JBCT Journal of BioProcess and Chemical Technology

2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Comparative study of fermentation-assisted extraction with Aspergillus niger GH1 of bioactive compounds from grape pomace

Chávez-González, ML[1]*, Amaya-Chantaca, D[1], Flores Gallegos C[1], Aguilar González CN1, Iliná A[2], Sepúlveda L[1], Ascacio Valdés, A[1]

[1]*Bioprocesses and Bioproducts Research Group, Food Research Department, School of Chemistry, Autonomous University of Coahuila, Blvd. V. Carranza s/n CP. 25280, Saltillo, Mexico.*

[2]*Nanobioscience Group, School of Chemistry Autonomous University of Coahuila, Blvd. V. Carranza s/n CP. 25280, Saltillo, Mexico*

**Presenting author: monica_chavez@uadec.uadec.mx*

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

The use of grape pomace agroindustrial residues is an alternative for obtaining metabolites of interest through fermentation in the solid-state and submerged conditions; these are important for the benefits they provide to health as antioxidants, antimicrobials, antiviral. In Mexico, one of the residues from the food industry is grape pomace; the main residues of this fruit come from the wine industry [1]. The main objective was to compare the biotransformation and extraction processes of polyphenols present in grape pomace in two fermentation systems using Aspergillus niger GH1 as a biological model. The best conditions to produce polyphenols were determined using a Hunter & Hunter and Plackett-Burman design; After determining the best conditions for the extraction of polyphenolic compounds, an optimization of the solid system was carried out in a not supplemented medium based on a Box-Bhenken design, where the best treatment was observed. Subsequently, a kinetic study of the best treatment observed in the optimization was carried out. Each of the extracts obtained were evaluated by LC-MS and by evaluating the enzymatic activities such as tannase, ellagitannase, β-glucosidase, α-L arabinofuranosidase, xylanase; these activities were compared with the products found in the LC-MS and it was demonstrated that they correspond with the release of each of the products.

Keywords: *Keywords: Submerged fermentation, Solid state fermentation, grape pomace, bioactive.*

REFERENCES

[1] Amaya-Chantaca et al., 2022. J Chem Technol Biotechnol, 97, 1494-1505.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Jackfruit *Artocarpus heterophyllus* L. juice powder: Physicochemical characterization and aroma release study in a food matrix

Barros-Castillo, J.C.*, Calderón-Santoyo, M., Calderón-Chiu, C., Ragazzo- Sánchez, J.A.

Laboratorio Integral de Investigación en Alimentos, Tecnológico Nacional de México/Instituto Tecnológico de Tepic, Av. Tecnológico #2595, C.P. 63175, Tepic, Nayarit, México.

**Presenting author: jbarros@ittepic.edu.mx*

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

Volatile compounds (VC) in fruits are present in two fractions, free and glycosidically bound. The latest, known as aroma precursors (AP) could be released by acid hydrolysis at low pH [1]. In this sense, a spray dry process was optimized to obtain jackfruit juice capsules containing the free and glycosidically fractions, then added to a matrix food, and finally, evaluate the liberation of VC throughout the time. Yogurt was suitable to assess the volatiles released under acidic conditions. A central composite design was used to estimate the effects of the air inlet temperature and flow feed on the dependent variables (moisture, Aw, yield, and abundance). Response surface methodology was used to optimize parameters. Analysis of VC was carried out by using the headspace-solid phase microextraction approach and thermal analysis of capsules was developed by TGA and DSC. The optimum conditions were 110 °C and 3.3 mL/min, producing capsules with 3.01 %H, 0.176 Aw, 67.18% of yield, and 4887051 of abundance (TIC). TGA of capsules suggests a suitable crosslink between the wall materials. For its part, DSC evidenced possible interactions between polymers, related to the glass transition temperature (Tg), thus a shift in Tg was recorded at 169.5 °C, this fact could improve the spray dry process. A total of 41 volatiles were identified in the whole study and some volatiles could be detected at different concentrations during the study. In this sense butanal, 3-methyl butanal, 2-ethyl-2-butenal, 3-hepten-2-one, (E, E)-3,5-octadien-2-one, ethyl 3-methylbutanoate, 3-methylbutyl acetate, 2-methylbutyl acetate, propyl 3-methylbutanoate, and limonene were the main volatiles released from capsules after post-acidification of yogurt at pH 4.1 after day 3. Findings in this work could suggest that the addition of jackfruit capsules into other matrix foods could enhance aroma during the manufacturing or shelf life.

Keywords: *jackfruit capsules, aroma precursors, aroma release, HS-SPME.*

REFERENCES

[1] Liang et al., 2022. Critical Reviews in Food Science and Nutrition, 62:215–43.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Conjugation of jackfruit leaf protein hydrolysates and maltodextrin for the microencapsulation of a *Coccoloba uvífera* L. leaf extract: Characterization physicochemical, thermal stability, and in vitro release

Calderón-Chiu, C.[1]*, Calderón-Santoyo, M.[1], Barros-Castillo, J. C.[1], Herman-Lara, E.[2], Ragazzo-Sánchez, J.A. [1]

[1]*Laboratorio Integral de Investigación en Alimentos, Tecnológico Nacional de México/Instituto Tecnológico de Tepic, Av. Tecnológico #2595, C.P. 63175, Tepic, Nayarit, México.*

[2]*Departamento de Ingeniería Química y Bioquímica, Tecnológico Nacional de México/Instituto Tecnológico de Tuxtepec, Calz. Dr. Víctor Bravo Ahuja s/n. Col. 5 de Mayo, C.P. 68350, Tuxtepec, Oaxaca, México.*

**Presenting author: carolinachiu@outlook.com.*

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

This study proposed to evaluate the application of LPH and MD as wall materials to microencapsulate a lipophilic extract by the spray-dried emulsions. Emulsions without LPH (control, K), LPH-MD without extract (E), and LPH-MD with extract (EWE) were spray-dried [1]. Subsequently, the physicochemical, thermal, and in vitro release characterization of the extract in the spray-dried capsules was carried out. Powder recovery (72.21%), encapsulation efficiency (70.58%), and loading efficiency (29.42%) were improved with the combination of MD-LPH. Low moisture content, aw, hygroscopicity, and bulk density were observed in the treatments with LPH-MD. The particle sizes for E (7.54 µm) and EWE (8.15 µm) were lower than in the K (26.7 µm). LPH increased the glass transition and decomposition temperatures of E and EWE. The release in vitro of extract in the EWE powder revealed that MD-LPH as wall materials protects *Coccoloba uvifera* extract from gastric conditions. This could ensure their possible bioaccessibility [2]. The above indicates that the combination of LPH-MD showed the potential for the microencapsulation of lipophilic compounds. Therefore, it could be a viable alternative to conventional wall materials, and the EWE powder could be added to any food product as a functional, clean label ingredient that the addition of jackfruit capsules into other matrix foods could enhance aroma during the manufacturing or shelf life.

Keywords: *Coccoloba uvífera, plant protein, protein hydrolysate, emulsion O/W, Spray drying, microencapsulation.*

REFERENCES

[1] Ruiz-Montañez et al., 2019. Journal of Dispersion Science and Technology, 40 (10), 1507–1515. [2] Lekshmi et al., 2021. Food Hydrocolloids, 121, 106976-106986.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Phytochemical characterization of extracts of horticultural losses in primary production in Hidalgo

Morán-Jiménez, F.[1], González-Mendoza, V.M.[2], Hernández-Domínguez, E.M.[1], Quiñones-Muñoz, T.A.[3]*

[1]*Universidad Politécnica de Pachuca, Carretera Pachuca - Cd. Sahagún km 20 Ex- Hacienda de Santa Bárbara, CP.43830, Zempoala, Hidalgo, México.*

[2]*Centro de Investigación en Alimentación y Desarrollo, Ciudad del Conocimiento y la Cultura de Hidalgo, Boulevard Santa Catarina SN, CP.42163. San Agustín Tlaxiaca, Hidalgo, México.*

[3]*CONACYT-CIATEJ, Av. Normalistas 800, Colinas de la Normal, CP.44270, Guadalajara, Jalisco, México.*

**Presenting author: dctanniaquinones@hotmail.com.*

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

Horticultural losses in the field can reach up to 100 % of the planted area, which is an important economic loss for producers and the region development. The anti-cancer and antioxidant properties of vegetables are attributed to phytochemicals. The objective of this study was to evaluate the phytochemical composition of the main crops lost to pests (lettuce, cabbage, cauliflower, broccoli) in Ixmiquilpan, Hidalgo, to find areas of opportunity for their recovery and as a strategy to reduce agri-food losses. The identification of the main crops lost, and their causes was carried out in the field, by means of producer interviews. Healthy and plagued samples (lost due to pests) from the same soil were evaluated. A significant absence of good agricultural practices was found. Proximal analysis was carried out on both types of samples (moisture, ash, crude fiber, protein [1]); lower concentrations of protein and crude fiber were found in the plagued samples. Phytochemical concentrates were prepared for the study by methanolic extraction (80 %) and rotavaporation; better yields have been demonstrated for hydroalcoholic than aqueous extractions, although analyses could be forthcoming for comparison. In general, both types of crops (healthy and plagued) presented quantities of phenols and flavonoids [2], standing out, for some of their parts, in the plagued form; they presented up to 19.72 mg GAE/100 g dw damaged lettuce of total phenols and 51.39 mg QE/100 g dw of dry plagued cauliflower leaf for flavonoids. For reference, the total polyphenol content in fresh broccoli has been reported to range of 34.5 to 128 mg GA/100 g fw [3]. Horticultural losses are due to poor handling and processing. Horticultural phytochemical extracts can be a good starting point in taking actions for the reduction of losses in the field, for valorization, and their use in the development of new products.

Keywords: *horticultural losses, phytochemicals, polyphenols, flavonoids.*

REFERENCES

[1] AOAC, 1990. Official Methods of Analysis. AOAC Press. [2] Gogna et al., 2015. Journal of Pharmaceutical and Biomedical Analysis, 115, 74-85. [3] Gliszczyńska-Świgło et al.,2006. Food Additives and Contaminants, 23, 1088-1098.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

The cooking method determines microstructural changes and nutritional properties of squash blossoms

Castañeda-Rodríguez, R.[1]*, Quiles, A.[2], Larrea, V.[2], Hernando, I.[2], Ozuna, C.[1]

[1]*Posgrado en Biociencias, División de Ciencias de la Vida, Campus Irapuato- Salamanca, Universidad de Guanajuato, Carretera Irapuato-Silao km 9, Irapuato, México.*

[2]*Grupo de Investigación Microestructura y Química de Alimentos, Universitat Politècnica de València, Camino de Vera s/n, 46022 Valencia, Spain.*

Presenting author: lr.castanedarodriguez@ugto.mx

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

The aim of this work was to evaluate the effect of different cooking methods (steaming, boiling, and stir-frying) on microstructural changes and nutritional properties of squash blossoms, a popular Mexican edible flower of great economic importance. For this, changes in moisture percentage (%M), protein concentration (PC), carbohydrate concentration (CC), bioactive compound concentration (chlorophyll: CHLO, total carotenoids: CAR, total phenolic compounds: TPC), and antioxidant capacity (AC) were evaluated for different cooking times and each cooking method. Fresh flowers and those cooked for 15 min were subjected to microstructure and TPC bioaccessibility analyses. Steaming did not cause changes in %M; however, boiling significantly increased ($p<0.05$) %M by up to 8%, while stir-frying significantly decreased ($p<0.05$) %M by 8%. All cooking methods caused damage to flower microstructure, which was probably provoked by thermal and mechanical degradation of the cell wall components and by moisture loss [1]. The cooking methods also induced a significant increase ($p<0.05$) in CC and PC, which could be related to the breakage of glycosidic and peptide bonds, respectively, during cooking [2]. On the other hand, boiling led to a greater loss in TPC (up to 96%) and AC (up to 91%), while stir-frying caused the greatest loss in CHLO (up to 84%) and CAR (up to 81%), all of which could be related to thermal degradation and/or leaching of the compounds into the cooking medium [1,3]. Finally, changes in TPC bioaccessibility were generated in the cooked flowers compared to the fresh ones. In conclusion, different cooking methods may modify the concentration and bioaccessibility of different beneficial compounds present in fresh squash blossoms. The knowledge of how the different cooking methods modulate the nutritional value of squash blossoms in their different forms of consumption will impact their use for specific consumer needs, by best preserving their nutritional and bioactive parameters.

Keywords: *Edible flowers, Phenolic compounds, Carotenoids, Antioxidant capacity.*

REFERENCES

[1] Cattivelli et al., 2021. Foods, 10. [2] Mireya et al., 2021. Emirates Journal of Food and Agriculture, 33(6), 510–519. [3] Monalisa et al., 2020. Food Science and Technology International, 26(4), 333–343.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Characterization of residual incubations solutions from the controlled transformation of cocoa seeds in terms of color, bioactive compounds, and antioxidant capacity

Becerra, L.[1]*, Escobar, S.[2], Ruíz, R.[3]

[1]*Doctorado en Biociencias, Universidad de La Sabana, Chía, Colombia.*

[2]*Corporación Colombiana de Investigación Agropecuaria (Agrosavia), Palmira, Colombia.*

[3]*Facultad de Ingeniería, Universidad de La Sabana, Chía, Colombia.*

Presenting author: lilibega@unisabana.edu.co.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

The physicochemical transformation of cocoa seeds under controlled process conditions has recently emerged as an alternative methodology to spontaneous fermentation since it allows for obtaining great sensory profiles in chocolates [1]. In this methodology, cocoa seeds are immersed in incubation solutions prepared with organic acids, which provide adequate pH conditions for initiating endogenous enzymatic activity. Likewise, operating variables (i.e., temperature, agitation, solid-liquid ratio) are controlled. Diffusion processes during transformation favor the migration of a broad group of compounds, highlighting the migration of polyphenolic compounds and methylxanthines towards the incubation solutions. These compounds are important because they have been widely associated with favorable effects on the central nervous, gastrointestinal, respiratory, cardiovascular, and renal systems [2,3]. However, these incubation solutions are residues from the process and are generally discarded. Thus, the objective of this work is to evaluate the effect of the controlled transformation of cocoa seeds on the color properties and the content of methylxanthines (theobromine, caffeine), flavan-3-ols (catechin, epicatechin, epigallocatechin), total polyphenol content (TPC), and antioxidant activity (ABTS, DPPH) of the incubation solutions. The results suggest that the solutions have a significant content of bioactive compounds, mainly epigallocatechin and theobromine, and high antioxidant activities. No dependence was found between the content of bioactive compounds and the organic acid used. However, a higher amount of phenolic compounds and methylxanthines in the incubation solution is achieved when the seeds are transformed using organic acid solutions at 30 g/L. Additionally, it was possible to establish a color-composition relationship to predict the concentration of the compounds of interest through CIELAB color parameters. This research opens new paths that allow these incubation solutions to be used as functional extracts that can be included in the formulation of new foods due to their chemical composition and antioxidant capacity.

Keywords: *Postharvest operations, organic acids, bioactive compounds, antioxidant capacity, cocoa by-products.*

REFERENCES

[1] Santander, M. et al., 2021. Food Research International, 143, 110236. [2] Franco, R. et al.,2013. Nutrients, 5(10), 4159–4173. [3] Panche, A. N. et al., 2016. Journal of Nutritional Science,5, e47.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Development of a functional beverage based on tamarind and partially-hydrolyzed agave syrup and its effect on metabolic responses and oxidative stress in healthy mice

Cardona-Herrera, R.[1]*, Escobedo-Avellaneda, Z.[2], Saldaña-Robles, A.[1], Franco- Robles, E.[1], Ozuna, C.[1]

[1]*Posgrado en Biociencias, División de Ciencias de la Vida, Campus Irapuato-Salamanca, Universidad de Guanajuato, Carretera Irapuato-Silao km 9, Irapuato, Guanajuato, 36500. México.*

[2]*Escuela de Ingeniería y Ciencias, Tecnológico de Monterrey, Av. Eugenio Garza Sada 2501 Sur, Col. Tecnológico, 64849 Monterrey, NL, México.*

Presenting author: r.cardonaherrera@ugto.mx.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

The aim of this research was to develop a tamarind-based functional beverage sweetened at 10°Brix with 50% hydrolyzed agave syrup and evaluate the stability of its physicochemical, microbiological, and antioxidant properties. In addition, the impact of consuming this beverage on metabolic responses and oxidative stress was evaluated in healthy C57BL/6 mice in comparison to other tamarind beverages sweetened with glucose or fructose at the same concentration. According to the obtained results, the optimal process conditions to generate tamarind extracts with higher contents of phenolic compounds (43.43±3.00 mg GAE/g) and antioxidant capacity (26.88±1.31 µmol TE/g) was to use a ratio of 1:10 (g tamarind/mL water) and boil the extract for 30 min. The partially- hydrolyzed agave syrup, composed mainly of 34.11% fructose, 7.10% glucose, 3.48% sucrose and 55.31% inulin, showed a concentration of phenolic compounds and antioxidant capacity of 10.99±0.75 mg GAE/g and 14.68±1.15 µmol TE/g, respectively. The developed functional beverage has a shelf life of 2 months at a storage temperature of 4°C, maintaining its concentrations of phenolic compounds (65.17±4.83 mg GAE/g) and antioxidant capacity (35.12±3.89 µmol TE/g). Regarding the in vivo study, the developed beverage contributed to keeping the body weight of the mice stable. In addition, the beverage contributed to a significant decrease ($p<0.05$) in the levels of glucose, cholesterol, and triglycerides and to a decrease in the oxidation of lipids and proteins in the liver, compared to those mice that consumed tamarind beverages sweetened with glucose or fructose. In conclusion, this workshows the feasibility of using a partially hydrolyzed agave syrup as an alternative to sweeteners rich in glucose and/or fructose in the development of stable tamarind-based beverages [1]. Finally, our research contributes to promoting the development of functional products that help prevent chronic-degenerative diseases, as long as a balanced diet and a healthy lifestyle are maintained [2,3].

Keywords: *Antioxidant capacity, Fructose, Glucose, Metabolism, Phenolic compounds.*

REFERENCES

[1] Ozuna, C. & Franco-Robles, E., 2022. LWT, 162, 113434. [2] Nazir et al., 2019. Trends in Food Science & Technology, 88, 516-526. [3] Mota et al., 2020. Innovative Food Science and Emerging Technologies, 66, 1-18.

Effect of salicylic acid-induced stress on the yield, composition, and nutraceutical properties of cape gooseberry *Physalis peruviana*

Ríos Lozano, A.[1]*, Reynoso-Camacho R. [2], Bravo Alonso H. E.[2], Figueroa-Pérez, M.G.[3]

[1]*Facultad de Ciencias Químico-Biológicas. Universidad Autónoma de Sinaloa. Culiacán, Sinaloa 80030, México.*

[2]*Facultad de Química, Universidad Autónoma de Querétaro, Querétaro, 76010, México. 3Universidad Tecnológica de Culiacán, Sinaloa, 80014, México.*

Presenting author: alexrioz13@gmail.com.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

Physalis peruviana L., commonly known as cape gooseberry, is an exotic fruit belonging to the Solanaceae family native to Peru, cultivated and exported from Colombia to various countries in Europe and the United States. Its cultivation in Mexico is beginning to be implemented in some states. The fruit has an attractive sweet and sour flavor and is commonly consumed fresh, in jams or dehydrated. In addition, several beneficial health properties are attributed to it, mainly antioxidant and antidiabetic, associated with its content in bioactive metabolites, which can be modulated during cultivation with the use of elicitors such as salicylic acid (SA) [2,3]. Based on the above, the effect of foliar application of salicylic acid (0, 0.25, 0.5, 1.0 and 2.0mM) during the cultivation of cape gooseberry on its yield, composition and nutraceutical properties was determined in the present work. The results obtained showed that salicylic acid did not significantly affect fruit yield, plant height or number of leaves. On the other hand, increases (15-35%) were found in the content of flavonoids and phenolic compounds of fruits elicited with 1.0 mM AS. However, no significant differences were observed in the analysis of antioxidant activity (ABTS, DPPH and ORAC) and total carotenoids. Likewise, there was an increase (60%) in the content of phytosterols and in the inhibitory capacity of pancreatic lipase, while for the inhibitory capacity of alpha amylase and alpha glucosidase no differences were found in the fruit of elicited plants with respect to the control. Therefore, the use of 1 and 2 mM AS could be used as a tool to improve the nutraceutical potential of cape gooseberry fruit.

Keywords: *Physalis peruviana, antioxidant, elicitor, abiotic stress.*

REFERENCES

[1] Ramadan, M.F., 2011. Food Rev Int. 27. [2] El-Esawi, M. A., et al., 2017. Frontiers in Physiology, 8, 716. [3] Varela, M. C., et al., 2016. Plant Physiology and Biochemistry, 104, 81–91.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Are melon by-products promising resources towards functional ingredients development with antioxidant and prebiotic effects?

Gómez-García, R.1,[3]*, Sánchez-Gutiérrez, M.[2], Freitas-Costa, C.[1], Vilas-Boas, A.A.[1], Campos, D. A.[1], Aguilar, C. N.[3], Madureira, A. R.[1], Pintado, M[1].

[1]*Universidade Católica Portuguesa, CBQF - Centro de Biotecnologia e Química Fina – Laboratório Associado, Escola Superior de Biotecnologia, Rua Diogo Botelho 1327, 4169-005 Porto, Portugal.*

[2]*Food Science and Technology Department, Universidad de Córdoba, Spain.*

[3]*BBG-DIA. Bioprocesses and Bioproducts Group. Food Research Department, School of Chemistry, Autonomous University of Coahuila, Saltillo, Coahuila, México.*

Presenting author: rgarcia@ucp.pt.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

Melon peels are by-products that represent rich sources of dietary fiber and phenolics, which could exhibit health-promoting benefits [1, 2]. The aim of this study was to evaluate the accessibility of phenolics throughout gastrointestinal digestion (GID) and the prebiotic effect of two peel fractions obtained by milling: liquid-rich and fiber-rich fractions. The first fraction was centrifuged and then freeze-dried, the second fraction was dried (55 ºC for 48 h) and milled, obtaining a fine powder and flour, respectively. During the GID of the powder, the recovery percentages of the total phenolic content (TPC=65.31%) and antioxidant activity (AA) (ABTS= 39.77%; DPPH=45.91%) were reduced. However, both parameters exhibited stable accessibility, accounting of 81.89% and 76.55%, and 54.07%, respectively. The flour showed an increase in AA at the gastric and intestinal phase, which was corroborated by the increase of the TPC (126.91%) with stable accessibility index on TPC=67.51%, DPPH=83.76% and ABTS=19.73%. The powder and flour exhibited a positive impact on the microbiota diversity (*Bifidobacterium* and *Lactobacillus*) when compared with the Frutooligosaccharides and promoted the production of short-chain fatty acids (mainly acetate). Therefore, these findings demonstrate that melon peels could be potentially used for functional ingredients development, which could promote human gut health.

Keywords: *Melon by-products, Functional ingredients, Dietary fiber, Gut microbiota.*

REFERENCES

[1] Gómez-García et al., 2021. Journal of Environmental Management, 299, 113571. [2] Gómez-García et al., 2020. Trends in food science & technology, 99, 507-519.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Supplemented diets with quercetin and epicatechin enhance the growth performance of *Totoaba macdonaldi*, related to the gut microbiota composition, and liver gene expression

Barragán-Longoria, M.F.*, Hinojosa-Álvarez, S., Hernández-Pérez, J., Fabian-Ortiz, E., García-Roche, A., Chávez--Santoscoy, R. A.

School of Engineering and Science, Tecnológico de Monterrey. Av. Eugenio Garza Sada 2501 Sur, Monterrey, Nuevo León, México.

Presenting author: a00819482@tec.mx.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

Totoaba macdonaldi is an endemic, vulnerable, carnivorous fish of the Gulf of California. It is currently being cultivated in Mexico for commercial and conservation purposes [1]. There are key aspects that need to be addressed for its exploration to be successful. One of the most difficult to overcome is to find a supplementation that reaches protein requirements at an acceptable price and does not compromise its overall performance; several diets have been tested, but so far, none has worked because their side effects on the digestive system [2,3]. The aim of this study is to evaluate the effects of supplemented diets with flavonoids quercetin and epicatechin at two doses (FL 0.25% and FH 0.5%) with and without inulin, on growth performance, gut microbiota and liver expression. The FL and FH diets outperformed the inulin and control diets. FL and FH reduced the presence of the pathogenic species *Vibrio anguillarum* and *Enterococcus faecalis* on gut microbiota diversity. From the differential expression analysis, FH presented enriched pathways involved in lipid metabolism, complementing the results obtained in the hematological analysis, where the same diet showed a significant reduction in plasma cholesterol and triglycerides levels. This analysis provides novel insights into the biological mechanisms involved in Totoaba's response to different diet strategies for the optimal growth for its commercialization, and for its successful reintegration into its natural habitat.

Keywords: *totoaba, flavonoids, inulin, microbiota, metagenomics, transcriptomics.*

REFERENCES

[1] Cisneros--Mata et al., 1997. Ecol Appl, 7(3). [2] Hardy. 2010. Aquac Res, 41(5), 770–6. [3] Gasco et al., 2018. Springer Briefs in Molecular Science, 1–28.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Design of snack bites made with legumes and oats flours for malnourishment

Espinoza-Tapia M.[1]*, Severiano-Pérez P.[2], Martínez-Arellano I[1], Córdova-Aguilar M.S.[1]

[1]*Instituto de Ciencias Aplicadas y Tecnología, Universidad Nacional Autónoma de México, C.U., Ciudad de México 04510, México*

[2]*Facultad de Química, Universidad Nacional Autónoma de México, C.U., Ciudad de México 04510, México*

Presenting author: marve7_9@hotmail.com.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

Protein-energy malnutrition is one of the main public health challenges in the world, whose main causes are inadequate protein and amino acid intake. One of the approaches to overcome is nutritional support, where patients consume nutritional high protein supplements that provide them with enough energy and protein [1]. The purpose of this work is the design of legume- based snack bites complemented with oats and puffed amaranth focused on young adults with protein-energy malnutrition. The mixture design experiment was performed through the Statgraphics® program using the Protein Digestibility Corrected Amino Acid Score (PDCAAS) of the flours and the final product finding 15 blends varying the amount of black bean, lentil, chickpea, and oats flours [2]. The legumes were soaked during 24 h at room temperature. They were subjected to a thermal process for 90 minutes and dried at 45-56 ° C until they reached an aw of less than 0.4 and a humidity of less than 12%. Oats and legumes were ground and sieved. Bites were elaborated using agave syrup as binding agent and covered by puffed amaranth. Moisture, sensory attributes as appearance, texture, taste, color, and flavor were measured. Three high ranking PDCAAS value (0.7) and 5 blends with average of 0.6 were selected, with higher content of the legume flours as well as guarantee a high level of acceptance (75-90%) using a sensory pleasure level test with a 9-point hedonic scale. The nutritional contribution of the high ranking PDCAAS bites selected have 4g proteins, 24g carbohydrates and 1g dietary fiber and provide energy 120 Kcal. The study of shelf life is being carried out under three storage conditions to assess stability, sensory and texture attributes as well as microbiology for 90 days.

Keywords: *snack, legumes, oats, protein quality.*

REFERENCES

[1] UNICEF/WHO/WBG. (2018). Joint Child Malnutrition Estimates 2018 Edition, 1–15 [2] Schaafsma, Gertjan. (2005). Journal of AOAC International, 88(3), 988–994.

Development of a pancake-type flour based on vegetable protein complemented with *Galdieria sulphuraria* as a high biological supplement for malnutrition

Contreras-Morales A.*, Martínez-Arellano, I, Córdova-Aguilar M.S.

Instituto de Ciencias Aplicadas y Tecnología, Universidad Nacional Autónoma de México, C.U., Ciudad de México 04510, México.

Presenting author: 310013402@quimica.unam.mx.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

This work focuses on designing a prepared pancake-type flour with the incorporation of *Galdieria sulphuraria* (Cyanidiales), a unicellular thermoacidophile microalgae [1] as an alternative to increase the PDCAAS, which is the quality of proteins [2] as well as the taste of the final product. Our incidence is to offer a different form of consumption of a high protein supplement for people with malnutrition. Microalgae is an important source of protein, which can offer greater protein value and complement the nutritional quality of the developed product. 15 blends varying the amount of black bean, lentil, amaranth, and oats flours were obtained from a mixture design, carried out through the Statgraphics® program. The amount of microalgae was kept constant in each mixture. The legumes were soaked 24 h/room temperature. They were subjected to a thermal process for 90 minutes and dried at 45-56° C until they reached an aw of less than 0.4 and a humidity of less than 12%. Oats, amaranth, and legumes were ground and sieved. The blends were evaluated in terms the consistency and uniformity of the suspensions, determined by a stress-controlled rheometer. As well as the moisture, sensory and texture attributes, taste and flavor and values of PDCAAS of the blends. Two final products were selected with its mean PDCAAS value of 0.54 since their sponginess attribute resemble a conventional pancake. A sensory pleasure level test was performed with a 9-point hedonic scale to consumers aged 20 to 60 years, who selected the mixture with oats 33.3%, beans 10%, lentils 28.3%, amaranth 28.3% and seaweed 5% as “I like”, with a nutritional contribution of 16.2g proteins and 3.6g dietary fiber.

Keywords: *pancake-type flour, Microalgae, legumes, cereals, protein quality.*

REFERENCES

[1] Gross, W., & Schnarrenberger, C. (1995 In Plant and Cell Physiology (Vol. 36). [2] Schaafsma, Gertjan. (2005). Journal of AOAC International, 88(3), 988–994.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Obtaining fermented chia with antihypertensive activity

Atonal-Sánchez, H.*, Luna-Suárez, S.

Centro de Investigación en Biotecnología Aplicada - Instituto Politécnico Nacional, Carretera estatal Santa Inés Tecuexcomac - Tepetitla km 1.5, C.P. 90700, Tepetitla de Lardizábal, Tlaxcala, México.

Presenting author: silvials2004@yahoo.com.mx.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

High blood pressure is a very serious health problem; it is estimated that one in four adults suffers from this disease. This leads to cardiovascular, kidney, and brain problems, and premature death [1]. There are drugs to control this disease, such as lisinopril, captopril, enalapril, having some side effects. However, alternatives are still being sought that, in addition to having a similar effect to existing treatments, provide more than one benefit, or even reduce undesirable side effects. Some of these treatments are based on the ability to inhibit the activity of the angiotensin-converting enzyme ACE, which converts angiotensin I (inactive compound) into angiotensin II (vasoconstrictor), one of the molecules responsible for raising blood pressure [2]. Foods such as eggs, milk, fish, seeds, among others, contain bioactive compounds that can have a positive impact on health, however, to take advantage of them, it is necessary to release them from the original source. The fermentation of foods with microorganisms such as lactic acid bacteria is a viable option for the release of these compounds, as they contain the necessary machinery such as enzymes that can do this task. In this work, we show the antihypertensive activity of fermented chia flour by Lactococcus sp. The best result obtained was from the sample taken at 48 h of fermentation, an IC50= 7.5 µg/mL was estimated, this result is comparable to that obtained by [3] who reported an IC50= 3.6 µg/mL from Oncorhynchus mykiss hydrolysate with alcalase. This indicates that fermentation of chia by *Lactococcus* sp is an alternative to produce ACE inhibitors, in addition to providing nutrients such as vitamins, antioxidants or beneficial minerals for health.

Keywords: *Antihypertensive, Lactococcus, Chia, ACE.*

REFERENCES

[1] R. Rodrigues et al., 2021. Nefrología, 4, 244-257. [2] Y. Zheng et al., 2017. Funct. Foods, 28, 48-58. [3] S. Ketnawa et al., 2019. Food Sci. Technol, 54, 1062-1073.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Evaluation of in vitro antioxidant activity from extracts and hydrolysates from *Sphenarium purpurascens*

Marín-Morales, M.S.*, Ibarra-Herrera, C.C.

Bioengineering department, School of Engineering and Science. Tecnológico de Monterrey, Campus Puebla, Av. Atlixcáyotl 5718, Reserva Territorial Atlixcáyotl, 72453. Puebla, Puebla. México.

Presenting author: a00828173@tec.mx.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

Entomophagy has increased worldwide as edible insects promise to be a great source of nutrients such as proteins, fatty acid, vitamins, and minerals [1]. In Latin America, the consumption of insects depends on the geographical area, for example, in some regions of Mexico, edible insects are consumed as typical food. One of the most common is *Sphenarium purpurascens*, commonly known as grasshopper [2]. Different approaches have been found in literature. Some of them focusing on biological activity obtained from extracts of edible insects [3,4]. The purpose of this research was to evaluate antioxidant bioactivity from extracts and hydrolysates of early and adult stages grasshoppers. Regarding proximal analyses of early grasshopper (EG) and adult grasshopper (AG) both samples shown statistically significant differences (p-value<0.05): in protein (49.4%, and 57.3%), chitin (10.5%, and 15.6%), and ethereal extract (9.35%, and 13.1%, respectively). Samples of extracts and hydrolysates of EG and AG presented higher concentration of total phenolic compounds (TPC) (up to 196 mg GAE). In the case of scavenging radical activity to DPPH• and ABTS•+, the extracts and hydrolysates presented also higher antioxidant capacity (up to 252.78 mM Trolox) against these radicals. Although edible insects are a promising source of nutrients, further studies are in progress to evaluate their bioaccessibility.

Keywords: *edible insects, grasshoppers, antioxidant compounds.*

REFERENCES

[1]Jantzen da Silva Lucas et al; Food Chem. 2020,311:126022. [2] Ramos-Elorduy J et al; Food Compos Anal. 1997;10(2):142–57. [3] Acosta-Estrada BA et al; Front Nutr. 2021; 8:344. [4] Ibarra-Herrera CC et al; J Food. 2020 ;18(1):257–63.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Evaluation of the chemical composition and nutritional value of eight species of quelites of recurrent consumption in raramuri communities of the Sierra Tarahumara, Mexico

González Pedroza, MG.[1]*, Chávez López, G.[1], Bye Boettler, R.A.[2], Castro Lara, D.[2], Cristians Niizawa, S.[2], Linares Mazari, E.[2], Mendoza Cruz, M.[2], Mera Ovando, L.M.[2], Rodríguez Servin, J.[2], Ramírez Orejel, J.C.[3]

[1]*Facultad de Química, UNAM,*

[2]*Instituto de Biología, UNAM,*

[3]*Facultad de Medicina Veterinaria y Zootecnia, UNAM, Avenida Universidad #3000, Col. Ciudad Universitaria, Alc. Coyoacán, Cd Mx, México.*

Presenting author: gonzpguad5269@gmail.com.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

The Sierra Tarahumara is considered one of the biodiverse areas in the north of Mexico [1]. The raramuri are considered subsistence farmers, supplementing their diet by consuming quelites [2]. The objective of this study was to determine the chemical composition and nutritional value of *Amaranthus retroflexus*, *Amaranthus palmeri*, *Phacelia platycarpa*, *Arracacia edulis*, *Tauschia madrensis*, *Chenopodium berlandieri*, *Cucurbita pepo* and *Monarda austromontana*, considered of recurrent consumption [3]. Physicochemical characterization was performed, amino acid profile, amino acid score, digestible protein, mineral concentration (Ca, Fe, K, Mg, Mn, Na, P and Zn) and finally nitrates and oxalates as antinutritional factors. Quelites were an excellent protein source around 13.76-22.80%, values of true protein ranged from 12 to 21%, amino acid score cover in most cases more than 50% of the requirement according to FAO/WHO (2007), being the trend SAA the limiting group. In addition, quelites cover the daily requirements of Zn (4.42-47.10mg/100g), Fe (10.40-58.53mg/100g), and Ca (0.59-2.69g/100g). Finally quantified oxalates (0.3-11.24g/100g) could limit the bioavailability of Ca. Quelites are source of essential microminerals to cover the daily intake requirements recommended by FAO, the chemical qualification of the protein showed and adequate balance of essential amino acids, which is important due the limited access to animal protein for this population.

Keywords: *quelite, raramuri, protein, supplementing.*

REFERENCES

[1] Salmon, et al., 2000. Ecological applications, 10,1327-1332. [2] Bye, 1981. Journal of Ethnobiology, 1,109-123. [3] Linares, et al., 2016. Patrimonio gastronómico de Chihuahua, 37-51.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Analysis of antioxidant capacity and bioactive compounds during osmotic dehydration of papaya cubes with *Hibiscus sabdariffa* solution

Aguirre-García, M.[1]*, Ruiz-López- I.I.[1], Ochoa-Velasco, C.E.[2]

[1]*Facultad de Ingeniería Química, Benemérita Universidad Autónoma de Puebla, Av. San Claudio y 18 Sur, Ciudad Universitaria, C.P. 72570, Puebla, Puebla, México.*

[2]*Facultad de Ciencias Químicas, Benemérita Universidad Autónoma de Puebla, Av. San Claudio y 18 Sur, Ciudad Universitaria, C.P. 72570, Puebla, Puebla, México.*

Presenting author: gonzpguad5269@gmail.com.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

Currently, lifestyle of the population has led them to consume healthy foods, especially those rich in bioactive compounds such as antioxidants (phenols, flavonoids, anthocyanins, etc.). These types of compounds have been associated with reducing the risk of developing chronic degenerative diseases [1]. Osmotic dehydration (OD) has been successfully applied to incorporate bioactive compounds in different fruit and vegetable products [2,3]. The aim of this study was to analyze the mass transport of antioxidant capacity and bioactive compounds on papaya cubes. The experimental section consisted in osmotic dehydrated papaya cubes (1.5x1.5x1.5cm) with hibiscus sabdariffa solution adjusted to 20°Bx with sucrose as osmotic medium different temperatures (45, 55, 65°C). OD on bioactive compounds was describe in terms of total antioxidant capacity (TAC), total phenolic compounds (TPC), total flavonoids (TF) and total anthocyanins (TA). Results indicated that after 360 min papaya cuts impregnated with hibiscus sabdariffa solution increase their TAC from 112.9±1.3 to 158.1±4.4 g Trolox /g P.T., TPC from 1735.6 to 5990.9 g GAE/g P.T., TA from 0.3±0.2 to12±1.9 g cianidina-3-glucósido /g P.T. The results shown a significative increase of the antioxidant capacity and bioactive compounds of the treated product. So, the impregnation of papaya with hibiscus solution was a viable way to incorporate bioactive compounds giving a healthy option to consume fruits with an added value, taking advantage of the antioxidants present in the hibiscus solution, giving another option for consumption.

Keywords: *Hibiscus sabdariffa, impregnation, bioactive compounds and mass transfer.*

REFERENCES

[1] Bellary and Rastogy, 2012. Innovative Food Science & Emerging Technologies, 16, 33-40. [2] Dinçer, 2021. Journal of Food Processing and Preservation, e15886. [3] Aguirre- García et. al., 2020. Journal of Food Engineering, 282, 110003.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Optimization of a double emulsion *O/W/O* elaboration with extract of *O. tuberosa* as antioxidant

Dimas-López, D.J.*, Piloni-Martini, J., Soto-Simental, S., López-Palestina, C., Quintero- Lira, A.

Instituto de Ciencias Agropecuarias, UAEH, Av. Universidad km 1, Rancho Universitario ex-Hacienda de Aquetzalpa, Tulancingo de Bravo Hgo., México

Presenting author: denisdimas29@gmail.com.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

Oxalis tuberosa is an Andean crop that has been introduced to Europe and México [1], the tuber is rich in polyphenols and anthocyanins which are associated with antioxidant and pharmacology properties [2,3], to enhance these properties is recommendable to extract the bio-compounds from the vegetal matrix and those can be used to develop functional or nutraceutical foods [4], to protect the bio-compounds from degradation for oxygen, light, and temperature changes is necessary to apply technologies as encapsulation, simple or double emulsions which can replace fat in meat, dairy and bakery products [5]. Therefore, this project evaluated the optimal ratio of fat and O. tuberosa peel extract as an antioxidant in a double emulsion. To determine this ratio on the primary emulsion (O1/W) and secondary emulsion (W/O2) the inclusion efficiency of anthocyanins was evaluated, according to the results for O1/W the 60:40 ratio preserves 80.38±0.52 % of the initial anthocyanin concentration and for W/O2 the optimal ratio was 30:70 which retains 95.54±1.86 % of the anthocyanins in the primary emulsion, as result the O/W/O emulsion presents an anthocyanin concentration of 340.33±5.55 mg eq. Cyn-3-glu g-1, total phenols of 3.41±0.019 mg GAE g-1, flavonoids of 2.70±0.017 mg EQ g-1 and antiradical inhibition power to ABTS of 75.65±1.72 % and a 73.47±1.32 % inhibition to DPPH. The optimal formulation for the double emulsion is 60:40 for O1/W and 30:70 for W/O2, with the addition in of *O. tuberosa* peel extract the O/W/O shows an important antioxidant capacity to stabilize free radicals as ABTS and DPPH, using double emulsions as fat replacements in food products can improve some pharmaceutical properties and change the fat profile (saturated to unsaturated fats) as result a healthier and functional product for the consumer.

Keywords: *O. tuberosa, emulsion, O/W/O, antioxidant.*

REFERENCES

[1] Guemes-Vera et al., 2018. Alternative and Replacement Foods, 17, 167-175. [2] Chirinos et al., 2009. Food chemistry, 113(4), 1243-1251. [3] Yang et al., 2022. Functional Foods,88, 1-15. [4] Shahidi et al., 2015. Journal of functional foods, 18, 820-897. [5] Stasse et al.,2020. Colloids and Surfaces A: Physicochemical and Engineering Aspects, 592, 124564.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

In vitro gastrointestinal digestion of ice cream with mango by- products: Potential absorption and load of polyphenols

Durán-Castañeda, A.C.*, Flores-Jiménez, EA., Zamora-Gasga, VM.

Tecnológico Nacional de México, Instituto Tecnológico de Tepic. Av. Tecnológico No. 2595, Col. Lagos del Country, CP. 63175, Tepic, Nayarit, México.

Presenting author: bellamy277@gmail.com.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

The objective of this study was to evaluate the substitution of mango paste (M-Paste) and mango peel (M-peel) var "Ataúlfo" on total soluble phenols (TSP), hydrolyzable polyphenols (PH), antioxidant capacity (AOX; DPPH, ABTS and FRAP), bioaccessibility (BA%), potential absorption (PA%) and load of polyphenols during the in vitro gastrointestinal digestion (GD) in ice cream. The sensory preference (Hedonic Scale: 1, I dislike; 10, I like very much) was evaluated in ice cream mixtures by modifying the proportions of milk powder, MPeel and Mpulp. Three formulations were selected (Milk powder-MPaste-MPeel, g/100g): F1 (10.44-0-0), F2 (3.48-3.48-3.48) and F3 (0-3.48-6.96). The samples were subjected to GD and TSP, pH, AOX in the intestinal fraction (IntF), indigestible soluble fraction (ISF) and indigestible Insoluble fraction (IIF) were determined [1]. The F2 showed maximum scores of 7.89 and 8.21 for flavor and texture. In IntF and IIF, the formulation that presented the highest content of TSP was F3 with 27.03 and 10.58 mg GAE/g. An increase in HP was proportional to the increase of M-Peel during the digestion steps ($p<0.05$). However, this behavior was not observed in AOX, only for DPPH, with values of 18.05 (F1), 38.16 (F2) and 91.86 (F3) µM ET/g. A decrease in %BA was observed for F3 (49.78%) compared to F1 (72.08%), but the polyphenol load in a 30 g was higher by 73.42 mg for F3 with equal PA% (≈55%). Mangiferin was mostly identified in IntF for F2 and F3 with a decrease in ISF and IIF. This compound has anti-inflammatory and anticancer properties [2]. In conclusion, M-Paste and M-Peel can be substituted for the elaboration of sensorially acceptable ice creams and could generate a beneficial effect on the health. Furthermore, the mango by-products considered as environmental contaminants have a high content of bioactive compounds which makes them potentially useful for the development of functional foods.

Keywords: *Ice cream, Mango by-products, Potential absorption, Polyphenols, Functional food.*

REFERENCES

[1] Cruz-Trinidad et al., 2019. International Journal of Food Science & Technology, 54 (11), 3091-3098. [2] Mei et al., 2021. Food and Chemical Toxicology, 149, 111997.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Implementation of *Persea americana* MILL by-products for the development of a functional beer

Casillas-González, R.[1], Montaño-Pérez, C.[2], Yañez-Ibarra, G.[2], Medina-Díaz I.[2], Ávila-Villareal G.[2], Rodríguez-Carpena J.[2]

[1]*LIIA-Instituto Tecnológico de Tepic. Av. Tecnológico 2595 Col. Lagos del Country, Tepic, Nayarit.*

[2]*CAyPN-Universidad Autónoma de Nayarit. C. Conocimiento. Tepic, Nayarit.*

Presenting author: german.rc@uan.edu.mx.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

The United States National Academy of Science defines functional foods as "any modified food or food ingredient that may provide a health benefit greater than that of the traditional nutrients it contains" [1]. Many industries are joining this trend, an example of this is the brewing industry, which has worked to develop functional beers, which seek to have positive effects on health by being enriched with bioactive compounds [2]. A food by-product that has a large amount of bioactive compounds of interest, such as tannins, phenolic acids and flavonoids, is the seed of *Persea americana* Mill [2]. The aim of the present work is to develop and evaluate craft beer formulations with the incorporation of P. americana Mill seed. Three beer formulations with the integration of P. americana seed were developed, which are described below; TS (aqueous extraction assisted by ultrasound to the seed of *P. americana*) M:S (Substitution of 30% of barley malt by seed of P. americana) and EH (1 g/L of hydroalcoholic extract of the seed of *P. americana*) it was determined that implementing this by-product does not negatively affect the fermentation stage, the nutritional qualities or the sensory qualities and, it was concluded that the treatment with the substitution of 30% of malt for P. americana is the best as it presents a significant increase in functional properties such as antioxidant capacity.

Keywords: *Beer, Persea americana MILL, Phenolic Compounds, Antioxidant Capacity.*

REFERENCES

[1] Asociación Americanana de Dieta., 2004. J Am Diet Assoc, ;104:814-826. [2] Zapata J., 2019. LWT Food SciTechnol, ;103: 139-14.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Nutrition profile, physical and techno-functional properties of *Arsenura armida* flour

Cortazar-Moya, S.*, Morales-Camacho, J.I.

DIQAA, Universidad de las Américas Puebla, Sta. Catarina Mártir, San Andrés Cholula, Puebla 72810, México.

Presenting author: sheila.cortazarma@udlap.mx.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

Edible insects are considered traditional foods in over 100 countries, and in Mexico, is a prehispanic practice [1]. Besides this traditional aspect, edible insects are gaining interest as alternative food sources for the increasing world population [2]. The purpose of this research was to evaluate the nutritional profile, physical and techno-functional characteristics of edible insect flour *Arsenura armida* to use as functional ingredient in the food industry. Results showed that this flour contains 26.62% protein, 24.18% lipids, 4.65% ash (macrominerals and microminerals), 7.3% fiber, 2.32% moisture and 28.98% total carbohydrates with a heat gross of 5.79 kcal/g. The oil is composed of 84.62% saturated fatty acids, 8.77% monounsaturated fatty acids and 6.61% polyunsaturated fatty acids. The particle size was 143 µm, the bulk density 0.38 g/ml and tapped density 0.49 g/ml with a compressibility index (CI) of 22 and a Hausner ratio of 1.2, which suggest this flour can have good flow characteristics. Regarding to functional properties, it had specific water and oil holding capacity of 222.51% and 118.7%, respectively. The viscosity values point that it behaves as a Newtonian fluid at a minimum concentration (5%), but as a non-Newtonian shear thinning fluid at high concentration (20%). No foam capacity was exhibited (5-20% flour) but had a 100% emulsion capacity and emulsion stability (15 and 20% flour). This flour could be a good source of nutrients to use as an ingredient for human food due to its protein content is like animal sources as beef (24.8%), and mineral profile can cover from 12 up to 70% of daily requirements [3-7]. Besides its functional properties make it a good option to use in some products as a substitute of animal protein due to insects shows great potential for food and feed as an environmentally friendly choice in future food systems [8].

Keywords: *Edible insects, Nutrition, Protein, Fatty acids.*

REFERENCES

[1] Rodriguez-Miranda et al., 2019. European Food Research & Technology, 245, 2613-2620. [2] Baiano, 2020. Trends in Food Science & Technology, 100, 35-50. [3] Siulapwa et al., 2014.International Journal of Science and Research, 3, 876-884. [4] FAO, 2013. Food and Agricultural Organization/The International Network of Food Data Systems (INFOOD). [5] Weaver, 2013. Advances in nutrition, 4, 368S-377S. [6] Beto, 2015. Clinical nutrition research, 4, 1-8. [7] FAO/WHO. 2002. [8] Akhtar et al., 2018. Proteins in food processing, 263-288.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Development of an oatmeal cookie with amaranth adding freeze- dried huitlacoche (*Ustilago maydis-Zea mays*) as an alternative to a functional food

Moreno-Hernández E.L.[2]*; Muñoz-Yáñez C.[1]; Enríquez Soto A.I.[2]; Luna García A.B.[2]; Sifuentes Ramos M.[2]; Ríos Valles A.[2]; Valdés-Téllez A.C.[2]; Correa-Cantú J.C.[2]; Guangorena-Gómez J.O.[1]

[1]*Universidad Juárez del Estado de Durango, Facultad de Ciencias de la Salud campus Gómez Palacio, Calzada las Palmas s/n Revolución, 35050, Gómez Palacio, Dgo., México*

[2]*Universidad Iberoamericana Torreón, Calzada Iberoamericana No. 2255, C.P. 27420, Torreón, Coahuila, México*

Presenting author: marcela.sifuentesr@ibero-torreon.edu.mx.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

Nowadays, most people's lifestyles are fast-paced, and they seek to meet their nutritional needs in a quick and convenient way that doesn't take up too much time [1]. Due to this, processed products have grown exponentially despite their low nutritional value. In Mexico, huitlacoche or cuitlacoche has traditionally been appreciated as a culinary delight since the time of the Aztecs, and its potential as a functional food and as a producer of natural bioactive substances, which can be used in the production of fortified foods, is currently being studied [2]. For this reason, the purpose of this research was to develop a cookie with oatmeal (*Avena sativa* L.), amaranth (*Amaranthus* spp.) and freeze-dried huitlacoche (*Ustilago maydi-Zea mays*) as functional ingredient. Total phenol content was evaluated showing an increase from 118,848 to 404,303 mgEAG/100g and antioxidant capacity was determined by the ability to inhibit free radicals 1, 1-diphenyl-2-picrilhydrazyl (DPPH). Finally, a bromatological and microbiological characterization was carried out, showing the following results: 6.45% moisture, 2.23% ash, 14.68% fat, 8.28% protein and 3.06% total fiber. A sensory evaluation of the cookie was performed using a hedonic test for aspects such as color, taste, hardness, chewability and general acceptability, in a group of 60 untrained people, which was accepted by its flavor and texture.

Keywords: *cookie, huitlacoche, total polyphenol content, antioxidant capacity.*

REFERENCES

[1] Álvarez Munárriz et al., 2009. Gazeta de Antropología 25 (1), 27. [2] Juárez-Montiel et al., 2011. Rev. Iberoam. Micol., 28(2), 69-73.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

The biofunctional potential of *Citrus aurantium* in different food matrices

Estrada-Sierra, N.A.[1]*, Villanueva-Rodríguez, S.J.[1], Padilla-Camberos, E.[2], González-Ávila, M[2]., Urías-Silvas J.E.[1], Rincón-Enríquez, G.[3], García-Parra, M.D.[1].

[1]*Food Technology.*

[2]*Pharmaceutical Biotechnology.*

[3]*Plant Biotechnology, Centro de Investigación y Asistencia en Tecnología y diseño del Estado de Jalisco (CIATEJ), Av. Normalistas #800, Guadalajara, México.*

Presenting author: naestrada_al@ciatej.edu.mx.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

The bioactive compounds of extracts of *C. aurantium* have shown biological effects such as antidiabetic, weight control, and stimulation of the intestinal microbiota [1]. However, there are few studies of this citrus as part of food matrices and the physicochemical interactions play an important role in the availability of bioactives, which could diminish or change their biological effect [2]. Therefore, in the current investigation, we study the hypoglycemic and hypocholesterolemic effects of *C. aurantium* juice and probe the prebiotic effect of a gummy made with C. aurantium extract and Opuntia cladodes mucilage to probe the biofunctional effect of sour orange in a different food matrix. The hypoglycemic and hypocholesterolemic effects of juice freshly squeezed or added with β-cyclodextrin and pasteurized were evaluated by measured oral glucose change and postprandial cholesterol in male mice Balb- c. The probiotic effect was measured by the colonic fermentation of gummy with or without extract in an Automatic and Robotic Intestinal System (ARIS) inoculated with lean or obese volunteer microbiota, change in the growth of *Lactobacillus* spp, *Bifidobacterium* spp, *Salmonella* spp, *Clostridium* spp and formation of short-chain fatty acid (SCFA) were measured. Both juice matrices demonstrated hypoglycemic and hypocholesterolemic effects compared with control. Colonic fermentation of gummy demonstrated significant growth of beneficial bacteria and an increase in production of SCFA, regardless of the type of matrix administered, obese microbiota was most sensitive to the presence of extract than lean ones. It can be concluded that both matrices have a potential biological effect, which shows that sour orange could be a source for functional foods.

Keywords: *citrus aurantium, hypocholesterolemic, hypoglycemic, prebiotic.*

REFERENCES

[1] Maksoud S. et al., 2021. Molecules, 26(19), 1-18., [2] Chen, X. et al., 2021. Critical Reviews in Food Science and Nutrition, 0(0), 1–20.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Moringa oleifera: an accessible strategy to prevent iron deficiency anemia

Castillo, R.I.[1]*, Pérez, A.[1], Taborda, P.[1], Cabal, A.[2], Ramírez, E.[3]

[1]*Colegio de Postgraduados Campus Veracruz, km 88.5 Carr. Fed. Xalapa- Veracruz, Veracruz, México.*

[2]*TECNM/Instituto Tecnológico Superior de Huatusco, C. 25 Ote., Reserva Territorial, 94106 Huatusco, Ver., México.*

[3]*TECNM/Instituto Tecnológico Superior de Zongolica, Extensión Tezonapa, Antiguo Recinto Ferial, Carretera a el Palmar s/n, Tezonapa, Ver*

Presenting author: rosychely@colpos.mx.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

Moringa is a plant that has been shown to be rich in nutrients that can be used as a supplement in places with extreme poverty [1]. The objective of this study was to develop supplements with *Moringa oleifera* flour and to evaluate the effect of its consumption on the nutritional status of children from a vulnerable community. Capsules for women and muffins for children were developed. A longitudinal-observational study was carried out with 50 repetitions each, to carry out a nutritional and biochemical evaluation. In general, there was a significant increase ($p<0.05$) in hemoglobin (HB), hematocrit (HC), and mean corpuscular volume (MCV) values in women and children. In the women, supplemented with moringa capsules during the study period, evidence was found that both HB and HC reached optimal values: HB >12.5 and HC > 36, respectively. Regarding the children, variations of HB were obtained in both groups (control and supplemented), at the beginning and end of the study. In addition, the values of HB and HC of the children at the end of the study increased significantly in the group that consumed supplements with moringa. It is concluded that supplementation with *Moringa oliefera* contributed to the decrease in the prevalence of anemia in school groups and women of reproductive age. Therefore, it is important to promote these nutrient-rich food alternatives as a strategic action within the Sustainable Development Objectives (SDO 2): Zero Hunger [2] Olson and Fahey, 2011.

Keywords: *Malnutrition, SDO, hemoglobin, muffin, Iron.*

REFERENCES

[1] Canett R. et al., 2016. Revista de Ciencias Biológicas y de salud, 1: 3-9. [2] Olson M., y J. Fahey. 2011. Revista Mexicana de Biodiversidad, 82:1071-1082.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Development and in-vitro evaluation of a Functional ingredient: Inulin-Soy Protein nanoparticles simultaneously loaded with Epicatechin and Quercetin

Ayala-Fuentes, J.C.[1], Magaña-Aguirre, J.J.[2], González-Meljem, J.M.[2], Chávez- Santoscoy, R.A.[1]*

1Tecnológico de Monterrey, Escuela de Ingeniería y Ciencias, Ave. Eugenio Garza Sada 2501 Sur, