression and induction of cancer cell death were analyzed by wound-healing scratch assay, fluorescent microscopy and flow cytometry analysis. The antioxidant activity determined by ORAC and HORAC methods was 3677.9±24.8 µmol TE/g 889.6±14.3 µmol GAE/g DW, respectively. The results demonstrate that the aqueous extracts from cultivated Salvia aethiopis plants possess potent anticancer properties and selective antiproliferative effect on human hepatocellular (Hep G2), lung (A549) and prostate (PC-3) carcinoma cell lines, and significantly lower activity in human non-cancer (HaCaT) cells. The detected antiproliferative effects was most pronounced against liver cancer cells and were associated with significant inhibition on the cancer cell migration, G2/M cell cycle arrest and induction of cell death via apoptosis and necrosis. Our data reveal the potential of S. aethiopis as a valuable source of bioactive compounds for therapeutic applications.

Funding: This research was funded by BULGARIAN NATIONAL SCIENCE FUND; Grant number KP-06-N56/16.

Keywords: Salvia aethiopis; antioxidant activity; antiproliferative activity, cytotoxicity; cell cycle arrest; apoptosis

ASSESSMENT OF THE ANTICANCER POTENTIAL OF WHOLE-PLANT WATER EXTRACTS FROM IN VITRO CULTIVATED AND WILD-GROWING CLINOPODIUM VULGARE PLANTS

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ABSTRACT

Clinopodium vulgare is a valuable medicinal plant rich in unique bioactive secondary metabolites with antioxidant, antimicrobial, DNA-protective, antiinflammatory, antihypertensive, and other valuable pharmacological properties. The presented study analyzes, and compares the polyphenol and flavonoid content, and antioxidant activity of whole-plant water extracts obtained from in vitro cultured and wild growing plants and assess their anticancer efficiency against a panel of cell lines. In vitro cultivated plants and wild-growing C. vulgare plants showed a high content of total polyphenols and flavonoids, as well as high antioxidant activity as measured by the ORAC and HORAC methods. The obtained results demonstrate that the whole-plant C. vulgare extracts exhibit selective anticancer effects on different types of human cancer cells, including cervical carcinoma HeLa, hepatocellular carcinoma Hep G2, colorectal adenocarcinoma HT-29, and mammary adenocarcinoma MCF-7. Moreover, the cancer-suppressive activity of the extracts obtained from in vitro cultured plants was similar and even higher than that of the wild plants. The strongest time-dependent increase in cytotoxicity was observed for the Hep G2 cells treated with extract obtained from in vitro cultured plants. The cell viability and migration assays demonstrate the selective anticancer effect of the extract and significant inhibition of cancer cell proliferation and motility. The fluorescence microscopy and cell cycle analyses indicate that the antitumor activity of the in vitro plant extract was related to both antiproliferative and proapoptotic effects. Our data demonstrate the micropropagated C. vulgare plants are an effective alternative for the production of biomass and valuable secondary metabolites and reveal the potential of the obtained extracts for prophylactic and therapeutic uses in anticancer treatment.

Keywords: Clinopodium vulgare; antioxidant activity; antiproliferative activity, cytotoxicity; migration; apoptosis

Acknowledgment: This research was funded by BULGARIAN NATIONAL SCIENCE FUND; Grant number KP-06-N56/16.

