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Table of Contents

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I. FOOD SECURITY AND PUBLIC HEALTH

Probiotics and Postbiotics: Comparative Roles in Functional Foods and Human Health

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ABSTRACT

The increasing interest in gut health and human microbiome has accelerated the development of functional foods incorporating probiotics and, more recently, postbiotics. Probiotics, which are live bacteria that provide health advantages when ingested in adequate amounts, have long been used to regulate intestinal microbiota, boost immune responses, and maintain gut barrier integrity. However, limitations like as viability during processing and storage, host-specific efficacy, and potential safety issues have motivated researchers to look into postbiotics as viable replacements or supplements. Postbiotics, which are described as inactivated microbial cells or their metabolic by-products that give health benefits, show promise in terms of stability, safety, and targeted functionality without the need for viability. Advances in omics technologies and microbial fermentation have increased the potential applications of probiotics and postbiotics in functional foods, ranging from dairy products and beverages to encapsulated supplements. Despite growing evidence supporting the usefulness of both, obstacles persist in defining criteria, guaranteeing clinical validation, and navigating regulatory structures. Emerging research suggests that combining probiotics and postbiotics may provide synergistic benefits, paving the path for next-generation symbiotic formulations. This work compares the roles of probiotics and postbiotics in functional foods and human health, looking at their mechanisms of action, health effects, technology applications, and regulatory implications. Probiotics exert their benefits primarily through competitive exclusion of pathogens, production of antimicrobial substances, and modulation of host immune responses. In contrast, postbiotics function through bioactive molecules such as short-chain fatty acids, peptides, and cell wall components to change gut microbial composition, reduce inflammation, and improve gut barrier function. While both probiotics and postbiotics hold unique functions in supporting human health, postbiotics offer a compelling, more stable alternative with broad application. Interdisciplinary research is required to fully understand their advantages, optimize delivery systems, and develop evidence-based guidelines for their application in food and clinical settings.

Keywords: Probiotics; Postbiotics; Microbiome; Bioactive compounds; Health effect.

Advancing Meat Quality and Sustainability through Foodomics: Integrative Approaches for Traceability and Innovation

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ABSTRACT

The growing demand for sustainable, safe, and high-quality food and animal products has intensified the need for innovative strategies to assess a wide range of quality dimensions. These include intrinsic quality properties such as nutritional, sensory, technological, safety…, as well as extrinsic dimensions like authenticity, origin, environmental footprint, and animal welfare. Within this context, proteomics has emerged as a key discipline in foodomics, offering powerful approaches to address these challenges and promote sustainable practices. Proteomics focuses on the comprehensive study of protein composition and functionality in food systems, providing valuable insights into how proteins influence essential quality traits, from nutritional and processing properties to stability and consumer appeal. By leveraging advanced techniques such as shotgun proteomics and data-driven analytics, it becomes possible to identify specific protein biomarkers that support quality control, traceability, and compliance with regulatory and consumer expectations. This talk will explore recent advances in proteomic technologies and their applications in the meat sector, highlighting their potential to improve raw material characterization, enhance processing efficiency, and minimize food waste. Integrative approaches that combine proteomic data with other foodomics domains create a holistic framework for understanding the mechanisms underlying meat quality. Such approaches enable the development of robust biomarkers and innovative tools for more accurate and efficient quality assessment. By showcasing the dual role of proteomics in both quality evaluation and sustainability, this talk will demonstrate how cutting-edge foodomics strategies can drive innovation, strengthen traceability systems, and foster consumer trust in meat and animal products.

Keywords: Proteomics; Nutritional profiling; Processing efficiency; Meat traceability; Food safety.

From Diet to Cardiovascular Disease: Computational Modeling for Personalized Surgery

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ABSTRACT

Cardiovascular diseases, the leading cause of death worldwide, are strongly influenced by poor nutrition. Excessive intake of saturated fats, refined sugars, and salt, combined with insufficient consumption of fiber, fruits, and vegetables, promotes hypertension, type 2 diabetes, obesity, and hypercholesterolemia. These conditions are directly linked to severe disorders such as aneurysms, aortic dissections, and valvular diseases. Nutritional prevention is therefore essential. At the same time, advances in computational modeling, medical imaging, and artificial intelligence are revolutionizing cardiovascular surgery. By creating digital twins of the heart and aorta, based on individual patient data, clinicians can simulate various surgical scenarios and assess the effects of treatments. Furthermore, artificial intelligence enables the prediction of disease progression. This approach paves the way for personalized surgery that is safer, more predictive, and more effective.

Keywords: Cardiovascular diseases; Unhealthy diet; Digital twin; Computational modeling; Personalized surgery.

Catecholamines and Foodborne Pathogens: Neurochemical Modulation of Bacterial Virulence and Implications for Food Safety

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ABSTRACT
Catecholamines such as norepinephrine and epinephrine are central mediators of the host stress response. Beyond their well-established roles in cardiovascular and immune regulation, these neurochemicals can directly interact with microorganisms, a phenomenon described within the framework of microbial endocrinology. Increasing evidence indicates that foodborne pathogens, including *Escherichia coli* O157:H7, *Salmonella enterica*, *Campylobacter jejuni*, and *Listeria monocytogenes*, are capable of sensing host-derived catecholamines and utilizing them as environmental cues. Exposure to catecholamines has been shown to modulate bacterial growth, iron acquisition, motility, quorum sensing, and the expression of virulence factors, ultimately enhancing pathogenic potential. Such host–pathogen cross-talk highlights the importance of stress-associated neurochemicals in shaping infection dynamics and foodborne disease outcomes.

Keywords: Microbial endocrinology; Pathogen growth; Infection dynamics; Quorum sensing; Stress hormones.

Screening of Aflatoxin B1 Levels in Peanuts in Algeria, Estimation of Dietary intake and Assessment of Cancer Risk

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ABSTRACT
Aims: The objective of this work was to assess the level of aflatoxin contamination in peanuts in Algeria and estimate the cancer risk for an average adult. **Methods:** Twenty-four samples were randomly collected from 11 provinces. AFB1 levels were determined in accordance with European standardisation requirements using high-performance liquid chromatography coupled with fluorescence detection after post-column photochemical derivatisation (HPLC-PHRED-FLD). Health risk assessment was estimated using the margin of exposure (MOE) approach and the hepatocellular carcinoma (HCC) risk approach recommended by EFSA (European Food Safety Authority**). Results:** AFB1 was detected in 62.5% of the samples. Four peanut samples exceeded the maximum limit set by the European Union for AFB1 at 2 µg/kg. The estimated daily intake (EDI) of AFB1 from the consumption of peanuts was 0.052 ng/kg bw/day, which allowed the calculation of a margin of exposure (MOE) of 7,609. This value was below the safety threshold which raises a public health issue for Algerian consumers. The estimated annual incidence of hepatocellular carcinoma (HCC) due to AFB1 exposure was 0.00085 cases per 100,000 adults, remaining below European Food Safety Authority's reference risk levels. **Conclusions:** Although aflatoxin B1 contamination does not seem to largely account for the occurrence of liver cancer, risk characterisation point out that it may cause potential health concerns. These findings underscore the importance of implementing more rigorous monitoring and regulatory measures for AFB1 within the national food safety systems.

Keywords: Aflatoxin B1; Peanuts; Risk assessment; *Hepatocellular carcinoma*; Algeria.

Development of a New Lower-Cost Tube-Method for the Screening of Antibiotic Residues in Meat

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ABSTRACT
Background: Quinoa processing requires effective treatments to remove saponins and improve palatability while preserving nutritional quality. High saponin content creates bitter taste and limits consumer acceptance, presenting a major barrier to quinoa utilization in food applications. **Aims:** This study aimed to reduce saponin content in Algerian quinoa cultivars by combining peeling and roasting treatments and investigate their effect on nutritional composition, particularly proximate composition, mineral profile, and fatty acid content. **Methods:** Amarilla Sacaca variety of quinoa (Chenopodium quinoa Willd.) from El Oued, Algerian Sahara, underwent sequential processing: mechanical peeling (7 min, traditional rotating disc abrasion machine) followed by roasting (180°C, 15 min with regular stirring). Both raw and treated quinoa were analyzed for nutritional profile, including minerals (ICP-OES), fatty acids (GC-FID), proximate composition (AOAC methods), and saponin content. **Results:** The combined peeling-roasting treatment significantly reduced saponin content by 72%, effectively improving palatability. Ash and fiber remained stable with minimal losses, while protein increased from 11.95 ± 0.06% to 13.04 ± 0.23% and fat from 3.56 ± 0.01% to 3.94 ± 0.24%. Saturated and monounsaturated fatty acids increased significantly ($p < 0.05$) by 77% and 60.46%, respectively, while polyunsaturated fatty acids improved by 18.36%. Among minerals, phosphorus and zinc showed retention, while other minerals experienced moderate reductions due to bran removal during peeling. **Conclusion:** Combined peeling and roasting effectively reduces saponins in Algerian quinoa while preserving essential nutritional components. This processing approach supports the development of quinoa-based traditional products such as couscous, with improved palatability and consumer acceptance while retaining the crop's nutritional advantages for addressing food security challenges.

Keywords: Quinoa; Saponins; Processing; Roasting; Peeling; Nutrition.

Effects of Sequential Peeling and Roasting Treatments on Nutritional Composition of Algerian Quinoa Cultivar (*Chenopodium quinoa* Wild.)

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ABSTRACT

Background and Aims: The analysis of antibiotic residues in meat poses an economic problem for certain countries, hence the need for simple, sensitive and inexpensive screening methods. Our study aimed to develop an alternative microbiological method that is effective and economic, for the screening of antibiotic residues in red and white meat. **Methods:** An alternative tube method was developed using Micrococcus luteus strain and Mueller/Hinton medium. The optimized parameters were the nature and concentration of the color indicator, the concentration of the inhibitor and the load of the medium in Micrococcus luteus. Optimal conditions were applied to 26 meat juice samples (12 negatives and 14 positives) and 3 negative controls, pre-analyzed by conventional methods (Prémi®Test for screening and the reference method for confirmation). The volume of meat juice was optimized. **Results:** The results showed that the alternative tube method is effective with Mueller-Hinton medium supplemented with Bromothymol Blue at 0.01 g/L, containing NaCl at a concentration of 50 g/L and inoculated with Micrococcus luteus at 144 109 CFU/mL. Under these conditions, 9 negative samples were detected out of 12 (3 false positive samples) and all positive samples (14) were detected as positive using 100 μL of meat juice. The recorded incubation time under these conditions was 2h – 2h30 min. **Conclusion:** In conclusion, an alternative screening method, sensitive and adapted to our economic means, has been developed. Validation (with a large number of samples) and an economic evaluation are desirable to prove its applicability.

Keywords: The reference method; Screening Method; The tube method; *Micrococcus luteus*.

Nutritional Value and Sensory Acceptance of Couscous Enriched with Algerian Quinoa Cultivar

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ABSTRACT

Background: Recognized as a "superfood" by the FAO, quinoa represents a potential wheat substitute due to its rich nutrient and micronutrient content. Traditional wheat-based couscous has nutritional limitations including low protein quality and the presence of gluten. **Aims:** This study aimed to investigate the nutritional profile and sensory acceptance of quinoa-enriched couscous through partial and complete substitution of wheat semolina with Algerian-grown quinoa. **Methods:** Amarilla Sacaca quinoa from El Oued (South Algeria) was peeled and roasted at 180°C for 15 min, then processed into semolina. Four couscous formulations were prepared using traditional hand-rolling methods at varying quinoa substitution levels: 0% (control), 50%, 75%, and 100%. Samples were analyzed for proximate composition, fatty acids (GC-FID), minerals (ICP-OES), color indices, and sensory properties through hedonic testing. **Results:** All quinoa formulations demonstrated significant nutritional improvements. The 100% quinoa couscous exhibited the highest protein (14.87 ± 0.36%), fiber (4.96 ± 1.2%), and fat (7.83 ± 0.08%) contents. Fatty acid analysis revealed substantially improved polyunsaturated fatty acid profiles, with long-chain omega-3 fatty acids (EPA, DHA) detected exclusively in the 100% quinoa formulation. Lightness decreased in quinoa-containing samples but increased after traditional steaming. The 50% quinoa couscous received high acceptability scores for taste, texture, and overall preference, surpassing traditional wheat couscous for most sensory attributes. The 75% substitution maintained good consumer acceptance with enhanced nutritional benefits, while the 100% formulation, despite superior nutrition, received lower sensory scores (all attributes > 5/9 except appearance). **Conclusion:** Quinoa substitution at 50% and 75% levels effectively enhances couscous nutritional value while maintaining consumer acceptability. These findings support quinoa-enriched couscous as a viable functional food for addressing modern dietary requirements and food security challenges while preserving North African cultural heritage.

Keywords: Couscous; Quinoa; Semolina; Sensory; Nutritional composition; Fortification.

In vitro Evaluation of the Antioxidant Potential of *Anethum graveolens* Seeds extract

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ABSTRACT

Background: *Anethum graveolens* L. (dill) is an aromatic annual herb from the Apiaceae family, that offers exploitable health-promoting properties, making it relevant for both agro-food and therapeutic uses. **Aims:** The present study evaluates the in vitro antioxidant activity of ethanolic dill seed extract and comparing the results with synthetic preservative butylated hydroxytoluene (BHT) and essential oils from the plant's leaves and flowers. **Methods:** The seeds of *Anethum graveolens* L. were used to prepare an ethanolic extract. The antioxidant activity of the extract was evaluated using the 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging assay, the reducing power method, and by determining the 50% inhibitory concentration (IC_{50}). **Results:** The dill seed extract exhibited a strong radical scavenging capacity, surpassing the essential oils from different plant parts. At 5 mg/L, the extract inhibited more free radicals than the essential oils could at 2000 mg/L, and at 100 mg/L it scavenged more than half of the radicals, while the oils showed minimal activity. However, despite

its significant antioxidant power, the extract remained less effective than the synthetic preservative BHT, with IC_{50} values of 86.15 mg/L and 27.80 mg/L, respectively. This observation is supported by the results of the reducing power assay, which allowed us to rank the reductive capacity as follows: BHT > dill seed extract > leaf essential oil > flower essential oil. **Conclusions:** the ethanolic extract of dill seeds demonstrated notable antioxidant potential, exceeding that of the plant's essential oils, although remaining less effective than the synthetic preservative BHT. These findings highlight dill seeds as a promising natural source of antioxidants with potential applications in the agro-food sector.

Keywords: *Anethum graveolens*; Dill seeds; Antioxidant activity; Reducing power assay; DPPH assay.

Oleaster Oil: Phytochemicals Composition, Fatty Acids Profiles and Potential Health Benefits

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ABSTRACT

Background: Oleaster oil (*Olea europaea* var. sylvestris), obtained from the wild olive tree, is a promising source of bioactive compounds such as polyphenols, flavonoids, and essential fatty acids. These compounds are well known for their antioxidant properties and potential role in preventing chronic diseases related to oxidative stress. **Aims:** This study aimed to determine the total polyphenol and flavonoid contents of oleaster oil, to characterise its fatty acid composition, and to evaluate its in vitro antioxidant activity. **Methods:** Oleaster fruits were collected and processed for oil extraction. Total polyphenols and flavonoids were quantified using the Folin–Ciocalteu and aluminium chloride methods, respectively. The fatty acid composition was analysed by gas chromatography–mass spectrometry (GC–MS), and antioxidant activity was evaluated through the DPPH free radical scavenging assay. **Results:** Oleaster oil showed high concentrations of polyphenols and flavonoids. The fatty acid profile was dominated by oleic acid, followed by linoleic, palmitic, and stearic acids. GC–MS analysis also identified minor fatty acids, including palmitoleic, gondoic, and heneicosanoic acids. Antioxidant activity reached an inhibition rate of 83%, reflecting a strong free radical scavenging capacity. **Conclusion:** The findings highlight the rich phytochemical composition and significant antioxidant potential of oleaster oil. The presence of both major and minor beneficial fatty acids supports its value as a functional food ingredient with promising implications for food security and public health, particularly in the prevention of metabolic and cardiovascular diseases.

Keywords: Oleaster oil; Polyphenols; Fatty acids; Antioxidants; Health benefits.

Modeling and Characterization of the Complexation of Aromatic Amino Acids by Cyclodextrins in Aqueous Solution

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ABSTRACT

Background: The complexation of amino acids by cyclodextrins (CD) represents a useful strategy for improving their stability, solubility, and bioavailability**. Aims:** In this study, we explored the interactions between aromatic amino acids and two types of natural cyclodextrins: α-cyclodextrin (α-CD) and β-cyclodextrin (β-CD), in an aqueous medium. **Methods:** An experimental modeling approach was adopted to study and optimize the conditions for complex formation. The design of experiments method was employed to assess the impact of various parameters, including concentration, contact time, temperature, and pH, on complexation efficiency. **Results:** The results showed that the behavior of the system follows a second-order mathematical model with significant interactions between the variables studied. This model was used to determine the optimal complexation conditions. In addition, the study of the stoichiometry of the complexes revealed the inclusion of two amino acid molecules in a single cyclodextrin cavity, suggesting a specific host-guest interaction mechanism. The complexes obtained in the solid state were isolated and then analyzed by Fourier transform infrared spectroscopy (FTIR). The results of this characterization confirmed the effective formation of inclusion complexes. **Conclusion:** This work highlights the interest of cyclodextrins in the vectorization of aromatic amino acids and opens up prospects for the improvement of pharmaceutical or nutraceutical formulations based on poorly soluble bioactive compounds.

Keywords: Aromatic amino acid; Cyclodextrins; Complexe d'inclusion; Plans of experiments.

Interplay NCDs-Lifestyle: Analysis Between Sociodemographic and Diet Parameters

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ABSTRACT

Background and aims: Non-communicable diseases (NCDs), are characterized by long durations and slow progression, and are not transmitted. Most NCDs are the result of several factors, including genetic, physiological, behavioral, and environmental factors. This study aimed to examine these relationships in an Algerian context. **Method:** A cross-sectional online survey was conducted in 2024 using a standardized questionnaire. Data from 322 adult respondents were analyzed to explore associations between NCDs (metabolic, digestive, cardiovascular, inflammatory, nervous and others diseases) and variables such as age, sex, marital status, education, income, occupation,

dietary habits, and lifestyle factors. **Results:** The majority of participants were aged 20–40 years (68.3%), female (66.8%), and university-educated (96.9%). Metabolic diseases were the most frequently reported NCDs. Statistically significant associations were observed between NCD prevalence and age (particularly for cardiovascular and inflammatory diseases), education level, and occupation. However, sex, marital status, income, and residence showed no significant associations. Most participants with NCDs did not follow disease-specific diets, and only a minority sought professional nutritional advice. Genetic factors were perceived to be more influential than environmental ones. **Conclusion:** This study provides valuable insights into NCDs risk factors in Algeria, emphasizing the importance of age-specific, occupation-aware, and education-sensitive strategies for disease prevention and health promotion. Interventions focusing on dietary education and genetic risk awareness could enhance NCDs management and public health outcomes.

Keywords: Non-communicable diseases; Lifestyle; Diet; Sociodemographic parameters; Interplay.

