

Acceptability of food supplemented with iron encapsulated in an edible matrix

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The objective of this study was to evaluate the acceptability of food supplemented with iron encapsulated in an edible matrix based on sodium alginate for possible oral administration.

Ferrous sulfate (SF) was used at a concentration of 6 g/40mL, sodium alginate (AS) at 3.16 g/190mL, and calcium chloride (CC) at 0.2 g/40mL, 28 Gx1mL syringes were used to make the capsules by ripping the calcium chloride in the alginate and iron solution until the solutions were exhausted [1]. The beads formed were dried at 50°C for six hours. French bread was made according to [2]. They were added with 0, 8, and 16mg of the dehydrated pearls of alginate with the ferrous sulfate to the wheat flour to make the bread. An acceptability test was carried out using 32 samples and a 5-point hedonic test where five was the most accepted and one the least accepted with untrained judges [3]. The acceptability of the pieces of bread was higher for the bread without SF (2.1 ± 0.3) followed by the bread with 8mg (2.4 ± 0.2), although there were no significant differences between them ($P < 0.05$). The pieces of bread with 16mg of SF did not have a good acceptance of 4.2 %; the average of the comments indicated that they perceived a different flavor from French bread. In conclusion, adding of 8mg of iron to French bread can be a well-accepted food for daily consumption without the perception of the sensory characteristics of iron.

Keywords: *Food supplement, Iron encapsulated, Acceptability, Edible matrix.*

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Quality characteristics and sensory properties of fish patties added with chickpea (*Cicer arietinum*) byproducts

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Chickpea (*Cicer arietinum*) is a valuable source of protein, polyunsaturated fatty acids, polyphenols, fibre, vitamins, and complex carbohydrates [1]. This study examined fish patties as influenced by addition of flour chickpea byproduct (CHBF) on the quality and sensory attributes. The fish patties were prepared with two levels of CHBF (10% and 20% CHBF) following formulations reported by [2], with some modifications and stored during nine days under refrigeration conditions (4°C). For fresh fish patties, moisture, protein, lipid, and ash content as well as a* and b* values increased with CHBF addition (P<0.05). However, there were no significant differences of L* values, pH values, but both treatments (10% and 20% CHBF) showed a 2-thiobarbituric acid reactive substances (TBARS) reduction overtime regarding control fish patties. The fish patties with 20% CHBF showed the lowest cooking loss and reduction in diameter (P<0.05). Microbial counts (mesophilic and psychophilic bacteria) were affected by formulation and storage time (P<0.05). Initially, microbial counts were below 6 log cfu/g irrespective of formulation but microbial counts increased (P<0.05) during storage, generally less 8 log cfu/g in fish patties added with 10% and 20% CHBF and more in control sample. The sensory attributes of fish patties added with 10% CHBF showed the highest scores respect to control and fish patties added with 20% CHBF. These results suggest that CHBF are a good ingredient for increasing the consumer acceptability and functionality of fish patties.

Keywords: Chickpea-byproducts, fish patties, sensory attributes, lipid oxidation.

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Effect of different protein sources on the physicochemical characteristics of an extruded feed for Nile tilapia (*Oreochromis niloticus*).

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The main source of protein in an aquafeed is fishmeal. However, due to its increasing demand and costs, it is currently looking to be replaced by vegetable proteins [1,2]. Therefore, the objective of this work was to study the effect of the use of different fishmeals (sardine and tuna), and moringa flour, on the physicochemical properties of extruded foods for Nile tilapia (*Oreochromis niloticus*). Two diets based on moringa flour, fish meal, corn, gelatin and vitamin and mineral premixes were formulated, in which the balance of fish flour (sardine or tuna) and moringa provided a final protein content of 37.53%. The treatments were moistened with 14, 15 and 16% water and processed in a laboratory extruder, Brabender of single screw, with four heating zones, where the final temperature zone was varied to 110 and 140°C. Extruded foods were analyzed according to their moisture, expansion index (EI), apparent density (DA), water absorption index (WAI), water solubility index (WSI), hardness and bulk density. All the treatments analyzed had floated percentages between 93.33 and 100, without presenting statistically significant differences ($p \leq 0.05$). While, the values of hardness (23.45 – 31.30 N) and moisture (6.26 – 8.03%) presented statistically significant differences between the treatments ($p \leq 0.05$). Results that allowed concluding that the type of fishmeal, the inclusion of moringa flour, temperature and moisture in the extrusion process, had a significant effect on the physicochemical properties of the feed obtained by extrusion. In addition to identifying moringa flour as a possible partial substitute for fishmeal in the formulation of aquafeeds.

Keywords: *Aquaculture, fishmeal, extruder food, Oreochromis niloticus.*

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Characterization of a Frankfurters-sausage modified by beeswax oleogel with canola oilcarriers

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The sausage is part of the line of cold meats, this being the main one because it is a practical food for cooking, accessible to the vast majority of families and adapts to any taste, lifestyle and pocket [1]. The most consumed sausages such as Frankfurt are rich in animal fat, which contains saturated fats. Partially replacing pork fat with vegetable oil oleogel would substantially reduce the percentage of these fatty acids considered harmful to health [2]. The main of this work is to characterize a Frankfurt-type sausage using oleogel composed of beeswax and canola oil as a fat substitute. The pork sausage was physicochemically characterized where the saturated fat was replaced by beeswax oleogel in canola oil, obtaining the following results: 38.1% fat, 14.4% protein, 38.5% moisture and 2.2% ash; compared to a commercial sausage, it has a better saturated lipid profile and higher protein content. The sausages obtained are acceptable according to their sensorial properties, presenting characteristics similar to those of any commercial Frankfurt-type sausage, colour L= 65.98, a= 11.38, b= 6.36 there is no difference in respect to control, aroma (characteristic), appearance, consistency (3-3.7 kg/cm² of hardness, rigid characteristic), with the difference of not contain the same percentage of animal fat considered as bad fats for the body. The interest of this work is to generate a sausage with a lipid part replaced by oleogel based on beeswax and vegetable oil, serving as an option to reduce the excessive consumption of saturated fats present in products of this category, providing healthier food in populations of high consumption such as children.

Keywords: *Oleogel, wax, Frankfurt sausage, saturated fats.*

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Stability and sensorial acceptance of a peanut beverage

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The consumption of nondairy beverages is rising worldwide due to the consumer's choice to lead a different lifestyle [1]. Peanut is a good option as raw material for beverages due to its nutritional quality and cost. This study aimed to prepare a vegetable beverage based on peanut added with ginger and investigate the beverage's physicochemical stability and sensory acceptance. Thirteen formulations were proposed with an extreme vertices mixture design modifying the content of peanut, soy lecithin, and gellan gum but keeping the amount of ginger fixed. The results showed four formulations with a low Sauter mean diameter ($D[3,2]$), a low Brouckere mean diameter ($D[4,3]$) and high zeta potential (ζ). The decrease in particle size and the increase in zeta potential are signs of stability [2]. A sensory evaluation was applied to the four most stable formulations; 30 untrained panelists evaluated the intensity of the peanut beverage attributes (flavor, color, consistency, and aroma), ranging the scale from 0 to 10. The formulations had no significant difference ($p \geq 0.05$) for the four attributes. Beverage achieved mean ratings of 6.71, 7.54, 6.62, and 8.23 for flavor, consistency, aroma, and color, respectively. In conclusion, soy lecithin and gellan gum increased the beverages' stability, and beverages showed good sensory acceptance.

