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Physico-chemical and sensory characterization of camel milk yogurt enriched with persimmon (*Diospyros kaki*) fruit

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Abstract: *Although camel milk is widely recognized for its nutritional value and pharmaceutical benefits, processing technology and consumer acceptability of its yogurt still need to be improved due to poor curd formation, taste, and flavor. Persimmon is a fruit known for its sweet and tangy flavor and is popular in many parts of the world. In this study, gelatin was used to manufacture camel milk yogurt to obtain an adequate level of firmness. Afterward, to enhance sensory characteristics and consumer acceptance of camel milk yogurt, persimmon pulp was added as a natural additive at different levels (3%, 5%, and 10%). Subsequently, the camel milk yogurt enriched with *Diospyros kaki* L. fruit was chemically analyzed and assessed for viscosity and sensory perception. 1% gelatin and 1.2% starter culture containing *Lactobacillus delbrueckii* subsp. *Bulgaricus* and *Streptococcus thermophilus* demonstrated the ability to form a good gel, reduce fermentation time to 6 hours, and improve consistency. Furthermore, adding persimmon pulp significantly enhanced the sensory characteristics of camel milk yogurt. Finally, the 5% level of persimmon pulp was the most preferred by consumers. These findings open up promising opportunities for enhancing camel milk yogurt's quality and market appeal, making it a more desirable and nutritious choice for consumers.*

Keywords: Camel milk; Yogurt; Enrichment; Persimmon pulp; Consumer's acceptance.

Innovative approaches for improving the quality and safety of Moroccan traditional goat dairy products

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Abstract: *Goat farming in Morocco is an essential sector that has had a big impact on socioeconomic growth and essential to sustainable development in rural areas. The population of goats increased globally between 2010 and 2018, rising from 918.189.481 to 1.045.915.764 (13.91% or an average of 1.73% per year), whereas in Morocco, it increased to 5.731.000, according to the Food and Agriculture Organization of the United Nations (FAOSTAT), 2021. Between 2010 and 2018, the total amount of goat milk produced climbed to 18.712.088 metric tons, or an average of 1.64 percent per year, from 16.249.163 metric tons. (Food and Agriculture Organization of the United Nations (FAOSTAT), 2021). In contrast, Morocco produced about 44.618 metric tons of milk in 2018, based on the same source (FAOSTAT), 2021) and as per the 2023 figures provided by the Minister of Agriculture, Morocco has a substantial herd of over 31 million animals, out of which 6.1 million are goats.*

One of the main purposes of goat farming in Morocco is the production of goat milk and its fermented products especially the traditional one as Jben (a fresh cheese) and due to a preference for goat cheese and increased consumption of fresh cheeses, the Moroccan cheese market expanded by 7.6% in 2018 (Corvaisier, 2020), Rayeb (a coagulated fermented milk), Zebda beldiya (a raw fresh butter), Smen (a fermented butter), and lben (traditional fermented milk) which is still mostly consumed locally and have significant impact on the diet of rural populations and are gradually being promoted across the nation informally, with high risk of deterioration and inadequate processing which might result in decreased food safety.

This review's objectives are to give a general overview of Moroccan traditional goat dairy products and to highlight innovative methods for raising their quality, increasing shelf life and safety.

The production of Moroccan goat dairy products is a vibrant and expanding sector but to ensure consumer protection, the health authority must mandate the creation of sanitary standards, a careful analysis of the microbiology, and instruction of producers and consumers regarding the importance of goat dairy products safety which can be produced in line with the laws controlling food safety while preserving the originality of the traditional products.

Traditional goat dairy products are typically consumed fresh, preservation is their biggest drawback. Numerous research recommended using different preservative components or processing to create novel products with high nutritional value, and longer shelf lives. More studies are still to improve the quality and standardize products to appeal to a larger market.

Traditional goat dairy products have a long history of use and are considered heritage foods. It is seen vital to safeguard the culinary legacy by applying novel approaches which can help that the traditional fermented goat dairy products would be more protected and valued not only at national level but also on the international market as a result.

Keywords: *Traditional goat dairy products, Food safety, quality, innovative approaches.*

Draft

Assessing the tenderness threshold of beef by instrumental and Consumer sensory evaluation. Cachena meat tenderness

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Abstract: *When consumers purchase beef meat, they primarily consider appearance, color, and presumed tenderness as the most crucial factor. However, when tasting after preparation for eating, tenderness becomes the most important attribute. Consumers are willing to pay a higher price for beef as long it is guaranteed tender. The definition of a tenderness threshold can be used as a precise quality control system to guarantee tender meat and ensure consumer acceptability. A threshold can be described as a position on the scale of sensory stimuli at which a transition occurs in a series of sensations or judgments.*

The primary objective of this study is to establish a tenderness threshold for beef through the relationship between instrumental and sensory consumer evaluations. This threshold will initially be established using commercially sourced meat from butchers. Subsequently, the study will investigate whether Cachena meat from young and adult animals can be considered tender. Cachena is a cattle breed part of the Portuguese genetic heritage, particularly valuable in the south Alentejo, a poor agricultural region of Portugal, due to the high rusticity of these animals. Cachena animals are small, and their meat is known for its exceptional characteristics of texture and flavor.

To achieve the first objective stated, about 250 consumers were asked to assess which tenderness category was most appropriate for each one of four beef samples of commercial origin, considering an affective acceptance test through a 5-category hedonic scale (Very Hard, Hard, Ideal Tenderness, Tender, and Very Tender). The same beef samples were evaluated through Warner-Bratzler shear force (WBSF) and texture profile analysis (TPA) to define their instrumental tenderness.

Most consumers considered tenderloin (96.4%), sirloin (54.7%), and knuckle (52.0%) to be tender ("ideal tenderness", "tender" or "very tender"). However, there are differences between these three beef cuts, with the tenderloin being recognized as the most valued and tender. On the other hand, most consumers considered the silverside beef to be hard or very hard (59.6%). According to the

model developed, a meat cut is tender when the WBSF is less than 39.60 N and, at simultaneously, the TPA hardness is less than 31.89 N. Both parameters are used to establish a tenderness selection index for beef samples. Furthermore, this study found an association between WBSF values and consumer tenderness scores ($R^2 = 0.64$). So, the results obtained allowed us to conclude that a correct threshold definition must always consider both instrumental evaluation methods, WBSF and TPA. Each instrumental test provides distinct information: the WBSF test evaluates the meat fibers perpendicularly, as do incisor teeth, while TPA mimics chewing with molar teeth. Therefore, it's essential to consider both instrumental tests when aiming to correlate the measured tenderness of beef with its sensory evaluation. After this clarification it is possible to achieve the second objective initially proposed, to evaluate Cachena meat tenderness. We can state that Cachena meat cuts, no matter if it's a young animal or an adult, were always tender, because all values obtained were consistently below the mentioned threshold values.

Keywords: *Tenderness, Texture profile analysis, Warner-Bratzler Shear Force, Consumer preferences, Sensory evaluation.*

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DRY

Exploring the microbial diversity of kombucha

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Abstract: *Kombucha is a unique fermented beverage made from a blend of brewed tea, typically black or green, sugar, and a Symbiotic Culture of Bacteria and Yeast (SCOBY). This concoction undergoes a fermentation process, during which the SCOBY consumes the sugar and transforms the tea into a tangy, slightly effervescent, and lightly carbonated beverage. The result is a drink with a complex tangy, slightly effervescent, and lightly carbonated beverage. The origins of kombucha are shrouded in mystery and folklore. Although its exact birthplace remains uncertain, it is widely believed to have originated in East Asia, possibly in China or Japan, over 2,000 years ago. Over time, it spread to various parts of the world, including Russia, Europe, and eventually the United States. Its enduring popularity and mystique have led to a rich tapestry of legends and stories surrounding its discovery and consumption throughout history. Recently, it has also gained popularity in Morocco and is locally produced for example in Marrakech.*

One of the most compelling aspects of kombucha is its potential health benefits. Due to its fermentation process, kombucha is teeming with probiotics, beneficial live bacteria that can support gut health and digestion. It also contains various vitamins, minerals, and antioxidants, which may contribute to overall well-being. Additionally, some enthusiasts claim that kombucha can aid in detoxification, boost the immune system, and provide an energy lift without the disadvantages associated with caffeinated beverages.

To investigate the microbial diversity of a Portuguese brand of Kombucha, we conducted a metagenomics analysis of the SCOBY, the starter culture, and the final product. The hypervariable V3V4a region of the 16S rRNA gene was used for bacterial metagenomics, while the rRNA ITS1b intergenic region was used for yeasts metagenomics.

*The most abundant bacterial species in the SCOBY was *Komagataeibacter xylinus*, while *Lactobacillus nagelii* was predominant in the starter and in some final products. Strains from the *Bacillus coagulans* group dominated in other final products. Regarding yeasts, *Saccharomyces cerevisiae* was predominant in both the starter and the SCOBY.*

As kombucha continues to gain popularity nowadays, researchers are exploring its potential health advantages and uncovering the strains and mechanisms behind its beneficial effects.

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Keywords: *fermented beverages, health benefits, probiotics, SCOBY, metagenomics*

Assessing the Prevalence of Foodborne Pathogens in Cooked Food Samples in Morocco

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Abstract: Foodborne pathogens affect around 600 million people annually, leading to considerable socioeconomic and public health challenges particularly in developing nations due to inadequate hygiene and sanitation, these zoonotic pathogens, like *Salmonella* and *Staphylococcus aureus*, often cause outbreaks of foodborne diseases. In this study, we aim to determine the prevalence of *Salmonella Spp.* and *Staphylococcus aureus* in cooked food samples to identify potential sources of contamination. This research has implications for public health, food safety, and policymaking.

Samples were collected from 12 different neighborhoods in Fes, including 88% local and 12% continental foods sourced from various restaurants and food vendors. A total of 147 samples were collected. These samples underwent pre-enrichment, enrichment, culturing, incubation and identification through phenotypic and biochemical tests according to ISO standards. (ISO 6888-1:2021 for *Staphylococcus aureus* and ISO 6579-1:2017/Amd1:2020 for *Salmonella*).

In this study, we observed *Salmonella Spp.* in 2 (1.4%) and *Staphylococcus aureus* in 21 (14.3%) of samples, with dairy products showing a higher prevalence of *Staphylococcus aureus*. In a study conducted in China to evaluate the presence of foodborne pathogens in food samples, *Salmonella Spp.* and *Staphylococcus aureus* were found in 3.46% and 7% respectively. Another study revealed the presence of *Salmonella Spp.* and *Staphylococcus aureus* in Ready-to-eat food at 26% and 0.07% respectively.

This findings emphasize the need for improved food safety measures, particularly in dairy products in Morocco with significant implications for public health policies and food safety regulations. To address these concerns, future actions could involve enhancing food handling practices and implementing stricter guidelines.

Keywords: foodborne pathogen, food safety, *Salmonella spp.*, *Staphylococcus aureus*, public health

Contribution to the evaluation of chemical quality of some Moroccan herbs and spices

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Abstract: *Herbs and spices are prevalent ingredients in cooking, adding aroma, flavor and visual appeal to food. Also known as nature's pharmacy, these plants have been used as traditional medicines in various cultures across generations.*

These spices and herbs are susceptible to microbial contamination during harvest and processing, since they may not be prepared under the proper conditions to ensure their quality and sold without any treatment to reduce contamination. In addition, spices and herbs may be in contact with dust and insects during storage or transport under poor hygienic conditions. But also during the exhibition for sale if they are not well packaged with materials that preserve their quality. Spices could also be subject to fraud.

Based on adequate sampling, we conducted:

- A participatory survey among herbalists in Rabat, Témara and Casablanca to assess the quality of the herbs and spices sold;*
- An evaluation of the physicochemical characteristics of these spices and herbs, in order to see whether they meet current national and international standards.*

Keywords: herbs, spices, quality, traditional herbalists, Morocco.