Study of Technological Potential of Rye : Bread-Making Suitability

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ABSTRACT

Background : The use of bakery products made with refined flour is excessive and can lead to health problems for consumers. Other alternatives besides whole wheat, such as using different cereal species with higher nutritional value, would be a good option. **Objectif** : This study aims to assess the technological potential of local whole rye flour at incorporation levels of 10 – 50%. **Methods :** Physicochemical analyses of whole rye flour—including thousand-kernel weight, ash content, protein content, and both dry and wet gluten—were conducted, along with rheological measurements using the alveograph test. Bread-making trials were then carried out with varying levels of flour incorporation. **Results :** Incorporation of whole rye flour increased ash content and swelling index, while reducing wet gluten (24.25% to 11%) and dry gluten (8.8% to 4.5%). Baking strength (W) decreased (182 to 105 × 10^{-4}), swelling decreased (13 to 9.03), and the configuration ratio (tenacity/extensibility) increased (3.59 to 14.1). Baking trials with yeast and accelerated sourdough fermentation showed that high-quality bread—comparable to 100% soft wheat control in texture, volume, and crumb structure—was obtained with 20% whole rye flour (yeast) and 10% whole rye flour (sourdough), with baking scores of 244.8/300 and 255.875/300, respectively. **Conclusion:** The whole rye flour has considerable technological potential for improving the nutritional profile of bread without compromising its quality, provided the incorporation levels are optimized.

Keywords: Whole rye flour; Rheological properties; Yeast; Accelerated sourdough; Baking value.

Determination of Calcium Magnesium and Iron in Infant Milk Formulas Using Atomic Absorption Spectroscopy

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ABSTRACT

Background: The rapid growth of children during the first months of life requires nutrients in adequate quantities, among these nutrients, minerals are particularly important due to their implications in many biological processes. **Aims:** The objective of this study is to determine the concentration of three minerals in infant preparations available on the Algerian market, namely calcium, magnesium and iron using atomic absorption spectrometry. **Methods:** Twelve infant preparations were purchased from supermarkets and pharmacies in the Algiers region, among which six for the first age, six for the second age, therapeutic preparations were not included in the study. The content of calcium, magnesium, and iron was determined by atomic absorption spectrometry after acid digestion with a mixture of nitric acid and hydrochloric acid, in the presence of hydrogen peroxide. **Results:** The average concentrations of calcium, magnesium and iron found by the analysis were 98.94, 3.78 and 0.83 mg / 100 Kcal for all the preparations, 94.31, 4.62, 0.74 mg / 100 Kcal for the 1st age preparations, 103.57, 2.94, 0.92 mg / 100 Kcal for the 2nd age preparations. Overall, the calcium contents respected the Algerian and European recommendations, the magnesium contents were lower than these recommendations, the iron contents were in accordance with the recommendations with the exception in three brands. **Conclusion:** This study highlights differences between the contents found by analysis and the contents of the packaging for three elements (Ca^{2+}, Mg^{2+}, Fe^{2+}), which suggests a continuous control due to the vulnerability of the children for whom these products are intended. In addition to microbiological analyses which are regularly carried out, analyses of the chemical composition of infant milk powders must be introduced.

Keywords: Infant milk; Minerals; Trace elements; Analysis; Atomic absorption.

Physico-chemical, Structural and Nutritional Characterization of Puff Pastry Margarines Marketed in Algeria

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ABSTRACT

Background: Puff pastry margarine is a fat used in the preparation of puff pastry products, which are widely consumed in Algeria. **Aims:** The objective of this study is to provide a physicochemical, structural and nutritional characterisation of the four most common puff pastry margarines (MF) on the algerian market, coded MF1, MF2, MF3 and MF4, which were selected using stratified random sampling. **Methods:** The products were subjected to the following analyses: water and salt content, acidity, peroxide index, melting point, oxidative stability

(Rancimat test), solids content (NMR), fatty acid profile (GC), crystalline structure (XRD) and functional groups (FTIR). **Results:** The physicochemical analyses showed overall compliance with standards. The oxidative stability observed varied between 34.14 hours (MF1) and 58.07 hours (MF4). The SFC study revealed a high solids content, varying between 44.60°C (MF2) and 51.60°C (MF1). X-ray diffraction analysis revealed two polymorphic groups : β' and β in MF1 and MF3, and β' and γ in MF2 and MF4. FTIR analysis showed a similar lipid composition between samples, dominated by triglycerides, with the presence of cis and trans fatty acids, water and emulsifiers. Finally, the fatty acid profile revealed the absence of trans FAs in MF1 and their presence at levels of 2.4%, 4.10% and 4.87% in MF4, MF2 and MF3, respectively. The WHO has called for the elimination of industrially produced trans fats. The atherogenic (IA) and thrombogenic (IT) indices vary between 1.04 and 2.18 (MF2) and 2.71 and 4.89 (MF4), respectively. The higher the values of these coefficients, the greater the risk of developing cardiovascular disease (CVDs). **Conclusion:** The results show that the MF formulation meets the technical requirements for the preparation of puff pastry products, but regular consumption of these products would be associated with a risk of developing CVDs.

Keywords: Margarine; Puff pastry; SFC; XRD; Polymorphism, Fatty acid.

From Safety to Health: Lactic Acid Bacteria Shaping Artisanal Cheeses

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ABSTRACT

Background: Advances in molecular biology have considerably enhanced our understanding of lactic acid bacteria (LAB) within cheese ecosystems. These tools have revealed the diversity, metabolic functions, and microbial interactions that shape artisanal cheese production an environment where maintaining food safety remains a major challenge. LAB are central to fermentation, contributing not only to the biochemical transformations that determine texture, flavor, and overall quality, but also to the natural preservation of dairy products. **Aims:** This review aims to synthesize current molecular insights into the dual role of LAB in artisanal cheese production with a focus on their contribution to food safety and their emerging relevance as health-promoting microorganisms. **Methods:** The study is based on a comprehensive review of recent molecular and genomic investigations focused on LAB communities in artisanal cheeses. The analysis integrates findings from culture-dependent and culture-independent approaches, including high-throughput sequencing, metagenomics, and functional characterization studies. **Results:** Molecular studies demonstrate that LAB ensure cheese safety through several mechanisms, including rapid acidification, production of antimicrobial compounds, and competitive exclusion of pathogens. These functions are strain-specific and shaped by the environmental conditions of artisanal production systems. Moreover, LAB are increasingly recognized for their health-promoting potential, such as probiotic effects, modulation of the gut microbiota, and synthesis of bioactive compounds. Together, these properties highlight their relevance in linking microbial functionality to public health outcomes. **Conclusion:** LAB play a pivotal role in artisanal cheese ecosystems as both bioprotective agents and health promoters. Insights provided by molecular biology deepen our understanding of their ecological functions and strengthen their relevance in advancing food safety, public health, and the sustainability of artisanal dairy systems.

Keywords: Wheat; Drought; Abscicic acid; ROS; HPLC; POD; SOD; CAT, and MDA.

Frequency of Overweight in Children Aged 3 – 5 Years in Skikda

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ABSTRACT

Background: Children who are overweight are at risk of becoming overweight and obese in adolescence and adulthood, hence the importance of early detection of this malnutrition in children. **Aims:** Our work aimed to assess the frequency of overweight in children aged 3 to 5 years. **Methods:** A cross-sectional study was conducted at a daycare center in Skikda (2023 – 2024). Mothers of the children were interviewed using adapted WHO questionnaires (2004). Growth monitoring was based on regular measurements of weight and height, and calculation of body mass index (BMI). BMI for age, expressed as standard deviations according to WHO standards (2006), was determined using WHO Anthro software version 3.2.2 (2011). The distributions of BMI Z-scores are presented according to their corresponding age. **Results:** From 104 children (50 girls), at age 3 (29 children, 12 girls), the mean Z-scores for the index (BMI/age) for boys and girls were 0.17 ± 1.16 SD vs. 0.24 ± 1.63 SD ($p > 0.05$). Among these children, 30.8% were at risk of being overweight and 3.8% were overweight or obese. At age 4 (29 children, 18 girls), the mean Z-scores were 0.42 ± 1.31 SD vs. -0.09 ± 1.5 SD ($p > 0.05$). Among these children, 30.4% were at risk of being overweight and 8.7% were obese. At age 5 (46 children), the mean Z-scores were: 0.65±2.02 SD vs 0.36±1.45 SD ($p > 0.05$). Among these children, 39.1% were at risk of being overweight, 17.4% were overweight, and 4.3% were obese. **Conclusion**: It is therefore essential that the health services concerned implement the necessary means to prevent it and further reduce its prevalence by raising awareness of the nutritional composition of the daily diet and its effects on human health.

Keywords: Children; z-Score; Nutritional status; Infants; Overweight; Obesity.

Nutritional Composition and Microbiota: Mediated Benefits of the Mediterranean Diet in Non-Alcoholic Fatty Liver Disease

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ABSTRACT

Background: Non-alcoholic fatty liver disease (NAFLD) is a leading cause of chronic liver disease worldwide, closely linked to obesity and poor dietary quality. Since no pharmacological treatment has shown universal efficacy, nutritional strategies based on bioactive compounds

represent a promising approach. **Aims:** The present study investigated the effects of oils on gut microbiote profile, hepatic steatosis and metabolic parameters in an experimental model of obesity-induced NAFLD. **Methods**: thirty male Wistar rats were randomized into three groups: control, high-fat diet (HFD), HFD supplemented with vegetal oils (03 mL/day). lipid parameters, liver function markers, serum oxidative stress, histological and gut microbiota analysis were assessed. **Results:** After 12 weeks, both supplementations significantly attenuated hepatic triglyceride accumulation (–38%, $p < 0.05$) compared with HFD. Markers of oxidative stress showed improvement (Superoxide dismutase: +29% and Malondialdehyde: –31%), while histological analysis revealed reduced steatosis scores and improved hepatocyte architecture in supplemented groups. HFD induced dysbiosis characterized by an increased Firmicutes/Bacteroidetes ratio, in favor of Firmicutes. Oils mixture reversed these alterations: it increased the abundance of protective commensal bacteria, and reduction of pro-inflammatory populations. **Conclusion:** These results demonstrate that dietary biomolecules such as omega-3 fatty acids exert hepatoprotective effects in obesity-related NAFLD by targeting oxidative stress and inflammation. This highlights their potential role as adjunctive strategies in the nutritional management of metabolic liver diseases.

Keywords: Hepatic steatosis; Obesity; Nutritional biomolecules; Gut microbiota.

Nutritional Security and Food Packaging in Algeria

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ABSTRACT

Background: Concerns regarding the possible impacts of plastic materials on food safety and human health have been raised in recent years due to their growing use in food packaging. **Aims:** This study aims to analyze the composition of food cling films used in Algeria and to assess their susceptibility to contaminate food products. **Methods:** The methodological approach combines a qualitative survey of more than 150 consumers with laboratory analyses. A questionnaire was developed to collect data on consumers' perceptions and practices regarding the use of food cling films . In parallel, 26 samples of food cling films were subjected to analyses, including gas chromatography–mass spectrometry (GC-MS) to determine their chemical composition, as well as UV and IR spectroscopy on three types of foods (water, vinegar, and oil) in direct contact with the films. **Results:** The results of this study revealed the presence of potentially harmful compounds in certain food cling films and showed that their migration into foods depends on the brand of the cling film and the type of food. **Conclusion:** In conclusion, this research highlights important food safety issues related to the use of food cling films in Algeria and may lead to recommendations for improving manufacturing standards and usage practices of these products.

Keywords: Food cling films; Composition; Contamination; Food products.

Antioxidant Activity of Muffins Enriched with Chia Seeds and Saffron

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ABSTRACT

Background: Chia seeds (*Salvia hispanica* L.) are well-known oilseeds, having biological and technological properties of interest to the food industry. Saffron (*Crocus sativus* L.) is rich in bioactive compounds widely recognized for their antioxidant properties. **Aims**: the objective of the present study was to enhance the antioxidant activity of muffins by incorporating chia seed flour (CSF) and saffron. **Methods:** Muffins enriched with CSF and saffron were produced. Though, 10, 20, 30, and 40 % of regular wheat flour were replaced with CSF, and 20 mg of saffron powder were added to each formulation. A sample consisting of muffins without any supplementation was prepared as a control sample. The physical properties, color, total phenolic content and the antioxidant activity of muffins were evaluated. **Results:** Enriched samples showed stability in weight and diameter after baking, while a slight decrease in height was observed in muffins containing high levels of CSF. The colorimetric study revealed an intensification of red and yellow hues, as well as an overall darkening, particularly in 40% chia muffin. Phenolic compounds data revealed that chia seeds and saffron addition induced a gradual and a significant increase in total content, particularly the free form (from 16 mgGAE per g in the control, to 36,8 mgGAE per g in 40% enriched muffins respectively). This richness in antioxidants was accompanied by a significant improvement in the antioxidant activity, confirmed by DPPH and ABTS tests (from 9.9 % in the control, to 13.6, 16, 20, and 22,1 % in 10, 20, 30 and 40% enriched muffins respectively for DPPH essay and 29.7, 41.8, 51.4, 60.1 and 64.3% in the control, 10, 20, 30 and 40% enriched muffins respectively for ABTS essay). **Conclusion:** These results confirm the usefulness of simultaneous enrichment with chia seeds and saffron to develop bakery products with high nutraceutical and functional value.

Keywords: Muffins; chia seed flour; saffron; phenolic compounds content; antioxidant activity

Assessment of Phytochemicals, Antioxidant Capacity and Enzyme Inhibitory Potential of Digested Date Fruit Extract

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ABSTRACT

Background: *Phoenix dactylifera* L. is one of the oldest cultivated plants, recognized for its nutritional and cultural importance. Its fruit is rich in phytochemicals and possess significant nutritional and health-promoting properties. However, many in vitro studies overlook the physicochemical changes occurring in the digestive tract, which can significantly influence the release, stability, and bioaccessibility of bioactive compounds. **Aims:** This study aimed to assess the impact of simulated gastric and intestinal digestion on the recovery and stability of phytochemicals, antioxidant activity and enzyme inhibitory properties of date fruit extracts. **Methods:** An in vitro gastrointestinal digestion model was applied to simulate the gastric and intestinal phases. Total phenolic and flavonoid contents (TPC), (TFC), antioxidant activities (ABTS, DPPH, ORAC, and FRAP assays), and enzyme inhibitory activities against α-glucosidase (α-GLU), tyrosinase (TYR), and acetylcholinesterase (AChE) were determined before and after digestion. Furthermore, UHPLC analysis was used to monitor qualitative and quantitative variations in the phenolic profile. **Results:** Exposure to digestion conditions showed a considerable increase in the TPC (1.5 to 11.26 mg GAE/g) and TFC (0.32 to 1.68 mg QE/g). Along the digestion process, some phenolics compounds were degraded, while others were released or transformed. After digestion, the scavenging ABTS (2.07 to 13.66 mg TE/g), DPPH (1.44 to 1.66 mg TE/g and ORAC (25.13 to 111.51 mg TE/g) and ferric reducing antioxidant power (FRAP) (12.91 to 18.83 mg AAE/g) were significantly improved. The inhibitory potential against α-GLU (52 to 72%), TYR (36 to 50%), and AChE (13 to 24%) was also enhanced post-digestion. **Conclusions:** The findings suggest that the date fruit bioactive components demonstrate enhanced bioaccessibility. This study highlights the potential health benefits of consuming date fruits, including their role in mitigating oxidative stress and reducing the risk of certain diseases. These results support the use of date fruits as valuable functional ingredients for developing valueadded food formulations.

Keywords: Date fruit; Bioaccessibility; Bioactive compounds; *In vitro* digestion; Microwave assisted extraction.

Biscuits Enriched with Lentisk Oil: Pathways to Functional and Nutritional Food Innovations

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ABSTRACT

Aims: This work focuses on the valorization of lentisk oil in biscuit formulations, due to its organoleptic properties and potential health benefits. **Methods:** Initially, the physicochemical characteristics and antioxidant activity of the oil were determined. Subsequently, Pistacia lentiscus oil was incorporated into the biscuit formulation to improve the technological and nutritional properties of the finished product. **Results:** Physicochemical analyses revealed an acidity of 5.54%, a peroxide value of 3.8 meq/kg, and a refractive index of 1.468. The antioxidant activity of the oil was evaluated through its total polyphenol content (137.78 µg/g) and the DPPH assay, indicating good free radical scavenging capacity with an IC50 value of 702.76 ± 0.567 mg/mL. The oxidative stability of the oil was confirmed by the Rancimat test, showing an induction time of 11.87 hours at a 2% concentration. Furthermore, gas chromatography analysis revealed a high content of essential fatty acids beneficial to human health. **Conclusion:** The results obtained confirm the potential of mastic oil as a valuable natural functional ingredient in the food industry, particularly in the biscuit sector, compared to unenriched formulations.

Keywords: *Pistacia lentiscus*; Biochemical analysis; Antioxidant activity; Oxidative stability; Biscuit formulation.

Characterisation of lectin (AML) from Astragalus membranaceus with antioxidant activity

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ABSTRACT

Plant lectins are carbohydrate-binding proteins of non-immune origin with cell agglutinating ability, and are ubiquitous in nature. In recent years, plant lectins have attracted increased interest due to their various bio-logical activities, such as agglutination, toxicity, anti-proliferation of cancer cells and immunomodulation, as well as having anti-fungal and anti-viral activities. A novel lectins (AML) was isolated from the roots of a Algerian herb *Astragalus membranaceus*, using a combination of ammonium sulphate fractionation and gel filtration chromatography connected with AKTA pure 25 system. AML was found to be a two proteins with a molecular mass arround of 25.5 kDa. Biochemical characterisation revealed that it is a glycoprotein containing 10.7% neutral sugars. Amongst the various carbohydrates tested, the lectins was best inhibited by D-galactose. The lectins were stable in the pH range of pH 5.0 – 12.0 and temperatures up to 55 °C for 30 min. The proteins hydrolyzed by trypsin with a degree of hydrolyzate of 30%. The hydrolyzate of the proteins have strong antioxidant activity "ABTS" with IC50: 17.22 µg/mL. The lectins and the hydrolyzate inhibited weakly the proliferation of EMT6 cell lines. In conclusion, Lectins extracted from the roots of Astragalus membranaceus have antioxidant potential and can be used as food additives.

Keywords: *Astragalus membranaceus*, Lectins and antioxidant activity.

Lacticaseibacillus paracasei BMK2005: A Promising Probiotic Strain Isolated from an Algerian Infant

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ABSTRACT

Lacticaseibacillus paracasei BMK2005 (*L. paracasei* MBK2005) isolated from the feces of a healthy 1-year-old Algerian infant, was identified via 16S rDNA sequencing and API profiling. This strain exhibited strong antibacterial activity against enteropathogenic Escherichia coli (EPEC) in both in vitro and in vivo models. It showed resilience to gastrointestinal-like conditions (acidic pH, bile salts, and digestive enzymes), was γ-hemolytic, and remained sensitive to a broad range of antibiotics—highlighting its safety. The anti-EPEC effect was evaluated using a milk formula containing 50% whey and 50% skim milk. In EPEC-infected holoxenic rabbits, a significant reduction in fecal EPEC counts was observed after treatment with the fermented formula. Histopathological analysis further revealed intestinal protection in treated animals, supporting the probiotic potential of L. *paracasei* BMK2005.