Keywords: *vegetable beverage, Arachis hypogaea, Sauter's diameter, Brouckere's diameter, zeta potential.*

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Grain starch modification using acid and acetate methods

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Native starches have few industrial uses, which limits their utilization. Starch modification brings about attainment-desired properties [1, 2]. This study investigated the physical, chemical, and nutritive values of the modified and unmodified starches. Cold extraction was used to obtain starches from the grains (rice, maize, beans, and corn), which are then modified with the acetate and hydrochloric acid techniques. The percentage yield of starches from wheat, beans, rice, and corn were 30.5 %, 30.0 %, 15.0 %, and 10.5 % respectively. The water & oil absorption capacities of the unmodified starches were 68.65 & 18.00 % (wheat), 65.00 & 22.35 % (rice), 67.15 & 19.55 % (corn) and 62.25 & 17.00 % (beans). Acid modified starches had the following water & oil absorption capacities 67.30 & 29.65 % (wheat), 69.65 & 20.90 % (rice), 66.10 & 28.75 % (corn) and 67.15 & 19.80 % (beans). Acetate modified starches had the following water & oil absorption capacities 65.70 & 16.35 % (wheat), 68.75 & 23.90 % (rice), 65.90 & 34.50 % (corn) and 67.30 & 19.80 % (beans). The high water absorption capacity of the acid-modified rice starch shows that it can withstand higher temperatures than unmodified rice starch, which is an advantage for its use in cooking. The high oil absorption capacity of the acetate-modified corn - starches can earn it a place in the cosmetic industry. The higher oil and water capacities of the modified starches (acid and acetate) indicates, they would be better component for the production talcum powder.

Keywords: *Modified Starch, Proximate, acid, acetate, nutritive, oil and water capacities.*

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Physicochemical evaluation and survival of *Bifidobacterium animalis* in vanilla ice cream added with inulin

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Ice cream is a dairy product, which can be a functional food, substituting fat for substances of lipid or carbohydrate origin, thus reducing the caloric intake [1]. Inulin is particularly suitable for fat replacement in ice cream, it is also suitable for the growth of probiotic microorganisms, which can be encapsulated for prolonged survival [2], likewise, the vanilla for its characteristic and pleasant flavor is the most used in food industries [3]. The objective was to evaluate the physicochemical properties and microbial survival of a vanilla ice cream added with encapsulated *Bifidobacterium animalis* and inulin. Ice cream formulations with 1% vanilla were made, varying the content of inulin (2 and 4%) and encapsulated *Bifidobacterium animalis* (1%, 2%), as a control ice cream was used without the addition of vanilla, inulin and *Bifidobacterium animalis*. The ice creams were made by mixing pasteurized milk, powdered milk, water, guar gum, Carboxymethylcellulose (CMC), inulin and encapsulated *Bifidobacterium animalis*, the mixture was pasteurized (79 °C/30 seconds), allowed to mature (4 °C/2 hours) and stirred at -4 °C/60 rpm for 10 min. The ice creams were kept at -4 ± 2 °C for 21 days of storage. Physicochemical properties pH, acidity, overrun, fusion tests (falling time of the first drop, melting percentage) were characterized. The samples showed pH values between 6.6-5.75, acidity between 0.19-0.28 g of ac. lactic, increase in the percentage of overrun between 2 and 10% in relation to the control, as well as an increase in the falling time of the first drop (3.36-4.47 minutes), percentage of melting at 30 minutes between 97 and 67% and decrease in survival of *Bifidobacterium animalis* from 12 to 10 Log CFU/mL in storage time.

Keywords: *Functional food, Ice cream, Bifidobacterium animalis.*

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Interaction of magnetic nanoparticles with *Streptomyces griseus* as a biological control agent

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This study aims to evaluate the antimicrobial activity of *Streptomyces griseus* extracts, obtained in the presence of magnetic nanoparticles, as a nanobiotechnological alternative for obtaining biological control agents. The study focuses on the synthesis of magnetic nanoparticles with chitosan or ethylenediamine to characterize their interaction with *S. griseus* cells. Manganese ferrite nanoparticles were synthesized by simultaneous coprecipitation with hydrothermal treatment [1]. Adsorption kinetics and Isotherms were obtained by counting free cells in a Neubauer chamber. Fermentations were performed to verify the growth of *S. griseus*. The results demonstrate the interaction between magnetic nanoparticles and *S. griseus* cells, proposing the interaction model. It was observed that nanoparticles did not prevent bacterial growth and antimicrobial activity.

Keywords: *Nanotechnology, Microorganism, Agriculture, Immobilization.*

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A RT-qPCR-based method for detection and quantification of norovirus in lettuce

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Norovirus is an important agent of food-borne human viral illness. No routine methods exist for culture of Norovirus, therefore, are not appropriate for application to food matrices. Detection is reliant on molecular methods using the reverse-transcriptase polymerase chain reaction (RT-qPCR) [1]. As many food matrices contains lows viral titers that may reach levels of 1-10 viral particles per gram of food [2], it is necessary to increase the sensitivity and specificity and optimized the process pre-RT-qPCR. The aim of the work is to evaluate our method of detection and quantification of Norovirus using RT-qPCR, establish limits of detection and recuperation. To do this, as food matrices we use lettuce from retail, decontaminated with exposure to UV light and spiked with different concentrations of Murine Norovirus (MNV-1) as subrogate of Human Norovirus. Virus obtention was done by elution with agitation using TGBE Buffer, followed by precipitation with PEG/NaCl. RNA was extracted using the Qiang Viral RNA Extraction mini kit from QIAGEN, a method based on virus capsid disruption and adsorption of RNA to silica particles. cDNA was synthesized using the Applied Biosystems™ High-Capacity cDNA Reverse Transcription Kit and RT-qPCR was performed using the SensiFAST™ Probe No-ROX Kit from Bioline and in a PikoReal 96 Thermo Scientific thermocycler. Generating a standard curve with pure fragments of MNV-1 we estimated a quantification range from at least 10^7 to 1 genomic copy. We estimate an average recuperation of 66.9% using our method and being able to quantify it. Our work stresses the need for effective real-time RT-qPCR tools capable of qualitative and quantitative detection of Norovirus which is crucial in several public health measures. Future investigation is needed, focusing on the development of methods for detecting viruses in food products placed on markets.

Keywords: *Norovirus, RT-qPCR, Foodborne, Detection method.*

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Antimicrobial activity of edible film based on chitosan, gelatin and whey

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Edible films have been used successfully for food packaging. It has been proven that composite or multicomponent edible films have better properties than monocomponent films, which, when applied to various food matrices, help to increase their useful life, or improve its visual characteristics. Among the components that are used, it has been proven that chitosan has antimicrobial characteristics, so when it is integrated as part of an edible film, it could reduce growth rate of certain microorganisms, promoting an increase in its shelf life. The objective of this study was to evaluate the antimicrobial properties of edible films based on chitosan, gelatin and whey. The films were prepared by casting method from optimization of Box-Benken design in Herrera-Vázquez et al. [1], obtaining edible films of chitosan (0.5-1.5%), gelatin (6.0%) and whey (2.5%). Its antimicrobial activity was determined by diffusion disk method [2], against grampositive (*Staphylococcus aureus*) and gramnegative (*Salmonella typhimurium*) bacteria. 20µg of amoxicillin was used as a positive blank and water as a negative blank. Inhibition halos of 9.8-13.7mm were observed for *S. aureus* the antimicrobial activity; inhibition halos of 7.5 – 13.2mm for *S. typhimurium* and 12.8mm amoxicillin halos. The antimicrobial activity increased with the content of chitosan, so it could be said that this edible film is an alternative for food preservation as well as being friendly to the environment.

Keywords: *edible film, chitosan, gelatin, whey, antimicrobial activity.*

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Microbiological analysis of the melon agroecosystem (*Cucumis melo* L.) and implementation of metagenomic sequence technology

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Foodborne diseases originate from the consumption of foods that harbor pathogenic microorganisms associated with contamination within an agroecosystem. *Escherichia coli*, *Salmonella* spp., *Enterococcus* spp. and *Listeria monocytogenes*, among others are foodborne pathogens that affect consumer health [1]. Usage of antibiotics in the agricultural environment carries a risk in the acquisition of antimicrobial resistance (AMR) by bacteria. Determination of the microbiome, resistome and elements associated with the acquisition of AMR is essential for health risk assessment [2]. We use microbiological culture techniques to determine the presence of microorganism's indicative of bacterial contamination and pathogens of clinical importance in melon agroecosystems in the state of Coahuila, Mexico. 48 samples from worker hand washing, product washing, irrigation and source water, and soil were analyzed. Maximum mean concentrations of \log_{10} 6.47 CFU/ml for fecal coliforms, \log_{10} 5.84 CFU/ml for *Enterococcus* spp. and \log_{10} 3.24 CFU/ml for *E. coli* were found. The presence of pathogens such as *E. coli*, *Salmonella* spp. and *L. monocytogenes* was determined. *Salmonella* spp. was detected from hands and confirmed by PCR. Concentrations of CFU/ml were statistically analyzed. We obtained DNA from these microorganisms for metagenomic studies, allowing us to implement a new generation molecular analysis method for DNA sequencing, Oxford Nanopore technologies, and the integration of bioinformatics tools for the analysis of genetic sequences [3]. It will be used in future studies to identify contaminating pathogenic microorganisms, and determinants associated with the acquisition of AMR. In conclusion, presence of *Salmonella* in workers' hands is important to be controlled to offer safe foods. The implementation of sequence technologies is ready for analysis of microbiota and resistome in the melon agroecosystem.

Keywords: Antimicrobial resistance, Metagenomic sequencing, Bioinformatics.

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Identification of pathogenic Bacteria in the hands of Gastronomy students at a Public University

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For the academic training of Gastronomy students, the continuous interaction with food and utensils in the surrounding environment are involved, where the microorganisms that are present in these places can be acquired and transmitted if proper hand hygiene is not followed. [1,2,5] In the present study, samples were from the hands of Gastronomy students of a Public University in the city of Puebla (n=44) were analyzed, in three random samplings, considering the palm, back, fingers, and nails. Quantification of BMA and CT was carried out, as well as the isolation and identification of microorganisms [3,4] The objective was to establish the frequency of isolated microorganisms in the hands of the students. The results obtained during this investigation indicate a high percentage of bacteria in the hands of the students, the presence of *Enterobacter cloacae* being relevant in 23.2%, to a lesser extent, the presence of *Staphylococcus aureus* (11.6%), *Enterobacter aerogenes*, *Staphylococcus epidermidis*, *Enterobacter agglomerans*, *Serratia marcescens*, (9.3%), *Providencia* spp (6.9%), *Enterobacter* spp, *Shigella* spp (4.6%), *Alcaligenes* spp, *Klebsiella pneumoniae*, *Citrobacter freundii*, *Serratia rubidaea*, *Klebsiella oxytoca* (2.3%). Therefore, it is important to implement strategies that minimize the circulation of microorganisms during the handling of food and kitchen utensils, making students aware of the techniques that must be carried out with good hand hygiene. [5]

Keywords: *gastrointestinal diseases, hands, hygiene, bacteria.*

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Virulome, resistome and plasmidome of multidrug-resistance *E. coli* strains isolated from fresh vegetables in Puebla, Mexico.

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Consumption of raw fruits and vegetables confers a high nutritional value to the diet; however, given their consumption and exposure to inadequate washing, there is an increasing number of foodborne disease outbreaks caused by consuming contaminated fresh products¹. *E. coli* is the main etiological agent associated with foodborne diseases; additionally, this bacterium is an important reservoir of resistance and virulence genes^{2,3}. This study characterized the virulome, resistome and plasmidome of *E. coli* strains recovered from fresh produce. One hundred forty-three samples were conveniently collected from fresh products during 2017-2018, (tomato, cucumber, spinach, lettuce, cilantro, onion, and radish). Twelve multidrug-resistant *E. coli* strains producing β -lactamases were isolated. Whole-genome sequencing was performed using the Illumina HiSeq 2500 platform, followed by assembly and the corresponding bioinformatic analysis. On average, the strains showed a size of 5.0 Mpb. and content of 5,103 genes. They were assigned to four phylogroups (A, B1, B2 and C), eight sequence types (ST) (ST10, ST23, ST101, ST131, ST155, ST410, ST746 and ST5019) and seven serotypes (O78:H9, O25:H4, O162:H10, O100:H34, O21:H48, O86:H10 and O4:H4). It is important to highlight the presence of one strain ST131/O25:H4 recovered from spinach. We identified 49 genes associated with resistance against 13 families of antibiotics, being aminoglycosides, β -lactams, and fluoroquinolones the most represented. Thirty-four virulence genes were also identified, mainly associated with iron metabolism, immune evasion, and adherence. All twelve strains showed at least one plasmid, being IncF type the most prevalent, followed by IncQ and IncHI2. Plasmid structures showed conjugation elements suggesting potential horizontal transfer. This study shows the presence of potentially pathogenic *E. coli* in fresh vegetables, harboring virulence and antibiotic resistance genes that could be transferred to other bacteria, which represents a risk to human and veterinary health.

Keywords: *Escherichia coli*, multidrug-resistance, vegetables, plasmids, ST131.

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Effect of polarity on the extraction of phenolic compounds from "hass" avocado peels

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Foodborne diseases arise from pathogen contamination during the mass food production chain [1]. Applying chemical preservatives have acute toxicity, teratogenicity, and slow degradation periods [2]. On the other hand, Avocado peel extract has the potential as a natural additive to replace chemical preservatives and mitigate the spread of pathogens due to the presence of bioactive compounds [3]. Therefore, the present study aims to perform ultrasound-assisted extraction of Hass avocado peel with Water, Ethanol, and an Ethanol: Water mixture, to evaluate the bioactivity of these extracts in order to determine the solvent that allows extracting the highest concentration of compounds. In this case, the mixture allows the extraction of the greatest amount of compounds from Hass avocado peel by the ultrasound-assisted extraction methodology employed and ensures a solvent mixture that is safe for use in food and easy to degrade in the environment. The method of optimization presented in this study advances in obtaining an extract from Hass avocado peel with beneficial properties as a natural ingredient in the formulation of products with application throughout the food production chain as an antimicrobial or antioxidant agent.

Keywords: *Avocado peel, Bioactive compounds, Antimicrobial, Polarity.*

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Huauzontle: from traditional ingredient in Mexican cuisine to potential source of probiotics

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“Huauzontle” is an edible pseudo-cereal native to México, which is part of the diet since pre-Hispanic times. Due to its valuable nutritional composition has been used as a replacement for some cereals [1]. Additionally, this plant has different health-promoting components, such as vitamins, saponins and polyphenols [2]. Despite its important nutritional and health benefits, there are no reports describing the potential probiotic properties of epiphytic bacteria of huauzontle. Hence, this study aimed to evaluate some safety properties and survival capacity under simulated gastrointestinal conditions of *Lactiplantibacillus plantarum* (Lp22, Lp24, and Lp39) strains isolated from huauzontle inflorescences. First, the antibiotic susceptibility profile, and the transferability of antibiotic resistance determinants were evaluated; then, the strains were exposed to a simulated three-stage gastrointestinal (GI) system, and survival was determined. Despite the strains showed to be resistant to Cephalexin (MIC 250 µg/mL), Ciprofloxacin (MIC 500 µg/mL), Tetracycline (MIC 250 µg/mL), and Trimethoprim/Sulfamethoxazole (MIC 250 µg/mL), resistance determinants were not transferred in the filter-mating assay. On the other hand, a survival of up to 75% ($>10^5$ CFU/mL) was recorded after GI exposure. Our findings evidenced that isolated bacteria from huauzontle met initial specific criteria for probiotics selection, which confirm the suitability of this plant as source of potential probiotics; nevertheless, additional experiments to assess bacteria health-promoting effects are still required.

Keywords: Probiotics, huauzontle, safety criteria, gastrointestinal conditions.

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Antileishmanial activity of phenolic compounds from sesame (*Sesamum indicum* L.) sprouts

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Parasitic diseases, such as leishmaniasis, are a public health problem. This disease is transmitted by species of parasites of the genus *Leishmania*. In Mexico, the *Leishmania mexicana* (Lm) species is endemic and the causal agent of cutaneous leishmaniasis[1]. Therapeutic agents used against this disease have been reported to have side effects[2]. Furthermore, the inhibitory effect of plant phenolic extracts on species of the *Leishmania* genus has been reported[3]. Sesame sprouts, a crop of global importance, contain phenolic compounds such as cinnamic acid and apigenin[4]. This study aimed to analyze the antileishmanial activity of sesame sprouts-phenolic extracts and evaluate the affinity energy, by molecular docking, of main phenolic compounds identified with enzymes of Lm-metabolic pathways. The phenolic extracts of sesame sprouts showed an IC₅₀ value against Lm of 50 µg/mL, whereas the cinnamic acid and apigenin showed an IC₅₀ value of 29 and 6 µg/mL, respectively. The cinnamic acid displayed affinity energies of -6.0 kcal/mol with arginase, -6.4 kcal/mol with glycerol-3-phosphate dehydrogenase, and -5.2 kcal/mol with pyruvate kinase, while apigenin showed affinity energies of -6.3 kcal/mol with arginase, -6.3 kcal/mol with glycerol-3-phosphate dehydrogenase and -7.7 kcal/mol with pyruvate kinase. These results could provide a lead in exploring the sesame sprouts for the treatment of leishmaniasis.

Keywords: *Leishmania mexicana*, phenolic extracts, sesame sprouts, docking molecular.

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Revalorization of agro-industrial wastes for the production of metabolites of biological interest from fungal co-cultures

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The new research has leaned towards the use of co-cultures, since they produce high value-added compounds and have a significant impact on the metabolism of microbial strains. Fungal co-culture in Solid State Fermentations (SSF) becomes capable of increasing the production of metabolites of interest [1]. The objective is the revalorization of peanut shells for the production and evaluation of metabolites of biological interest, from a solid fermentation using different strains of the genus *Trichoderma* and *Aspergillus* for the realization of co-cultures. The chemical composition of peanut shells was evaluated, the selected cocultures were subjected to a SSF with peanut shell residues, subsequently an in vitro evaluation of the potential of the metabolites as biological control agents was performed, evaluating their antimicrobial inhibition capacity against a pathogen *Colletotrichum* sp. following the microplate technique [2] and determining the total polyphenolic content (TPC) of the extracts obtained. The results showed that the cocultures formed (*T. harzianum*-*T. asperellum* and *T. harzianum*-*A. GH1*), elevated the characteristics of biocontrol agent inhibition in its use for SSF with peanut shell. The extract presented high inhibition values up to 88.84% against the pathogen, while the polyphenolic content showed increases up to 85.94%, values that increased when forming a co-culture compared to the fungi used alone.

Keywords: Co-cultures, biological control, fungal co-cultures, metabolites, Solid state fermentation.

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Modified atmospheres reduces the incidence of *Botrytis cinerea* in blackberry fruits without affecting the fruit quality

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The presence of *B. cinerea* or gray rot is one of the main factors in the rejection of blackberry in destination markets [1,2]. Preharvest fungicide applications have been made to control this fungus; however, this has led to fungicide resistance and inefficient control of the spoilage microorganism [2]. In this sense, the objective of this work was to evaluate the inhibitory effect of modified atmospheres on the growth of *B. cinerea* on fresh blackberry fruit. Thirty-six Blackberry clamshells of 6 oz were subjected to a randomized experimental design with three replicates. T) modified atmospheres (air + 15 % CO₂); C1) positive control (disinfected and inoculated fruit); and C2) negative control (field fruit). The treatment and controls were stored for 12 days at 10 °C; subsequently, the percentage incidence of *B. cinerea*, fruit quality (dehydration and % color reversion), and chemical composition (° Bx, titratable acidity (TA), and anthocyanins content) were measured. From day 8 of storage, it was observed that fruits treated with modified atmospheres (MA) presented a lower incidence of *B. cinerea* by 80 % compared to controls. After day 8 of storage in the quality parameters, the modified atmosphere treatment reduced dehydration and color reversion by 44 % and 40 %, respectively, and increased fruit firmness three times compared to the controls after day 8 of storage. Regarding chemical composition, both treatment and controls showed similar values at 11.97 % ° Bx and 0.25 % TA; however, from day 4 of storage, anthocyanins in the MA treatment decreased by 53 % compared to controls. These data show that MA (15% CO₂ + air) reduces the incidence of *B. cinerea* without affecting quality parameters.

Keywords: Blackberries, *Botrytis cinerea*, deterioration, quality.

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Effect of microplastics (PET) on immune activity and oxidative stress in a murine model

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Microplastics (Mp) are plastic fragments of less than 5 mm, which come from the weathering of plastic waste. Mp are found in various ecosystems worldwide; their presence in water and the food web represents a human health problem because they can be absorbed by species consumed by humans or through direct water consumption [1]. In addition, it is known that Mp, due to its components and plastic additives, as well as its size, can obstruct the gastrointestinal system, increased immune activity, oxidative stress, erosion of the epithelium and inflammatory process, among others [2]. The present study aims to find the effect of Mp of polyethylene terephthalate (PET) bottle residues in a murine model, observing the changes in weight, biochemical parameters, and immune activity, besides on liver and small intestine caused by chronic ingestion of 30 days of PET at doses of 10 and 100 mg/kg. Our results showed a decrease in weight, an increase in serum glucose levels, an increase in periportal lymphocytes in the liver and chronic intestinal inflammation of rats who consumed a dose of 100 mg/kg Mp compared to negative controls representing a health risk.

Keywords: *Microplastics, PET, murine, health effects.*

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Biocontrol of phytopathogenic microorganisms by *Penicillium* sp. R1: influence of culture conditions on the biosynthesis of antimicrobial metabolites

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The *Penicillium* genus is a prominent source of natural bioactive products important to biotechnology, medicine, and agriculture [1,2]. Therefore, it is a promising candidate for its use in biological control. The antagonistic activity of *Penicillium* sp. R1 against phytopathogenic bacteria and fungus was evaluated. To evaluate the effect of culture conditions for antifungal compound production by *Penicillium* sp. R1, the Hunter-Hunter experimental design was applied. Three factors were considered: cellular concentration, temperature, and pH. A kinetic study was performed to evaluate changes in the antimicrobial activity of cell-free filtrates. The flasks were incubated on a shaker at 130 rpm and 28 °C for 7 days. The most significant antagonistic effect was observed for *Penicillium* sp. R1 on *F. oxysporum* Fsox C11 inhibited 48% using in agar 20% (v/v) of culture filtrate compared to the control. However, for *Penicillium* sp. R1, no antimicrobial activity was observed against the bacteria tested. The β -1,3-glucanase activity of *Penicillium* sp. R1 was 54.07 U/mL. The highest antimicrobial activity was detected under conditions: pH 7, 28 °C, 1×10^6 cells/mL, and 144 h of incubation, achieving 87% inhibition of *F. oxysporum* Fsox C11. Conclusion. Of the studied five strains, *Penicillium* sp. R1 showed the highest antifungal activity against *F. oxysporum* C11. The obtained results show potential for the use of *Penicillium* sp. in the biological control of phytopathogens and the possibility of improving their antifungal activity by changing the fermentation conditions.

Keywords: *Penicillium*, antimicrobial, biological control, *Fusarium oxysporum*, antagonist..

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Determination of the antifungal effect in model systems of extracts of peel and seed of mamey (*Pouteria sapota* Jacq)

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The mamey (*Pouteria sapota* Jacq.) is a fruit of important consumption in Mexico [1], and it is susceptible to contamination by phytopathogenic microorganisms [2]. Therefore, the objective of the present work was to evaluate the antifungal effect of ethanolic extracts of mamey peel and seed, on *Lasiodiplodia theobromae*. Vegetable samples were dried, pulverized, and macerated with ethanol. The application of the extracts in the model systems with concentrations of 500 and 1000 mg/L, led to a decrease in the growth rate of the fungus with values of 0.016 and 0.017 mm/h compared to the control 0.020 mm/h. Likewise, the time required to reach the stationary phase increased (radial growth of 5 mm), in the systems with 500 mg / L (288h) and 1000 mg / L (312h) in comparison with the control (240h). The results demonstrated an appreciable antifungal activity of plant extracts on *L. theobromae* in the evaluated systems [3].

Keywords: *Antifungal activity, Pouteria sapota Jacq, ethanolic extracts.*

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Effect of essential oils of oregano (*Origanum vulgare*), thyme (*Thymus vulgaris*), orange (*Citrus sinensis* var. Valencia) in the vapor phase on the antimicrobial and sensory properties of a meat emulsion inoculated with *Salmonella enterica*

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The demand for healthier meat products is increasing remarkably and natural antimicrobial agents such as essential oils (EOs) are required, which can be applied in the vapor phase [1]. For this experiment, the effectiveness of essential oils of oregano, thyme, and orange in the vapor phase on the microbiological and sensory characteristics of sausages inoculated with *Salmonella enterica* and stored at 4°C during 72 hrs and 144 hrs, were studied [2]. Oregano EO with 2000 ppm was the most effective treatment against *Salmonella enterica* with a logarithmic reduction of 1.97 Log₁₀ CFU/g compared to thyme 1.36 Log₁₀ CFU/g and orange 1 Log₁₀ CFU/g after 144 hrs [3]. In relation to the general acceptance level, the meat product exposed to the orange EO in vapor phase presented the highest approval by the judges nevertheless, however, were the ones that showed the least reduction in the microbial population. Finally, the results showed that the addition of essential oil in the vapor phase to meat products exerted a bactericidal effect with higher EOs concentrations and some also caused alterations in the sensorial properties of the product.

Keywords: *Antimicrobial agents, Sensory evaluation, Salmonella, essential oils, vapor phase.*

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Application of silver nanoparticles combined with citric extract for disinfection on fresh lettuce

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Prevention and control of bacterial contamination on fresh produce is an imperative task to ensure food safety. The objective of this work was evaluating the efficacy of biogenic silver nanoparticles combined with citric extract for disinfection on fresh lettuce which is commonly eaten raw and characterized by a fragile texture. Lettuce (10 g) was artificially inoculated with *Escherichia coli* ATCC 11229, followed by a five and ten minutes dipping in silver nanoparticles at concentrations of 0.0625 g/L and 0.125 g/L, enumeration of bacteria after times of exposure was compared to control (water) [1]. Silver nanoparticles at lowest concentration showed an up to 1.9, and 2.2 log CFU/g reductions in *E. coli*, for 5 and ten minutes, respectively. Up to 4.5, and 4.9 log CFU/g reductions were observed on the same bacteria with concentration of 0.125% [2]. The data suggest that applying biogenic silver nanoparticles combined with citric extract may be an effective antimicrobial control strategy for fresh produce at the ready-to-eat stage. Application of an efficient, organic, and non-toxic disinfectant for vegetables.

Keywords: silver nanoparticles, lettuce, disinfection, *Escherichia coli*.

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Postharvest effect of hot water treatment combined with chitosan to control *Colletotrichum* sp and quality in mango fruit (*Mangifera indica* L.) c.v. Keitt

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Mango is susceptible to anthracnose, caused by *Colletotrichum* sp. being the main postharvest disease of the fruit. Chitosan has become an alternative treatment to the use of synthetic fungicides [1]. Among physical methods, hot water baths are effective in controlling postharvest diseases [2]. The objective of this research was to evaluate hot water treatments (45°C and 55°C) for 120 s combined with 1.0% chitosan, inducing resistance against *Colletotrichum* sp. as well as compliance with quality. The treatments inhibited mycelial growth, sporulation and germination of the fungus *Colletotrichum* sp. For treatments applied to postharvest fruits stored at 25 ± 1°C (95% RH) for 14 days, the incidence and severity were reduced, being more effective the hot water treatment at 55°C for 120 s with 1.0% chitosan. In fruit quality, there was no significant difference (P<0.05) in quality parameters and bioactive compounds. In chromaticity and titratable acidity, both treatments were significantly higher, in pH and total soluble solids the treatment (55°C at 120 s) with 1.0% chitosan was significantly lower. In conclusion, the hot water treatment combined with chitosan can be an effective strategy in the induction of resistance against *Colletotrichum* sp, as well as the conservation of quality and bioactive compounds in mango fruit c.v. Keitt. This information is relevant for the application of new methods that contribute to the reduction of the use of synthetic fungicides.

Keywords: Postharvest diseases, Chitosan, *Mangifera indica*, Hot water treatment.

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Growth kinetic study of *Salmonella* and a surrogate of *Escherichia coli* O157:H7 in fruit pulps through predictive models using ComBase®

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In 2015, the World Health Organization published a report estimating the global incidence of foodborne illness. In their results, they mention that *Salmonella* and *Escherichia coli* O157:H7 are important etiological agents causing diarrheal diseases and are responsible for substantial deaths and foodborne illnesses. In recent years, fruits and vegetables have been recognized as important vehicles for the transmission of these pathogens [1]. Therefore, it is important to study the growth of these microorganisms, taking advantage of predictive microbiology. Thus, the objective of this work is to compare the predictive models of ComBase® for the growth of *Salmonella* Enteritidis and a surrogate of *Escherichia coli* O157:H7. The design of experiments considers four food-microorganism combinations. Two factors were studied: the initial cell concentration of the pathogen in the food (1-5 log CFU/g) and the incubation temperature (7-29°C). Once the microbial counts were obtained, the growth curves were constructed. These data were then fitted to the Baranyi and Roberts model, using ComBase® to obtain maximum growth rates and lag time [2]. The experimental results show that *E. coli* at 7°C grows on melon with a Y_{max} of 6.56 log CFU.g⁻¹. In contrast, ComBase does not predict *E. coli* growth at this temperature. Furthermore, at a temperature of 29 °C, a μ_{max} of 0.6 h⁻¹ was found for cucumber with a Y_{max} of 8.7 log CFU.g⁻¹ at 17 hours without lag time, while ComBase® estimates lag time of 5 hours. In the case of *Salmonella*, the ComBase® predictive model overestimates growth at 29°C, for both melon and cucumber, giving a safety margin. However, at 7°C the predictive model does not foresee growth, which reduces this safety margin in handling the product. These results show the need to complement ComBase® databases to obtain reliable results for the food industry.