OPEN-SOURCE HEALTHWARE IN EPIDEMIOLOGY

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ABSTRACT

Open-source health technologies (healthware) have transformative potential in the field of epidemiology. Rising healthcare spending, the increasing prevalence of infectious diseases, and inequitable access to medical devices highlight the need for diverse solutions. The open-source approach, through collaborative production and development and transparent design sharing, enables affordable and customisable designs. This study introduces open-source health technologies and examines their opportunities and limitations within the context of epidemiological applications. Systems developed with open-source approaches, such as chronic disease management and remote patient monitoring systems, rapid diagnostic and surveillance hardware, environmental health and community-based monitoring systems, and data analysis tools, are valuable for early diagnosis, outbreak control, and chronic disease management. The rapid development of open-source hardware during the COVID-19 pandemic has proven the practical impact of these approaches. Open-source projects also increase diagnostic capacity and make medical devices accessible in low- and middle-income countries. The study also examines the technological and operational requirements of open-source approaches. The impact of low-cost microcontrollers, 3D designs, and platforms like GitHub on open-source development is undeniable. Open-source projects, which enable global collaboration, provide transparency and significantly reduce costs compared to proprietary devices. Integration with artificial intelligence and machine learning enables real-time analysis, predictive modelling, and more personalised epidemiological interventions. However, open-source health technologies face several challenges, including security and data integrity concerns, ethical, legal, and regulatory challenges, and a lack of standardisation, technical expertise, training, and documentation. To overcome these challenges, strategies to improve data quality and security, along with the development of regulatory frameworks and policies, standardisation and integration efforts, and increased global collaboration, are necessary. Open-source technologies hold great potential to increase access to medical devices, accelerate innovation, and ensure the resilience of healthcare systems in emergencies. Adaptive tool development and open knowledge sharing can contribute to building more inclusive and resilient healthcare systems.

Keywords: open source hardware, health technologies, epidemiology, public health innovation, access to medical technology, global health equity

EVALUATION OF MATRIX EFFECT IN THE PLASMA QUANTIFICATION OF CLOZAPINE BY HPLC-UV

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ABSTRACT

Introduction: The matrix effect is a critical factor in the development and validation of bioanalytical methods, particularly for drug quantification in biological fluids. This study investigates the influence of human plasma on the quantification of clozapine using high-performance liquid chromatography with ultraviolet detection (HPLC-UV). Methodology**:** The HPLC method was developed using a mobile phase consisting of 30% acetonitrile and 70% phosphate buffer , at a flow rate of 1 mL/min, with UV detection at 265 nm on a C18 column (250 × 4.6 mm). Three concentrations (10, 20, and 24 mg/L) were analyzed in human plasma and compared to standard solutions prepared in solvent without matrix. Samples were processed by liquid-liquid extraction prior to injection. Results:
The matrix effect was assessed by comparing chromatographic peak areas. The relative response percentages ranged from 91.2% to 99.1%, with coefficients of variation (CV%) below 5% at all tested levels. Conclusion:
The developed method is reproducible, reliable, and shows low susceptibility to plasma matrix effects. It complies with the validation criteria established by SFSTP, FDA, and EMA guidelines, and is suitable for therapeutic drug monitoring of clozapine in clinical settings.

Keywords: Clozapine, HPLC-UV, matrix effect, bioanalysis, SFSTP validation.

IN VITRO ANTIOXIDANT AND ANTI-INFLAMMATORY EFFECTS OF ARTEMISIA ABSINTHIUM L. FROM PHYTOCHEMISTRY TO MOLECULAR DOCKING

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ABSTRACT

Artemisia absinthium L. (A. absinthium), a medicinal plant widely used in Moroccan traditional folk medicine, is well known for its antioxidant and anti-inflammatory properties. Thus, this study provides a comprehensive evaluation of the phytochemical profile, in vitro bioactivities, and molecular interactions of its aqueous extract. To assess the phytochemical profile of the aqueous extract of A. absinthium, both qualitative screening and quantitative analyses were conducted. The antioxidant potential of the extract was assessed through a serieof in vitro assays, including DPPH•, ABTS•+, FRAP and TAC assays. Anti-inflammatory activity was determined through the bovine serum albumin (BSA) protein denaturation assay. Additionally, an in silico analysis was performed on the major compounds of A. absinthium to explore their potential inhibitory mechanisms and molecular targets. Phytochemical analysis revealed substantial levels of phenolic compounds, flavonoids, tannins, and flavonols bioactive constituents, known for their health promoting properties. The aqueous extract of A. absinthium exhibited a significant antioxidant activity, as indicated by various IC50 values, providing a comprehensive assessment of its radical scavenging and reducing capabilities. Furthermore, the extract demonstrated the ability to inhibit protein denaturation, a key mechanism involved in the inflammatory response. For in silico analysis, ten phytochemicals, selected through literature review, were evaluated by molecular docking against the key protein targets Keap1 and NF-κB. The results showed that all compounds interacted with both targets, with anabsinthin, quercetin, and luteolin exhibiting strong binding to Keap1, while absinthin and anabsinthin demonstrated the highest affinities for NF-κB. Collectively, these findings highlight A. absinthium as a promising source of antioxidant and anti-inflammatory agents, potentially acting through activation of the Nrf2 pathway and regulation of NF-κB signaling. This study provides a basis for further in vivo validation and mechanistic investigations

Keywords: A. Absinthium, Aqueous extract, Antioxidant, Anti-inflammatory.

RED CELL DISTRIBUTION WIDTH (RDW) AS A PROGNOSTIC FACTOR IN ACUTE HEART FAILURE

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ABSTRACT

Acute heart failure (AHF) is one of the most common cardiovascular diseases in the world, with an incidence that has increased significantly in recent years. It is a major health problem due to its morbidity and mortality consequences, requiring early diagnosis and rapid appropriate treatment. The aim of this study was to evaluate the role of red cell distribution width (RDW) as a mortality prognostic factor in patients with acute heart failure. This was a single-centre prospective study of 90 patients with acute heart failure, conducted in the medical surgical emergency department and the cardiology department. The diagnosis of AHF was based on the measurement of left ventricular ejection fraction (LVEF) by echocardiography. Demographic and clinical data were collected. Biological tests were performed, including blood count, biochemical and coagulation tests. Statistical analysis was performed using SPSS and Excel software. The mean age of our population was 53 years and the sex ratio M/F was 3.34. Mean RDW-sd values in deceased patients (51.6±5.43 fl) were significantly higher than those recovered (46.4±7.2 fl) (p=0.022). The diagnostic performance study showed that RDW-sd had a high discriminatory capacity for the prognosis of AHF with an AUC of 0.743 (95% CI: 0.572 - 0.914) and the RDW cut-of value of 49.75 had a sensitivity of 77.8% and specificity of 72.5%. Analysis of the RDW values measured at admission and discharge showed significant differences between patients who died (P=0.016) and those who recovered (P=0.001). The univariate and multivariate analyses of the factors influencing the prognosis of AHF showed that RDWsd, LVEF, NLR, PLR, INR and urea were significant in the prognosis of AHF ($P < 0.05$) and the multivariate logistic regression analysis showed that RDW-sd was statistically significant (RR = 0.136; P=0.004). RDW-sd was negatively correlated with LVEF score. Our results highlight the value of the red cell distribution width (RDW) as a promising and readily available biomarker for assessing the prognosis of patients with AHF.

Keywords: RDW (red cell distribution width), acute heart failure AHF

BEHAVIORAL RECOVERY AND MYELIN PRESERVATION INDUCED BY THE TETRAPEPTIDE AATS-1 IN A MULTIPLE SCLEROSIS MODEL

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ABSTRACT

Multiple sclerosis (MS) is a chronic neurological, inflammatory, and autoimmune disorder affecting the central nervous system (CNS). The present study focuses on the effects of the tetrapeptide Androctonus australis Tetrascorpion-1 (AaTs-1), recently isolated from the venom of the scorpion Androctonus australis hector. The main purpose is to evaluate the impact of AaTs-1 on behavioral changes and demyelination in a murine model of multiple sclerosis induced by cuprizone. The experimental protocol involved administering cuprizone (0.2% w/w in the diet) to mice for six weeks to induce acute demyelination. Demyelinated mice received intranasal doses of AaTs-1 at 100 µg/kg for five days with aninterval of 24h. Behavioral performance was assessed using beam walking, wire, and open field tests, while histological examination of brain tissues was conducted to evaluate myelin integrity. The results obtained show that AaTs-1 improves motor and exploratory functions and promotes remyelination.Thus, these results open new perspectives for the development of innovative strategies targeting FPR receptors in the treatment of demyelinating diseases of the central nervous system and neurodegenerative disorders in general.

Keywords: multiple sclerosis, cuprizone model, demyelination, remyelination, beam walking, wire hanging, open field, AaTs-1.

THE THERAPEUTIC EVALUATION OF BACTERIOPHAGES AGAINST SALMONELLA ENTERICA GALLINARUM IN IN-VITRO

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ABSTRACT

Background: Multidrug-resistant (MDR) in bacteria is one of the key factors reduces the efficacy of available antibacterial treatments. Therefore, it is needed to find out alternative options to combat with the phenomenon of MDR. Aim: This study was designed to find out the suitable bacteriophages as an effective alternative strategy against the pathogenic bacteria in comparison to conventional antibiotics. Materials & Methods: Bacteriophages were isolated from sewage samples and evaluated for their ability to infect and lyse S. Gallinarum. Multiplicity of infection (MOI) assay was conducted and the reduction in bacterial population was measured by using spectrophotometer. Results**:** Isolated phages; SOP3, SOP4, and SOP7 formed clear plaques, confirming their lytic activity against the bacteria and showed suppression of bacterial growth at different MOIs. Phage SOP7 SOP3 and SOP4 exhibited sustained bacterial suppression, particularly at MOI, 10 and 100. Furthermore, SOP3 and SOP7 phages successfully reduced the biofilm of S. Gallinarum as compared to SOP4. Conclusion: Altogether, the phages showed antibacterial activity against an antibiotic-resistant strain S. Gallinarum which offers an alternative therapeutic strategy against Salmonella.

Keywords: Multi-drug resistance, Bacteriophage therapy, Multiplicity of infection, Salmonella Gallinarum

EFFECT OF ALTERNATING MAGNETIC FIELD ON RED BLOOD CELLS IN THE PRESENCE OF IRON OXIDE (FE_3O_4) NANOPARTICLES

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ABSTRACT

This study investigates the hemolysis kinetics of red blood cells (RBCs) exposed to Fe_3O_4 nanoparticles, synthesized via co-precipitation, under various magnetic field strengths. The nanoparticles were characterized using X-ray diffraction (XRD) and scanning electron microscopy (SEM), confirming their crystalline structure and revealing particle sizes ranging from 50 to 60 nm. The effects of nanoparticle concentration and magnetic field strength on RBC hemolysis were studied using a power-law model. The characteristic half-time (t_{50}) for RBC hemolysis decreased significantly with increasing nanoparticle concentration (μg/mL) and stronger magnetic field intensities, indicating that higher nanoparticle concentrations result in faster hemolysis. This is likely due to increased nanoparticle aggregation and enhanced interactions with RBC membranes under stronger magnetic fields. The power-law relationship between hemolysis and nanoparticle concentration was confirmed by the linear $\ln(1/t_{50})$ vs. $\ln(C)$ plot, providing a solid fit with kinetic exponents and R^2 values confirming the validity of the model. Microscopic observations further supported these results, as RBC suspensions exposed to magnetic fields showed distinct color changes, signifying hemolysis progression. Additionally, the power dissipation mechanism, primarily governed by Néel and Brownian relaxation, was corroborated by the data showing consistent trends in hemolysis kinetics under varying magnetic field strengths. These mechanisms contribute to localized heat generation that facilitates RBC membrane destabilization. This study highlights the potential of Fe_3O_4 nanoparticles in magnetic hyperthermia applications, providing valuable insights for targeted cancer therapies where localized heating can selectively damage cancer cells while minimizing harm to healthy tissues.

Keywords – Fe_3O_4 nanoparticles, Hemolysis kinetics, Magnetic hyperthermia, Red blood cells (RBCs), Targeted cancer therapy, Nanomedicine.