Keywords: Diarrhea; Enteropathogenic *Escherichia coli;* Infant-milk formula; *Lacticaseibacillus paracasei*.

Palm wine as a source of probiotic lactic acid bacteria with antifungal potential against *Candida albicans*

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ABSTRACT

Palm wine, a traditional fermented beverage, represents a rich but underexplored source of microbial diversity. This study focused on isolating and evaluating lactic acid bacteria (LAB) from palm wine for their probiotic properties and antagonistic activity against vaginal Candida albicans isolates. LAB strains were isolated from two palm wine samples collected in Oued Souf, Algeria. Preliminary identification confirmed their Gram-positive, catalase-negative profile. The isolates were screened for key probiotic traits, including safety, adhesion potential, and antifungal activity. None of the palm wine isolates showed hemolytic activity, indicating their biosafety. The hydrophobicity of the isolates ranged from 95.07% to 100%, and their auto-aggregation capacity after 4 hours reached up to 60.76%, suggesting good potential for mucosal adhesion. Adhesion assays on polystyrene surfaces confirmed biofilm formation in several strains. Antifungal activity against seven C.albicans clinical isolates was assessed using spot and well diffusion methods. Inhibition zones ranged from 17.5 mm to 21.5 mm, with strain VP4 exhibiting the most potent activity. Anti-adhesion tests revealed several strains significantly reduced C.albicans attachment, with inhibition rates between 50% and 90%, and a maximum of 85.91% for strain VP6. Although co-aggregation with C. albicans remained low (< 20%). These results demonstrate the potential of palm wine as a valuable source of probiotic LAB with promising antifungal and anti-adhesive capabilities. Valorization of such traditional bioresources contributes to sustainable food biotechnology and opens avenues for developing alternative therapies targeting vaginal fungal infections.

Keywords: Palm wine; Lactic acid bacteria; *Candida albicans*; Probiotics; Antifungal activity.

From Saharan Pastures to Medical Nutrition: Camel Milk Processing in Tamanrasset to Build a Sustainable Functional Food Industry

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ABSTRACT

Our artisanal production unit in Tamanrasset has operated camel milk processing for eight months (January-August 2025), utilizing advanced sterilization and controlled fermentation technologies. This venture transforms a traditional Saharan resource into specialized functional food products. Our quality assurance protocol includes California Mastitis Test (CMT), pH measurement, electrical conductivity analysis, total dissolved solids (TDS) assessment, and compositional profiling via Milkotester technology. Raw milk undergoes microwave sterilization and controlled lactic acid fermentation before packaging in autoclave-sterilized 0.5L glass bottles, ensuring pharmaceutical-grade safety standards. Production serves medically-conscious consumers with documented benefits: diabetic patients experiencing improved glycemic regulation, individuals with benign prostatic hyperplasia, pediatric cow's milk protein allergy cases, and patients managing gastritis and esophagitis. This precision nutrition approach addresses critical gaps in conventional dairy alternatives. Current weekly output reaches 60 bottles (30L), distributed through direct orders and four retail partners in Tamanrasset. This demand-driven model guarantees freshness while maintaining complete traceability. This pilot validates technical viability and market demand for natural functional products. Our proven artisanal methods create a scalable foundation for industrial implementation, establishing a sustainable regional industry framework harmonizing traditional pastoralism with cutting-edge food technology.

Keywords: Camel milk; Tamanrasset; Functional food; Patients; Food technology.

Quality and Safety of Dried Fruits and Vegetables: A Review of Drying Methods

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ABSTRACT

Drying is one of the most widely used techniques to extend the shelf life of fruits and vegetables, but its impact on overall product quality varies greatly depending on the method applied. This review highlights the effects of key drying techniques such as convective drying, vacuum drying, freeze-drying, microwave drying, and combined methods on the sensory, nutritional, microbiological, and hygienic properties of fruits and vegetables. It examines how drying influences color, texture, bioactive compounds (vitamins, polyphenols, carotenoids), and safety parameters, including microbial load reduction and pesticide residue mitigation. Findings show that conventional high-temperature methods can significantly degrade pigments and aromas, reducing sensory acceptability. In contrast, innovative approaches such as microwave drying, freeze-drying, and combined techniques better preserve color, bioactive compounds, and antioxidant activity. Nutritionally, freeze-drying and vacuum drying are more effective in retaining polyphenols, vitamin C, and carotenoids compared to hot-air drying. From a hygienic perspective, drying lowers moisture content and microbial activity, but some spores and resistant bacteria may persist. Additionally, several techniques, including hot-air and microwave drying, show promise in reducing pesticide residues, thereby enhancing the safety of dried products. This review provides a comprehensive overview of the strengths and limitations of various drying technologies, offering valuable insights for food industry professionals and researchers to select suitable methods for quality retention and safety improvement.

Keywords: Drying methods; Sensory quality; Nutritional quality; Microbial quality; Hygienic quality.

Pharmacogenetic Impact of CYP3A4 and ABCB1 Polymorphisms on Cyclosporine Pharmacokinetics and Lipid Profile in Algerian Renal Transplant Recipients

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ABSTRACT

Cyclosporine A (CsA) remains one of the most widely used immunosuppressive drugs in kidney transplantation. However, patient responses to CsA vary considerably from one individual to another. This variability is largely influenced by genetic differences, particularly in enzymes and transporters such as CYP3A5 and ABCB1. Despite their clinical importance, the role of these polymorphisms has been poorly explored in North African populations. In this study, we investigated how the CYP3A53 (rs776746) and ABCB1 C3435T (rs1045642) polymorphisms affect CsA pharmacokinetics and lipid metabolism in Algerian kidney transplant recipients. We included 50 stable transplant patients, measured their CsA blood levels using the EMIT method, and calculated dose-adjusted values. Genotyping of CYP3A5 and ABCB1 was performed using direct sequencing. Biochemical markers, including cholesterol, albumin, and glycemia, were analyzed across genotypes. Our results showed that patients carrying the CYP3A53/*3 (GG) genotype, representing 72% of the cohort, had significantly higher CsA trough concentrations (C_0) and dose-adjusted levels (C_0/D). They also exhibited higher cholesterol, albumin, and calcium levels, along with lower glycemia. Regarding ABCB1, although CsA levels did not differ significantly between genotypes, the TT variant was associated with significant differences in biochemical parameters such as chloride, proteinuria, glycemia, and albumin. Taken together, these findings suggest that CYP3A5 and ABCB1 genetic polymorphisms not only influence CsA exposure but may also affect lipid and metabolic profiles. These insights support the integration of pharmacogenetic screening into routine clinical practice to optimize immunosuppressive therapy and improve long-term outcomes in renal transplant patients, particularly within North African populations.

Keywords: Cyclosporine A; Pharmacogenetics; CYP3A5; ABCB1; Kidney transplantation; Lipid profile; Genetic polymorphism; Algerian population.

Exploring the Gut–Muscle Axis through Animal Protein Intake

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ABSTRACT

Introduction: The gut–muscle axis has become a key concept in understanding how nutrition impacts muscle performance and recovery. Animal proteins, particularly from meat and whey, are widely known for their role in promoting muscle protein synthesis due to their high digestibility and complete amino acid profiles, but their role in modulating gut microbiota and influencing muscle via this axis remains under debate! Ensuring access to high-quality proteins that support both gut and muscle health is increasingly important in the context of food security and population nutrition. This meta-analysis aimed to gather current evidence on how animal protein intake affects both muscle outcomes and gut microbiota composition. **Methods:** A systematic search was conducted across PubMed, Scopus, Google Scholar and science Direct of 20 scientific papers. Our goal is to identify recent studies that examined the effects of animal protein intake (meat or whey) on gut microbiota composition and muscle. Detailed data such as protein type, dosage, intervention duration, microbial changes, and muscle-related outcomes were extracted and analyzed. The following Keywords were used: “Gut-muscle axis”, “Whey supplementation and gut flora”, “Meat rich diet and muscle”, “Animal-based protein”, “Muscle Protein Synthesis”, “Whey protein and gut microbiota”. **Results:** The literature indicates that whey protein quickly stimulates muscle protein synthesis post-ingestion, while meat protein provides sustained anabolic effects. On the other hand, Meat-rich diet led to a reduction in beneficial microbial taxa (e.g., *Bifidobacterium, Faecalibacterium*) and an increase in potentially

harmful genera (e.g., *Alistipes, Clostridium*). Similarly, whey protein reduced the abundance of *Blautia, Roseburia, and Bifidobacterium longum*. **Conclusion:** While whey and meat proteins are effective in enhancing muscle protein synthesis, their consumption is linked to altered gut microbial profiles, potentially affecting intestinal health. These findings highlight the importance of selecting dietary protein sources that not only that support both muscle growth and microbiota diversity but also contribute to meeting global nutritional needs and food security goals. Further research is recommended to better understand the role of animal-based proteins in optimizing sports nutrition metabolic health.

Keywords: MPS; Gut microbiota; Animal protein; Muscle; Gut-muscle axis.

Sustainable Valorization of Pistacia lentiscus Oil through Physicochemical Characterization and Antioxidant Assessment

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ABSTRACT

Vegetable oils are essential dietary components, not only as sources of energy but also as carriers of bioactive molecules such as tocopherols, sterols, carotenoids, and polyphenols. However, their susceptibility to oxidation limits quality and shelf life. Identifying natural sources of stable and bioactive oils therefore represents a major challenge in food, pharmaceutical, and cosmetic sciences. This study investigated the physicochemical properties and antioxidant activity of Pistacia lentiscus L. oil, extracted from fruits collected in the Bejaia region (Algeria). The oil exhibited a density of 0.91 g/cm³, a refractive index of 1.47, and a low moisture content (0.28%), confirming its quality. Chemical indices included an acid value of 1.62 mg KOH/g, a peroxide value of 4.21 meq O_2/kg, and a saponification value of 193 mg KOH/g, all within acceptable ranges for edible oils. These parameters attest to the freshness and nutritional potential of Pistacia lentiscus oil. The oil also demonstrated a remarkable biochemical profile, with high levels of unsaturated fatty acids (notably oleic acid), significant concentrations of pigments (carotenoids and chlorophylls), and a considerable tocopherol content. To further enhance stability, the oil was enriched with leaf-derived antioxidants. Comparative analyses revealed that enriched oil exhibited improved oxidative stability and superior antioxidant activity in DPPH and ABTS radical scavenging assays, with markedly reduced IC_{50} values compared to pure oil. These findings highlight the dual nutritional and functional value of Pistacia lentiscus oil, confirming its role as a natural source of antioxidants with potential protective effects against oxidative damage. Moreover, this work provides a sustainable example of plant resource valorization, transforming underutilized Mediterranean biodiversity into high-value products for pharmaceutical, nutraceutical, and cosmetic applications, while supporting circular economy strategies.

Keywords: *Pistacia lentiscus*, Physicochemical parameters, Oxidative stability, Antioxidant activity, Circular economy.

Weight Loss Outcomes with Prebiotic, Probiotic, and Synbiotic Interventions: A Systematic Review and Comparative Statistical Assessment

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ABSTRACT

In this study we evaluate and compare the efficacy of prebiotics, probiotics, and synbiotics in promoting weight loss using data from clinical trials. A systematic review was conducted on 28 prebiotics, 30 probiotics, and 16 synbiotics studies extracted from all articles . Fisher's exact test was applied to assess differences in success rates across intervention types, with success defined as a statistically significant reduction in body weight, BMI, waist circumference (WC), or fat mass. Results indicated that probiotics had the highest success rate (90%), followed by synbiotics (87.5%), and prebiotics (75%). However, no statistically significant difference was observed between groups ($p \approx 0.41$). Among probiotics, strains such as Lactobacillus gasseri, *Bifidobacterium breve* , and multi-strain formulations showed consistent benefits. Inulin-type prebiotics, especially oligofructose and resistant dextrin, demonstrated moderate but sustained effects on anthropometric parameters. Synbiotic combinations generally enhanced outcomes, suggesting synergistic interactions. All three interventions improved metabolic markers including insulin sensitivity, appetite regulation, and lipid profiles. While probiotics slightly outperformed other categories, findings support their complementary use in obesity management. This analysis underscores the potential of microbiota-targeted dietary strategies and highlights the need for further research into personalized formulations and long-term impacts.

Keywords: Prebiotics; Probiotics; Synbiotics; Obesity; Gut microbiota; Weight loss.

Towards the Implementation of Genetically Modified Organisms (GMO) Monitoring system in Algeria: Challenges and Outcomes

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ABSTRACT

Over the past three decades, GMO have significantly transformed agricultural practices, offering promising tools to enhance food production and sustainability. However, GMO have also raised serious concerns regarding safety, environmental impact, and regulatory oversight. The global regulatory landscape remains highly divergent, with approaches varying widely among countries. Two major regulatory forces have shaped international trends: GMO-producing

countries such as the United States, which adopt a product-based approach, emphasizing substantial equivalence; and the European Union, which applies a precautionary, process-based framework with stringent authorization, labeling, and traceability requirements. In Algeria, discussions on GMO regulation gained prominence with the adoption of the Cartagena Protocol on Biosafety. The country ratified the protocol and issued regulations prohibiting the importation, production, distribution, marketing, and use of genetically modified plant materials, except for research purposes (Arrêté du 24/12/2000). However, no specific regulations exist to control the presence or use of GMOs in food or to establish clear labeling requirements. Data from our comprehensive national survey, consisting of GMO monitoring in maize-derived foods through a full-scale study, revealed a high prevalence of GM ingredients. Conventional PCR-based screening and event-specific identification, together with real-time PCR-based quantitative analyses showed that 20% of the tested products were positive for at least one screening element (35S promoter and/or NOS terminator). Six transgenic events were identified in 16 GM-positive samples (MON810, NK603, TC1507, GA21, Bt11, and DAS59122), with most samples exhibiting stacked GM events, resulting in extremely high GM levels. The findings highlight the urgent need for a clear national policy on GMO commercialization and use in food, as well as robust systems for verifying labeling compliance. This presentation aims to critically assess the current state of GMO monitoring in Algeria, review the regulatory and technical milestones achieved, identify persisting challenges, and outline key steps toward establishing an effective, science-based monitoring framework.).

Keywords: PCR; Regulatory Framework; Transgenic events; Stacked events.

Advances in Biotechnology to Overcome Antinutritional Factors: Targeting Phytates and Oxalates for Improved Mineral Bioavailability

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ABSTRACT

Phytates and oxalates, widely distributed antinutritional factors in plant-based foods, represent a major challenge for the bioavailability of essential minerals such as iron, zinc, and calcium, thereby negatively impacting human and animal nutrition. Conventional food processing methods, including soaking, thermal treatments, and germination, often provide only partial reduction of these compounds. This limitation has driven the development of innovative biotechnological approaches as more effective and sustainable solutions. Genetic engineering has been employed to develop low-phytate crops through modification of biosynthetic pathways or by enhancing the expression of endogenous enzymes involved in phytate degradation. Similarly, the use of microbial enzymes, such as recombinant phytases and oxalate decarboxylases/oxidases, provides a targeted strategy for the breakdown of these compounds. These enzymes can be applied as food additives or integrated within biotransformation processes to improve the nutritional value of plant-based matrices. In addition, the optimization of fermentation technologies, particularly through the use of starter cultures selected for their strong enzymatic activities, has proven effective in significantly reducing phytate and oxalate levels while simultaneously enhancing the sensory and functional properties of foods. While these biotechnological advances still face challenges, particularly with respect to efficiency, cost-effectiveness, and consumer acceptance, they hold considerable promise. By improving mineral bioavailability and reducing the negative impacts of antinutritional factors, such strategies open new perspectives for the development of innovative food products with higher nutritional quality. Ultimately, these approaches contribute to the promotion of food security, better mineral nutrition, and global health.

Keywords: Phytates; Oxalates; Biotechnology; Phytase; Fermentation.

Oleaster Oil: Phytochemicals Composition, Fatty Acids Profiles and Potential Health Benefits

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ABSTRACT

Oleaster oil (Olea europaea var. sylvestris), derived from the wild olive tree, is a promising source of bioactive compounds, particularly polyphenols, flavonoids, and essential fatty acids, which are recognised for their antioxidant properties and potential role in the prevention of chronic diseases associated with oxidative stress. This study aimed to determine the polyphenol and flavonoid contents of oleaster oil, to characterise its fatty acid composition by gas chromatography–mass spectrometry (GC-MS), and to evaluate its in vitro antioxidant activity. The oil was extracted from oleaster fruits, with total polyphenol and flavonoid contents measured using the Folin–Ciocalteu and aluminium chloride methods, respectively. The fatty acid profile was established by GC-MS, while antioxidant activity was assessed through the DPPH free radical scavenging assay. The results revealed high levels of polyphenols (350 ± 5 mg GAE/100 g of oil) and flavonoids (95 ± 3 mg QE/100 g of oil), a fatty acid composition dominated by oleic acid (C18:1, 57.38%) followed by linoleic acid (C18:2, 17.76%), palmitic acid (C16:0, 14.39%), and stearic acid (C18:0, 4.19%). In addition, GC-MS analysis enabled the identification of minor fatty acids, including palmitoleic acid (C16:1, 0.81%), gondoic acid (C20:1, 0.12%), and heneicosanoic acid (C21:0, 0.36%). Antioxidant evaluation showed a radical inhibition rat of 83%, indicating strong free radical scavenging capacity and a potential protective effect against oxidative stress. Altogether, these findings demonstrate that oleaster oil combines a rich phytochemical profile with both major and minor beneficial fatty acids and marked antioxidant activity, reinforcing its potential as a functional food ingredient with implications for food security and public health, particularly in the prevention of metabolic and cardiovascular diseases.

Keywords: Oleaster oil, polyphenols, fatty acids, antioxidants, health benefits.

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Culinary Performance, Nutritional Composition and Protein Digestibility of Conventional Pasta Fortified with *Moringa Oleifera* leaf powder

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ABSTRACT

Pasta is one of the most popular staple food worldwide, considered as an excellent product for the addition of functional and bioactive ingredients. Fortified pasta could represent a healthy choice for consumers. This study aimed to evaluate the impact of Moringa Oleifera leaf powder (MOLP) addition on the culinary, nutritional, and protein quality of traditional durum wheat pasta. However, fortified pasta samples (PM0, PM5, PM10, and PM15) were formulated by replacing durum wheat semolina by 0, 5, 10 and 15 g/100g (w/w) of dried MOLP respectively. With the progressive fortification, cooking process revealed a reduction in optimal cooking time of pasta (from 11 min at PM0 to 7.5 min at PM15) and water uptake (from 61.14% at PM0 to 55.15% at PM15), with minimal increase in cooking losses (from 3.32%at PM0 to 4.36%at PM15), thus preserving acceptable culinary quality. Nutritionally, using Kjeldahl method, protein content in fortified pasta samples showed higher levels (from 11.32 at PM0 to 14.11 mg/g of sample at PM15), with a gradual increase in fat, ashes and fibers. for all pasta samples, cooking process had no effect on protein contents. While, significant ($p < 0.05$) decrease was reported for the other compounds. Using HPLCwith OPA/FMOC derivatives, amino acid analysis, revealed asignificant ($p < 0.05$) improvement in essential amino acids (EAAs), notably the concentrations of lysine and threonine typically deficient in wheat and its derivatives. fortified pasta samples were closer to the quality requirement, presenting higher EAAs scores (EAAsS > 1). However, in vitro protein digestibility of fortified pasta decreased significantly ($p < 0.05$), from 77.86% at PM0 to 58.50% at PM15. This study highlights the potential of MOLP as a promising functional ingredient in pasta products. Further research on protein digestibility and bioavailability are needed to the development of value-added products that contribute to food security.

Keywords: Pasta; Moringa Oleifera; Cooking quality; Nutritional composition; Protein digestion.

Assessment of Chemical Residues in Layer Eggs in Algeria

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ABSTRACT

Over the recent decades, the Algeria's poultry production has seen substantial growth. However, there are major public health concerns. The poultry products can be contaminated with chemical residues including antibiotic residues and heavy metals, which can pose risk to consumer health. The present study aimed to detect and quantify oxytetracycline residue, cadmium (Cd) and lead (Pb) in egg samples collected from sixteen layer farms located in different Wilayas (provinces) of Algeria. Egg samples were analyzed using Liquid chromatography coupled with tandem mass spectrometry (LC–MS-MS) for the detection of oxytetracycline residues and Graphite furnace atomic absorption spectrometry (GFAAS) for the detection of Cd and Pb. Oxytetracycline was detected and the residue values are below the established maximum permissible limit (MRL). For heavy metals, Cd and Pb were detected in all samples and their levels did not exceed the dietary food's MPL. These results revealed that the detected chemical residues in eggs samples do not pose a significant risk to human health. However, the risk of residues cannot be ignored, given the cumulative risk of antibiotics and heavy metals to the human body. Continuous monitoring of contaminants throughout the production chain is recommended to avoid dangerous transfer to the consumer via poultry foods.

Keywords: Algeria; Antibiotic residues; Eggs; GFAAS, LC-MS/MS.

II. Agroecology and Sustainable Food Systems

Agrobiological Resources (Seeds and Seedlings) in Algeria: Biotechnological Approaches for the Characterization and Valorization

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ABSTRACT

Agrobiological resources are vital for both ecosystems and the agroeconomy. They support biodiversity, regulate ecological processes, form the basis of food security, and serve as a source of economic value. In Algeria, according to law no. 05 – 03 of February 6, 2005, concerning seeds, seedlings, and the protection of plant varieties, a plant variety is defined as any new plant type that has been created, discovered, or developed as a result of a specific genetic process or a particular combination of hereditary mechanisms. This presentation highlights three ongoing case studies at the Biotechnology Research Center (C.R.Bt – Constantine, ALGERIA), each with distinct objectives:

- **Case Study 1:** Morphogenetic characterization of local strawberry populations for potential inclusion in the national catalog;
- **Case Study 2:** Characterization and development of a micropropagation protocol for the argan tree;
- **Case Study 3:** Gene expression analysis in four potato varieties induced in vitro to enhance resistance to Alternaria leaf spot.

The current research aimed to develop innovative solutions to valorize local agrobiological resources, improve agricultural productivity, and strengthen the resilience of Algerian agriculture.

Keywords: Agrobiological resources, seeds and seedlings, strawberry, argan tree, potato, plant biotechnology.

Diversity of *Campylobacter lari* in a One-Health Context: Focus on Shellfish, Wild Birds, Surface Water and Human Health Risk

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ABSTRACT
The microbiological quality of coastal environments is strongly influenced by fecal inputs from urban, agricultural, and wildlife sources. Within these settings, shellfish intended for human consumption are particularly vulnerable to microbial contamination. *Campylobacter lari* is the most frequent Campylobacter species detected in shellfish and has been identified as a sporadic cause of human gastroenteritis. While seabirds are considered a potential reservoir, *C. lari* dissemination is likely supported by the aquatic environment and the coastal water cycle. This study investigated the occurrence, diversity, and potential health risks of *C. lari* in a shellfish-harvesting area and its livestock farming-intensive watershed in Brittany (France). Isolates were obtained from mussels, oysters, cockles, wild birds, river water, seawater, and human feces. More than 300 *C. lari* isolates were analyzed by whole-genome sequencing (Illumina MiSeq), followed by genome assembly, genotyping, and phylogenomic comparison using state-of-the-art bioinformatic tools. Results showed that while *C. jejuni* and *C. coli* predominated in river waters, C. lari was the dominant species in shellfish (90.2%), seabirds (56.9%), and marine waters (54.5%). Whole-genome analysis revealed substantial genetic diversity, with more than 80% of isolates corresponding to newly described sequence types (STs). Distinct genetic patterns were observed between shellfish and upstream freshwater sources, suggesting unique ecological adaptation and limited direct input from catchment contamination. Importantly, comparative genomics identified a novel lineage within the *C. lari* complex, for which we proposed the designation *Campylobacter armoricus* sp. nov. This taxon was consistently recovered from shellfish and seawater and displayed clear phylogenomic separation from classical *C. lari* clades, with unique genetic markers supporting its species-level distinction. The description of *C. armoricus* highlights the underestimated diversity of the *C. lari* group and reinforces the need to consider emerging species when assessing One-Health risks associated with shellfish consumption and coastal ecosystems.

Keywords: Marine microbiology; Genomic epidemiology; Phylogenomic analysis; Environmental surveillance; Fecal contamination.

From Waste to Resources: Converting Canada Geese Feces into Protein and Plant Fertilizer Using the Black Soldier Fly (*Hermetia illucens*)

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ABSTRACT
The management of fecal waste from superabundant species in urban green spaces is a central topic in environmental sustainability and public health. In North America, the Canada goose (*Branta canadensis*) is particularly problematic because of its large abundance in public spaces, resulting in large quantities of droppings that negatively affect the recreational, aesthetic and hygienic quality of the environment. Here, we evaluate the potential of black soldier fly (BSF; *Hermetia illucens*) larvae to bioconvert Canada goose feces into protein, while producing frass that can be used as plant fertilizer. We performed an experiment that evaluates BSF performance (Larval growth performance, adult body weight, and adult lifespan) under three diet treatments: a standard Gainesville diet (control), a mixed diet containing 50% goose feces and 50% Gainesville, and a diet consisting entirely (100%) of goose feces. We found that the BSF larvae can survive and complete its larval development in both 50% and 100% fecal treatment diets, albeit the growth rate, adult body weight, and adult lifespan decreased with increasing concentration of feces. We also conducted an experiment that assesses growth performance of duckweed (*Lemna minor*) across different fertilization treatments, including Hoagland's media (control), and three concentrations (2.5, 5, and 10 g·L-1) of fresh goose feces and insect frass (derived from 100% goose feces). Duckweed growth was fastest in the frass treatment at concentrations of 10 g·L-1, suggesting that BSF larvae increased nutritional value of goose feces for the duckweed. Our study suggests that BSF can be used to bioconvert Canada goose feces into proteins while generating a valuable plant fertilizer.

Keywords: Bioassays ; Environmental sustainability ; Urban green spaces ; Public health.

YOLOv8 Based Systems for Agriculture Harvesting Optimization: Potato Tuber Seed Selection

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ABSTRACT
Background: In response to the growing need for smart agriculture practices, this work presents a Deep Learning (DL) model to optimize the sorting process of potatoes tuber seed—an economic and socially important worldwide crop, particularly in Algeria. Traditional sorting methods often rely on manual labor and lack accuracy and precision, prompting the need for optimization and automatization. **Aims:** Leveraging advances in computer vision and DL, particularly

YOLOv8, the proposed system analyzes images to classify potatoes based on quality attributes such as shape, open eyes number, and surface defects, in order to distinguish between those destined for consumption and those intended for planting. **Methods:** The study presents a full project pipeline that includes: (i) the collection and annotation of a dedicated image dataset of potato tubers exhibiting diverse visual traits; (ii) the training of a YOLOv8-based model for detecting and classifying tubers according to predefined quality criteria; and (iii) the evaluation of the model performance using standard metrics such as precision, accuracy, and mean average precision of the 0.5 threshold (mAP50). **Results:** The obtained results — over 90% precision, 82% accuracy, and 95% mAP@0.5 for the developed model in both tasks (normal and abnormal potato shape classification, and potato eye detection) — demonstrate the efficiency of this practical solution in reducing post-harvest losses, improving classification accuracy, and enhancing the precision of sorting potato tuber seeds. **Conclusion:** This work highlights the potential of Deep Learning (DL), particularly computer vision techniques, to contribute to automation and sustainability in the agricultural sector.

Keywords: Potatoes tuber seed; Deep learning; Smart agriculture; YOLOv8; Sustainability agriculture.

Evaluation of the Effect of *Trichoderma* sp. Against Some Pathogens of Lentils (*Lens culinaris*)

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ABSTRACT

Background: Lentil (*Lens culinaris*) is a key legume crop in Algeria but suffers from major yield losses due to fungal pathogens such as *Aspergillus* sp., *Penicillium* sp., *Fusarium* sp., and *Alternaria* sp. Chemical fungicides, while effective, raise environmental and health concerns. Therefore, sustainable biological control alternatives are increasingly needed. **Aims:** This study aimed to evaluate the antagonistic and biocontrol potential of *Trichoderma* sp. against major fungal pathogens affecting lentil crops in Algeria. **Methods:** Pathogenic fungi were isolated from infected lentil plants collected in Ouled Hamla and Chaab Rassas. Morphological identification was performed using macroscopic and microscopic criteria. Antagonistic activity of *Trichoderma* sp. was assessed *in vitro* through dual and indirect confrontation assays on PDA medium. *In vivo* tests involved treating lentil seedlings (two-leaf stage) with *Trichoderma* sp. spore suspensions followed by pathogen inoculation. **Results:** In vitro results showed strong inhibitory effects, with inhibition rates exceeding 40% for most pathogens. Direct confrontation assays recorded inhibition rates of 56.25% for *Aspergillus* sp., 50.1% for *Penicillium* sp., and 61.53% for *Alternaria* sp. Microscopic examination revealed clear signs of mycoparasitism, including hyphal coiling around pathogenic mycelia. In vivo assays demonstrated reduced disease symptoms and higher plant survival in *Trichoderma*-treated plants compared to untreated controls. **Conclusion:** *Trichoderma* sp. exhibited effective antagonistic activity against key lentil pathogens both in vitro and in vivo. These results highlight its promising potential as a sustainable biocontrol agent and eco-friendly alternative to chemical fungicides in lentil crop protection.

Keywords: *Trichoderma* sp.; Biocontrol; Mycoparasitism; Antagonism; Lentil; Sustainability.

A Sustainable Composting Approach for the Valorization of Olive By-Products in Direct-Seeding Vegetable Systems in Northern Algeria

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ABSTRACT

Background: The rapid growth of the global population, climate change, and soil degradation associated with conventional agricultural practices require the development of new production systems to ensure global food security. The potato (Solanum tuberosum), a staple crop worldwide, is characterized by high demands for fertile soils and nutrients. The application of compost produced from olive mill waste, cattle manure, and poultry manure represents an interesting alternative to chemical fertilizers. **Aims:** This study aims to compare two potato production systems: an organic amendment (compost and cover crops) and a chemical amendment (NPK 15-15-15 fertilizer). **Methods:** The experiment was conducted at the Tadmaït nursery (Tizi-Ouzou province) on a silty, slightly calcareous alluvial soil (pH 7.63; organic matter 1.59 mg·g^{-1}). Compost analyses included total carbon (loss-on-ignition at 550 °C for 6 hours), total nitrogen (Kjeldahl method), polyphenol content (Folin–Ciocalteu colorimetric assay), and phytotoxicity (Tiquia *et al.*, 1986). Soil carbon was determined using the Anne method (1945), and soil porosity was measured by the pycnometer method. **Results:** The physicochemical analysis of the final compost revealed a mature product (C/N ratio = 12.75), low in polyphenols (0.16 mg.g-1 of compost), and non-phytotoxic according to the germination test. Results showed a significant improvement in soil properties with compost application: porosity reached 50.99 % compared to 41.60 % under conventional management, and total organic carbon content was 1.46 mg.g-1 of soil versus 1.03 mg.g-1 of soil, with chemical fertilization. **Conclusion:** The use of compost derived from olive by-products combined with cover crops thus enhanced both of the soil physical and chemical properties under potato cultivation, and represented a sustainable and innovative alternative to conventional production systems.

Keywords: Compost; Polyphenols; Conventional; Soil; Potato.

Effect of Compost Application on Degraded Vineyard Soil in Northern Algeria under a Semi-Arid Climate

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ABSTRACT

Background: Global population growth and shifting dietary patterns are driving a rapid increase in food demand. Meeting this challenge requires the development of sustainable agricultural practices that ensure food security while preserving soil quality. Compost offers a sustainable alternative to mineral fertilizers by reducing dependence on chemical inputs and replenishing organic matter lost through intensive farming. Vineyard soils, which are particularly vulnerable to degradation due to intensive management, are a key target for such practices. **Aims:** This study was conducted at the Tadmaït nursery (Tizi Ouzou, Algeria) to evaluate the effect of compost application on the physical quality of vineyard soil compared with conventional management. **Methods:** A locally produced mineral-enriched compost (C), derived from olive mill waste, cattle manure, and poultry manure, was characterized by a pH of 8.38, electrical conductivity of 2.31 $mS \bullet cm^{-1}$, and a C/N ratio of 11.5. After one year of compost incorporation, soil samples were collected and analyzed for structural stability and bulk density relative to a conventionally managed control (T). **Results:** Results showed mean weight diameter (MWD) and bulk density values of 1.28 mm and 1.08 $g \bullet cm^{-3}$ for compost-treated soil (C), compared with 1.02 mm and 1.25 $g \bullet cm^{-3}$ for the control (T). **Conclusion:** The application of mineral-enriched compost significantly improved soil structural stability and reduced bulk density in vineyard soils under semi-arid conditions. These findings highlight compost amendment as a promising strategy for enhancing the physical quality and sustainability of vineyard soils.

Keywords: Vineyard; Mineral; Compost; Stability; Soil.

Effect of Nitrogen Fertilization on Grain Yield and Grain Protein Content in some Algerian Maize Populations

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ABSTRACT

Background: Maize is one of the world's most important crops, due to its high demand for food and feed, and its great adaptability. Like all cereals, maize needs nitrogen fertilizers to produce maximum yields with a high protein content. **Aims:** Therefore, the present study was conducted to (i) evaluate the genetic diversity in grain yield (GY) and grain protein concentration (GPC) among some Algerian maize populations, (ii) assess the effect of nitrogen fertilization on GY and GPC, and (iii) identify the relationship between GY and GPC. **Methods:** To achieve our objective, 12 Algerian maize populations of Saharan origin were evaluated using three different nitrogen fertilization levels (0, 80 and 150 kg N ha^{-1}). **Results:** The results revealed significant genetic variability for GY and GPC across the three nitrogen treatments. The GY averaged 10.49 t ha^{-1} at 150 kg N ha^{-1}, which was 16.24% and 46.17% higher than that for 80 kg N ha^{-1} (9.03 t ha^{-1}) and 0 kg N ha^{-1} (7.18 t ha^{-1}), respectively. However, GPC was not affected by nitrogen treatment, where GPC in the three nitrogen treatments was almost similar. Furthermore, a negative correlation between GPC and GY (r= –0.80***) was noted due to the dilution effect. **Conclusion:** Consequently, improving maize genotypes for high GPC without penalizing GY presents a major challenge.

Keywords: *Zea mays* L.; local populations; Nitrogen fertilization; Protein content.

Rhizospheric Bacteria and Sustainable Nutrition: An Agroecological Approach

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ABSTRACT

Background: The excessive use of chemical fertilizers threatens soil, water, and ecosystems. Beneficial soil microorganisms, especially rhizospheric bacteria, provide sustainable alternatives by improving plant nutrition. They mobilize nutrients, produce bioactive metabolites, and promote plant growth, making them ideal for developing environmentally friendly biofertilizers that enhance agricultural sustainability. **Aims:** This study aims to isolate and characterize rhizospheric bacteria associated with *Vicia faba* and *Lens culinaris* from different agricultural regions of Algeria, and to evaluate their functional capacities related to plant nutrition—specifically phosphate solubilization, potassium solubilization, and siderophore production—in order to identify multifunctional strains with potential for biofertilizer development. **Methods:** In this study, samples of *Vicia faba* and *Lens culinaris* were collected from three agricultural regions of Algeria: Béjaïa, Skikda, and Tlemcen. Rhizospheric bacteria were isolated using selective media (YMA, KB, ASHBY, and MAC), these isolates were evaluated for three key plant nutrition-related functions: phosphate solubilization on Pikovskaya medium, potassium solubilization on Aleksandrov medium, and siderophore production on Chrome Azurol S (CAS) medium. **Results:** Out of the 38 isolated strains belonging to the genera *Pseudomonas*, *Serratia*, *Achromobacter*, and *Bacillus*, 22 exhibited phosphate-solubilizing ability, 11 solubilized potassium, and 10 produced siderophores. Notably, a group of 7 strains, identified as belonging to the genera *Pseudomonas* and *Serratia*, demonstrated all three activities simultaneously, revealing remarkable multifunctional potential. **Conclusion:** These results highlight the functional diversity of local rhizospheric bacteria and their potential for use as natural biofertilizers. Their application could help reduce chemical inputs and promote more sustainable agricultural systems.

Keywords: Biofertilizer; Potassium; Siderophores; Phosphate; *Pseudomonas*.

Food Security and Farm Sanitation: The Public Health Impact of Antibiotic Resistance in the Farming Environment

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ABSTRACT

Background: Modern farming techniques have contributed to the spread of antibiotic resistance within agricultural systems and its transmission to vegetables, largely due to the uncontrolled use of agrochemical fertilizers, sewage sludge, organic waste manure, industrial waste, and wastewater irrigation. **Aim:** In the present study conducted in 2024, we investigated the presence of carbapenem-resistant Gram-negative bacteria in 50 distinct environmental samples, including irrigation water, soil, and manure, collected from both large and small farms in Boumerdes, Bouira, and Béjaia. **Methods:** Following sample preparation and pre-enrichment in nutrient broth, screening for carbapenem-resistant Gram-negative bacteria was performed. A volume of 50 µL of the pre-enrichment culture was added to 1 mL of Carba MTL broth, and the mixture was incubated at 37 °C for 18 hours. Positive Carba MTL broths were plated onto MacConkey and Cetrimide agar. Chromagar Orientation and conventional techniques were used to identify the isolates, and their antibiotic susceptibility was assessed according to EUCAST guidelines. The CIM test and double-disk (DD) test were used to screen for the production of carbapenemase and ESBL enzymes. **Results:** From the water, soil, and manure used to grow vegetables, ten *Enterobacterial* strains (01 *E. coli*, 06 *Enterobacter* sp., 03 *K. pneumoniae*) and seven *P. aeruginosa* were identified. All *E. coli* and *P. aeruginosa* isolates tested negative for ESBL production but positive for carbapenemase production. The isolates exhibited resistance to carbapenems along with other β-lactam antibiotics. **Conclusion:** These findings raise important concerns regarding food safety and public health, as farmed vegetables may serve as a reservoir for antimicrobial-resistant bacteria.

Keywords: Farm; Vegetables; Bacteria; Resistance; Carbapenem.

Production, Purification, and Characterization of Lipase from *Streptomyces* sp. Strain 22dz

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ABSTRACT

Background: Olive mill wastewater (OMW) is a lipid rich effluent that poses environmental concerns but also represents a potential low-cost substrate for microbial enzyme production. Actinobacteria, particularly Streptomyces species, are recognized for their ability to produce industrially relevant lipases with diverse catalytic properties. **Aims:** This study aimed to isolate and identify a lipolytic Streptomyces strain from OMW, optimize lipase production conditions, and purify and characterize the enzyme to assess its biochemical stability and potential industrial applications. **Methods:** Four isolates were screened for lipase activity. The most active isolate (5.33 U/mL) was identified as Streptomyces sp. strain 22dz through 16S rRNA gene sequencing (GenBank accession ON322956.1). Lipase production was optimized using a statistical design considering incubation time, pH, inoculum size, temperature, and OMW concentration. Purification was achieved via ammonium sulfate precipitation and Sephadex G-150 gel filtration. The enzyme was characterized for molecular mass, pH and temperature stability, solvent tolerance, and metal ion effects. **Results:** Optimal lipase activity (8.82 U/mL) was obtained after 9 days at pH 4 and 30 °C, with 6 % (v/v) OMW and 1.7 × 10^7 spores/mL. The purified enzyme showed an 18.5fold increase in purity, specific activity of 50 U/mg, and 19 % yield. Its molecular weight was19 kDa (gel filtration) and 22 kDa (SDS-PAGE). The enzyme was active at 30 – 40 °C, stable between pH 7 – 9, and tolerant to methanol, petroleum, SDS, and Triton X-100. Potassium and zinc (10 mM) enhanced activity, while EDTA and H_2O_2 inhibited it. **Conclusion:** The lipase from *Streptomyces* sp. 22dz demonstrates strong catalytic activity, stability under various physicochemical conditions, and robustness in organic solvents, indicating its potential for sustainable biotechnological and industrial applications using OMW as a substrate.

Keywords: Olive mill wastewater; Lipase activity; *Actinobacteria*; Purification; Characterization.

Bee Health and Food Security : Mitigating Pesticide Impacts through Natural Solutions

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ABSTRACT

Background: Bee health plays a crucial role in global food security, as pollinators ensure the reproduction of many agricultural crops. However, the progressive decline of colonies, particularly the Tellian honeybee (*Apis mellifera intermissa*), represents a major threat to biodiversity and pollination. Among the main contributing factors, chronic exposure to pesticides severely compromises bee survival and vitality. **Aims:** This study aimed to promote the use of local plant resources, particularly rosemary (*Rosmarinus officinalis*), as a natural protective alternative to mitigate the harmful effects of pesticides on pollinators. **Methods:** Rosemary essential oil, collected from the Akbou region (Bejaïa, Algeria), was administered orally (*in vivo*) to bees exposed to different pesticides. The investigation focused on evaluating the oil's protective effects by assessing bee viability and oxidative stress biomarkers, such as malondialdéhyde and total antioxidant capacity. **Results:** The essential oil, non-toxic at the tested doses, significantly improved bee viability compared to controls and reduced oxidative stress, evidenced by a marked decrease in Malondialdéhyde levels. This protective effect was particularly pronounced in bees exposed to Deltamethrin and Chlorpyriphos, while an improvement in total antioxidant status was only observed in bees exposed to Cypermethrin. **Conclusion:** The findings demonstrate the potential of rosemary essential oil as a natural protective agent enhancing bee resistance to

chemical stress. These results support the development of sustainable strategies for pollinator conservation and, consequently, food security.

Keywords: Viability; Pesticides; Essential oil; *Rosmarinus officinalis*, Oxidative stress.

Health Risks Associated with Antibiotic Residues in Animal-Derived Food Products: A Situational Analysis in Africa

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ABSTRACT

Background : Antibiotic residues in animal-derived food products represent a major public health concern in Africa due to their potential to induce bacterial resistance and allergic reactions. **Aims:** This work aimed to compare the occurrence, prevalence, and concentrations of antibiotic residues detected in milk and poultry meat, according to the tissues analyzed, the antibiotic classes involved, and the analytical techniques used. **Methods:** The findings were synthesized using a meta-analysis approach of African studies published between 2011 and 2025. **Results** : In milk, positivity rates range from 10% to over 90%, with frequent exceedances of maximum residue limits (MRLs), particularly for β-lactams, tetracyclines, and sulfonamides. Studies conducted in Algeria (Meklati, Boultif, Zeghilet, Samari) indicate that up to 92.5% of the samples contained residues, with a significant proportion exceeding regulatory thresholds. Similar findings were reported in Egypt, Kenya, Nigeria, and South Africa. For poultry meat, analyses show that the liver is the most contaminated organ, followed by the kidneys and muscles. In Egypt, 100% of livers tested positive for oxytetracycline residues, while in Algeria, prevalence ranged from 32% to 85%. The most frequently detected antibiotics included tetracyclines, β-lactams, sulfonamides, colistin, and macrolides. **Conclusion :** These results indicate that the issue persists despite health and regulatory alerts, highlighting the urgent need to strengthen veterinary controls, address the problem of excessive antibiotic use in livestock, improve farmer training, and raise consumer awareness.

Keywords: Antibiotic residues; Broiler chickens; Food safety; Milk; Veterinary practices.

Factors limiting the use of Pesticide-Free Products in Algeria

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ABSTRACT

Background: Pesticide residues in fruits and vegetables are a major concern for food safety and public health. It is therefore essential to understand consumer attitudes toward pesticide-free products in order to encourage them to make safer and more sustainable food choices. **Aims:** This study aimed to identify the main factors limiting the purchase and consumption of pesticide-free products among Algerian consumers. **Methods**: A cross-sectional survey was conducted between February and June 2025 among Algerian consumers. Data were collected through an online questionnaire distributed mainly via social media platforms. A total of 269 valid responses were analyzed using descriptive statistics to assess awareness, perceptions, and purchasing barriers related to pesticidefree products. **Results:** The findings revealed that most respondents demonstrated a high level of awareness regarding the potential health risks associated with pesticide residues in food. Limited product availability emerged as the most significant barrier, cited by 209 respondents. High prices were identified as the second major obstacle (86 respondents), while 31 participants mentioned concerns about contamination and mistrust regarding the traceability and safety of pesticide-free products. **Conclusion:** The results highlight that improving the accessibility and affordability of pesticidefree products, in parallel with strengthening consumer confidence and awareness of their benefits, is essential to promote their adoption in Algeria. Removing these barriers could contribute to healthier and more sustainable food practices.

Keywords: Pesticide residues; Survey; awareness; Consumer; pesticide free products.

Pesticides Impact on Seed Quality and Germination: Biotechnological Perspectives for Characterisation and Valorisation

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ABSTRACT

Background: Seed quality and germination potential are key factors in agricultural productivity and food security in Algeria. However, the intensive use of pesticides poses serious risks by inducing oxidative stress and disrupting key biochemical pathways, which negatively affect germination, vigor, and genetic diversity. **Aims:** To assess the impact of pesticide residues on seed quality. **Methods:** Various biotechnological tools were employed, including molecular markers, transcriptomic and metabolomic analyses, and in vitro germination assays. These tools were used to evaluate biochemical and genetic responses of seeds exposed to pesticide-induced stress. **Results:** The analyses revealed that pesticide residues trigger oxidative stress and alter important metabolic pathways, resulting in a significant reduction in seed performance. Molecular and physiological assessments enabled the identification of seed varieties showing greater tolerance to pesticide-induced stress. Metabolomic profiling also identified specific stress biomarkers, allowing early detection of pesticide effects. The findings confirm that biotechnological approaches are effective in evaluating the genetic and physiological impacts of pesticides on seed quality. The identification of tolerant varieties and reliable stress biomarkers provides a foundation for developing resilient crops and implementing effective conservation strategies. **Conclusion:** There is an urgent need to integrate these tools into Algeria's standard seed quality assessment system to promote sustainable agriculture and safeguard local genetic resources.

Keywords: Agrobiological ressources; Seed; Viability; Productivity; Food security.

Food Security in Algeria: Assessment and Prospects in the Era of Agri-Food Innovation

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ABSTRACT

Background: Food and nutrition security remain key issues in Algeria, influenced by import dependence and climate variability, despite recent progress in agricultural productivity and social policies. **Aims:** This study aims to assess the current state of food security in Algeria, compare it with regional and global trends, and identify structural challenges and opportunities for sustainable improvement. **Methods:** The analysis is based on FAOSTAT quantitative indicators and a comparative approach with North African and global averages, focusing on undernourishment, food insecurity, dietary quality, and nutritional health. **Results**: The results show that undernourishment remains very low (< 2.5%) and severe food insecurity declined from 13.0% to 4.9% between 2014 and 2024. Child stunting and wasting are improving, yet dietary imbalance, rising female anaemia (29.9% to 31.6%), and increasing obesity (adults: 23.8%; children: 12%) persist. **Conclusion:** These findings reveal a dual nutritional burden, combining deficiencies and excess, and highlight the need to reinforce social protection, diversify agricultural production, and promote sustainable agri-food systems to improve nutrition, resilience, and public health in Algeria.

Keywords: Micronutrients; Obesity; Resilience; Sustainability; Vulnerability.

Study of Underlying Determinants of Insect-Based Animal Feed Acceptance among Algerian Consumers and their Perceptions of Potential Risks and Expected Opportunities

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ABSTRACT

Background: Due to their high nutritional value, insects are increasingly viewed as a viable and sustainable source of protein for animal feed. The growing worldwide consumption of animal products has accelerated efforts to find substitutes for traditional feed components. However, challenges related to consumer acceptance and concerns about safety continue to hinder the widespread use of insect-based feed. In Algeria, no studies have yet explored how consumers perceive this novel feed option. **Aims:** This research investigates Algerian consumers' perceptions and acceptance of insect-based feed for poultry, cattle, small ruminants, and fish, focusing on perceived benefits, potential risks, attitudes, and socio-demographic influences. **Methods:** To accomplish this, an online survey was distributed via digital platforms starting in February 2024, gathering about 300 responses. The collected data were analyzed through descriptive statistics and logistic regression to identify key factors affecting acceptance. **Results:** Initial findings reveal generally low acceptance among Algerian consumers, though a notable differentiation emerged: participants showed higher acceptance for poultry and fish feed compared to bovines and ovines. Psychological factors, particularly disgust, and perceived nutritional benefits significantly influenced acceptance. Frequently cited advantages included increased global food availability, improved organic waste valorization, and reduced production costs. Conversely, significant concerns encompassed potential risks such as biodiversity impacts, microbiological contamination, and allergenic reactions in both animals and humans. The survey respondents represented a highly educated sample (> 90% higher education), with approximately 50% reporting acceptable financial status and over 60% residing in urban areas. **Conclusion:** These insights offer a foundational understanding of the complex factors shaping consumer perceptions of insect-based animal feed in Algeria.

Keywords: Food safety; Food security; Insect-based feed; Consumer acceptance; Potential risks; Opportunities; Algeria.

Multitarget Anticoccidial Activity of Olive Seed Phenolic Compounds against *Eimeria tunella*: Insights from Molecular Docking and Experimental Validation

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ABSTRACT

The present investigation evaluates the anticoccidial potential of olive (*Olea europaea* L. var. *Chemal*) seed ethanolic extract through *in vitro* assays and complementary in silico analyses against *Eimeria tenella*. Eight phenolics identified in this seed were selected for their molecular interactions with three *Eimeria tenella* target receptors via molecular docking including calcium-dependent protein kinase (PDB ID:4YSM), extracellular solute-binding protein family 1 (PDB ID: 5IXP), and hexokinase (PDB ID: 6KSR). The *in vitro* results revealed that the explored extract at an optimal concentration of 9.89 mg/g, significantly ($p \leq 0.05$) reduced the development of *Eimeria* oocysts, causing damage to their surface integrity and cell fragmentation after 24 hours of incubation. Among the phenolics studies, 4 exhibited high binding affinities (-7.0 kcal/mol to -9.6 kcal/mol) for major parasitic targets. Three compounds demonstrated a notable multi-target profile. In this regard, 2,3 dihydroamentoflavone interacted with the three proteins; isorhamnetin, oleuropein and 3-p-coumaryolquinic acid had affinity against two targets. This multitarget interaction pattern demonstrates olive seed chemicals' ability to affect multiple antiparasitic pathways simultaneously. This integrated experimental and computational approach highlights the value of olive seed derivatives in developing alternative antiparasitic strategies.

Keywords: Anticoccidial activity; *Eimeria tonella*; *Olea europea* L. seed; Phenolics; Molecular docking.

Study of the Purification Performance of the Beni Fouda Wastewater Treatment Plant, Eastern Algeria

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ABSTRACT
Several costly techniques can be used in the treatment of non-conventional water. However, the difficult economic conditions in Algeria make the rapid implementation of an expensive purification system unlikely. As a result, phytoremediation, a less expensive and easierto-operate process compared to other treatment systems, while also being environmentally friendly, represents a credible alternative or a complementary approach to wastewater treatment in small and medium-sized communities (such as the case of Beni Fouda). The main objective of this contribution is to study a technique for treating domestic wastewater in the city of Beni Fouda, in compliance with existing standards before any discharge into the natural environment, and to analyze the phytoremediation system used for wastewater treatment in the city. This study started in 2017 at the biological wastewater treatment plant: a natural lagooning system in the municipality of Beni Fouda (Setif Province). This process employs phytoremediating plants such as reeds (*Phragmites australis*) and cattails (*Typha latifolia*) downstream for final treatment. Our results revealed a decrease in the concentration of pollutant loads, particularly the following heavy metals: Zn, Cu, Fe, Mn, and Pb, in the wastewater from upstream to downstream of the station during the winter season. The findings show a significant reduction of pollutant lomads, especially in the downstream basins, which highlights the crucial role of phytoremediating plants in eliminating pollutants.

Keywords: Wastewater; Phytoremediating plants; Lagooning process; Heavy metals; Biology technical.

III. Valorization of By-Products for a Circular Economy

Valorization of Food Waste into Circular Economy

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ABSTRACT
Food waste valorization to enzymes by microbial interventions is the process of converting agroindustrial food residues into useful bioproducts by utilizing microbial enzymes. It is solution to world problems including food security, waste disposal, and ecological sustainability, as it converts various plants and animal derived food waste into biochemicals and functional ingredients. Microbial enzymes enable the degradation and bioconversion of recalcitrant food waste constitutents, allowing high valued enzymes and other bioproducts to be produced under sustainable conditions. The strategy is consistent with the principles of circular economy by advocating for resource efficiency and waste reduction, providing economic and environmental advantages. Enzyme production from food waste not only encourages sustainable resource use but also raises the feasibility of bioprocessing for biochemical production, supporting circular bioeconomy. The conjunction of microbial interventions in food waste valorization offers a promising direction towards sustainable and green biotechnological solutions.

Keywords: Microbial bioconversion; Enzyme production; Green biotechnology; Sustainable bioprocessing.

Valorization of Agri-Food Waste through Composting: An Approach to Sustainable Development and Circular Economy

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ABSTRACT
Rapid population growth and urbanization are driving a substantial increase in solid waste generation, both municipal (MSW) and industrial, along with changes in their composition and an excessive demand for energy. According to the World Bank, annual MSW volumes are projected to reach 2.2 billion tons by 2025 and 3.4 billion tons by 2050. Currently, 33% of this waste is still disposed of in open dumps, a practice prevailing in developing countries (93%), particularly in the Middle East and North Africa (50%), creating significant environmental and public health risks. Industrial production processes and the use of their resulting products account for up to 9.1% of global greenhouse gas (GHG) emissions. Transitioning to a circular economy (CE) is therefore considered a key pathway to reducing these emissions (European Parliament, 2023). Moreover, food loss and waste generated about 1.05 billion tons in 2022, equivalent to 132 kg per capita, with considerable socio-economic and environmental impacts (UNEP, 2024). In this context, achieving Sustainable Development Goal (SDG) 12 on responsible consumption and production requires businesses to rethink their models and integrate circular practices. Such approaches simultaneously contribute to other SDGs, including ocean preservation (SDG 14), access to clean water (SDG 6), climate action (SDG 13), protection of terrestrial ecosystems (SDG 15), and the reduction of food waste in alignment with "Zero Hunger" (SDG 2). Co-composting of organic waste offers a simple, cost-effective, and environmentally friendly alternative that reduces GHG emissions, improves soil fertility, and promotes sustainable resource use. The integration of artificial intelligence into the process enhances monitoring, shortens composting duration, and yields high-quality products suitable as soil amendments and as biological control agents through the production of fermented compost teas. This presentation will showcase three applications of composting involving organic waste from the olive oil industry (olive pomace and olive mill wastewater), confectionery residues (sesame waste and almond shells), and date palm cultivation (date palm residues), combined with poultry manure. The relevance of this technology will be discussed in terms of its economic viability, environmental benefits, and contribution to the implementation of a sustainable circular economy.

Keywords: Biofertility improvement; AI monitoring; Biofertility improvement; Industrial byproducts; Soil enhancement.

From Agricultural Wastes to Products: Biofuels, Bioplastics, and Clean Water

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ABSTRACT
The Western Cape Province of South Africa is renowned for its agricultural contributions to the South African economy. Examples of some of the major crops include apples, canola, and grapes. During the processing of these crops, various waste products, such as pulp, wastewater, and lignocellulose fines, are produced. These waste products typically end up in a landfill or are discharged into the environment with detrimental effects. Over the past ten years, our research team has aimed to explore the potential of these wastes for the generation of value-added products: (1.) A 20% (w/v) sugar-rich apple pomace was successfully degraded in a 20L stirred-tank bioreactor through the use of a commercial enzyme mixture, resulting in the release of > 6 mg/ml glucose, 1.8 mg/ml galactose, and 1.5 mg/ml arabinose. (2.) In contrast, during the processing of grapes for winemaking, a phenolic-rich wastewater is generated. The high carbon oxygen demand (COD) levels (2000 – 3000 COD mg/L) prevent the direct use of the wastewater in irrigation and would require treatment before use. Biological sand filters were successfully applied in the removal of contaminants in the wastewater, resulting in water suited to irrigation. Biotic and abiotic factors all contributed to the bioremediation of the wastewater (> 75% COD removal within 24 hours). (3.) Finally, in the production of canola oil, lignocellulose-rich fines are generated. Actinobacterial strains, Nocardia gamkensis CZH20T and Gordonia lacunae BS2T, cultivated in the presence of canola fines, were shown to produce polyhydroxyalkanoates (bioplastics; 476 – 479 µg/mL), with genomic sequence data confirming the biosynthetic capability of the strains to produce bioplastics. These are but a few examples of the potential trapped within agricultural wastes, with the potential to contribute towards the development of a circular economy.

Keywords: Apple pomace, Canola fines, Polyhydroxyalkanoate, Wastewater bioremediation.

The Importance of Analyzing and Monitoring Organic Compounds of Emerging Concern in Treated Wastewater

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ABSTRACT
Organic contaminants of emerging concern (OCECs) groups a large and growing number of chemical compounds such pharmaceuticals, personal care products, hormones, flame retardants, etc., which have received a great deal of attention in last years, mainly because these compounds are emitted continuously into the environment and can become harmful to both ecosystems and humans. The presence of these compounds in aquatic and terrestrial ecosystems exhibits harmful effects on organisms and there is clear evidence of the repercussions that these substances can have on biological processes in flora and fauna, and even in human beings. In this context, non-treated and treated wastewater may contain this type of contaminants, and then if those are reused for agriculture irrigation, OCECs may be transferred to plants and fruits and finally to consumers. Thus, it is of great importance to monitor the presence of emerging contaminants in these aquatic systems. In this lecture we present and discuss the most important results obtained in the analysis and monitoring of some families of OCECs in wastewater from different wastewater treatment plants (WWTPs) with different characteristics and located in insular scenarios.

Keywords: Emerging contaminants; Environmental impact; Contaminant transfer; Pharmaceutical pollution; Human health.

Evaluation of Poultry Manure-Based Substrates Using Mixture Design for the Sustainable Cultivation of *Pleurotus ostreatus*

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ABSTRACT
Background: The valorization of agricultural by-products is a key strategy to promote circular economy models in the agri-food sector. Poultry manure, although rich in nutrients, poses sanitary risks if not properly stabilized. Its reuse as a substrate component for *Pleurotus ostreatus* cultivation offers an opportunity to transform waste into value-added products. **Aims:** This study aimed to evaluate the potential of treated poultry manure, combined with wheat straw and wood ash, as a substrate for the cultivation of *Pleurotus ostreatus*, and to determine the optimal mixture proportions for efficient mycelial growth. **Methods:** Poultry manure was thermally treated to reduce microbial and chemical hazards. A mixture design approach generated eight substrate formulations with varying proportions of the three components. After physico-chemical characterization, substrates were inoculated with *Pleurotus ostreatus* and incubated for 15 days. Mycelial colonization was assessed using sensory criteria (color, odor, texture, visual growth) and quantitative parameters (biomass yield and substrate conversion rate). **Results:** A strong correlation was found between sensory attributes and quantitative outcomes. Substrates showing dense, homogeneous colonization and favorable odor achieved the highest biomass yield and conversion efficiency. The optimal formulation contained about 70% treated poultry manure, 30% wheat straw, and 0.5 – 1% wood ash. Principal Component Analysis confirmed these findings and revealed the influence of each component on overall performance. **Conclusion:** The results demonstrate that properly stabilized poultry manure, integrated with complementary residues, provides an efficient and low-cost substrate for mushroom cultivation. Combining sensory evaluation, quantitative analysis, and multivariate statistics offers a comprehensive approach to substrate

optimization and contributes to sustainable circular bioeconomy models.

Keywords: *Pleurotus ostreatus*; poultry manure; mixture design; circular economy; substrate optimization.

Nutritional Quality Indexes in Quail Breast Meat Fed with *Pterygoplichthys Pardalis* By-Product Meal as an Alternative in the Circular Economy

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ABSTRACT

Background: In the feed industry, anti-nutritional factors present in plant sources have been shown to reduce digestibility and nutrient uptake in poultry, including meat and laying poultry. In order to address ecological concerns relating to the use of fishmeal and soybean meal, a new source of hydrobiological animal protein has been identified: '*Pterygoplichthys pardalis* by-product meal' (PPSM), obtained from an invasive fish species. **Aims:** Therefore, a dose-response study was carried out on isoproteic (23.8% CP) and isoenergetic (2770 Kcal Kg^{-1}) diets for quails with PPSM inclusion levels (0%, 50%, 75% and 100%) replacing soybean meal. **Methods:** A total of 240 quails (60 per treatment) were used to evaluate the growth performance and nutritional indices of quail (Coturnix japonica) breast meat. An analysis of variance (ANOVA) was performed, with initial live weight as a covariate, using the statistical program Statgraphics Plus 5.1. **Results:** The 50 PPSM diet was found to yield optimal final weights (184.28 ± 2.82 g) and a feed conversion ratio of 3.58 ± 0.12, indicating reduced feed intake and enhanced weight gain compared to the other treatments, 0, 75, and 100 PPSM. Regarding the lipid profile, similar values were observed for ∑MUFA, while higher values were observed for ∑PUFA in quail breast meat with the 50 PPSM diet compared to the 0 PPSM diet. Likewise, significant differences were observed for ∑ω-3, with higher values for 100 PPSM (29.44 ± 10.07). In contrast, ∑ω-6 and ω6/ω-3 had higher values for 0 PPSM. However, in the nutritional indexes, the atherogenic index (AI), thrombogenic index (TI), and hypocholesterolemic / hypercholesterolemic index (h/H) in the treatments were within the established range (<1, <1, and >1, respectively). **Conclusions:** Consequently, for PPSM at inclusion levels of 50% and 75%, it has been demonstrated to promote sustainability, provide omega-3-enriched food, and prevent micro- and macro-coronary diseases.

Keywords: Breast-meat; *Pterygoplichthys pardalis*; Nutritional indexes; atherogenic; thrombogenic.

Valorizing Orange Peel Waste: A Sustainable Approach to Food Packaging

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ABSTRACT

Background: Plastics have played a decisive role in the development of modern society. In 2019, global production exceeded 460 million tonnes per year, generating nearly 353 million tonnes of plastic waste annually. Of this waste, 22% was poorly managed, burned in the open air or dispersed into the environment. This accumulation not only contributes to greenhouse gas emissions, but also leads to the formation of harmful microplastics, endangering ecosystems and human health. To accelerate the transition to a more sustainable and resource-efficient circular economy, specific objectives have been put forward, including the use of bio-based, biodegradable and compostable plastics. **Aims:** This study addresses the urgent need for sustainable food packaging by valorizing orange peel waste an abundant agri-food by-product through its integration into polylactic acid (PLA) matrices. **Methods:** Fresh orange peels (Citrus sinensis) were collected from a local natural juice factory in the Bejaia region, rinsed with distilled water, chopped into small pieces, and dried in an oven at 40°C. The polylactic acid (PLA) matrix used in this study was supplied in granules under the reference Ingeo Biopolymer 2003D by Nature Works, specifically formulated for fresh food packaging and food service applications. The ethanolic extract of the fresh orange peels (OPE) was obtained as detailed in our previous research. Various formulations were created using virgin PLA and PLA/OPE at different loading rates of 10%, 20%, and 30%, labeled as F0, F10, F20, and F30, respectively. The antioxidant activity was assessed using the DPPH assay, while the antibacterial activity was evaluated through a micro-dilution test in a liquid medium. **Results:** The OPE was incorporated into PLA at 10%, 20%, and 30% loadings to fabricate biocomposite films. The OPE demonstrated potent bioactivity, with high antioxidant capacity (IC_{50}: 165.12 µg/mL) and significant antibacterial effects against E. coli (IC_{50}: 0.55 mg/mL) and *S. aureus*. Films with 30% OPE exhibited enhanced functionality, achieving 63.84% DPPH radical inhibition and > 70% bacterial growth suppression. **Conclusion:** The research bridges waste valorization with material science, offering an eco-friendly alternative to conventional plastics for perishable food preservation.

Keywords: Polylactic acid (PLA); Phenolic extract; Biocomposite films; Antioxidant activity; Antibacterial proprieties.

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Enhancing Date Palm Syrup By-Products with *Aloe Vera*: The Physicochemical, Microbiological, and Antioxidant Properties -A Sustainable Approach

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ABSTRACT

Background: The palm date fruit syrup 'Robb' the traditional palm date fruit syrup, holds a significant place in Algerian culinary traditions. This rich syrup is not only a staple for its flavor but also boasts considerable nutritional and economic value. **Aims:** Enhancing the nutritional value of date syrup through the addition of *Aloe vera* contributes to sustainable and healthy diets. **Methods.** In this study, the physicochemical parameters: pH, free acidity, electrical conductivity (EC), moisture, total sugar and ash content - along with microbiological parameters analysis such as total microbial count, sulfate-reducing *Clostridium*, *Streptococci* and *Staphylococci* were evaluated. Antioxidant activity was assessed using DPPH, and an organoleptic characterisation survey was conducted to gauge sensory acceptability. **Results.** The physicochemical results of the syrups enriched with A. vera (2.5%; 5%) demonstrated pH values ranging from 4.4 to 4.63, free acidity levels of 8 to 9, and EC values between 2.45 and 3.52 ms/cm. The total sugar content ranged from 67 to 75%. The Principal Component Analysis (PCA) results confirmed that all the tested parameters used efficiently distinguished between the syrup samples. The microbiological tests showed the absence of most bacteria, with very low yeast germs. Improvement in antioxidant activity IC_{50} was 0.067 mg/ml. Sensory analysis of syrup samples indicated that they are acceptable to consumers. **Conclusion.** It was concluded that the addition of *A. vera* to palm-date syrup altered certain physicochemical parameters, enhanced microbiological quality, as well as increased antioxidant activity; which improving its nutritional value and bioavailability for human.

Keywords: *Aloe vera*; *Hmira*; *Tagazza*; Palm-date syrup; Physicochemical test; Microbiological test; Antioxidant activity; Nutrition.

Mech-Degla Dates Valorization by Incorporating them into Stirred Natural Yogurt

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ABSTRACT

Background: In recent years, healthy eating has shifted from low-fat to enriched products to improve their nutritional value and sensory properties. Date fruit (*Phoenix dactylifera* L.) is considered a high-nutrient-dense food, rich in vitamins, carbohydrates, minerals such as iron, phenolic acids, flavonoids, and carotenoids. This fruit possesses significant health benefits, including antimutagenic, anticarcinogenic, antihyperlipidemic, hepatoprotective, nephroprotective, and gastroprotective properties. Algeria is a country traditionally date producer with 30 to 50% common dates with low market value. Due to the absence of a processing industry, these dates are either lost or sold to low price or oriented towards livestock feed. The valorization of common "*Mech-degla*" dates and analogs has been the subject of scientific works such as the bio-production of ethanol, incorporating date powder into the preparation of a biscuit and the transformation of these dates into syrup. Current trends and evolving consumer needs indicate a significant opportunity for innovation and development in fermented milks. Today, several studies have focused on the incorporation of dates into foods and their application as a gelling agent in various processed food products, such as jellies, yogurt, and cheese. **Aim:** This study aimed at the sensory study of a stirred yogurt enriched with *Mech-Degla* dates. **Methods:** In this work, a low-quality date variety "*Mech-degla*" was used as an ingredient to prepare 4 types of stirred yogurt: yogurt with date powder, yogurt with date lumps, yogurt with date pieces and a control yogurt added with brown sugar. The sensory analysis of the 4 types of yogurt was carried out with 110 naive tasters and experts. For Day 1, Day 7 and Day 15, only the expert tasters who did the tasting test. **Results:** The results of the sensory analyses show an acceptability of the yogurt with date lumps because of its organoleptic criteria appreciated by the tasters. **Conclusion:** the use of *Mech-Degla* in dairy industry can be a very interesting opportunity for the valorisation of dattes.

Keywords: Dates; Valorization; Sensory study; Yogurt; *Mech-Degla*.

Biodegradable Film Packaging Enriched with Antioxidant Extract from Olive Leaves

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ABSTRACT

Background: The need for food is increasing due to global population expansion, necessitating greater food production and generating considerable by-products which often encompass bioactive chemicals that provide health advantages and hold significant potential for active food packaging applications. **Aims:** This study investigates the development an environmentally sustainable edible film using gelatin derived from chicken feet, enriched with wild olive leaves extract. **Methods:** Wild olive leaves were extracted by decoction, infusion, and ethanolic solvent methods. The DPPH assay was employed to evaluate antioxidant activity. Edible films were produced at two doses (3.125×10^{-3} and 6.25×10^{-3} mg/mL) using gelatin derived from chicken feet and enriched with ethanolic extract from wild olive leaves and. The sensory properties, biodegradability, and antioxidant activity of the edible film were evaluated. **Results:** The ethanolic olive leaf extract had high phenolic content: 202.291 mg GAE/g total phenolics, 17.117 mg QE/g flavonoids, and 46.46 mg CE/g tannins. The extract showed significant DPPH radical inhibition, with an IC_{50} value of 46.54 ± 0.62 μg/mL. The enhanced films exhibited polyphenol concentrations of 4.15 and 5.87 mg GAE/g, corresponding to 40% and 68.2% significant antioxidant activity, respectively. Sensory tests confirmed film acceptability. The biodegradability test showed that the packaging decomposing within seven days. **Conclusion:** These findings are

exceptionally encouraging and indicate the necessity for additional investigation.

Keywords: Enriched edible film; Olive leaf extract; Polyphenols; Antioxidant activity; Biodegradability.

From Agri-food Waste to High-Performance Adsorbent: Optimization via Machine Learning Approaches

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ABSTRACT

Background: The increasing demand for low-cost and sustainable adsorbents in wastewater treatment has encouraged the valorization of agri-food by-products. Among these, jujube stones represent an abundant and underutilized lignocellulosic material suitable for producing activated carbon (AC) with high adsorption capacity. **Aims:** This work aims to optimize the adsorption of methylene blue (MB) onto activated carbon prepared from jujube stones by applying an artificial intelligence-based modeling and optimization strategy. **Methods:** Activated carbon was produced from jujube stones through chemical activation and characterized physicochemically. The adsorption performance was optimized using a hybrid artificial intelligence model combining Gaussian Process Regression (GPR), the Dragonfly optimization algorithm, and bootstrap aggregation (GPR_DA_Bootstrap). Five operational parameters were investigated: initial MB concentration (400 – 700 mg/L), adsorbent dosage (0.6 – 1.6 g/L), contact time (30 – 540 min), solution pH (7 – 11), and temperature (20 – 50 °C). The optimization objective was to maximize the adsorption capacity. **Results:** The GPR_DA_Bootstrap model accurately predicted the optimal conditions for MB removal: 700 mg/L initial MB concentration, 0.6 g/L adsorbent dosage, 540 min contact time, pH 11, and 50 °C. Under these conditions, an experimentally validated adsorption capacity of 501.01 mg/g was obtained. The model exhibited a low prediction error of 8.64 mg/g, confirming its high reliability and robustness. **Conclusion:** The proposed GPR_DA_Bootstrap approach proved to be an effective predictive and optimization tool for adsorption systems. The results highlight the potential of jujube stone-derived activated carbon as a cost-effective and sustainable adsorbent for dye removal in wastewater treatment, aligning with the principles of the circular economy.

Keywords: Activated carbon; Adsorption; Jujube stones; Methylene blue; Optimization.

Promoting Circular Economy in Algeria's Agri-Food Industry: Toward a Sustainable Valorization of Co-products

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ABSTRACT

Background: Population growth and increased food demand challenge sustainable resource management ; the promotion of circular economy (CE) principles offers an effective strategy for reducing waste, conserving resources, and generating economic value. As Algeria faces increasing food demand and limited natural resources, the issue of food loss within its agri-food sector has become a major concern. Food processing results in substantial loss and waste, particularly during the transformation of fruits and vegetables. **Aims:** This study aims to quantitatively assess food losses generated from the processing of ten key crops in Algeria and to explore the potential for waste valorization through the adoption of CE principals. **Methods:** using FAO production data and waste coefficients, we estimated the amount of loss from processing ten key crops in 2020. **Results:** The results show that olive processing alone generated over 823,000 tons of waste, with a loss rate of 82.5%, while wheat waste was estimated between 1.9 and 3 million tons (25 – 40%). Tomatoes, barley, and dates also contributed significantly. These figures highlight both a food security issue and a major economic inefficiency. It is important to foster collaboration among actors across the supply chain, including policymakers, industries, and research institutions, to establish circular supply chains and waste valorization technologies. **Conclusion:** Implementing CE approaches in Algeria's food industry can lead to notable environmental benefits—such as reduced pressure on natural resources and lower greenhouse gas emissions—improve supply chain efficiency, and create new economic opportunities, including cost savings and new revenue streams. To conclude, transitioning toward a circular economy is vital for sustainable development, requiring strategic policy support, stakeholder engagement, and technological innovation to effectively reduce waste and promote resource-efficient growth.

Keywords: Circular Economy; Food Loss; Valorization; Agrifood industry; Algeria.

Eco-Friendly Food Packaging Films Based on Pectin Extracted from Agro-Industrial Fruit Residues

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ABSTRACT

Background: Apple pomace, a major by-product of the agri-food industry, remains underexploited despite its richness in bioactive compounds such as polyphenols, dietary fiber, and pectin. Owing to its gelling, stabilizing, and film-forming properties, pectin represents a promising natural, non-toxic, and biodegradable alternative to

synthetic polymers in sustainable material development. **Objectives:** This study investigates the relationship between the physicochemical properties of pectin extracted from Golden Delicious apple pomace and the functional characteristics of the resulting biofilm, with the goal of developing eco-friendly food packaging materials. **Methods:** Pectin extraction was optimized at pH 2.5 and 85 °C for 90 min to maximize yield and quality. The purified pectin was characterized for yield, moisture, degree of esterification, methoxyl content, water- and oil-holding capacities, and ash content. The extracted polymer was then used to prepare biodegradable biofilms. **Results:** The pectin obtained exhibited a degree of esterification of 68%, methoxyl content of 6.4%, water-holding capacity of 3.8 g H_2O/g DM, oil-holding capacity of 1.5 g oil/g DM, ash content of 0.73%, and extraction yield of 18.7%. The biofilm displayed a water content of 10.2% (dry basis), moderate hydrophilicity, and a uniform thickness of 120 ± 1.5 µm. Microbiological analysis confirmed its safety, showing total coliforms < 10 CFU/g and yeasts/molds < 50 CFU/g, in compliance with the Food and Agriculture Organization (FAO) standards. Its low microbial load, stable structure, and good texture indicate its suitability for short-term food coating and biodegradable packaging. **Conclusions:** Apple pomace represents a valuable natural source for producing biodegradable pectin-based materials. The biofilm developed from this residue is environmentally friendly and safe, offering a viable alternative to conventional synthetic films. Further research will focus on improving its mechanical and barrier properties for applications in active and intelligent food packaging.

Keywords: Pomace; Pectin; Extraction; Biofilm; Quality.

Enzyme-Producing Rhizobacteria from Legume Crops: Sustainable Bioproducts for Soil Health and Food Security

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ABSTRACT

Background: In the face of increasing concerns related to soil degradation, agricultural waste, and food security, sustainable alternatives to synthetic agro-inputs are urgently needed. Enzyme-producing rhizobacteria represent a promising solution by enhancing soil fertility and supporting the recycling of organic matter. **Aim:** This study aimed to assess the functional potential of native rhizobacteria associated with legume crops as sustainable bioproducts. **Methods:** Twenty bacterial strains were isolated from the rhizosphere of faba bean and green pea cultivated in the Sétif Department. Gram-negative bacteria were isolated on MacConkey and Cetrimide agar, while Gram-positive Bacillus strains were recovered on nutrient agar following heat treatment. Molecular identification was performed using 16S rRNA gene sequencing. The enzymatic potential of all isolates was assessed through amylase, cellulase and phosphatase activity. **Results:** Among the 20 phosphate-solubilizing strains, three also exhibited amylolytic activity and five showed cellulolytic activity. Notably, three strains demonstrated all the enzymatic activities tested. Two of these multifunctional isolates were identified as Bacillus spp., while the third belonged to the genus *Pseudomonas*. **Conclusion:** These multifunctional rhizobacteria demonstrate strong potential as sustainable bio-inputs, contributing to nutrient cycling, the degradation of plant residues, and overall improvement of soil quality, ultimately supporting resilient food production systems aligned with circular economy principles.

Keywords: Rhizobacteria; Enzymatic activity; Biofertilizer; Bioprodact; Circular agriculture.

Pistacia lentiscus Oil Cake: Valorization of a By-Product for the Extraction of Bioactive Phenolic Compounds

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ABSTRACT

Background. In Mediterranean regions, oil is obtained from the berries of the *Pistacia lentiscus* L. (mastic tree) by cold pressing and mainly used in traditional medicine. However, this process yields a byproduct consisting in the oil cake (LOC). Unfortunately, despite being rich in bioactive compounds, the LOC is undervalued. **Aims.** The objectives of this study were to optimize the green, ultrasound-assisted extraction (UAE) of phenolic compounds from lentisk oil cake; to determine the composition of the optimized extract; and to evaluate its antioxidant and antidiabetic activity. **Methods**. A Box-Behnken design and response surface methodology was used to evaluate the effects of an ethanol/water mixture, temperature, and extraction time on the total polyphenol yield of LOC. High-performance liquid chromatography (HPLC) coupled with a diode array detector (DAD) was then used to determine the phenolic profile of the optimized extract. The extract's antioxidant and antidiabetic activities were also evaluated. **Results.** The predicted extraction conditions (50% ethanol, 60 °C, and 86 minutes) were confirmed experimentally. Under these conditions, the optimized extract exhibited an IC_{50} of 61.79 ± 0.40 µg/mL against the $ABTS^{+}$ free radical, compared to a positive control of Trolox with an IC_{50} of 50.67 ± 0.32 µg/mL. Additionally, the optimized extract demonstrated promising anti-αamylase activity with an IC_{50} of 99.82 ± 2.03 µg/mL. This bioactivity is likely due to the phenolic composition of the TL extract. Twelve phenolic compounds, including six flavonoids and five phenolic acids, were identified and quantified in the optimized extract. **Conclusions.** The lentisk's oil byproduct constitutes a sustainable source of biologically active polyphenols with a great potential for industrial valorization in various fields including food, packaging and pharmaceutics.

Keywords: *Pistacia Lentiscus* L. cake; Ultrasound-assisted extraction; Box Behnken design; Phenolic compounds; HPLC-DAD; *In vitro* biological activities.

Innovative Enzymatic Valorization of Agricultural Co-Products for Fermentable Sugar Production

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ABSTRACT

Background: Lignocellulosic biomass represents the most abundant renewable carbon source on Earth, primarily composed of cellulose and hemicellulose. Its effective valorization depends on enzymatic hydrolysis catalyzed by fungal glycosyl hydrolases. Filamentous fungi, such as *Aspergillus* and *Trichoderma* species, are well known for their high enzyme productivity, making them promising candidates for lignocellulosic biomass conversion. **Aims:** This study aimed to evaluate the enzymatic saccharification potential of lignocellulosic industrial co-products specifically wheat bran and straw using a crude enzyme extract produced through mixed solid-state fermentation (SSF) of *Aspergillus niger* strain BG and *Trichoderma afroharzianum* AZ12. **Methods:** Wheat bran and straw were used as the sole carbon sources in SSF, conducted at 28 °C for seven days with an 85% moisture content and a 60:40 straw-to-bran ratio. The crude enzymatic extract was analyzed for cellulolytic and hemicellulolytic activities, including xylanase, CMCase, avicelase, total cellulase, β-glucosidase, and β-xylosidase. The saccharification kinetics of treated and untreated wheat straw and bran were further studied, and the released sugars were quantified by the DNS method and characterized using thin-layer chromatography (TLC). **Results:** High enzymatic activities were obtained: xylanase (1469.6 U/mL), CMCase (418.2 U/mL), avicelase (1948 U/mL), total cellulase (292.6 U/mL), β-glucosidase (65.3 U/mL), and β-xylosidase (53.3 U/mL). The enzymatic extract efficiently degraded both untreated and pretreated substrates, yielding various mono- and oligosaccharides. The highest reducing sugar concentration was achieved from untreated wheat bran (384.24 mg/mL), followed by treated bran (146.34 mg/mL). TLC confirmed the presence of diverse saccharides in the hydrolysates. **Conclusion:** The synergistic action of cellulases, hemicellulases, and peroxidases significantly enhanced the saccharification efficiency of low-cost lignocellulosic co-products. This mixed fungal SSF system demonstrates strong potential for sustainable production of fermentable sugars, contributing to the bioconversion of agricultural residues into value-added bio-based products.

Keywords: Lignocellulosic biomass; Cellulases; Xylanases; Fermentation; Saccharification.

Valorization of Wheat Husk in the development of composites

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ABSTRACT

In several developing nations, cereals and their derivatives make up the majority of the diet particulary in the maghreb countries, in Algeria, cereal product play a strategic role in Food system and in national economy,the cereal processing industry also occupies a major place in the agri-food industry sector, due to its significant cruching capacity. Wheat husk is the by-product of wheat grain processing , it is currently little valued, exept in animal feed. It is a source of lignocellulosic fibers for the manufacture of agro-materials such as particle board, paper and more recently, the production of thermoplastic composites. The aim of this work is to contribute to the valorisation of agri-food waste and renewable resources by using wheat husk (WH) in the elaboration of composite materials based on polyvinyl chloride (PVC) as a matrix. In order to improve the compatibility between the hydrophilic surface of the fiber and the hydrophobic polymer, the fiber has been chemically modified with acetic anhydride. The treated and untreated wheat husk and the composites devloped were caracterized by thermogravimetric Analysis (ATG/DTG) and X-ray diffraction analysis (XRD), the physical characterization by the water absorption test. The results of thermogravometric of wheat husk fiber show better thermal stability after treatment. The water absorption rate of composites incrises with immersion time;However, chimecal modification reduces the absorption rate.

Keywords: Valorization; By-product; Composite; Acetylation; Polymer.

Valorization of Olive Mill Wastewater for Lipase Production by HSA6- DZ46 Bacterial Strain Isolated from an Algerian Hot Spring

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ABSTRACT

Lipases are a unique group of biocatalysts that catalyse the hydrolysis of triglycerides to fatty acids and glycerol through a phenomenon known as “interfacial activation”. Hot springs play a significant role in the isolation of lipase-producing bacteria that are of industrial interest. Agro-industrial residues are increasing annually, leading to significant environmental and economic challenges. The valorization of these materials as substates in culture media for enzymatic production represents a significant biotechnological approach within the

framework of green chemistry. The present study demonstrates the use of Olive Mill Wastewater as an alternative culture medium for lipase production. A new strain of Stutzerimonas sp. (HSA6- DZ46), with lipolytic properties has been isolated from an Algerian hot spring. First, lipase production under submerged fermentation was evaluated using an organic synthetic medium containing: Glucose (7.5 g/L), Peptone (7.5 g/L), $MgSO_4$ $7H_2O$ (0.5 g/L), NaCl (3 g/L) and 2% of olive oil (v/v) as an inducer at a pH of 7 ± 0.2. After 72 hours of cultivation at 37°C, a lipolytic activity of 4.5 U/ml was observed using the titrimetric method. Subsequently, low-cost medium formulated with 15% (v/v) Olive Mill Wastewater (OMW) was used to evaluate its potential for lipase production. The highest lipase production yield observed was 3 U/ml. This finding not only demonstrates its environmental impact, but also highlights its biotechnological potential for industrial applications like detergent and cosmetic sectors.

Keywords: Hot spring; Stutzerimonas; Lipase; Olive mill wastewater.

Betanin and Indicaxanthin Valorization: A Sustainable Route from Food Waste to Functional Coatings for Enhanced Probiotic Performance

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ABSTRACT

This study explores the valorization of Beta vulgaris and Opuntia ficus-indica residues as sustainable sources of bioactive pigments, betacyanins (Btc) and betaxanthins (Btx), respectively, for enhancing the properties of lactic acid bacteria. Using the COSMO-SAC thermodynamic model to select a suitable green solvent, the extracted betalains were applied as surface coatings to *Lactobacillus bulgaricus* (L.b) and *Lactococcus lactis* (L.lac). The functionalized bacteria were then assessed for antioxidant capacity, viability, and application in a yogurt matrix. The results showed a significant enhancement in antioxidant activity, as evaluated by DPPH and ABTS assays. Uncoated control bacteria exhibited a low radical scavenging ability of only 10 – 20%, whereas strains coated with Btc from beetroot achieved a high of approximately 85% scavenging activity. Btc-based coatings consistently outperformed Btx-based ones, displaying IC50 values that were approximately three times lower for L.b strains. Viability assessments demonstrated that the coatings supported and protected bacterial growth. When incorporated into yogurt formulations at concentrations up to a 3-fold increase (1–2×109 CFU/mL), the Btc-coated bacteria retained their enhanced functionality, boosting the yogurt's radical scavenging activity from a baseline of ~45% to ~63% while also imparting a desirable red color. These findings highlight a promising, sustainable strategy using agro-industrial residues to develop functional dairy products with improved probiotic stability, enhanced antioxidant potential, and appealing sensory characteristics.

Keywords: Betanin; Betaxanthin; Agro-waste; Redox state; Lactic bacteria.

Study of the hydrothermal ageing of polypropylene-based composites filled with olive

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ABSTRACT

Algeria is acknowledged as one of the foremost olive oil-producing countries. Consequently, substantial quantities of olive husk are discharged into the environment, resulting in considerable damage. The scientific community has demonstrated significant interest in the valorization of olive husk, particularly for its application as reinforcement in the development of composite materials. This method yields a material that is strong, lightweight, non-abrasive, structured, and cost-effective. However, despite these numerous advantages, natural fillers present a notable limitation when combined with thermoplastics, especially polyolefins. Their hydrophilic nature may restrict the use of such composites in outdoor environments where moisture absorption is a critical concern. This study investigates the hydrothermal ageing behavior of polypropylene (PP) composites reinforced with olive husk flour (OHF). Results demonstrate a progressive decrease in Young's modulus with immersion time, alongside an increase in elongation at break, particularly in high filler content composites without compatibilizers. These changes are attributed to interfacial water diffusion, which induces a plasticizing effect and enhances ductility. Thermal analysis further reveals that hydrothermal ageing lowers the onset temperature of decomposition due to void formation at OHF-PP interfaces during desorption, thereby increasing the susceptibility of natural fillers to thermal degradation.

Keywords: Olive husk flour; Composites; Hydrothermal ageing; Polypropylene.

Preparing a yogurt based on date powder

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ABSTRACT

The present study aimed to valorize processed food products based on date, notably by using date powder of low commercial value for the preparation of steamed yogurt. Methods : In this work, we employed the powder from a variety of dates known as "*Mech Degla*" as an ingredient in the production of steamed yogurt. Four types of yogurts were studied, each prepared with different percentages of date powder: 0%, 8%, 10%, and 12%. Results: The results of physicochemical and microbiological analyses of the four yogurts demonstrated their perfect compliance with standards. Organoleptic analyses and tasting tests, conducted with naive tasters, show excellent acceptability of the yogurts. The sensory analysis tests for the different yogurts reveal a marked preference for the yogurt containing 10% date powder, due to its organoleptic qualities. Conclusion: The addition of "*Mech Degla*"

date powder to steamed yogurt not only enhances its nutritional characteristics but also its sensory acceptability, which could contribute to a better valorization of this food product.

Keywords: Date powder; Yogurt; Sensory analysis tests.

IV. Trends and Challenges in the Agri-Food Industry

Combined Processes Plasma/Photocatalysis for Air and Water Treatment

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ABSTRACT

Air and water pollution is a crucial problem for the environment and for the health of individuals. The effluents (air and water) released by different activities such as industry and agriculture need to be treated to protect the environment and people. Efficient and inexpensive treatment processes are essential to solve this issue. Among the promising processes, plasma and photocatalysis treatments can be used to reduce water and air pollution. The combination of the two processes is an interesting way to increase the efficiency of the treatment. Some VOCs degradation results by DBD plasma, photocatalysis and combined plasma/photocatalysis process in animal manure and in food processing rooms (cheese factory, delicatessen) will be presented. For the gaseous effluents, it is noted that the combination of processes greatly improves the treatment performance due in particular to a synergy effect. This synergy effect leads to a higher yield than the elimination (more than 10% compared to the sum of the two processes) and a reduction in the formation of by-products. The influence of operating parameters on the synergy effect will be presented. Similarly, the elimination of microorganisms present in the indoor air has proven to be very efficient. Refractory microorganisms were drastically reduced by the plasma. In water treatment, photocatalysis can be an innovative and effective solution. The development of active materials under visible radiation is an interesting challenge to be able to directly use sunlight. Doped materials were prepared and proved effective in removing organic molecules using sunlight.

Keywords: Effluent remediation ; Microbial elimination ; Industrial emissions ; VOC degradation ; Environmental pollution.

Heterogeneous Photocatalysis for the Sustainable Treatment of Agro-Industrial Wastewater: Current Challenges and Future Prospects

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ABSTRACT

Agro-industrial operations produce vast quantities of wastewater containing a high level of pollutants, including substantial amounts of organic matter, nutrients and hard-to-treat compounds, which pose a significant threat to the environment. Traditional treatment techniques often fail to achieve the complete breakdown of pollutants in a cost-effective manner. This review explores the use of heterogeneous photocatalysis, an advanced oxidation method, for eco-friendly agro-industrial effluent management. This work analyzes the fundamental principles of the photocatalytic process and evaluates the performance of various parameters that affect the catalytic properties of the material used. This work explores recent advances aimed at improving photocatalytic efficiency, such as modifying catalysts to be activated by visible light and optimising reactors. Finally, we provide a forward-looking analysis of the future prospects for this technology, focusing on the key pathways to commercialisation: developing scalable, cost-effective systems, and integrating photocatalytic processes into a circular economy framework for recovering valuable resources. Our analysis concludes that, with strategic solutions to current challenges, heterogeneous photocatalysis has great potential as a sustainable and effective technology for water purification in the agro-industry.

Keywords: Effluent management; Reactor optimization; Circular economy; Water purification.

Emerging Technologies in Food Packaging: Active Films and Coatings for Quality, Safety and Sustainability

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ABSTRACT

Food packaging is undergoing a profound transformation, evolving from a passive barrier into an active and sustainable system that contributes to food quality, safety, sustainability, and shelf-life extension. Among the most promising strategies are biopolymer-based edible coatings and biodegradable films enriched with active components that can act as antioxidants, antimicrobials, or oxygen scavengers. A distinctive feature of recent research is that these active agents can be obtained through the valorization of agri-food by-products, thereby combining functionality with circular economy principles. Edible coatings based on sodium caseinate and polysaccharide blends have been successfully optimized with natural antioxidants and antimicrobials such as propyl gallate or essential oils, significantly reducing respiration, transpiration, and microbial growth in minimally processed vegetables. Similarly, alginates and chitosan matrices enriched with coffee oil extracted from spent coffee grounds have demonstrated tailored release kinetics and enhanced antioxidant activity. In addition, protein–polysaccharide blends functionalized with fennel or coffee by-products exhibited both antimicrobial and antioxidant functions, confirming the potential of food waste-derived compounds. At the level of biodegradable films, polyhydroxybutyrate-

valerate (PHBV) has been engineered with activated gallic acid, providing dual radical and oxygen scavenging capacity, validated by predictive modeling. Polylactic acid (PLA) films enriched with natural extracts, as well as PLA and polypropylene matrices containing orange peel extract, demonstrated strong antioxidant activity and compliance with safety regulations, with the PP case serving as a benchmark for the transition from fossil-based to biobased solutions. Overall, these studies demonstrate that the integration of bio-based polymers with active compounds derived from agri-food waste represents a powerful approach to achieve multifunctional packaging that is at once sustainable, effective, and circular. Future directions will focus on scaling up production, evaluating industrial applicability, and addressing regulatory challenges, which are essential steps to enable the adoption of these technologies in real food systems.

Keywords: Active packaging; Biopolymer coatings; Sustainable films; Agri-food by-product valorization; Shelf life.

Impact of HP Crystallization on White Sugar Quality

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ABSTRACT

Background: The stage of high-product (HP) crystallization is the most decisive moment in sugar refining, a direct significant factor for the final quality of white refined sugar. **Aims:** The study intended to check and quantify the influence of High-Pressure (HP) crystallization on main quality parameters (color, moisture, granulometry, purity) of white refined sugar during its production. **Methods:** The main quality parameters of the different stages of concentration, crystallization, and drying were monitored daily. Changes were observed and significance indicated by *p*-values. To figure out variations in liquor clarity, cooked masses, color, and purity t-tests and LSD were used together with other statistical analyses. **Results:** The high-pressure crystallization made the liquor much clearer and also reduced the color to a great extent. Average liquor clarity values were 99.20 ± 0.13% (LS1), 98.45 ± 0.29% (LS2), and 95.23 ± 1.36% (LS3) as compared to 99.00 ± 0.18% (MC1), 97.74 ± 0.73% (MC2), and 96.62 ± 0.34% for the cooked masses. *T*-tests confirmed these differences were significant ($p < 0.05$). The quality of the last white sugar was very good, its average color being 38.6 ± 3.26 IU (≤ 45 IU), moisture 0.033 ± 0.018% (< 0.04%), and crystals of the sugar being homogeneous (mean opening: 0.604 ± 0.045 mm; CV: 30.9 ± 1.53%). It was established that variations in seeding, concentration time, and impurities were the main causes of changes that were kept at a minimum due to controlled evaporation and seeding. **Conclusion:** The quality of white sugar of international standards is basically sustained through the effective control of the HP crystallization process.

Keywords: Refining; Crystallization; Purity; Sugar; Quality.