Opuntia ficus-indica fruits: Storage and Nutritional value

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Abstract: *The Prickly pear cactus, Opuntia ficus-indica (L.) Mill, is a cactus that is frequently found in semi-arid climates. This plant presents high adaptability to elevated temperatures and high drought tolerance. The concern about climate alterations today has increased the interest in this crop due to its characteristics. However, the prickly pear fruits present a non-climacteric behavior and high perishability, so it is essential to search for methods to increase their shelf-life. The University of Évora has carried out preliminary studies regarding the valorization of this crop in the Alentejo region, south of Portugal, using two regional varieties commonly known as “orange” and “red” varieties. The nutritional composition of the fruits of the two varieties produced in the region was analyzed. These analyses allow us to conclude that the regional varieties of fruits have high levels of calcium, magnesium, and potassium, which gives these fruits an interesting food value. The fruits also have smaller concentrations of other minerals such as phosphorus, copper, iron, and zinc. Furthermore, a trial was done with the objective of establishing practical conditions to store the prickly pear and to clarify what was the best storage temperature, since the literature suggested very different storage conditions extend the fruit's shelf life. In this trial, only the “red” variety was used, the fruits were packed in biodegradable bags, divided in two groups, and one group was stored at a temperature of 2 °C, and the other group was stored at a temperature of 5 °C. The trial was carried out for 40 days, and quality analyses were done every 10 days (weight loss, texture, color, SST, antioxidant capacity, total polyphenol, and visual evaluation). The results allowed the conclusion that it's possible to store prickly pear fruits for 30 days with good quality, and the storage at 2 °C presented better results, less weight loss, and less fungi contamination than those stored at 5 °C.*

Keywords: Post-harvest, Storage, Minerals, Shelf-life, Prickly Pear

Virgin olive oil life cycle water and carbon footprints analysis: A comparative and driver analysis of different agro-technological pathways in northern Morocco.

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Abstract: *The current study embarks on a comprehensive assessment of the carbon and water footprints, adopting a cradle-to-grave approach, in one of Morocco's key regions for virgin olive oil production: the Meknès El Hajeb zone. To achieve this, a total of 45 integrated olive farms (farms that include olive orchards and an olive oil mill) were selected to represent the diverse spectrum of virgin olive farms operating in both the Meknès El Hajeb region and throughout Morocco. Among these farms, some exclusively cultivate organic olive orchards relying on rainfed olive tree cultivation, while others adopt conventional practices: super-intensive, intensive, or extensive irrigated olive growing systems. Virgin olive oil extraction is carried out using one of three extraction systems: traditional press, two-phase, or three-phase centrifugation. Field surveys were conducted with these farms, where, at each one of them, a predefined questionnaire, validated by virgin olive oil production professional experts, was completed by the farm owner or the responsible farm manager. Subsequently, a Life Cycle Analysis "from cradle to grave" was performed, and the carbon and water footprints were calculated using the "Carbon Balance" tool proposed by the International Olive Council and "Hoekstra" methodology. The agricultural phase is the primary contributor to both greenhouse gas emissions, accounting for 89.59%, and water consumption, representing 99.9%. The organic olive growing systems emerged as the most environmentally friendly system in terms of both greenhouse gas emissions and water use. It produced 1.31 kg of CO₂ equivalent and consumed 3.67 m³ of water per kg of virgin olive oil, in contrast to the conventional system, which resulted in 2.10 kg of CO₂ equivalent and a water consumption of 6.41 m³ per kg of virgin olive oil. Regarding the conventional approach, the super-intensive system seems to be a sustainable and cost-effective olive growing system, emitting only 1.7 kg of CO₂ equivalent while requiring 4.3 m³ of water per kg of virgin olive oil. This efficiency is attributed to the high productivity of such olive orchards, which compensates for both CO₂ emissions and water consumption. In the virgin olive oil extraction phase, the two-phase system demonstrated to be the least carbon-emitting technology, with just 0.45 kg of CO₂ equivalent per kg of olive oil, and the least water requiring, utilizing only 0.74 liters of water for every kg of virgin olive oil produced. Overall, the comparative application of both environmental indicators (water and carbon footprints) provides useful insights into the environment-related impacts of different virgin olive oil production systems and processes in the Meknès El Hajeb region and support a comprehensive assessment of the best management practices aimed at improving environmental sustainability while ensuring higher virgin olive oil quality.*

Keywords: Virgin olive oil, life cycle assessment, carbon footprint, water footprint, environmental sustainability.

Chemical composition and antioxidant activity of three spices of *Cupressus* from Moroccan Middle Atlas

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Abstract: *Plant essential oils and aromas are a real potential for the industry to substitute the synthetic compounds that might have harmful effects on the human health and the environment. In order to contribute to the green chemistry principles, this study focuses on Chemical composition and antioxidant activity of three spices of Cupressus from Moroccan Middle Atlas.*

During this study, we first focused on the chemical characterization of the essential oils from the aerial parts of three species of the Cupressus genus: Cupressus atlantica, Cupressus arizonica, and Cupressus sempervirens. Samples from the cones of the three species provided the highest yield of essential oil compared to that from the leaves. The essences isolated by hydrodistillation from the aerial parts of the three Cupressus species were analyzed by GPC and GC-MS. The chemical profiles show that the majority compound common to the different species and parts of the plant studied of Cupressus is the α -pinene except for the essential oil of the leaves of Cupressus arizonica, the latter is characterized by the presence of another majority compound which is the Cis-muurola-4-(14),5-diene. In a second step, The study of antioxidant power through DPPH radical scavenging and ferrous ion reducing antioxidant power tests demonstrated a potent antioxidant activity of essential oils. essential oil from the cones of Cupressus arizonica presents the best antioxidant power with IC₅₀ of the order of 0.098 mg/ml, followed by the two oils essential elements of Cupressus atlantica with IC₅₀s of the order of 1.33 mg/ml and 1.37 mg/ml, while the essential oils of the twigs and cones of Cupressus sempervirens are endowed with moderate antioxidant power with IC₅₀ of the order of 10.09 mg/ml for cones and 12.64 for the branches. Regarding iron reduction, essential oils of Cupressus arizonica still remain the most capable of reducing this ion with EC₅₀ of 0.410mg/ml for the cones and 0.996mg/ml for the branches, but the other two species remain less active. These results show that the essential oil of the cones of Cupressus arizonica and those of twigs and cones of Cupressus atlantica could be used as a source potential natural antioxidant with possible applications in systems food.

Keywords: Antioxidant activity, Cupressus, Essential oil, aerial parts

Ultrasound-assisted extraction of pumpkin seeds protein and their use developing edible films: physicochemical and functional characterization.

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Abstract: *Currently, pumpkin seeds are attracting increasing attention as a promising alternative source of well-balanced and nutritious proteins. Nevertheless, the choice of extraction method can have a substantial impact on the physicochemical properties and functional attributes of the derived protein extracts. This, in turn, can affect their suitability for use in the development of health-promoting food formulations and functional edible films. This research explores the impact of ultrasound power and treatment duration on the yield and recovery of proteins from defatted Moroccan pumpkin seed samples and their potential use in the development of functional edible films. The results showed that, when operating under optimal conditions, which included a power level of 185 W, a treatment time of 25 minutes, and a solvent-to-solid ratio of 1/10, ultrasound-assisted extraction achieved a significantly higher extraction rate of 49.98% compared to the traditional alkali extraction method, which yielded 40.12%. The recovered protein isolates were then analyzed for various physical properties, particularly water absorption capacity and fat absorption capacity, with values of (233 ± 0.02%, 146 ± 0.06%) and (388 ± 0.02, 199 ± 0.03%), respectively. Subsequently, the protein isolate obtained through ultrasound-assisted extraction was utilized to develop an agar edible film. The protein and agar were blended in a ratio of 0.65:0.85, and the film was cast using standard techniques. The film's color and thickness properties were then evaluated, falling within an acceptable range.*

Keywords: Pumpkin seeds, ultrasound-assisted extraction, alkali extraction, protein isolate, edible film.

Characterization of antimicrobial compounds obtained from the potential probiotic *Lactiplantibacillus plantarum* S61 and their application as a biopreservative agent

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Abstract: *This work aimed to characterize the antimicrobial compounds obtained from the potential probiotic *Lactiplantibacillus plantarum* S61, isolated from traditional fermented green olive, involved in their activity against fungi and bacteria responsible for food spoilage and poisonings. Their application as a biopreservative agent was also investigated. The culture of *L. plantarum* S61 showed substantial antifungal and antibacterial activity against yeasts, molds and pathogenic bacteria with inhibition zones > 10 mm. Likewise, the cell free supernatant (CFS) of *L. plantarum* S61 showed an essential inhibitory effect against fungi and bacteria, with inhibition diameters of 12.25–22.05 mm and 16.95–17.25 mm, respectively. The CFS inhibited molds' biomass and mycelium growth, with inhibition ranges of 63.18–83.64% and 22.57–38.93%, respectively. The antifungal activity of the CFS was stable during 4 weeks of storage at 25 °C, while it gradually decreased during storage at 4 °C. Several antimicrobial compounds were evidenced in the CFS of *L. plantarum* S61, including organic acids, ethanol, hydrogen peroxide, diacetyl, proteins, and fatty acids. The protein fraction, purified by reversed-phase high-performance liquid chromatography (RP-HPLC), demonstrated important antifungal activity, in relation to the fraction with molecular weight between 2 and 6 kDa. *L. plantarum* S61 and its CFS, tested in apple and orange fruit biopreservation, demonstrated their protective effect against *P. digitatum* spoilage. The CFS exhibited effectiveness in reducing *Salmonella enterica* subsp. *enterica* in apple juice. *L. plantarum* S61 and/or its bioactive compounds CFS represent a promising strategy for biocontrol against pathogens and spoilage microorganisms in the agro-industry.*

Keywords: *Antifungal, Antibacterial, *Lactiplantibacillus*; Biopreservation.*

Prevalence of *Salmonella* spp. isolated from meat marketed in the Rabat, Salé and Kénitra

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Abstract: *Salmonella* is the main cause of serious food-borne illness. This is essentially due to the virulence of these micro-organisms and the level of acquired antibiotic resistance.

The aim of our study is to determine the prevalence of *Salmonella* in broiler meat sold in the Rabat, Salé and Kénitra region between January 2022 and March 2023 and the level of antibiotic resistance. To do this, we analysed 200 samples taken from various sales outlets. Two types of methods were used to identify the isolated strains: conventional methods and real-time molecular biology PCR. Sensitivity tests against 12 antibiotics were carried out for antibiotic resistance using the agar diffusion method.

The prevalence of *Salmonella* was 12% (22/200); the predominant serotypes were Kentucky, salmonella group II, hadar and enteritidis. 50% of *Salmonella* isolates were resistant to more than one antibiotic. This study provides baseline data on the prevalence of *Salmonella* and antimicrobial resistance in retail broilers in this region. *Salmonella* contaminates broiler meat during production, processing, storage or preparation. Food safety measures, such as proper handling, adequate cooking and hygiene, are essential to prevent *Salmonella* infections and the need to implement effective control measures to reduce *Salmonella* contamination.

Keywords: *Salmonella*, real-time PCR, antibiotic resistance, collective food poisoning

Soxhlet methanolic extraction of secondary metabolites from almond waste: phytochemical characterization and antioxidant activity

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Abstract: *Recently, there has been increasing interest in using lignocellulosic waste as a feasible feedstock. This approach is gaining popularity due to its abundance, renewability and biodegradability. By reducing pollution, it not only minimizes ecological impact, but also creates new opportunities for sustainable economic development in various sectors. Almond waste, known for its richness in natural polymers such as cellulose, hemicellulose and lignin, in addition to secondary metabolites called extractives, could be a valuable source of raw materials in various fields. However, these extractibles, mainly phenolic in nature, are rarely characterized and used as a valuable source of secondary metabolites. They have great potential as antioxidants and corrosion inhibitors in new industrial applications. Secondary metabolites biodegradable in nature are easily extractable by simple and inexpensive procedures. The present study focuses on phytochemical screening to highlight phenolic classes and their content of polyphenols, tannins and flavonoids. In addition, the evaluation of antioxidant activities of the extract of the fleshy husk noted AH and the almond shell noted AS is studied by the 2,2-diphenyl 1-picrylhydrazyl (DPPH) method, as well as by the FRAP iron reduction method. The results obtained indicate a significant phytochemical composition and antioxidant activity of the AH extract compared to that of AS.*

Keywords: Almond waste; Phytochemistry; Antioxidant activity; Agro-industry wastes

Metabolomics in phenylketonuria: a systematic review

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Abstract:

INTRODUCTION

Phenylketonuria (PKU) is a rare inborn error of metabolism (IEM) resulting in a deficiency of the PAH enzyme. Consequently, phenylalanine (Phe) concentrations accumulate in blood and achieves toxic levels in the brain generating neurocognitive impairments. A Phe-restricted diet is key to support a correct metabolic control. Metabolomics could aid to improve diagnostic efficacy and offer a better view of the relationship between metabolites and health status.

OBJECTIVE

The aim of this systematic review is to compile the altered metabolites in PKU patients compared to general population identified by metabolomic techniques, and to determine which metabolites are found to be up- and downregulated.