TOWARDS SUSTAINABLE NANODENTISTRY: LIFE CYCLE AND ENVIRONMENTAL IMPACT ASSESSMENT OF DENTAL NANOSYSTEMS

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ABSTRACT

The use of nanotechnology in dentistry has made available nanosystems such as silver nanoparticles (AgNPs), titanium dioxide (TiO_2), and nano-hydroxyapatite, significantly enhancing diagnostic and therapeutic approaches in caries management, periodontal care, and restorative dentistry. However, the environmental consequences of using such materials ranging from their production to clinical application and ultimate disposal are yet to be investigated thoroughly. This review addresses the life cycle and ecotoxicological relevance of dental nanomaterials and proposes green chemistry-based sustainable alternatives. A comprehensive life cycle assessment (LCA) of the widely used dental nanoparticles has been conducted with special attention on the synthesis methods like sol-gel, precipitation, and high-pressure homogenization, raw materials sourcing, and end-of-life strategies. Ecotoxicity with Daphnia magna and Chlorella vulgaris focused on the bioaccumulation and persistence in aqueous environments of metal-based nanoparticles. Due to these problems, this review evaluates chitosan and lignin-derived biodegradable nanocarriers for the delivery of plant antimicrobials such as thymol and carvacrol. These green nanosystems exhibited comparable therapeutic efficacies and encouraging degradation patterns in aquatic and terrestrial environments. The findings advocate the inclusion of environmental impact assessment in research on dental nanomaterials. Implementing ecologically friendly strategies will help reduce the environmental footprint of nanodentistry while maintaining clinical performance, hence laying the ground for sustainable dental innovation.

Keywords: Sustainable nanodentistry, Dental nanoparticles, Life cycle assessment (LCA), Green nanotechnology, Biodegradable nanocarriers

Berberis thunbergii DC. SUPRESSES ANTIOXIDANT ENZYME GENES AND INCREASES REACTVE OXYGEN STRESS, THEREBY CAUSING APOPTOSIS IN THE HeLa CERVICAL CANCER CELL LINE

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ABSTRACT

The *Berberis thunbergii* DC., part of the Berberidaceae family, is a pharmacological plant commonly used in treating various diseases. It is recognized for its antidiabetic, antibacterial, antioxidant, antifungal, antiviral, and anticancer properties. In this study, *Berberis thunbergii* DC. leaf extract was applied to the HeLa cell line with a range of 0.077 to 1 mg/mL. The cells treated with 0.077 mg/mL of extract showed a viability of 89.79 ± 1.13% and 72.52 ± 1.89% at 24-hour and 48-hour durations, respectively. Viability was 69.14 ± 2.18% and 34.65 ± 1.92% when treated with 1 mg/mL. At a concentration of 0.5 mg/mL for 48 hours, 49.61% viability was detected. By applying 0.5 mg/mL of extract to the HeLa cells, expressions of *CytC1*(1.8 ± 0.36-fold), *CASP3* (3.16 ± 0.26-fold), and *CASP9* (1.62 ± 0.13-fold) genes increased, while expressions of survivin (0.2 ± 0.05-fold), *Bcl-2* (0.1 ± 0.016-fold), *c-IAP1* (0.15 ± 0.02), *XIAP* (0.25 ± 0.08-fold), *CAT* (0.09 ± 0.04-fold), and *Mn-SOD* (0.1 ± 0.05-fold) genes decreased. Flow cytometry analysis revealed 40.98% apoptotic and 72.99% ROS-affected cells. Changes in membrane potential and apoptotic nuclei were observed. The data indicate that the leaf extract of *Berberis thunbergii* DC induces reactive oxygen stress in HeLa cells and leads to apoptosis. Consequently, it may be beneficial in cancer treatment, particularly for cervical cancer.

Keywords: Apoptosis, *Berberis thunbergii DC*, HeLa, reactive oxygen spesiec

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