Chia and Carrot Juice Fortified Yogurt: Physicochemical, Microbiological and Sensory Properties

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ABSTRACT

Background: Carrot juice constitutes an excellent source of β-carotene, polyphenols, and vitamins, making it a valuable functional ingredient for improving the nutritional and sensory properties of dairy products such as yogurt. Its incorporation could enhance antioxidant potential and consumer acceptability. **Aims**: The objective of thise study was to formulate a functional yogurt enriched with carrot juice and Chia seeds, and to evaluate the effect of adding carrot juice at two levels (10% and 15%) on the microbiological, physicochemical, antioxidant, and sensory characteristics of the final product. **Methods:** Raw milk and carrot juice were characterized by standard microbiological and physicochemical analyses, including pH, titratable acidity, dry matter, and carbohydrate content. The effect of juice addition on fermentation was assessed through acidification kinetics and gel stability, measured by syneresis rate. Functional properties were evaluated using total polyphenol content (Folin–Ciocalteu method) and antioxidant activity (DPPH assay). A sensory evaluation was performed to determine consumer preference using descriptive and hedonic tests. **Results**: The raw materials met quality standards. The incorporation of carrot juice stimulated the activity of lactic acid bacteria, particularly Lactobacillus bulgaricus, improved yogurt stability during 15 days of storage by reducing syneresis, and enhanced total polyphenol content with marked antioxidant activity (IC_{50} = 50 μg/mL). The yogurt enriched with 15% carrot juice exhibited the best sensory attributes—color, texture, and flavor—and was the most preferred by the tasting panel. **Conclusion:** The enrichment of yogurt with pasteurized carrot juice effectively improves its microbiological stability, antioxidant capacity, and sensory quality, making it a promising functional dairy product for health-oriented consumers.

Keywords: Functional yogurt, Carrot juice, Antioxidant activity, Polyphenols, Sensory quality, Fermentation.

Incorporation of Atlas Cedar Extract into the Soybean Oil: Assessment of the Oil's Quality after Frying

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ABSTRACT

Background: Soybean oil is among the most valuable vegetable oils. In addition to being a useful nutritional supplement, the high levels of polyunsaturated fatty acids make it more susceptible to lipid oxidation resulting in breakdown products with undesirable flavors. **Aims:** In the current study, chemical composition, acute toxicity, antioxidant and antimicrobial properties of Cedrus atlantica stem extract were assessed; as well as its effects after incorporation into the soybean oil. **Methods:** In fact, ferric reducing antioxidant power (FRAP) and free radical scavenging tests (DPPH and ABTS) were performed to evaluate the

antioxidant capacity. The antimicrobial activity was assessed on seven bacterial and two fungal strains. The effect of the incorporation of the extract into the soybean oil during repeated frying was evaluated by the measurement of the color intensity, refraction index, polar substances, acidity and peroxide index. Furthermore, the extract's acute toxicity assessment was established in accordance with the OECD Guidelines for Testing of Chemicals. **Results:** The total phenolic content was about 383.57 ± 4.12 mEq GA/g of extract with flavonoid and tannin contents of 5.87 ± 0.44 mEq Q/g of extract and 148.83 ± 3.88 mEq C/g of extract, respectively. The extract had the best effect on *Candida albicans* (CMI>3.9 mg/mL) and a CMI>7.81 mg/mL for *Staphylococcus* sp. The addition of the extract to the soybean oil improves its quality. The polar substances were lowered from 12.5% to 5% after ten fryings. The acute toxicity study showed that the stem extract is either not toxic or slightly toxic. **Conclusion:** Thereby, the *Cedrus atlantica* stem extract showed interesting antioxidant and antimicrobial activities along with a potential application for enhancing the soybean oil quality.

Keywords: *Cedrus atlantica*; Chemical composition; Antioxidant; Antimicrobial; Soybean oil.

Limitation of Antioxidant Migration in Polypropylene Food Contact Films Using Clay Nanofillers

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ABSTRACT

Background: The role of plastic food packaging is to protect, preserve and transport the packaged food. Generally, this packaging is no more than a film made up of a polymer matrix and additives. As a result, these additives tend to migrate into the food they come into contact with. This migration raises regulatory issues and potential health risks. Nanofillers offer a potential strategy for limiting this migration while preserving the material's performance. **Aims:** The aim of this study was to assess the effectiveness of incorporating nanofillers in reducing antioxidant migration in polypropylene (PP) films intended for food contact. **Methods:** In this study, polypropylene (PP) nanocomposite films were prepared by extrusion with 1% Cloisite 15A and 1% of the antioxidant "Irganox 1076". Quantification of antioxidant migration was performed by FTIR method, after exposure of the samples to a food simulant "ethanol (95%)", under accelerated aging conditions at 40°C, 60°C and 80°C for ten days. The study was carried out in accordance with European Union Directive 10/2011. **Results:** The results revealed that the incorporation of 1% nanofiller decreased the diffusion coefficient by 25% compared to virgin PP, and increased the half-migration time ($t1/2$) by 44%, indicating that the introduction of Cloisite 15A into the polymer matrix slows down the migration of Irganox 1076. This reduction may be explained by the barrier nature of the clay sheets dispersed in PP, which create a more tortuous path for migrating molecules. **Conclusion:** The reduction of the antioxidant migration rate in polypropylene films using a nanofillers is a clear pathway for the industry to meet stringent regulatory standards and develop next-generation, high-performance films. We are confident that this clay-nanofiller strategy will play a vital role in enabling the safe use of plastics in food contact.

Keywords: Polypropylene; Food-packaging; Migration; Antioxidant; Safety.

Development of Active Biodegradable Packaging Based on Polylactic Acid (PLA) and Orange Peel Extract

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ABSTRACT

Background: The use of active agents derived from agro-industrial waste has attracted considerable interest in recent years. Orange peel (OP) is one such waste product and represents a significant proportion of this waste. Composed of 80% water, they are particularly rich in bioactive compounds, such as carbohydrates, vitamins and various essential phytochemicals such as pectin, flavonoids, terpenoids, glycosides, carotenoids, vitamin C and soluble fibre. This makes them a valuable biological resource to be exploited. **Aims:** It is with this in mind that this work aims to valorise orange peel waste as a bioactive filler in a biodegradable polymer matrix, in this case polylactic acid (PLA), for food packaging applications. **Methods:** Ethanolic extraction of orange peel waste yielded an extract rich in bioactive substances, with high levels of phenolic compounds, flavonoids and condensed tannins. Packaging films enriched with 10, 20 and 30% of the EO obtained were characterised. **Results:** The results revealed that FTIR analysis confirmed the structure of the orange peel extract and the PLA matrix, as well as an increase in hydrogen bond interactions between the filler and the matrix. Furthermore, the tensile test revealed a decrease in tensile strength due to interfacial incompatibility, but an increase in elongation at break depending on the filler content, indicating plasticisation that induces a decrease in stiffness. The hydrophilicity of the films also increased with the loading rate, as confirmed by analyses of the contact angle of the films, which decreased from 75.6° to 62.8°, and water absorption, which increased from 1.41% to 35.46% for formulations F0 and F30, respectively. **Conclusion:** This research demonstrates that orange peel waste can be used as a multifunctional filler for active packaging, and that the PLA/OPE films developed offer a dual advantage in terms of the environment and preservation.

Keywords: Polylactic acid (PLA); Orange peel waste; Food packaging; Mechanical properties; FTIR analysis.

Redesigning Snack Traditions: A Nutrient-Enrichment Approach to Consumer-Friendly Alternatives

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ABSTRACT

Background: The Algerian chips market is largely dominated by industrial potato-based products that are high in saturated fats, salt, and additives, contributing to public health concerns such as obesity, hypertension, and cardiovascular disease. **Aims:** This study aimed to develop healthier chips by partially replacing potato flour with olive and cheese flours, and to evaluate their sensory properties. **Methods**: Potato, olive, and cheese flours were prepared using convective-air drying followed by milling. Chips were cooked without oil using an air fryer to reduce fat absorption compared to traditional frying. A constrained centroid mixture design with fifteen formulations was used to optimize flour proportions. Samples were coded and evaluated blindly by an expert sensory panel, who rated taste, texture, aroma, color, and overall acceptability on a nine-point hedonic scale. **Results:** The addition of olive and cheese flours significantly enhanced sensory scores. Overall acceptability improved as the proportion of potato flour decreased. The optimal formulation—40% potato, 21% olive, and 39% cheese flour—achieved the best balance of flavor, crispness, and consumer appeal. **Conclusion:** Blends of potato, olive, and cheese flours offer a promising approach to creating nutrient-enriched, healthier chips. These findings may inform the development of similar snack products. Further studies should assess nutritional composition, shelf-life, and consumer acceptance across diverse populations to support scale-up and commercialization.

Keywords: Chips; Potato Flour; Olive Flour; Cheese Flour; Mixture Design.

Apple Fruit Quality Classification Using Deep Neural Networks

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ABSTRACT

Background : Ensuring fruit quality is a major challenge in the agri-food sector, especially for apples, which experience high post-harvest losses due to microbial spoilage and improper handling. Traditional visual inspection methods are subjective, time-consuming, and inefficient for large-scale sorting, which highlights the need for automated, accurate, and real-time quality assessment systems. **Aims :** This study aims to develop and evaluate an artificial intelligence-based system for automatically classifying healthy and spoiled apples using deep learning techniques. The objective is to provide a fast and reliable approach that can be implemented in industrial sorting processes. **Methods** A balanced dataset of RGB images of healthy and rotten apples was used. The images were preprocessed through resizing, normalization, and data augmentation to enhance model robustness. A transfer-learning-based approach was adopted using the ResNet18 architecture, fine-tuned to classify apples into two categories. 80% of the dataset was used for training, and 20% was used for testing. Model performance was evaluated using accuracy, confusion matrix, precision, recall, F1-score, and ROC-AUC analysis. **Results** The proposed model achieved a testing accuracy of 95.24%, demonstrating strong classification performance. The confusion matrix showed 120 correct predictions for each class and only 6 misclassifications, while precision, recall, and F1-score exceeded 0.93 for both categories. The ROC curve exhibited an AUC close to one (1), confirming excellent discriminative ability. **Conclusion** The deep learning-based ResNet18 model proved highly effective for automated apple quality assessment, offering a reliable and non-destructive alternative to manual inspection. This approach has strong potential for integration into real-time industrial fruit-sorting systems, reducing post-harvest losses and enhancing supply-chain quality control.

Keywords: Apple quality; Deep learning; ResNet18; Food inspection; Computer vision; Post-harvest technology.

Study of the Physicochemical Properties of Food Packaging in Interaction with its Content

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ABSTRACT

Background: The interaction between packaging and food products can lead to changes in the properties of both components, particularly under severe conditions such as temperature, mechanical stress, etc. In this context, it is crucial to study their behavior under real or accelerated conditions in order to optimize their performance and ensure consumer safety. **Aims:** Study the effect of certain parameters, such as temperature and agitation process, on the variation of the physicochemical properties of food packaging "polyethylene terephthalate (PET)", in interaction with its content "edible sunflower oil". **Methods:** PET samples cut into rectangular shapes are immersed in a defined amount of sunflower oil for 11 days under three conditions: 20°C, 40°C, and 40°C with stirring. The evaluation of the physical appearance, quality and chemical structure of PET specimens and sunflower oil is carried out by measuring their physicochemical characteristics and by spectral analyses. **Results:** Weighing the PET samples before and after immersion revealed low rates of variation, while the results of the oil analysis showed an increase in peroxide, acid, and viscosity index values after 11 days of contact. These effects are accentuated at 40°C with agitation. The rate of change of mass reached 1.5%, the peroxide indice was 12 meq O2/kg oil, the acid indice was 0.16 mg KOH/g oil, the viscosity reached 67.5 mPa.s, and the rate of thermal shrinkage was approximately 29.88% along the length and 32.43% in the transverse direction. Infrared analysis revealed chemical changes in the PET structure, and UV-Visible spectra highlighted the formation of oxidized compounds in the oil. **Conclusion:** This study revealed that PET, although effective for packaging sunflower oil, can interact with its content under aggressive or accelerated conditions (combined effect of temperature and agitation) leading to changes in their physicochemical properties.

Keywords: Plastic packaging; Sunflower oil; Immersion; Food safety.

Lead Removal from Contaminated Water Using Biochar: CFD simulation

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ABSTRACT

Abstract. Lead (Pb) is a toxic contaminant present in water, the effective removal of which is crucial for human and environmental health. Among the remediation techniques, adsorption has emerged as a simple and effective method for removing heavy metals from aqueous solutions. Biochar, a carbon obtained by pyrolysis of biomass, appears to be a promising candidate. It is inexpensive (up to six times cheaper than CA) and can often be used without additional activation. Many plant wastes (shells, kernels, agricultural residues) serve as precursors to produce biochar, offering an ecological recovery of these biomasses. The adsorption phenomenon numerical simulation of lead by apricot kernel biochar is essential given its potential for recovery in the remediation of contaminated waters. For this purpose, ANSYS Fluent simulation software is used to model and simulate the adsorption phenomenon. A reactor equipped with a central stirrer and wings attached to the walls is used. Solving momentum equations allows for visualizing velocity fields and calculating lead adsorption rates, sedimentation rates and concentrations. Extending CFD models is a promising area for accelerating the rational design of biochar-based adsorption processes. Combining laboratory experiments and CFD simulations is gradually establishing itself as a powerful approach for designing efficient, economical, and environmentally friendly water treatment solutions using biochar derived from local biomass to address pollution from heavy metals such as lead.

Keywords: Biochar; CFD; Simulation; Water treatment.

Application of Food-Grade Surfactants for the Separation of Biological Compounds

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ABSTRACT

Background: The isolation of phenolic compounds from natural matrices is an active area of research due to their antioxidant, antimicrobial, and health-promoting properties. Conventional extraction and purification techniques are often time-consuming, energy-intensive, and rely heavily on organic solvents, raising environmental and safety concerns. **Aims:** This study aimed to evaluatce the use of Colloidal Gas Aphrons (CGAs), generated from food-grade surfactants, as a green, selective, and sustainable method for the separation of phenolic compounds. **Methods:** CGAs were prepared using Tween 20 (10 mM) and tested on three model phenolic acids: gallic, chlorogenic, and caffeic acids. Recovery efficiency and separation factors were determined for each compound. The optimized system was then applied to a natural matrix (Mentha spicata) extract previously obtained by microwave-assisted extraction. The phenolic and flavonoid contents, as well as antioxidant activities of the aphron phase, were analyzed using standard spectrophotometric methods. **Results:** The CGA-based process achieved the highest recovery for caffeic acid (80%, FS = 2.83), followed by gallic acid (69%, FS = 2.11) and chlorogenic acid (55%, FS = 1.25). When applied to Mentha spicata, the aphron phase was enriched in polyphenols (49.08 mg GAE/g dry weight) and flavonoids (13.13 mg rutin equivalent/g), while maintaining strong antioxidant activity, as confirmed by DPPH scavenging (49%) and phosphomolybdate assay (Abs = 0.44). **Conclusion:** The results demonstrate that CGA-based separation using food-grade surfactants is an efficient and environmentally friendly approach for concentrating phenolic compounds while preserving their functional properties. This green technique offers promising perspectives for application in the food, pharmaceutical, and cosmetic industries.

Keywords: Colloidal Gas Aphrons; Phenolic compounds; Green extraction; Tween 20; *Mentha spicata*.

Stability of Saffron and its Use as Source for the Development of High Added-Value Ffood Products with New Techno-Functional Properties

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ABSTRACT

In order to support the rising of saffron cultivation, production and consumption in Algeria, our studies were focused on the stability of saffron extract and the formulation of innovative food products with new techno-functional properties. Being well known as the red gold, our motives were to challenge its expensiveness by using it as ingredient since it is used mainly under its row form (saffron stigmas). Our research was conducted within the international project SAFFROMFOOD funded by PRIMA Foundation, which the main objective was the valorization of saffron and its floral by-products as sustainable innovative sources for the development of high added-value food products across the Mediterranean region. The study of saffron extract stability was carried out first by optimizing the aqueous extraction of the main bioactive compound (crocin) from saffron by maceration, microwave-assisted extraction (MAE) and ultrasound-assisted extraction (UAE), then by modeling the kinetics of crocin degradation during storage at different pH and temperature. The effect of preservatives addition was also studied. Regarding the formulation of saffron-enriched food products, we have tested tow type of food: yogurt as a dairy product and pasta as cereal product. Our findings indicate that MAE and UAE, particularly at higher energy levels, yielded the most efficient extraction, and whatever the method of extraction, the results showed that all the parameters: temperature, extraction time, solid-to-solvent ratio, and microwave power (microwave) have a significant effect on crocin extraction and degradation. Regarding the enriched food, the formulated yogurt and past have gained new techno-functional properties and enhanced their organoleptic characteristics.

Keywords: Saffron; Crocin; Extraction; Degradation; Enriched-food.

Persistent *Staphylococcus aureus* Biofilms on Stainless Steel: Implications for Sanitary Control in the Food Industry

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ABSTRACT
Bacterial biofilms are a persistent source of contamination in the food industry, especially on stainless steel surfaces widely used for their hygienic and structural properties. *Staphylococcus aureus*, a common foodborne pathogen, is capable of forming resilient biofilms that significantly reduce the effectiveness of conventional cleaning and disinfection protocols. This resistance presents a serious challenge to food safety management systems. In this study, we evaluated the efficacy of benzalkonium chloride, a quaternary ammonium compound commonly used in the food industry, against mature *S. aureus* biofilms formed on AISI stainless steel. Biofilms were developed over five days, with the growth medium renewed every 48 hours. These biofilms were subsequently treated with a 5% (w/v) benzalkonium chloride solution for 30 minutes. The biocidal effect was assessed using viable cell counting (CFU) and scanning electron microscopy (SEM) to evaluate both bacterial survival and biofilm structure. Results revealed a significant decrease in cultivable *S. aureus* cells following treatment. However, SEM imaging demonstrated the persistence of biofilm architecture on the treated surfaces, suggesting that the disinfectant was unable to fully disrupt the biofilm matrix. These findings underline the limitations of standard disinfectants in eradicating mature S. aureus biofilms and highlight the need for biofilm-specific sanitation approaches. Strengthening regulatory monitoring systems with protocols targeting biofilm resilience is essential to ensuring microbiological safety in food processing environments.

Keywords: Biofilm; *Staphylococcus aureus*; Biocide; Persistence; Food safety.

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Plant-Based Cheese Development: Coagulation Process Optimization and Sensory Evaluation

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ABSTRACT
Plant-based alternatives to dairy products are gaining increasing attention in response to global sustainability concerns and the need to shift towards more sustainable diets. However, consumption remains heavily reliant on traditional dairy products, making the introduction of plant-based substitute especially cheese, a dual challenge and opportunity. Nutritional concerns focus on the quality of plant-derived proteins and their capacity to meet dietary requirements, while sensory challenges relate to consumer expectations in terms of flavor, texture, and visual appeal. This study aime to optimize the production process of plant-based cheeses using various plant-based milk formulations and natural coagulants, with the objective of achieving products that are comparable to conventional dairy cheeses both nutritionally and sensorially. Different milk bases, including almond, soy, and oat, were tested in combination with selected coagulants under various processing conditions. The optimization of coagulation parameters resulted in satisfactory yields and favorable physicochemical properties, particularly in terms of protein content. Sensory evaluation revealed differences among the products, with almond-based cheeses receiving the highest acceptance scores from panelists. These findings demonstrate the feasibility of producing plant-based cheese alternatives that align with local dietary habits and preferences, while emphasizing the need for continued research to further enhance their nutritional profiles and consumer appeal.

Keywords: Plant-based milk; Cheese; Coagulation; Optimization; Sensory evaluation.