MATERIAL AND METHODS

Literature containing studies examining urine, plasma and blood metabolites published up to May 2023 were analyzed from Pubmed, Scopus and Web of Science databases. MetaboAnalyst 5.0 was used to elaborate Enrichment- and Pathway Analysis from the KEGG pathway library. Pathways affected were considered significant if the False Discovery Rate (FDR) < 0.05.

RESULTS

Twelve studies met the inclusion criteria with sample sizes higher than 5 participants and the inclusion of a control population. Metabolites were identified through different metabolomic techniques (i.e. LC-MS, GC-MS, NMR). Phe, and Phe-related metabolites (phenyllactic acid, phenylacetic acid, phenylpyruvic acid) were upregulated in PKU participants while carnitines seem to be downregulated probably due to a low nutritional carnitine intake or reduced endogenous synthesis. In addition, fatty acid profile in PKU patients may also be altered, for instance, docosahexanoic acid (DHA) has been reported to be both up- and downregulated, which could have

been caused by the presence/absence of dietary supplementation as a Phe-restricted diet provides a low polyunsaturated acid (PUFA) intake, or by metabolic disturbances in PKU. Differences across biosamples were evident as urine metabolites are more related to Phe metabolism (i.e., phenylpyruvic acid, phenylacetylglutamine, hydroxyphenylacetic acid) while studies analyzing plasma and blood reported more metabolites (e.g., carnitines, cholines, and amino acids). Pathway analysis with Metaboanalyst 5.0 showed that metabolism alteration was not restricted to Phe metabolism pathway only, as several amino acids pathways were also affected (i.e., Arginine biosynthesis; Alanine, aspartate and glutamate metabolism and Aminoacyl-tRNA biosynthesis).

CONCLUSIONS

Metabolic differences were observed between PKU patients and controls. Phe and its derivatives were consistently elevated in PKU patients but alterations observed in other metabolites such as amino acids, carnitines and cholines, showed that energy metabolism and oxidative stress were also affected in PKU. Also, diet adherence may differentiate PKU phenotype according to plasma and urinary metabolites.

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Keywords: *Phenylketonuria; Systematic analysis; metabolomics; inborn errors of metabolism; biomarkers.*

Metabolomics and phenylketonuria: urinary metabolome study in pediatric patients with hyperphenylalanemia and phenylketonuria

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Abstract

INTRODUCTION

Phenylketonuria (PKU) is one of the most common inborn errors of metabolism, and dietary control plays a crucial role in managing these patients. Inadequate metabolic control has been observed to result in neurocognitive impairments. High-resolution metabolomics is a useful approach for evaluating metabolic changes associated with the confluence of complex exposures. This study aimed to compare the urinary metabolome of different phenotypes of phenylketonuria, compared with an age-matched control cohort.

MATERIAL AND METHODS

Within the framework of the PKU.CAT consortium, 82 children (43% males and 57% females) were recruited for the pediatric cohort in the Hospital Sant Joan de Deu, including: 21 children with PKU, 21 children with PKU and tetrahydrobiopterin therapy (PKU-BH4), 20 children with hyperphenylalaninemia (HPA) and 20 children in the control group. The metabolic urinary metabolomic profile of these subjects was analyzed through untargeted metabolomic analysis using a LC-Q-Tof mass spectrometer (Agilent).

RESULTS

Preliminary analyzes revealed that individuals with PKU exhibited the most significant differences in metabolic profiles compared to the control group. Furthermore, approximately half of the PKU-BH4-treated subjects manifested a metabolic profile similar to those with PKU, whereas the remaining half of the PKU-BH4 subjects showed a better metabolic control, resembling the profiles observed among children in the control and HPA groups.

CONCLUSIONS

Untargeted metabolomics is opening new avenues for in-depth analysis of the metabolic profile in patients with different phenotypes of phenylketonuria. Concurrently, it highlights the potential for the identification of novel therapeutic targets and a better treatment monitoring of individual PKU patients.

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Keywords: *Phenylketonuria; Non-targeted Metabolomics; Urinary metabolome; Children.*

DRY

L'impact du changement climatique sur la sécurité alimentaire : Défis et opportunités pour l'agriculture durable

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Resumé: *Le changement climatique est l'un des défis les plus pressants de notre époque, L'un des domaines les plus sensibles à ces changements est la sécurité alimentaire, une préoccupation mondiale majeure. Au cours des dernières décennies, la planète a été témoin d'une augmentation de la fréquence des phénomènes météorologiques extrêmes. Selon le Centre de recherche sur l'épidémiologie des catastrophes (CRED) rapporte que le nombre annuel moyen de ces événements a plus que doublé, passant d'environ 200 dans les années 1980 à près de 400 dans les années 2010. Ces transformations climatiques ont un impact direct sur l'agriculture, la sécurité sanitaires des aliments et la disponibilité des ressources alimentaires. L'Organisation mondiale de la santé (OMS) souligne que La variabilité accrue des conditions météorologiques, y compris les sécheresses prolongées, les inondations dévastatrices et les tempêtes violentes peuvent contaminer les sources d'eau potable, augmentant ainsi le risque de maladies d'origine hydrique et affectant la sécurité sanitaire des aliments. Les agriculteurs sont confrontés à des défis sans précédent pour protéger leurs cultures contre ces phénomènes imprévisibles, ce qui entraîne une insécurité alimentaire accrue. les écosystèmes naturels qui soutiennent la biodiversité, la pollinisation et la qualité des sols sont perturbés, ce qui a un impact indirect sur la production alimentaire. Dans ce Context, il ne s'agit pas seulement de défis, le changement climatique offre également des opportunités pour repenser notre approche de l'agriculture. L'adoption de pratiques agricoles durables, l'utilisation de technologies de pointe et l'innovation dans la production alimentaire sont autant de moyens de renforcer la résilience de l'agriculture face au changement climatique. Le Global Report on Food Crises souligne que les phénomènes météorologiques extrêmes exacerbent les crises alimentaires, soulignant la nécessité de renforcer la résilience des systèmes alimentaires face à ces événements. Dans cette communication, nous explorerons en détail les défis actuels que le changement climatique pose à la sécurité alimentaire et les opportunités pour l'agriculture durable de jouer un rôle clé dans la garantie d'une alimentation suffisante et saine pour une population mondiale croissante.*

Mots clés: Sécurité alimentaire, changement climatique, agriculture durable, adaptation, innovation, résilience.

Food control and monitoring in Morocco: who does what?

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Abstract: In Morocco, although the consumer situation has improved thanks to the efforts made by the various civilian and military bodies to apply the legislation in force, it is still characterized by different types of fraud. It is therefore important to exercise the utmost vigilance throughout the production- processing-distribution chain. Previously, food control often focused on the examination of finished products and the inspection of food processing facilities. However, in recent decades, there has been a growing awareness of the importance of an integrated, multi-disciplinary approach, which takes into account the entire food chain (and in some cases goes beyond what is traditionally considered as this chain). In particular, this new approach recognizes the need for better control of both the composition and safety of animal feed. The aim of this work is to explain the main components of the national food control system, and how these components can and should be managed for maximum efficiency. Emphasis is placed on the importance of government, industry and consumers working together to meet national objectives in terms of enhanced consumer protection and economic progress through trade in safe, quality food. In addition, this research looks at the different missions of the elements of the national food control system, as well as the limits of this system, and proposes some recommendations.

Keywords: control, food, national system

Striking the impact of olive growing system and varietal origin on Moroccan virgin olive oil features by the shape analysis of its quality, sensory and bioactive profiles.

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Abstract: *For centuries, traditional olive orchards have played a crucial role in Moroccan landscapes and production systems. However, their low productivity and limited economic value have led to a shift towards two alternative systems: high-density and super high-density orchards. The adoption of these new planting systems requires thorough examination, especially concerning their impact on the quality and composition of virgin olive oil (VOO). This study aimed to investigate the influence of three olive planting systems on the quality, sensory profile, and phenolic composition of monovarietal VOO samples produced from four cultivars: 'Arbequina' and 'Koroneiki' planted under the super high-density system (1250 trees/ha); 'Arbosana' cultivated under an intensive system (666 trees/ha); and 'Picholine Marocaine' grown in a traditional orchard (100 trees/ha). The results demonstrate that all the analyzed samples meet the criteria for the extra-virgin olive oil category in terms of both physicochemical properties and sensory attributes. This underscores the possibility of producing high-quality virgin oils through appropriate agro-technological practices, regardless of the olive variety or planting system employed. In particular, sensory evaluation reveals significant distinctions among the analyzed oils based on their respective varieties. Oils derived from the 'Koroneiki' variety are notable for their elevated and well-balanced fruity notes, with discernible undertones of herbs and fresh fruits. Samples originating from the 'Picholine Marocaine' variety also exhibit an intense fruity character, albeit slightly less pronounced than those from 'Koroneiki'. Conversely, oils from the 'Arbosana' variety display a more moderate fruity profile, while those from 'Arbequina' show a lower level of fruitiness. Turning to the nutritional profile, samples from 'Picholine Marocaine' stand out for their high concentration of monounsaturated fatty acids, with oleic acid being the predominant component (averaging 76.23%). They are followed by oils from the Koroneiki, Arbosana, and Arbequina varieties. In terms of tocopherols, oils from 'Koroneiki' and 'Arbequina' varieties boast elevated levels of these compounds (285.23 and 276.15 mg/kg of VOO, respectively), whereas oils from 'Arbosana' exhibit the lowest values. The phytosterol content follows a similar pattern, with β -sitosterol being the primary compound. Focusing on the phenolic fraction, the studied samples exhibit a complex phenolic profile rich in 20 phenolic compounds from various phenolic families. Despite their similarity in overall phenolic profile as determined by LC-MS profiling, significant differences were observed in the quantitative phenolic composition of the analyzed oils. The 'Koroneiki' samples exhibited the highest mean total phenolic content (562.03 mg/kg), followed by 'Arbosana' (524.53 mg/kg) and 'Picholine Marocaine' (467.44 mg/kg). In contrast, the 'Arbequina' samples recorded the lowest mean total phenolic content with an average of 449.66 mg/kg of oil. Secoiridoids were the predominant phenolic compound class across all analyzed samples, with ligstroside aglycon and decarboxymethyl ligstroside aglycon contributing significantly to the total secoiridoid content in all studied samples.*

Keywords: Olive growing system, olive variety, Virgin olive oil, quality, nutritional profile.

Exploring the Potential of Olive Oil By-products valorization in Northern Morocco: A Step Forward with Accurate Estimation and Physicochemical Characterization of Biomass Generated by the Meknès Virgin Olive Oil Industry

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Abstract: *The growing global demand for virgin olive oil has led to significant environmental challenges, especially in the Mediterranean region, which stands as the principal virgin olive oil producer worldwide. Various countries within this zone grapple with issues stemming from the generation of environmentally harmful by-products during the virgin olive oil extraction process. Nevertheless, despite their environmental impact and substantial costs of their disposal, virgin olive oil by-products hold substantial potential for valorization across diverse sectors, encompassing both food and non-food industries. In this sense, compelling evidence from successful valorization endeavors in various Mediterranean countries underscores that an efficient valorization strategy of these by products should hinges on accurate assessments of their annual availability (quantitative estimation) and a thorough understanding of their physico-chemical characteristics and chemical composition. This study, centered in the Meknès region of Morocco (the main virgin olive oil producing zone in this country), aimed to estimate the quantities of olive pomace and olive mill wastewater generated by the industrial olive oil extraction sector in this region and evaluate the physicochemical characteristics of these by-products. The investigation revealed the presence of 62 olive oil mills in the region, with an average crushing capacity of approximately 187,832.01 tons of olives and the potential to reach a maximum of 309,000.80 tons annually. As a result, these mills can potentially produce 144,666.60 tons of olive pomace, 29,114.86 m³ of olive mill wastewater, and 15,965.72 tons of olive stones on an annual basis. The physico-chemical analysis of olive mill wastewater and olive pomace encompassed the examination of 353 samples collected from these mills. Olive pomace exhibited acidic pH levels, low electrical conductivity, and high organic matter content. It also contained high levels of potassium and significant amounts of sugars and total polyphenols. On the other hand, the analyzed olive mill wastewater displayed acidic pH levels, high salinity, a substantial presence of non-biodegradable organic matter, sugars, total polyphenols, and phosphorus content. It had significant dry matter content, organic matter, and mineral matter. These findings indicate that olive mill wastewater and olive pomace generated by the olive oil sector in the Meknes region pose a significant environmental challenge due to their high pollutant load. However, they also represent a valuable opportunity, given their substantial quantities, specific physico-chemical properties, and richness in certain valuable compounds.*

Keywords: Virgin olive oil by-products, physico-chemical characteristics, bioactive compounds, valorization.

Étude des leviers et freins nutritionnels et diététique à la diminution de la consommation de viande au Maroc

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Résumé: *La baisse de la consommation de viande est une tendance actuelle et de fortes perspectives d'avenir, mais ses modalités alimentaires et ses défis nutritionnels sont encore peu documentés en utilisant l'optimisation du régime alimentaire sous de nombreuses contraintes. L'objectif de cette étude est de mettre en lumière les problèmes nutritionnels et les solutions alimentaires pendant la réduction de la viande. Notre étude va être fournie sur une analyse claire et complète de l'importance de la viande dans les diètes durables. Nous pensons que c'est une contribution importante à un grand problème nutritionnel. Nous allons définir une transition séquentielle de la diminution de la viande et analyser les enjeux nutritionnels et les leviers alimentaires.*

Mots clés: *Régime alimentaire, diminution de la viande, leviers alimentaires, enjeux nutritionnels l'importance de la viande.*

DR' O

Nutritional Determinants and Risk Assessment of Hypercholesterolemia in Kénitra

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Abstract: *Cardiovascular diseases (CVDs) represent a significant public health challenge, being the primary cause of death globally, accounting for 17.7 million deaths attributed to CVD, constituting "31% of total global mortality." Among these fatalities, 7.4 million result from coronary heart disease, and 6.7 million are attributed to stroke (WHO, 2017).*

In Morocco, 38% of deaths in 2016 were attributed to CVD, meaning that approximately four out of every ten deaths were CVD-related (WHO, 2016). Changes in the population's diet are expected to have significant implications for the prevalence and severity of CVD. This is particularly noteworthy because cardiovascular risks, such as hypercholesterolemia, overweight, obesity, etc., are closely connected to dietary habits.

The primary objective of this study, conducted in March and April 2022, is to evaluate cardiovascular risk and hypercholesterolemia in Kénitra, with a focus on nutritional determinants. Data were gathered through a four-part questionnaire, encompassing a socio-demographic and economic section, a segment on dietary habits, a third section addressing organic food, and a final section dedicated to food waste.

The collected data were input into Excel, and after filtration and coding, we transferred them to the SPSS software. A total of 170 subjects participated in the study, with a higher representation of women (69.4%) compared to men (30.6%). The mean age of our population was 24.7 ± 9.5 years, and 95% of participants had attained a higher educational level. Of the participants, 20% were classified as overweight, and 14% as obese (either type 1, 2, or 3 obesity). The percentage of body fat was high in 49% of women and 40% of men, while the percentage of visceral fat was elevated across the entire population. Hypercholesterolemia affected 4% of the population, 14% had low HDL levels, and 2% exhibited hypertriglyceridemia.

Through the chi-square test, we identified a significant relationship between milk consumption and hypertriglyceridemia ($p = 0.00$). Another significant relationship was observed between red meat consumption and HDL value ($p = 0.048$), as well as between processed meat consumption and the ratio (C-Total/HDL) ($p = 0.032$).

Effective communication stands out as the paramount method for controlling and preventing health problems by advocating for adherence to hygienic and dietary guidelines. A balanced diet, in particular, remains one of the most potent remedies against cardiovascular diseases.

Keywords: *Cardiovascular disease; Stroke; Hypercholesterolemia ; Nutrition*

Epidemiological Study of Nosocomial Infections and nutritional status of patients in the Kenitra Traumatology Department During the Period of Covid-19.

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Summary: *The objective of this study is to determine the epidemiological profile of nosocomial infections in the CHP Kenitra Traumatology Service in Morocco and the role of nutrition. The study focused on patients admitted between 2020 and 2021. A questionnaire established for the study of the state of knowledge. Results:* The results show a prevalence of 9.09% out of 550 patients, including 47 episodes bacterial infections; several infectious sites have been identified those related to the pulmonary system and the urinary system and surgical site.

Undernourished patients had more chances of acquiring NI. The most common bacteria are Escherichia coli and Pseudomonas aerogenosa with incidences of 19% and 12% respectively. Regarding the state of knowledge, most of the respondents have no idea about IN and are not even informed of this infection.

Nosocomial infections in the department dominated by bacteremia and are mainly due to Gram-negative bacilli. Despite the efforts undertaken, the authorities called upon to establish a firm and effective control system.

Key words: nosocomial infections- prevalence-nutrition - bacteremia- covid19

Hyperactivité et Alimentation: À La Recherche D'un Équilibre

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Résumé

Introduction : Les facteurs alimentaires ont une influence profonde sur la manifestation de l'hyperactivité, en particulier chez les enfants atteints du trouble déficitaire de l'attention avec hyperactivité (TDAH), mettant ainsi en évidence le rôle crucial de la nutrition dans l'amélioration de cette maladie. Par conséquent, il devient impératif d'élucider quelques aspects critiques à prendre en compte lors de l'examen de l'impact du régime alimentaire sur le TDAH.

Objectif : Le but de notre travail consiste à mettre au point les facteurs de risque du TDAH chez des enfants âgés de 6 ans à 12 ans dans la région de kénitra.

Outil de travail : Pour en avoir, nous avons eu recours au Diagnostic and Statistical Manual of Mental Disorder fourth edition (DSM-IV, 1994.) déjà validé.

Résultats: Les premiers résultats montrent que certains enfants qui mangent trop d'aliments contenant des additifs alimentaires en particulier les colorants artificiels et les conservateurs, ont montré des degrés important d'hyperactivité. Éviter ces additifs peut aider à réduire les symptômes du TDAH. De même un autre résultat montre que les enfants ayant un régime équilibré, en particulier méditerranéen, surtout riche en fruits, légumes, grains entiers, protéines maigres et graisses saines, peut contribuer à stabiliser l'énergie et à maintenir la concentration.

Conclusion : Il est extrêmement important de reconnaître que le fait de se concentrer uniquement sur les mesures diététiques ne suffit pas à traiter efficacement le trouble déficitaire de l'attention avec hyperactivité (TDAH). La prise en charge du TDAH nécessite généralement une stratégie holistique englobant divers éléments tels que les interventions médicales, les thérapies comportementales et les modifications du mode de vie.

Mots clés : TDAH – nutrition – facteurs de risques – additif alimentaire - Kénitra

Out of Home Eating (OHE) patterns of the population of Kenitra, Morocco

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Abstract: Morocco is presently experiencing swift shifts in dietary patterns and lifestyles, primarily driven by the forces of globalization and urbanization. As a result, this study aims to delineate and investigate the phenomenon of Out of Home Eating (OHE) within the Kenitra population, employing a validated survey methodology. The survey consisted of a combination of closed and open-ended questions related to many topics (socio-demographic characteristics, types and frequency of consumed foods, frequencies of OHE and main outlets/suppliers). The selection of participants was conducted in a randomized manner across diverse locations, including streets, parks, supermarkets, and universities, spanning from May 10th to September 11th, 2022. The survey encompassed a total of 442 households, featuring participants aged 18 years and above, with a gender distribution of 51% women and 49% men. To ensure survey clarity and alignment with the study's goals, a pre-test with a sample of 20 respondents was conducted. This study revealed that approximately 91.3% of the studied population engages in OHE with varying frequencies. Coffee shops and restaurants are the most frequented places, with 70% of the surveyed population preferring them. Fast-food restaurants come next, at 19.9%, followed by canteens and workplace dining areas, accounting for 6.9% of choices. The findings suggest that OHE is a prevalent practice in Kenitra, indicative of shifting dietary and lifestyle patterns. Public health efforts could benefit from focusing on OHE to promote healthier choices and behaviours within this context.

Keywords: OHE; Kenitra province; survey; food consumption; dietary pattern.

Carence en riboflavine dans l'alimentation de la population marocaine et son impact sur l'apparition du kératocône

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Résumé : *Le kératocône, une pathologie de la cornée, affecte principalement les jeunes et présente une prévalence élevée au Maroc. La riboflavine, un nutriment essentiel pour la santé de la cornée, pourrait jouer un rôle crucial dans cette dynamique.*

Dans le but d'explorer cette relation, une étude transversale a été menée, impliquant 100 jeunes marocains âgés de 15 à 30 ans atteints de kératocône évolutif. La méthodologie a combiné la collecte de données alimentaires par questionnaire et la mesure du taux de riboflavine dans le sang.

Les résultats préliminaires révèlent que les patients atteints de kératocône affichent un taux de riboflavine significativement inférieur par rapport aux sujets sains, et que la carence en riboflavine semble être associée à un risque accru de développer un kératocône.

Ces conclusions suggèrent que la carence en riboflavine pourrait constituer un facteur de risque du kératocône. Toutefois, il est impératif de mener des recherches plus approfondies pour confirmer ces résultats. Envisager une augmentation de l'apport en riboflavine pourrait potentiellement servir de stratégie préventive contre le kératocône, une recommandation cruciale pour les jeunes marocains, qui devraient être sensibilisés à l'importance d'une alimentation équilibrée, riche en fruits et légumes. La cornée, principalement constituée de fibres de collagène, est un tissu transparent qui recouvre l'œil. La riboflavine joue un rôle essentiel dans la synthèse du collagène. Des études antérieures ont déjà mis en évidence que la carence en riboflavine peut fragiliser la cornée, augmentant potentiellement le risque de développer un kératocône.

Le kératocône étant fréquent au Maroc, en particulier chez les jeunes, cette recherche apporte un éclairage précieux. Elle souligne l'importance de poursuivre des études plus approfondies pour confirmer ces résultats préliminaires et évaluer si l'augmentation de l'apport en riboflavine pourrait être une stratégie préventive du kératocône dans ce pays.

Mots Clés : *Kératocône, Riboflavine, Alimentation, Prévention, Cornée*

Promoting innovation of fermented foods (PIMENTO) - COST ACTION CA 20128

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Abstract: *Fermented foods (FF) are present in all Mediterranean diets and hold a strategic place due to their benefits regarding nutrition, sustainability, innovation, cultural heritage, and consumer interest. The potential of FF for improving human health but also for driving food innovation and local production in the next decades has become highly relevant. The PIMENTO project, COST Action CA20128 (Promoting Innovation of ferMENTed fOods; <https://fermentedfoods.eu/>) is supported by COST (European Cooperation in Science and Technology; www.cost.eu) and started in November 2021. The challenge of PIMENTO is to federate the scientific community and other key stakeholders working on FF. The long-term goal of PIMENTO is to place FF at the forefront of innovation on microbial foods, promoting health, regional diversity, and local production at different scales, contributing to economic and societal development as well as food sovereignty to promote innovation and respond to the expectations of*

producers and consumers. The wide variety of stakeholders engaged will enable PIMENTO: i) to tightly connect and clarify scientific knowledge on health aspects of FF; ii) to tackle technical, societal, and legislative bottlenecks behind FF-based innovations; iii) to contribute to the establishment of long-term scientific collaborations on FF; iv) to disseminate widely defined scientific knowledge on FF; and v) to outline a strategic roadmap for future joint research. PIMENTO will contribute to the European Green Deal and the “Farm to Fork” strategy by enhancing research and innovation into fermentation-based solutions for food products and processes, improving nutritional, sensory and functional properties. This collaborative network of researchers that includes food scientists, innovators, entrepreneurs, microbiologists, biochemists, and nutritionists has a very broad geographical coverage with more than 480 partners in 59 countries, including Morocco. This regional and international diversity will play an important role through considering a differentiated panel of FF in diets. Together with the other recently funded EU projects in the field of FF, PIMENTO wants to contribute to promote and disseminate the knowledge on FF and further collectively build the future.

Keywords: *fermented foods; cartography; food frequency; food safety; health benefits*

Draft



Malnutrition as a risk factor of nosocomial infections (case of the orthopedic trauma department of Kenitra, Morocco)

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Abstract: *Malnutrition is a real public health problem causing significant complications including nosocomial infections (NI). However, malnutrition is not traditionally one of the recognized risk factors for IN. The objective of this study was therefore to evaluate the impact of malnutrition on the occurrence of IN.*

The study was prospective, prospective, composed of adult patients hospitalized in the orthopedic traumatology department of the Idrissi hospital in Kenitra Morocco. The survey took place over six successive months, from February to July 2022. Patients benefited from an assessment of their nutritional status by a dietitian according to the HAS 2003–2007 recommendations, with the collection of BMI, weight loss, albuminemia.

389 received a complete nutritional assessment. In total, 49.9% of patients were malnourished with 35.4% and 14.5% moderately and severely malnourished respectively. A total of 61 patients presented with IN, an incidence of 15.6%. There is a higher incidence of NI depending on the severity of malnutrition (5.9% not malnourished vs. 23.3% moderately malnourished vs. 38.8% severely malnourished.

In view of our results, malnutrition seems to be an independent and important risk factor for the development of NI in the same way as prolonged hospitalization or the presence of a central KT.

Key words: *Malnutrition, nosocomial infection, HAS 2003-2007.*



Optimizing Athletic Performance through Advanced Sports Nutrition Strategies

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Abstract: *In the field of sports nutrition, a highly intricate and intellectually stimulating discipline is devoted to examining and implementing nutritional and dietary principles in relation to enhancing athletic performance. This multifaceted area of study primarily involves the meticulous analysis and evaluation of the specific nature and optimal quantity of both liquid and solid food consumed by individuals engaged in sports activities. Furthermore, it delves into the nuances of various essential nutrients, including but not limited to vitamins, minerals, supplements, as well as organic compounds such as carbohydrates, proteins, and fats. Through a comprehensive examination of these essential nutritional components, sports nutritionists aim to unleash the vast potential of the human body, enabling athletes to achieve optimal physical condition and, ultimately, maximize their performance capabilities. Indeed, young athletes require nutritionally adequate diets comprising a broad range of nourishing food sources to optimize their sports performance and overall health. It is imperative that their dietary intake maintains a proper balance of macronutrients. Specifically, carbohydrates should constitute a significant portion of their energy intake, representing between 55% and 75% of the total caloric expenditure. Similarly, proteins should contribute significantly to their energy requirements, ideally representing 15% to 20% of the total caloric expenditure. Finally, fats should be consumed in moderation, constituting 25% to 30% of the total caloric expenditure. In conclusion, the dietary habits of individuals regularly engaging in physical training or sports activities play a crucial role in terms of performance levels and progress. Ongoing scientific advancements and recent discoveries regarding the physiological effects of various food groups empower athletes to tailor their diets, optimizing their performance in the realm of sports.*

Keywords: *Sports Nutrition, Athletic Performance, Macronutrient Balance, Nutrient Optimization, Dietary Strategies*

A Mediterranean diet-based metabolomic score is inversely associated with cognitive decline in community-dwelling older adults

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Abstract: *Self-reported dietary intake is likely to be influenced by measurement error, thus affecting the accuracy and precision of currently established epidemiological associations between diet and cognitive health. We here developed a Mediterranean diet metabolomic score (MDMS) and evaluated its association with cognitive decline (CD) in older adults living in the community. Older persons from the Three-City population-based cohort who had not been diagnosed with dementia at the time of blood sampling were included, and repeated measures of cognition over 12 subsequent years were collected. Using a targeted metabolomics platform, we developed the MDMS based on serum biomarkers related to key food groups in the Mediterranean diet in a case-control study on CD, nested within the cohort (discovery $n = 418$; validation $n = 422$). Higher MDMS was associated with decreased odds of CD (OR (95% CI) = 0.90 (0.80–1.00) for the discovery. Similar results were observed in the validation cohort, on the brink of significance (OR (95% CI) = 0.91 (0.83–1.01)). In summary, this study suggests that greater adherence to the MD, as assessed by the serum MDMS, is associated with lower risk of experiencing CD in older adults.*

Keywords: Alzheimer's disease, cognitive dysfunction, cognitive impairment, aging, metabolite

Nanoencapsulation of *Salvia rosmarinus* Speen essential oil in gum arabic: Optimization and antioxidant activity

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Abstract: *Salvia rosmarinus* Speen essential oil is well-known by its antioxidant properties. However, the stability, water solubility, and bioavailability of the active components of essential oils are recognized as serious problems, and nanoencapsulation has been considered one of the most effective techniques for solving these problems. Therefore, this research aimed to investigate the incorporation of a *Salvia rosmarinus* Speen essential oil (SEO) in Gum Arabic (GA) and to assess the impact of nanoencapsulation on its antioxidant activity. A preliminary research based on literature data was conducted to enhance the encapsulation process in GA by identifying the parameters that most affected encapsulation efficiency. The nanoencapsulation condition was optimized utilizing response surface methodology (RSM), focusing on the independent parameters of the solid-to-liquid ratio of SEO/ethanol and the solid-to-solid ratio of SEO/GA and using encapsulation efficacy as dependent responses. To ensure the establishment of SEO/GA, as well as the inclusion procedure of SEO via GA. The morphological examination of GA and SEO/GA, were carried out by scanning electron microscope (SEM) (JSM-IT500HR), X-ray diffractometry (XRD) (Xpert-Pro), dynamic light scattering (DLS) (Litesizer 500), Fourier transform infrared spectroscopy (FTIR) (VERTEX 70 – BRUKER), and thermo-gravimetric analysis (TGA) (LINSEIS STA PT1600). The optimal nanoencapsulating conditions obtained from response surface methodology (RSM) were ratios of SEO/GA of 1:10 (w/w) and SEO/ethanol of 10 % (v/v), which provided the greatest encapsulation efficiency (87%). The results of SEM, XRD, DLS, FTIR, and TGA showed that the encapsulation of SEO using GA modified particle form and molecular structure and increased thermal stability. 1,1-diphenyl-2-picrylhydrazyl was performed to assess the antioxidant activity of SEO before and after the nanoencapsulation process. As a result, SEO encapsulated by GA (with lower Inhibitory Concentration 50 (IC₅₀) = 0.44±0.88 mg/mL) sequentially exhibited higher antioxidant activity than SEO (IC₅₀= 0.62±0.15 mg/mL) in free form. These findings indicate that the encapsulation of SEO into GA enhance its antioxidant properties. Therefore, the nanoencapsulation of SEO in GA may be an ecologically friendly and sustainable method that can be applied in the food industry as a food preservative or sanitizer.

Keywords: Antioxidant activity, Gum Arabic, Nanoencapsulation, Response surface approach, *Salvia rosmarinus* Speen essential oil

Olive oil quality control and fraud detection

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Abstract: *Olive oil is one of the oldest vegetable oils, and the only one that can be consumed in its untreated form. It is a typical source of lipids in the Mediterranean diet, consumption of which has been associated with a limited incidence of cardiovascular diseases, neurological disorders, and breast and colon cancer.*

These benefits have been linked to its fatty acid composition, in which oleic acid is the main component, and to the presence of minor biomolecules, such as vitamins and natural antioxidants. Well-known for its nutritional and medicinal virtues, olive oil is exposed to fraudulent practices through the addition of other refined vegetable oils. This situation has prompted the public authorities to tighten controls in this area in order to safeguard consumer rights.

The present work on olive oil quality control and fraud detection has the dual aim of studying the various physico-chemical parameters with a view to quality control and characterizing the fatty acid composition using chromatographic analytical methods to determine the nature of the oils studied.

The initial results of this work have confirmed the purity and authenticity of oil samples taken from various oil mills in the Khemisset region (Northwest Morocco), since their acidity and peroxide values are low, and the fatty acid percentages comply with current limits.

The second set of results showed that gas chromatography coupled with a mass spectrometry detector (GC/MS) is a highly sensitive, reliable and more efficient tool for determining the nature of the oils studied, not requiring standards for confirmation, since it is equipped with a universal database (NIST), enabling the detection and identification of compounds according to their mass-to-charge ratio (m/z). The addition of soy-based edible oil to the three blends was thus highlighted. In fact, the percentage of oleic acid characteristic of olive oils decreased (from 42.91% to 47.09%), while the percentages of linoleic and linolenic acids, the major components of table oils, increased (from 27.85% to 29.80% and 7.78% to 8.47%) respectively.

Keywords: *olive oil, quality control, fatty acids, GC/MS*

Effet antifongique in vitro des extraits aqueux de quelques plantes Marocaines

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Résumé: Des extraits aqueux préparés à partir de neuf plantes spontanées du Maroc, ont été testés pour évaluer leur potentiel antifongique contre quatre champignons phytopathogènes. Les principaux métabolites secondaires ont été déterminés qualitativement dans les extraits qui ont montré une activité inhibitrice vis-à-vis au moins d'une des espèces fongiques ciblées. L'activité antifongique a été évaluée in vitro en utilisant la méthode des aliments empoisonnés. Les phyto-extraits de cinq plantes ont montré des activités inhibitrices significativement différentes vis-à-vis des champignons phytopathogènes. L'extrait de *Ptychotis verticillata* a montré un effet inhibiteur de 78,81% sur *Fusarium culmorum* et de 47,40% *F.oxysporum*. La croissance mycélienne de *Botrytis cinerea* a été réduite de plus de 50% par les extraits aqueux de *Cistus monspeliensis* et *Saxifraga granulata* et a par contre été stimulée par trois autres extraits dont celui de *Quercus suber* lequel avait un effet positif significatif plus élevé de 31% que le témoin. La croissance de *Verticillium dahliae* a été inhibée par les extraits de *Cistus monspeliensis*, *C.salviifolius* et *C.ladaniferus* et l'effet le plus élevé a été provoqué par l'extrait du *Ciste ladaniferus* avec un pourcentage d'inhibition de 94%. L'analyse phytochimique qualitative des cinq extraits actifs a montré la présence de composés phénoliques, tanins et flavonoïdes. De plus les extraits des trois cistes ont été riches en saponines et alcaloïdes. Les activités antifongiques révélées dans les phyto-extraits dépendent de la plante source et des champignons phytopathogènes ciblés. Les plantes *Ptychotis verticillata*, *Cistus salviifolius*, *Cistus ladaniferus*, *Cistus monspeliensis* et *Saxifraga granulata* pourraient être exploitées en phytopharmacie pour le traitement des maladies causées par *Fusarium oxysporum*, *Fusarium culmorum*, *Verticillium dahliae* et *Botrytis cinerea*.

Mots clés: extrait végétal, métabolites secondaires, activité antifongique, poisoned food technique, champignons phytopathogènes, croissance mycélienne.

Extraction and effects of *S. officinalis* essential oil on depressive-like Performance in Female Wistar Rats

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Abstract: *In recent years, Salvia officinalis has been a subject of intensive studies to document its traditional use and to find new biological effects (treatment of different kinds of disorders including seizure, ulcers, gout, rheumatism, inflammation, dizziness, tremor, paralysis, diarrhea, and hyperglycemia) [1].*

The Purpose of this study is to extract and to explore the antidepressant-like effects of S.officinalis essential oil.

The plant material was collected in the province of Kenitra-Morocco (Sidi Taibi) and leaves were subjected to hydrodistillation with the Clevenger apparatus. After 3h, hydrodistillation of S. officinalis offered an essential oil with an average yield of 1%.

This experimentation is executed on 30 adult female Wistar rats, 3 months old and raised in the pet house of the Department of Life Sciences, Faculty of Sciences of kenitra. S.officinalis essential oil was administered once by oral gavage to four groups of female Wistar rats (n=6) at three different doses, 1000, 2000 and 3000 mg/kg.

The depression-like was measured by forced swimming test (fst) where the animals were put in the water individually and the test swimming was recorded for 5min in the absence of the experimenter.

The experimental protocol is accomplished in line with the Organization for Economic Co-operation and Development (OECD) requirements [2].

Based on student t analysis, the duration of immobility in the FST was significantly decreased when administrating S. officinalis essential oil and it revealed clear antidepressant actions in female Wistar rats.

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Potentiel antimicrobien et antioxydant de L'huile essentielle extraite des feuilles de trois espèces d'*Eucalyptus* issues de la forêt Maâmora : *E.maidenii*, *E.grandis* et *E.gomphocephala*

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Résumé: Ce travail de recherche a pour but d'évaluer l'activité antioxydante et antimicrobienne des huiles essentielles (HE) extraite des feuilles de trois espèces d'*Eucalyptus* reboisées à la forêt de Maâmora: *E.maidenii*, *E.grandis* et *E.gomphocephala*. L'évaluation de l'activité antioxydante de ces HES a été effectuée par les tests de DPPH et FRAP. Par ailleurs l'activité antibactérienne et antifongique a été évaluée par la technique de dispersion des HE dans l'agar agar à 0,2% pour la détermination de la CMI vis-à-vis de quatre souches de bactéries et trois souches de moisissures. Les résultats obtenus ont montré que les HES d'*E.maidenii* et d'*E.gomphocephala* exercent une forte activité de piégeage du radical libre DPPH avec un pourcentage d'inhibition de 93,06 % et 91,6 % successivement. Du même que le test de FRAP a confirmé les résultats obtenus par le test de DPPH, puisque la valeur de la EC50 de l'HE d'*E.maidenii* et d'*E.gomphocephala* correspond respectivement à $6,856 \pm 0,021$ mg/ml et $10,104 \pm 0,078$ mais nettement inférieure à celui de l'acide ascorbique (< à 0.1 µg/ml) utilisé comme témoin positif.