Keywords: predictive microbiology, *Salmonella*, *Escherichia coli*, ComBase®.

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Characterization of Diamine oxidase-based biosensors for biogenic amines detection assembled using two different crosslinkers

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The high content of biogenic amines (BA) in food is a food safety issue [1]. They cause adverse health effects, e.g. histamine poisoning. Traditionally BA in food are detected using chromatography; in this work, we aim to build and characterize a biosensor for BA detection in food using diamine oxidase (DAO) as biorecognition element. To build our biosensor SiO₂ substrate functionalized with 3-APTMS and two different crosslinkers: glutaraldehyde (GA) and terephthalaldehyde (TA) were used. Kinetics were carried out with cadaverine, putrescine, histamine, and spermidine, respectively. In a spectrophotometer at 440nm equipped with a Peltier cell to maintain the temperature at 37°C. For each BA, three biosensors were used for statistical purposes; the resultant kinetics were compared to those with the free enzyme. Free DAO kinetics showed higher activities to putrescine, cadaverine and, spermidine obtaining a relative response at 10 minutes of 100%, 91% and, 74.8%, respectively; the activity with histamine was the lowest with a relative response of 10%. Glutaraldehyde crosslinker biosensors got their best results at the interaction with cadaverine and putrescine with 100% and 45% relative response at 10 minutes, while histamine and spermidine obtained 6% and 14%, respectively. Interestingly, TA biosensors presented statistically lower activities than GA ones as demonstrated by paired t-tests ($p < 0.0001$) for all BA. This could be associated with the chemical nature of the crosslinker, being GA an aliphatic homodialdehyde while TA is an aromatic para-dialdehyde [2,3], another possibility is the fact that less enzyme is being crosslinked with TA than GA, but this still must be proven. The results herein demonstrate the biosensor's functionality with both crosslinkers (GA and TA) in vitro. The possibility of using them in the food industry could have a positive impact on reducing analysis time and effort, but still, more research must be done on this behalf.

Keywords: Biosensors, Biogenic amines, Diamine oxidase, crosslinkers.

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Histamine quantification in tilapia fillets using infrared spectroscopy and chemometrics

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Histamine is a biogenic amine synthesized by food spoiling bacteria with L-histamine decarboxylase activity. When ingested in doses greater than 50mg/100g, it causes scombroid poisoning, a food borne illness with severe allergic-like symptoms. To detect it, chromatographic methods have been used but most of them are time consuming. The objective was to develop a fast method to detect and quantify histamine in tilapia fillets without sample extraction, derivatization nor chromatographic runs, using Infrared Spectroscopy (FT-IR). Frozen tilapia fillets were purchased in the supermarket and transferred to the laboratory in a cooler. They were thawed and washed using deionized water. The initial histamine concentration was determined by HPLC using a calibration curve from 1 to 1,000 ppm (7 points, each point by triplicate). For the FT-IR analysis, 45 grams of fillet were doped with Histamine-2HCl as free base at: 1, 5, 10, 50, 100, 200, 500 and 1000 ppm and homogenized. The doped tilapia samples were put on the ATR crystal and measured in the IR-medium region. The quantification model was performed by partial least squares (PLS) using the 1484 to 1054cm⁻¹ and 909cm⁻¹ region which showed spectral variation according to histamine concentration. The most accurate model was the one that obtained a RMSEC=2.17 and a r²= 0.994, as well as a RMSEP=4.89 and r² = 0.9983 using 10 factors. The optimal range for histamine quantification was determined to be between 10 and 200 ppm, which is desirable because international regulations often allow a maximum of 100 ppm for unprocessed fish and 200ppm for processed fish, respectively, being the exception of the US (50 ppm). Using this technique, it is also possible to reduce the analysis time from several hours (depending on the sample number) to only 10 minutes.

Keywords: *Histamine, FT-IR, PLS, tilapia.*

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Bio-formulated product of *Meyerozyma guilliermondii* LMA-Cp01: thermal and physicochemical properties, and control of blue mold on Persian lime

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Meyerozyma guilliermondii LMA-Cp01 formulation has been used to control anthracnose in mango fruit [1]. The characterization of microencapsulated *M. guilliermondii* is essential to improve the formulation to increase its potential for future commercial applications. Therefore, this study aimed to evaluate the thermal, physicochemical, and rehydration properties, shelf-life, and effectivity against *Penicillium italicum* on Persian lime of *M. guilliermondii* microencapsulated inside a soy protein isolate: sodium alginate matrix. A formulation with a viability of 10.15 Log CFU g⁻¹ was obtained. However, its viability decreased during storage, being more stable at 4 °C (6.8 Log CFU g⁻¹) than at 25 °C (5.5 Log CFU g⁻¹) after storage for 120 d. Values of 5.7% humidity, 0.29 Aw, 8.2% hygroscopicity, 94% dispersibility, and 33% solubility were obtained. The glass transition and decomposition temperatures were 139.4 °C and 233 °C. The spray-dried *M. guilliermondii* bioformulation effectively reduced the incidence (50%) and severity (46%) of blue mold on Persian lime, as well as the fresh cells of this yeast. *M. guilliermondii* microcapsules produced by spray-drying showed good physicochemical and rehydration properties. FTIR and thermal analysis revealed interactions between SPI and sodium alginate and no interactions between *M. guilliermondii* and wall materials [2]. These findings suggest that the microencapsulation process increases the stability of *M. guilliermondii*, and guarantees a progressive delivery. The bioformulation of *M. guilliermondii* LMA-Cp01 can be used as an effective method for the postharvest diseases management in citrus fruit.

Keywords: Bioformulation, *Meyerozyma guilliermondii*, Physicochemical properties, Biocontrol efficacy, Persian lime.

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Microbiological evaluation of frozen tilapia fillet marketed in the city of Tepic Nayarit, Mexico

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Foodborne Diseases (FD) are identified as a major global public health challenge due to their incidence, mortality and economic repercussions [1]. Fish is a nutritious, widely traded food and constituent of the human diet obtained through fishing and aquaculture activities [2]. However, this food is very susceptible to contamination and microbiological deterioration in all phases of the food chain, reducing its shelf life and becoming a high-risk product for the health of consumers. The present study focuses on performing the microbiological evaluation of frozen fillet of tilapia (*O. niloticus*) available for human consumption in fishmongers of the popular market of the city of Tepic Nayarit, Mexico. For the analysis, samples of frozen fillet were collected one day per week for 4 weeks for 4 different fishmongers (A, B, C, D) for a total of 8 samples. The evaluation of Total Aerobic Mesophiles (TAM) [3], Total Aerobic Psychrophiles (TAP) [3], Total Coliforms (TC) [4], Fungi (F) and Yeasts (Y) [5] was carried out. The results obtained indicated that all the samples presented microbiological contamination with maximum proportions for TAM of 21550 CFU/g for samples from fishmonger D, TAP with 15050 CFU/g from fishmonger C, F with 73500 CFU/g from fishmonger A, Y with 27000 CFU/g from fishmonger D and finally TC with 16800 CFU/g for samples from fishmonger A. Therefore, the fish fillet available for human consumption may be a potential risk to the health of consumers, especially if it is consumed raw state.

Keywords: *public health, food safety, microbiological indicator, food quality.*

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Evaluation of antimicrobial activity and antioxidant capacity of peel extracts from different varieties of pomegranate

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The pomegranate peel (PP) is a by-product obtained during the processing of the juice, is considered a source of natural compounds with antimicrobial and antioxidant activity [1] due to the high content of polyphenols, hydrolysable tannins (punicalin, punicalagin, gallic and ellagic acid) and flavonoids (anthocyanins and catechins) compared to other parts of the fruit [2]. The objective of the present work was to evaluate the antimicrobial activity and antioxidant capacity of PP extracts obtained by different extraction methods using pomegranate genotypes of southern Jalisco. Four extraction methods (maceration, ultrasound, Naviglio and soxhlet) and three varieties of pomegranate peel (Wonderful, Verde and Tecozautla) were evaluated for their antioxidant capacity by DPPH and FRAP methods and the antimicrobial activity by minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC). The results obtained for the antioxidant capacity showed that the ultrasound and maceration methods allowed the greatest extraction of antioxidant compounds, in terms of the PP varieties evaluated, the Verde variety extract presented statistically highest antioxidant values with 2586 mg ET/g for the DPPH method and 3243 mg ET/g for the FRAP method. The antimicrobial activity obtained for extracts evaluated showed MIC values from 6.25 to 12.5 mg/ml and MBC values from 12.5 to 25 mg/ml against *Escherichia coli*, *Salmonella enterica*, *Listeria monocytogenes*, and *Staphylococcus aureus*, showing the green variety the highest antimicrobial activity. In conclusion, PP is a potential source of natural antioxidants and antimicrobials; the variety of pomegranate used as well as the method for obtaining extracts influences the activities evaluated, being the ultrasound method an alternative to obtain extracts with greater antimicrobial and antioxidant activity.

Keywords: *pomegranate peel, Wonderful, Verde, Tecozautla, antioxidant capacity, antimicrobial activity.*

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Antioxidant and antibacterial activity of extracts from *Plectranthus hadiensis* var *Tomentosus*

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Foodborne diseases cause illness in 1 of 10 people, resulting in 420,000 deaths per year [1]. Therefore, alternatives are sought to control foodborne pathogens. The use of antimicrobial substances that inhibit the growth of pathogenic microorganisms and prolong the shelf life of food products has tended towards the use of natural antimicrobials such as those of plant origin, which exhibit antioxidant, antimicrobial and pharmaceutical properties [2]. The genus *Plectranthus* contains bioactive compounds as polyphenols and diterpenoids that exhibit antioxidant and antimicrobial activity [3]. The objective was to evaluate the antimicrobial and antioxidant activity of extracts from *Plectranthus hadiensis* var *Tomentosus* (PHT) obtained by different extraction methods (maceration, Naviglio, Soxhlet and ultrasound-assisted extractions). The results obtained for FTIR showed the presence of polyphenols, terpenoids and monoterpenes in all the extracts. Extracts exhibited antioxidant capacity assessed by the DPPH method, the highest antioxidant activity was shown by the ultrasound-assisted extract with a scavenging activity of 42% at 500 µg/ml. The antimicrobial activity of the extracts was evaluated against *Staphylococcus aureus*, *Listeria monocytogenes*, *Escherichia coli* and *Salmonella enterica* by broth microdilution method, all extracts showed antibacterial activity. The Naviglio extract exhibited the higher antimicrobial activity with a minimum inhibitory concentration of 12.5 mg/ml and a minimum bactericidal concentration of 25 mg/ml. The extracts of PHT are a potential source of natural antioxidants and antimicrobials, being the Naviglio's method a recommended method for obtaining compounds with high antimicrobial activity from *Plectranthus hadiensis* and for other vegetable sources with thermosensitive bioactive compounds.

Keywords: *Plectranthus hadiensis*, foodborne pathogens, Naviglio, ultrasound-extraction.

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Influence of different drying methods on the stability and physicochemical properties of microcapsules of *Lactobacillus salivarius* obtained by complex coacervation

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Currently, the use of probiotics such as *Lactobacillus salivarius* has increased as studies have shown that they help modulate the intestinal microbiota [1]. On the other hand, one of the most interesting prebiotics is agave fructans with a high degree of polymerization (≥ 40) (AFHDP), since they are used as a prebiotic [2]. For this reason, in the present work the influence of different drying methods (oven, freeze and spray drying) on the stability and physicochemical properties of capsules of *L. salivarius* and AFHDP obtained by complex coacervation was evaluated. The coacervation technique allowed to obtain an encapsulation efficiency higher than 90% regardless of the type of drying. Physicochemical properties, micrographs, thermal adsorption and isothermal adsorption showed significant differences ($p \leq 0.05$) between the capsules obtained by the different drying methods, all these parameters show that the capsules have high stability. Oven drying produced a higher retention during the drying process (11.09 log CFU/g microcapsules). On the other hand, spray microcapsules exhibited higher survival at 40 °C after one month of storage. The three samples analyzed showed viability at a concentration greater than 7 log CFU/g of sample after being subjected to *in vitro* gastrointestinal digestion. Concluding that it is important to consider the type of drying in obtaining encapsulated probiotics since it influences the different properties of a powder at the time of being consumed. Finally, it is suggested that the encapsulated probiotics obtained in this work have the potential to be added to various food products due to their high stability and viability, and thus contribute to improving the gastrointestinal health of the consumer.

Keywords: *Agave fructans*, *coacervation*, *encapsulation*, *probiotics*, *L. salivarius*.

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Antifungal activity of tomato plant extract against *F. oxysporum*

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Fruits during postharvest maturation can be affected by phytopathogenic fungi, which can cause irreversible, internal and external damage, in addition to mycotoxins production [1]. An alternative to combat fungi is through extracts obtained from plants, which contain bioactive substances such as phytochemical compounds with antimicrobial and antifungal activity [2]. The main objective was to evaluate the antifungal activity of tomato plant extract (TPE) against *F. oxysporum* by the agar diffusion method. 100 μL of a solution of 1×10^4 spores/mL were inoculated in Petri dishes with PDA and three paper discs of 6 mm diameter impregnated with 20 μL of TPE at concentrations of 20, 30, 40, 50, 60 and 70 mg/mL were placed [3-4]. The poisoned food technique was used to determine the mycelial growth inhibition percentage at 4.9, 9.9, 19.6, 47.6, 74.7 and 90.9 $\mu\text{g/mL}$ of TPE concentration after incubation at 28 °C for 10 days [3]. The maximum inhibition growth were presenten at 70, 60 and 50 mg/mL of TPE resulting 16, 15.3 and 12.8 mm halo diameter, respectively. Concentrations of 20, 30 and 40 mg/mL did not show growth inhibition. Mycelial growth inhibition percentage obtained was 13.1, 14.4, 18.3, 73.3, 100 and 100, for each concentration tested, obtaining a MIC of 30.52 and MFC of 90.9 $\mu\text{g/mL}$. Results showed a correlation between TPE concentration and the fungi growth inhibition. TPE contains phenolic and flavonoid compounds in a high concentration, which are responsible of the antifungal activity. Recent research has been found that hydroxyl groups found in phenolic and flavonoid compounds cause inhibitory action on microorganisms and interacting with the cell membrane of fungi causing the loss of their components [2]. Therefore, TPE could serve as a natural fungicide for *F. oxysporum* and other fungi that damage crop fields.

Keywords: *Phytopathogenic fungi, postharvest, mycelial growth, food safety.*

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Evaluation of *in vitro* adherence properties of Lactic Acid Bacteria and inhibition of urease activity produced by *Helicobacter pylori*

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Helicobacter pylori (HP) is currently responsible for 70% of intestinal infections, as well as being considered a carcinogen. In recent years HP has been shown to acquire resistance to antibiotics. It has been shown that Lactic Acid Bacteria (LAB) inhibit the growth of HP. Recently, four LAB with antibacterial effect against *Salmonella* Typhimurium and Shiga toxin-producing *Escherichia coli* were isolated in our laboratory. To evaluate *in vitro* the adherence properties of *Lactocaseibacillus paracasei* UAEH20 (L20) and three LABs (L17, L19 and L25), their ability to inhibit the urease produced by HP, in addition to performing the molecular identification of L17, L19 and L25 via the 16s RNA gene. The adherence capacity of LAB was evaluated as described by Prabhurajeshwar & Chandrakanth [1]. Urease inhibition capacity was performed according to Sgouras et al. [2]. Strains L17, L19 and L25 presented 100% sequence coverage and identity with *Enterococcus lactis* spp. On the other hand, L17, L19 and L25 managed to inhibit the activity of the urease produced by HP. Regarding the hydrophobicity of the cell surface, L20 presented the best percentage (86.37%±1.05) compared to L17, L19 and L25 who presented from 3.18±0.88 to 20.97±0.13. The coaggregation of the 4 LABs with HP showed percentages between 23.53±0.15 to 24.16±0.35. The L25 strain showed the best autoaggregation percentage (42.86±1.91) compared to the other LAB. The 4 LABs have a high adherence potential to the intestinal epithelium according to the results obtained in the tests carried out. In addition to inhibiting the activity of urease. This research demonstrates that the LAB studied have the ability to inhibit a HP and that they could be used as adjuvants. In addition to presenting good adhesion properties, which gives us an indication of good adhesion in the intestine.

Keywords: *Helicobacter pylori*, Lactic Acid Bacteria, urease, adhesion.

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Chemical modification of naturally-extracting chitosan leads to new antifungal agents against *Fusarium oxysporum* f.sp. *physali*: synthesis, characterization, and *in vitro* assays towards novel applications development on cape gooseberry crops

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Chitosan is a biopolymer constituted by β -(1 \rightarrow 4)-linked, mostly-deacetylated *D*-glucosamine units, which can be obtained from chitin, the most abundant natural polymer after cellulose. Several applications of chitosan have been reported, particularly its promising potential as an antifungal agent against several relevant pathogens, e.g., *Candida albicans*, *Coniella diploidiella*, and *Fusarium oxysporum* [1-2]. Chitosan extraction and subsequent chemical modification to attach an imine functional group were carried out, using caridean exoskeleton residues as raw starting material. Chitin was obtained by performing a chemical method on the exoskeleton residues. Hence, the 1M NaOH treatment at 80°C for 2 hours and a successive 50% NaOH hydrolysis at 100°C afforded the deproteinized and deacetylated chitin residue. The extracted chitosan (80% yield) was subsequently derivatized through the Schiff reaction using the respective aromatic aldehyde in DMSO under microwave irradiation at 120 °C for 20 min. The chemically-modified chitosan products were characterized by infrared spectroscopy. The characteristic absorption bands for C=N and N-H stretching were evidenced as proof of product formation. Subsequently, the *in vitro* antifungal activity was evaluated against *Fusarium oxysporum* f.sp. *physali* using a microscale amended medium [3]. The measured half-maximal inhibitory concentrations (IC₅₀) led us to identify that the chitosan derivatives obtained from 3-(4-methylphenoxy)benzaldehyde and 4-nitrobenzaldehyde, respectively, were the most potent antifungal products. Molecular docking simulations and receptor-ligand interaction analyses suggested that chitosan, depending on the enzyme and along with its chemical modifications, exhibited an enhanced biological activity, implicating the imine group as a possible toxophore. Such chemical features can be used to design and obtain new antifungal agents, potentially applicable to the agricultural sector. The present work is a product derived from the project INV-CIAS-3412 funded by Vicerrectoría de Investigaciones at UMNG—Validity 2022.

Keywords: *Fusarium oxysporum*, cape gooseberry, antifungal agents, chitosan, chitin, imines.

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Relationship between the level of food insecurity and the quality of the diet of Venezuelan adults living in the city of Cuenca-Ecuador

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The objective was to determine the relationship between the level of food insecurity (FI) and the quality of the diet (QD) of Venezuelan migrants (VM) residing in the city of Cuenca, through a virtual survey. The results obtained through statistical analyzes showed that there is no statistically significant relationship between the level of FI and the QD of the VM residents in Cuenca who participated in the research (P value of Pearson's Chi square = 0,914 and value of Cramer's V = 0,130). In addition, 83.61% of the surveyed population presented FI and the predominant QD was unhealthy with 72.13%. We can conclude that according to the study carried out there is no relationship between these two variables, however, it can be distinguished that the vast majority present FI with a predominance of the moderate level and an unhealthy QD, which will be reflected in their nutritional status and in turn on their health status, as seen in several studies [1,2]. In recent years, Venezuelan migration has increased due to the country's sociopolitical situation, with more than 54% qualified Venezuelan immigration in Ecuador. In 2019, it was found that 55% of this population is in severe and moderate FI. For this reason, 78% of migrant households live below the poverty line that corresponds to \$1.90 a day. In the city of Cuenca there are no studies of this type, for this reason this research will provide information of a social nature, by publicizing the level of FI with which the VM live, and its relationship with the QD, so that public and private entities carry out charitable projects that guarantee the food security of these people. [1,3,4,5].

Keywords: *Venezuelan migrant, Food insecurity, Diet quality, Relationship.*

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Phenotypic and genotypic alterations of some virulence factors in *E. coli* O104:H4 by induction of β -lactamases CTX-M15

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In recent years, the appearance of microorganisms, such as the multiresistant hypervirulent serotype *E. coli* O104:H4, producers of extended-spectrum β -lactamases, has raised concerns about their therapeutic implications [1]. An interesting question for this is, is the virulence of resistant bacteria altered when β -lactamases are induced by sublethal concentrations of ampicillin? [2,3]. To answer this, the effect of ampicillin concentrations on some *E. coli* O104:H4 virulence factors was tested. The sensitized inoculum was prepared by growing bacteria in LB media plus 0.1, 0.3 or 0.5 mg/ml of ampicillin, and incubated for 4 h at 37°C. This inoculum was used for the assays of viability, swarming motility, biofilm, curly production, and measure of the transformation capacity by monitoring the expression of specific genes. Our results showed that the concentrations of ampicillin used did not affect the viability of the bacteria. Furthermore, when the ampicillin concentration of the inoculum was 0.5 mg/ml but 1.0 mg/ml was used for the swarming assay, the mobility was increased ($P < 0.05$, 7.6 vs 6.0 cm of control), as well as the biofilm production (1.87 times more than control, $P < 0.05$). In contrast, macrocolonies showed higher curli production in the presence of 0.5 mg/l. Bacterial transformation was also increased after ampicillin treatments, especially after exposition to 0.3 mg/ml of ampicillin. Expression of DNA repair genes was also altered. *recA* gene (DNA repair) was upregulated up to 4.5 ($P < 0.05$) fold in the presence of 0.3 and 0.5 mg/ml ampicillin, in contrast *lexA* (*recA* repressor) showed up to 0.77-fold downregulation for all treatments. In conclusion, ampicillin-resistant *E. coli* O104:H4 alters virulence factors in presence of ampicillin. This study allows us to understand the importance of antibiotic residues in food or environmental sources, as a potential risk to human and animal health.

Keywords: *E. coli*, O104:H4, β -lactamases, ampicillin, virulence, factors.

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