Quant à l'activité antimicrobienne, les HES étudiées ont révélé une inhibition de croissance significative des souches étudiées à des concentrations de CMI comprises entre 1/250 et 1/1000 (v/v). En ce qui concerne l'HE d'*E.gomphocephala* présente une activité antifongique plus prononcée contre les moisissures (CMI = 1/1000 v/v) et les HES d'*E.maidenii* et d'*E.grandis* inhibent favorablement la croissance bactérienne à une valeur de CMI estimée de 1/500 v/v.

Mots clés: *Eucalyptus.maidenii*, *Eucalyptus.gomphocephala*, *E.grandis*, huile essentielle, activité antimicrobienne, activité antioxydante, moisissures, bactéries.

Unlocking quality and nutritional traits of the Moroccan pomegranate variety "Sefri" through morpho-pomological characterization and LC-MS profiling

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Abstract: *The surge in global consumption of pomegranate fruit and juice in recent years can be attributed to their recognized health benefits. This study sought to comprehensively examine the morpho-pomological attributes of fresh fruits from the Moroccan pomegranate variety "Sefri" and delve into the metabolic composition of their juices. In the 2018/2019 harvest season, a total of 38 fruit samples were collected from diverse "Sefri" pomegranate orchards situated within the Protected Geographical Indication (PGI) designated region of "Oulad Abdellah". The morpho-pomological assessment concentrated specifically on characteristics related to the fruit's maturation index, as well as the dimensions and weight of the fruit, arils, and seeds. Initial analyses of the juices encompassed the determination of total sugar content, titratable acidity, and pH levels. Subsequently, their metabolic profiles were characterized employing a robust and sensitive LC-MS analytical methodology. The findings revealed that the "Sefri" pomegranate variety exhibits distinctive characteristics. Notably, it is distinguished by its considerable size, with an average weight exceeding 501.00 g and a diameter surpassing 110.61 mm. Furthermore, this variety shows a notable yield of arils paired with a relatively low seed weight, alongside a juice content ranging from 27.39 to 54.97 ml per 100 g of fruit. The sensory evaluation highlighted a superior taste profile, characterized by a harmonious blend of sweetness and acidity in the juice. Furthermore, the characterization of the bioactive fraction unveiled the presence of a plethora of chemically and functionally diverse metabolites, exhibiting significant variations in terms of their concentration. Particularly striking was the significant prevalence of tannins, with the identification of ten ellagitannins and gallotannins among the 27 phenolic compounds identified in the analyzed juices. Phenolic acids represented the second most abundant group with seven distinct compounds, followed by six compounds categorized as anthocyanins, and four as flavonoids. In addition to these phenolic compounds, our analysis also identified two amino acids, namely phenylalanine and tryptophan, as well as the recognition of vitamin B5, also known as pantothenic acid.*

Keywords: Pomegranate, "Sefri" cultivar, morpho-pomological characteristics, metabolic profile, bioactive compounds, liquid chromatography-mass spectrometry.

Effet Préventif du Traitement par le Thymol sur le Développement d'*Aspergillus flavus* dans les Grains de Maïs

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Résumé : *Le maïs constitue un aliment de base dans l'alimentation humaine et animale. Cependant, il risque d'être contaminé par les moisissures soit dans le champ soit lors du stockage. L'utilisation des agents antifongiques est un moyen de lutte couramment utilisé pour réduire ces contaminations. Néanmoins, l'usage abusif et répété de ces agents antifongiques chimiques entraîne d'une part l'émergence de souches résistantes à ces agents, et d'autre part l'accumulation de résidus toxiques dans les denrées alimentaire destinées à la consommation humaine et animale. C'est dans ce contexte que s'impose la nécessité de recherche de traitements alternatifs à base de produits naturels pour minimiser ces risques.*

*L'objectif de ce travail est en premier lieu d'évaluer in vitro l'effet inhibiteur de l'huile essentielle d'origan et d'un composé phénolique ; le thymol sur la croissance de certains genres de moisissures isolés des grains de maïs contaminés. Ultérieurement, vérifier si le traitement par le thymol a une action préventive sur le développement d'*Aspergillus flavus* dans les grains de maïs afin de l'utiliser comme fongicide naturel pour la protection des céréales de la contamination par ces moisissures.*

Le traitement des grains de maïs par le thymol a été utilisé en comparaison avec un agent antifongique conventionnel utilisé dans l'industrie agroalimentaire (le funginibe).

*L'huile essentielle d'origan et le thymol ont montré une activité antifongique importante sur tous les genres de moisissures isolés du maïs. Les résultats du suivi de la charge fongique pendant un mois ont montré que le traitement des grains de maïs par le funginibe présente un pourcentage d'inhibition de l'ordre de 89,65 % au bout de la quatrième semaine. Alors que pour le thymol, ce traitement s'est avéré très efficace entraînant une inhibition totale du développement d'*Aspergillus flavus* sur les grains de maïs avec un taux d'inhibition de 100 % sur toute la période de l'essai.*

Keywords: (Thymol, Origan, *Aspergillus flavus*, maïs, activité antifongique)

In-depth analysis of fermentable sugars and phenolics in Moroccan brewers' spent grains for subsequent recovery and valorization

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Abstract: *Fermentable sugars and phenolic compounds are pivotal constituents with considerable potential for diverse applications. Their significance lies in their versatile utility across various industries, ranging from food and beverage to pharmaceuticals and beyond. These compounds hold promise for innovative processes and products due to their inherent properties. In the context of Morocco's food and beverage industry, where significant quantities of by-products are generated, understanding the content and potential applications of fermentable sugars and phenolics is of paramount importance. These compounds, if harnessed effectively, can lead to the development of sustainable practices, adding value to these by-products and mitigating environmental impacts. Within this framework, our study sought to delve into the analysis of fermentable sugars and phenolic compounds within brewery by-products in Morocco. By scrutinizing these components, we aim to uncover avenues for their strategic utilization, thereby contributing to the broader goals of sustainable resource management and industrial innovation. To achieve this goal, brewer's spent grain samples were meticulously collected and subjected to thorough analysis, with a specific focus on quantifying fermentable sugars and phenolic content. The comprehensive examination of the elemental composition extended to the spectrophotometric determination of phosphorus in the form of molybdovanadophosphoric acid, providing detailed insight into the presence of this element. Additionally, the extraction of phenolic compounds through ultrasound was conducted, exploring the richness of these compounds with diverse properties. Finally, the sugar composition was determined using high-performance liquid chromatography, enabling a detailed analysis of the various sugars present in the brewers' grains. The results elucidated a significant presence of fermentable sugars, averaging at $7.92 \pm 1.17\%$ on a dry weight basis, alongside a diverse array of phenolic compounds, including catechin, ferulic acid, p-coumaric acid, caffeic acid, sinapic acid, and vanillic acid. By shedding light on the abundance of fermentable sugars and phenolic compounds in Moroccan brewery by-products, this study lays the foundation for their valorization into value-added processes. This not only opens new avenues for economic utilization but also addresses environmental concerns by reducing waste and promoting sustainable practices.*

Keywords: Brewers' spent grains, fermentable sugars, phenolic compounds, recovery, valorization

Effets de l'extrait aqueux de quelques plantes aromatiques et médicinales marocaines sur la croissance de champignons phytopathogènes

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Résumé : *La recherche de produits qui permettent d'augmenter la production des cultures menacées par les ravageurs et les maladies, sans l'utilisation de pesticides qui sont néfastes pour la santé humaine et pour l'environnement, est devenu très indispensable ; d'où l'intérêt des bio-pesticides à base de plantes aromatiques et médicinales.*

*L'objectif de notre travail est l'étude de l'activité antifongique d'extrait aqueux de huit espèces appartenant à trois familles (Amaranthaceae dont *Dysphania ambrosioides*, Cupressaceae dont *Tetraclinis articulata* et Lamiaceae dont *Mentha pulegium*, *Salvia rosmarinus*, *Marrubium vulgare*, *Origanum elongatum*, *Origanum compactum* et *Ajuga reptans* (L.) Schreber) vis-à-vis de quatre champignons phytopathogènes (*Fusarium oxysporum*, *Alternaria alternata*, *Verticillium dahliae* et *Phytophthora fragariae*).*

*La méthode de dilution dans un milieu gélosé nous a permis de mettre en évidence des taux d'inhibition variables sur les souches fongiques testées. Ainsi les pourcentages d'inhibitions les plus élevés pour l'espèce *T.articulata* sur *V.dahliae*, pour *M.vulgare* sur *A.alternata*, pour *O.elongatum* sur *F.oxysporum* et pour *T.articulata* sur *P.fragariae*.*

Le criblage phytochimique réalisé sur les extraits de ces plantes a mis en évidence la présence des saponines, des composés phénoliques, des tanins, des flavonoïdes et des alcaloïdes lesquels sont des composés à potentiel antifongique contre ces champignons phytopathogènes et peuvent être source de produits biopesticides.

Mots clés: *extrait végétal, biopesticide, activité antifongique, champignons phytopathogènes.*

Utilisation des compléments alimentaires et plantes médicinales associées : cas de la région du Gharb

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Résumé : *Les compléments alimentaires sont des sources concentrées d'un ou plusieurs nutriments (vitamines, sels minéraux...), qui ont pour but de pallier à une carence du régime alimentaire régulier de l'individu, ces compléments peuvent être des extraits de plantes médicinales ou des préparations des plantes.*

En effet, de nombreux compléments alimentaires sont extraits de plantes médicinales. Le but de notre étude est de relever si les compléments alimentaires et la plante médicinale dont il est extrait sont utilisés pour les mêmes fins thérapeutiques.

Notre étude a permis de montrer qu'il existait souvent une relation étroite entre le complément et la plante médicinale dans la mesure où ils sont utilisés aux mêmes fins thérapeutiques. Après avoir analysé nos résultats grâce au logiciel IBM SPSS STATISTICS 25, nous avons constaté que le complément alimentaire « Eucalyptus Bio » est utilisé par la plupart des utilisateurs pour son effet sur les voies respiratoires avec une fréquence de 82,2%, suivie par la catégorie qui prend ce complément pour des troubles digestifs 7%, viennent par la suite les enquêtés utilisant l'Eucalyptus Bio pour des fins dermatologiques et d'autres maladies avec respectivement 3% et 2%. Concernant la plante dans son usage traditionnel, nous avons trouvé que 61.6% des enquêtés emploient cette plante pour les maladies affectant les voies respiratoires, alors que 30.1% utilisant l'Eucalyptus pour les troubles digestifs, et dans le but d'améliorer les affections dermatologiques et d'autres maladies avec 6.3% et 2%.

Aussi, nous constatons l'existence d'une similitude, entre les compléments alimentaires et les plantes médicinales, dans la mesure où ils sont utilisés pour le traitement de la même pathologie.

Mots-clés : *Plante médicinale, Complément alimentaire, Eucalyptus.*

Valorisation des cals d'*Argania Spinosa* (L.) Skeels' pour la production des bioconservateurs en industrie agro-alimentaire.

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Abstract: L'arganier '*Argania Spinosa* (L.) Skeels'' est un arbre fruitier-forestier appartient à la famille des sapotacées, c'est une espèce endémique du Maroc qui pousse principalement dans le sud-ouest marocain; Ce patrimoine national a suscité ces dernières années beaucoup d'intérêts vu l'importance de ses produits (notamment de son huile) ainsi que ses sous-produits (feuilles) qui demeurent aujourd'hui la base de préparation de plusieurs produits destinés pour des utilisations cosmétiques, médicinales et industrielles. Ce pouvoir est dû principalement à la présence de métabolites secondaires notamment des polyphénols qui ont un potentiel antioxydant très puissant. Dans ce sens, ce travail a pour objectif dans un premier temps d'extraire les polyphénols à partir des cals issus de plusieurs essais d'induction de l'embryogenèse somatique à partir des feuilles de l'arganier, puis estimer le contenu phénolique (polyphénols totaux) qu'on prévoit étudier et évaluer leur potentiel comme bioconservateurs dans l'industrie alimentaire, car leurs activités antimicrobiennes et antioxydantes peuvent augmenter la durée de conservation des produits alimentaires.

Les extraits bruts ont été obtenus par broyage manuel après dessèchement des cals à l'air libre pendant 5 jours à l'obscurité, puis chaque 100mg de poudre récupérée subi une macération par différentes concentration de l'éthanol (60%, 80% et 100%) dans un bain à ultrason à une température de 30°C pendant 30min. Les résultats ont montré que les taux de rendement en polyphénols peuvent arriver jusqu'à 20%, ce qui témoigne que les cals est une source riche en polyphénols qui doivent être valorisé dans la production de ces molécules antioxydantes en vue de les utilisés comme conservateurs naturels des produits de l'industrie agroalimentaire.

Mots clés: Agro-alimentaire, antioxydants, bioconservateurs, cals, polyphénols.

Etude de l'effet du séchage et de la provenance sur le rendement et la composition chimique de l'huile essentielle de la menthe verte «*Mentha Spicata*» du Maroc.

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Abstract: Dans le cadre du projet FoSaMED, le présent travail contribue à la mise en valeur du potentiel naturel du Maroc dans le domaine des Plantes Aromatiques et Médicinales (PAM) en s'intéressant à la menthe verte qui a une importance socio-économique et environnementale importante à l'échelle nationale. Elle représente une grande biodiversité, occupe une superficie moyenne de l'ordre de 3500 hectares et assure une production moyenne de 50000 tonnes annuellement. L'objectif de cette étude est de déterminer la composition chimique de l'huile essentielle (HE) de la menthe verte «*Mentha Spicata* L» et d'étudier l'effet du séchage à l'air libre qui est fortement utilisé au niveau du Maroc par les acteurs du secteur et la provenance sur le rendement et la composition chimique de l'HE. Les échantillons de menthe ont été collectés au niveau de cinq régions du Royaume, connues par la production de menthe, à savoir : Casablanca- Settat, Fès-Meknès, Marrakech-Safi, Rabat-Salé-Kénitra et Souss-Massa. L'extraction de l'HE de la menthe verte a été réalisée par hydrodistillation et son analyse a été réalisée par Chromatographie en Phase Gazeuse (CPG) et Chromatographie en Phase Gazeuse couplée avec la Spectrométrie de Masse (CPG-SM). Les travaux réalisés ont permis d'obtenir les résultats suivants:

- 21 constituants ont été identifiés dont les composés majoritaires sont : la carvone, le D-limonène, le Trans-dihydrocarvone, l' α -myrcène et le 1,8-cinéole.
- L'effet du séchage à l'air libre de la menthe verte montre une augmentation du rendement après trois jours de séchage, passant de 1,92 à 2,47 ml/100gMS.

L'effet de la provenance de la menthe verte a révélé des différences significatives dans le rendement et la composition chimique de l'HE qui se traduit par des concentrations différentes en composés majeurs et absence de quelques composés dans certaines régions. Il serait intéressant d'approfondir les recherches afin d'identifier le facteur responsable de la variation des variables étudiées.

Keywords: Menthe verte “*Mentha Spicata*, rendement, huile essentielle, séchage, , provenance.

Analyse de l'impact de la pollution atmosphérique sur l'accumulation tissulaire en Pb, Cd et Zn chez les pigeons *Columba Livia* de la ville de Mohammedia en lien avec leur alimentation

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Résumé : Les organismes vivants sont connus pour témoigner des conditions environnementales selon leur sensibilité. Il s'agit de biosurveillance, ou surveillance biologique, en utilisant les espèces animales ou végétales les plus sensibles face aux polluants recherchés dans leur milieu environnant. L'utilisation de ces organismes vivants pour contrôler la qualité de l'air est un outil à privilégier. Dans ce cadre, notre étude vise à évaluer le niveau de la contamination de l'air par le plomb, le cadmium et le zinc sur les pigeons dans les zones industrielles, urbaines et rurales de la ville de Mohammedia ainsi de mettre en évidence ce problème en lien avec leur alimentation. Les concentrations de Pb, Cd et Zn ont été étudiées dans tissus des pigeons (*Columba livia*), 40 pigeons ont été sélectionnés à partir de quatre sites classés en fonction des activités industrielles et la densité du trafic routier puis analysés par la méthode de la spectrophotométrie d'absorption atomique. Des différences de concentrations des éléments traces métalliques ont été observées entre les organes et les zones étudiées. Les plus hauts niveaux de plomb et de cadmium ont été trouvés dans la zone industrielle et le centre-ville, tandis que les niveaux de zinc les plus élevés ont été enregistrés dans la zone rurale.

Quant à l'accumulation tissulaire, il est noté que les plus fortes contaminations par ces éléments ont été observées dans les reins et le foie des pigeons y compris ceux capturés dans la zone rurale. Les habitudes alimentaires liées à l'ingestion des pierres contenant des éléments provenant de la pollution atmosphérique constitue une cause de l'accumulation tissulaire de ces éléments.

Mots clé : Métaux lourds, contamination, tissus, pigeons, Alimentation

Chitin and Chitosan: Natural Biopolymers Shaping the Future of Food Preservation, Environmental Sustainability, and Health

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Abstract: *Over the past three decades, interest in natural polymers, particularly chitin—the second most abundant biopolymer on Earth after cellulose—has significantly increased. This review aims to examine various sources of chitin, its utilization in the food industry, and its applications in areas such as food preservation, beverage clarification, and the synthesis of biologically active films. This biopolymer (chitin) can be derived from diverse sources, including marine crustacean waste, insects, and invertebrate exoskeletons. In the worldwide food industry, chitosan (derived from chitin by deacetylation) finds diverse applications, serving as a thickener, structure-forming agent, and for creating emulsions, sauces, pastes, edible sausage casings, and the clarification of beer, juices, and wines. Moreover, homogeneous chitosan films, flexible and crack-free, exhibit selective permeability, acting as microbial filters on fruits and vegetables, thereby contributing to extended shelf life. Additionally, chitosan coating induces morphological changes in spoilage pathogens affecting tomatoes and peppers. In the case of frozen tuna, the chitosan film acts as a barrier regulating oxygen penetration and water evaporation, thereby extending the product's shelf life. Indeed, chitosan, present in food products, has a positive impact on their biological value. Classified among dietary fibers not absorbed by the human body, it forms a viscous solution in the stomach. As a food component or prophylactic therapeutic medicine, chitosan possesses properties as an enterosorbent, immunomodulator, anti-sclerotic, anti-arthritic, gastric acid regulator, and pepsin inhibitor. Its absorbing properties, stemming from its unique molecular structure rich in amino groups, render it more effective than vegetable cellulose and other natural absorbents. The amino groups of chitosan facilitate the formation of chelated complexes, explaining its efficacy in removing heavy metals from the body and its radioprotective effect. In conclusion, we emphasize the significance of utilizing natural biopolymers (chitin and chitosan) in food preservation, environmental protection, and health.*

Keywords: Chitin, Chitosan, Agro-industry, Chitosan films, Food preservation

Effect of Conservation Mode on the Biochemical Composition of Sugar Beet Pulp

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Abstract: *Technological processes aimed at improving safety of food products and their lifespan are of real interest to agro-food industry. In this case, conservation is an effective means of coping with supply risks as well balancing availability and needs. Chemical modifications that may occur during storage have any chance to affect biochemical composition of food and consequently on their nutritional values. In this context this work was carried out, aiming at studying the influence of conservation mode (bulk, silage or drying) on the nutritive contents of beet pulp. For the three matrix studied (pressed pulp, ensiled pulp and dehydrated pulp), dry matter, total nitrogen (TN), total sugars, fat, ashes and mineral elements: Calcium (Ca), Magnesium (Mg) and Phosphorus (P) were determined. The results obtained show that pulp has an average dry matter content of about 27% at the exit of presses, measured values of total nitrogen have very few variations around 9.96% DM. Rate of total sugars in pulp is around 7% DM. Contents of fat are very low around 1.14% DM. Ashes content is around 10.24% DM. In contrast beet pulp is very low in phosphorus, it contains about 0.07% DM. However, it is fairly well supplied with magnesium, it contains about 0.246% DM. Silage results show that total nitrogen and calcium content increased relative to pressed pulp. On the other hand there is a decrease in contents of fats, ashes and total sugars; however magnesium and phosphorus contents remained stable. For drying, results show that there is a decrease in fat content and total sugars in dehydrated pulp compared to pressed pulp accompanied by an increase in contents of ashes, calcium and magnesium. However, phosphorus and total nitrogen contents remain stable. Silage made it possible to keep contents of the various beet pulp constituents studied almost similar to pressed pulp compared to drying mode.*

Keywords: Sugar beet pulp; silage; drying; composition

Effects of carbon-rich residues fertilization on strawberry production and quality

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Abstract: *Strawberry is a high-valued crop rich in bioactive compounds that are healthy for the human diet. However, agricultural intensification together with conventional farming practices and climate change-related events pose a challenge for strawberry production. Organic farming has been proposed as a more sustainable alternative to conventional farming not only for crops but also for soil health. Despite its beneficial effects on soil, organic agriculture, in some instances, has resulted in a crop yield reduction, which becomes a hindrance for farmers. In order to test the effects of organic agriculture on crop productivity, the production and quality of two strawberry cultivars (Donna and Dream) was evaluated in a regenerating soil where carbon-rich residues from peri-urban areas were added prior to a no-till period of 16 months. Four treatments were established depending on the fertilization and tilling practices: the two control treatments were tilled during the experiment and one was fertilized with plant residues compost and the other one with N rich organic fertilizer; the two no-till treatments were added with carbon-rich residues from pruning (a high dose and a low dose) 16 months before the planting of strawberry. Strawberry production and quality were assessed. Total production did not decrease in treatments with the carbon-rich residues and without tilling. Production was greater in the Donna cultivar compared to Dream and did not vary among treatments. The water content of fruits in the Donna cultivar increased in the C-rich residues treatments. Total soluble solids were greater in the Dream cultivar. Vitamin C had an increasing trend in treatments with carbon-rich residues in the Donna cultivar while total anthocyanins were higher in the Dream cultivar. Moreover, the anthocyanin pelargonidin-3-O-rutinoside was only present in the Dream cultivar and showed an increasing trend with the addition of C-rich residues. Factor analyses of mixed data revealed that the Dream cultivar was more affected by the different fertilization treatments. These results show that the addition of C-rich residues as an organic fertilizer maintains strawberry yield and increase fruit quality depending on the cultivar, which makes the addition of carbon-rich residues a good circular economy-related practice for growing strawberries of good quality using carbon-neutral local resources.*

Keywords: *strawberry, polyphenols, antioxidants, organic farming, fruit quality*

Household food waste in Kénitra

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Abstract: *Food waste is a pressing issue in Morocco, with each person discarding approximately ninety-one kilograms of food annually, as reported by the United Nations Food Waste Index 2021. This problem poses significant obstacles to achieving food security and sustainable food systems, with wide-ranging societal, economic, and environmental consequences. To gain insights into the current state of food waste in Kenitra households, this study has two main objectives: (1) to quantify the types and amounts of discarded food items in the province and categorize these disposals, and (2) to explore people's opinions on the reasons for and consequences of food waste. While there has been limited research on this topic in Morocco, none have specifically focused on the province of Kenitra. This study, conducted in 2022, utilized a combination of face-to-face and online surveys (via email, telephone, and social media) with 442 respondents aged 18 to ≥ 65 , comprising 49.80% women and 50.20% men. The questionnaire included key questions along with sub-questions, encompassing both single-choice and multiple-choice queries. Participants were asked about their age, education level, household income, and monthly household income. The results indicate that approximately 21.49% of respondents have an annual income ranging from 36,000 to 60,000 Moroccan Dirhams (DH) per person, with 43.44% allocating 30-40% of their monthly income. Furthermore, 29.41% hold a bachelor's degree or an equivalent qualification. Bread stands out as the most frequently wasted food item in Kenitra, while meat and cereals experience minimal wastage. On average, households discard about 361 grams of bread per week, fresh vegetables, and fruit 98.17g, compared to a mere 8.59 grams of cheese.*

Keywords: *Survey; Household Food Waste; Food Security; Kenitra; Morocco*

Optimization of the internal procurement process at the world's leading producer of phosphate rock

Hamza Adlane, El Mahjoub Aouane

Abstract

Purpose: This article discusses the results of a field study that was carried out over a 6-month period. The objective of this research aimed at studying the internal procurement system of one of the world's leading Moroccan companies that has a 4.3% contribution to the national GDP.

Design/methodology/approach: Our work, based first of all on the elaboration of an overview and then on the use of more than 6 methods and logistic tools, will allow this company to develop its own procurement method, adapted to its constraints and capacities.

Findings: In terms of figures, this company sources 157 items from several suppliers. These references are then stored initially in the company's store, and depending on the demand from internal customers, a distribution is subsequently planned. A shortage of stock on some items and overstocking on others is a blatant contradiction suggesting several paths for improvement. Ultimately, the results of our work have enabled us to reduce financial immobilization by 40%, as well as a considerable gain in storage space.

Practical implications: This paper shows the importance of responding to the problems of large companies with adapted and targeted methods.

Originality/value: This article presents an original parallel application of almost all conventional logistics methods, for a global and efficient optimization.

Keywords: Logistics, Procurement, Lean management, Costs

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Valorisation des margines par extraction des polyphénols et leur application dans la conservation des aliments

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Résumé: *Les olives noires représentent une précieuse source de nutriments destinée à la consommation humaine. Cependant, lors de leur stockage, elles sont susceptibles de subir des altérations nuisibles, causées notamment par des microorganismes tels que les bactéries et les levures. Ces altérations risquent de diminuer leur valeur nutritionnelle et aussi de compromettre leur qualité organoleptique. C'est dans ce contexte que notre étude se focalise. L'objectif de ce travail est de développer une méthode de conservation des olives noires en utilisant des composés naturels comme une alternative aux produits chimiques. Dans cette optique, nous avons opté pour l'utilisation des margines reconnus pour leur richesse en polyphénols, tels que les hydroxytyrosols, les acides caféiques, les flavonoïdes.*

La partie expérimentale a été initialisé par la récupération des polyphénols des margines. A cette fin, l'extraction de trois échantillons de margines : margines à presse, margines du système continu à deux phases et à trois phases a été réalisée en suivant la méthode décrite par Romeo et al. 2019. Le processus implique plusieurs étapes, notamment l'élimination de la fraction lipidique des margines en utilisant l'hexane, suivie de l'extraction des polyphénols avec l'acétate d'éthyle. Les extraits obtenus ont ensuite été concentrés et conservés à 4°C. Par la suite nous avons évaluée l'activité antioxydantes des extraits par deux méthodes différentes, le test du piégeage du radical 1,1-diphényl-2-picrylhydrazyl (DPPH) selon la méthode de Tepe et al., 2005 et le test FRAP (ferric reducing ability of plasma) selon la méthode de Benzie et Strain 1996. Le deuxième volet de cette partie a été consacré à l'étude de l'effet des polyphénols sur la charge microbienne des olives noires dans le but d'améliorer leur conservation.

Les résultats obtenus sont représenté ci dessous.

Les trois échantillons de margines présentent des différences significatives en termes de concentration et de composition spécifique des composés phénoliques, en fonction des méthodes d'extraction. Cette variation peut ainsi influencer l'efficacité de ces composés en tant qu'agents conservateurs. De plus, les trois échantillons exhibent une activité antioxydante élevée, ce qui les qualifie comme des sources favorables d'antioxydants.

La charge microbienne des olives noires a été déterminée et le pouvoir antibactérien des trois échantillons de margines est en cours d'évaluation. Les résultats préliminaires sont très prometteurs. En conclusion, les margines constituent une source redoutable en composés phénoliques dotés d'une activité antioxydant et antibactérienne intéressantes. Ils peuvent contribuer à la stabilité des produits alimentaires en retardant l'oxydation des graisses et des huiles, ce qui peut prolonger la durée de conservation des aliments tels que les olives noires et prévenir leur détérioration.

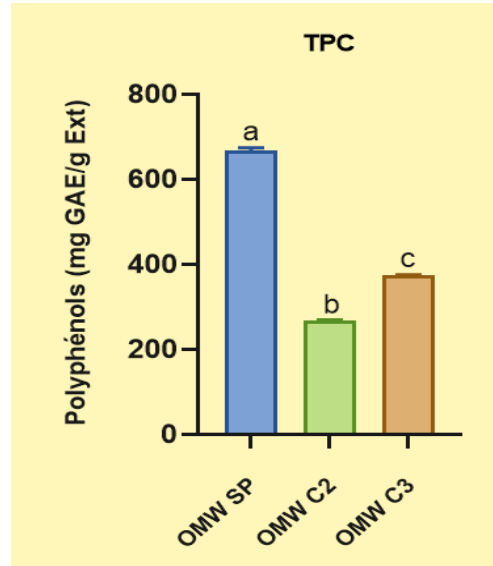


Figure 1 : Contenu phénolique total (TPC) des trois extraits des margines. Les résultats sont présentés par la moyenne ($n=3 \pm SEM$). Les barres avec des lettres différentes sont considérés comme statistiquement significatif.

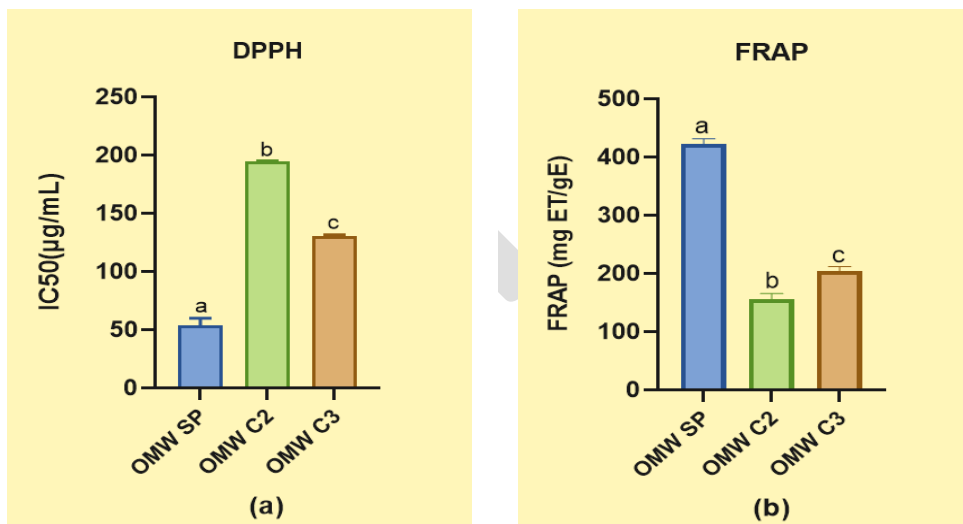


Figure 2 : Activité de piégeage des radicaux des trois extraits des margines ; (a) : test DPPH ; (b) : test FRAP. Les résultats sont présentés par la moyenne ($n=3 \pm SEM$). Les barres avec des lettres différentes sont considérés comme statistiquement significatif.

Mots clés : Margines, polyphénols, activité antioxydante, conservation des aliments, olives de tables.

Evaluation of antioxidant effect and the chemical composition of the phenolic extracts of two aromatic and medicinal plants : *Salvia officinalis* and *Papaver rhoeas*

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Abstract: Antioxidants play a crucial role in our diet by helping to protect our cells from oxidative stress. Antioxidant-rich foods and medicinal plants are rich source of antioxidants such as phenols, polyphenols and carotenoids. These compounds can scavenge free radicals and thereby prevent diseases associated with oxidative stress. In addition they exhibit a wide range of biological effects, such as anti-inflammatory, anti-aging, anti-atherosclerosis, anti-cardiovascular and anticancer effects.

Two medicinal plants « *Salvia officinalis* » and « *Papaver rhoeas* » were examined in order to determine and compare the antioxidant activity and the chemical composition of their phenolic extracts. The *in vitro* total antioxidant activity of the extracts was evaluated using the DPPH method.

Keywords: *Salvia officinalis*; *Papaver rhoeas*; chemical composition ;Antioxidant activity; DPPH, PAM.

DR

Les interrelations entre l'eau et la sécurité sanitaire des aliments

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Abstract: *Au Maroc, la sécurité alimentaire est étroitement liée aux pressions environnementales et à la qualité de l'eau, soulignant l'importance cruciale de comprendre et de traiter cette relation complexe. Dans ce contexte, l'agriculture, en tant que pilier économique du pays, est particulièrement vulnérable aux défis posés par la qualité souvent compromise de l'eau. Les pratiques agricoles intensives, associées à l'utilisation de pesticides et aux effets des changements climatiques, contribuent à la contamination des ressources en eau, compromettant ainsi la sécurité alimentaire en impactant directement la qualité des cultures. Parallèlement, la transformation des aliments au Maroc est également influencée par la qualité de l'eau, car les risques de contamination microbiologique et chimique lors de ces processus soulignent la nécessité de normes strictes et de pratiques sécuritaires. Cependant, les défis ne se limitent pas à la production alimentaire, mais s'étendent également à l'hygiène personnelle, où l'accès à une eau de qualité devient crucial pour prévenir les maladies d'origine hydrique, impactant ainsi la santé humaine et, par extension, la sécurité alimentaire. Cette interrelation complexe entre la qualité de l'eau, la production alimentaire, et la santé humaine nécessite une approche intégrée et des mesures politiques cohérentes. Les implications mondiales de ces défis sont évidentes, soulignant la nécessité d'une collaboration internationale, de normes mondiales et d'actions concertées pour surmonter ces obstacles et garantir un avenir alimentaire durable au Maroc. une gestion durable de l'eau, soutenue par des politiques informées par la recherche et la collaboration internationale, est impérative pour relever ces défis et assurer une sécurité alimentaire robuste dans le contexte marocain.*

Keywords: l'eau, la sécurité sanitaire des aliments, environnement, interrelations

Towards the Improvement of Camel Milk Consumption in Morocco

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Abstract: *In recent years, the consumption of camel milk has risen worldwide owing to its high nutritional value and health promoting properties. However, its limited consumption in arid and semi-arid regions is still a major concern for both nomads and producers. In this context, the present contribution investigates the main factors affecting camel milk consumption in Morocco. A questionnaire was established for studying the perceptions of a wide range of the Moroccan population. Then, a consumer test was carried out in order to measure camel milk's acceptance and preference percentages while comparing it to consumption of the widespread cow's milk. The analysis of the obtained feedbacks from the questionnaire revealed that around 73.4% of responders attributed their nonconsumption of camel milk to its unavailability and the ignorance of its pharmaceutical and nutritional benefits. Furthermore, the consumer test allowed to conclude that camel milk was by far the most preferred milk by the participants. Hence, since camel milk production in Morocco is still unexpectedly weak, the industrial exploitation of this product to a large scale may be considered as a virgin economic path for policy makers and industrial actors. A well-established investment in this sector can indeed improve the income of farmers and breeders, especially in rural areas, and support the Moroccan economic growth.*

Keywords: Camel milk, Consumption, Consumer test.

Stable isotopes (^{15}N and ^{13}C) as perfect tools for determination of the geographical origin of processed spices

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Abstract: An inspection food control system ensures that food available in a country is safe, wholesome, fit for human consumption, meets food safety and quality requirements and is labeled honestly and accurately in accordance with legal necessities.

Spices are used worldwide to flavor and aromatize dishes for more than 2000 years. They have many beneficial effects for human health, including digestive stimulant, and anticarcinogenic actions. However, spices are a source of a number of substances in a wide range of concentrations having negative effects on health. These harmful substances can come from growing in a polluted area, or as a result of tampering or fraud. These frauds are generally perpetrated in order to assimilate the product to a recognized brand or to seek a high profit margin, using cheaper products that are not intended for human consumption (alteration of paprika by paint products).

Chemical analysis and visual assessment as a conventional control method, they have demonstrated their inability to respond to this type of gaps. Conversely, recent research in plant metabolism and stable isotope fractionation has proven the usefulness of isotope techniques to detect frauds and alteration in food products. These technologies are currently used in many official methods of verifying food authenticity and origin. Stable isotopes (^{13}C , ^{15}N) being conservative elements constitute a characteristic fingerprint of each compound. The determination carried out using an isotope ratio mass spectrometry (IRMS) provide information on the botanical and geographical origin which are often considered important characteristics of many food products either by the consumer or by international regulations.

Keywords: food, safety, stable isotope, fingerprint, authenticity.

Smart Farming: Predictive Modeling for Crop Selection Using Machine Learning

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Abstract: *The field of agriculture is experiencing a transformation with the advent of digital technologies and data-driven approaches. In this context, predictive analysis using machine learning models has emerged as a powerful tool for optimizing crop production by recommending suitable crops for specific soil conditions. This paper focuses on the application of machine learning models, to address this critical task. The primary objective of this study is to develop a predictive model capable of recommending the most appropriate crop for a given soil type. This recommendation system aims to enhance agricultural productivity and reduce potential losses by considering key soil properties, such as pH levels, rainfall, humidity, and chemical components. The primary dataset features employed for this analysis include Nitrogen, Phosphorus, Potassium, average soil temperatures for bioactivity, pH range, and rainfall quantity. The proposed models undergo extensive training and evaluation to ensure their accuracy and reliability in predicting the optimal crops for different soil compositions. By leveraging the power of machine learning, this research contributes to more sustainable and efficient agricultural practices, promoting the cultivation of crops tailored to the specific requirements of the soil. This digital approach to agriculture has the potential to revolutionize crop production, minimize resource wastage, and ultimately lead to increased food security and environmental sustainability.*

Keywords: *Digital Agriculture, Predictive Analysis, Machine Learning Models, Crop Recommendation, Soil Properties*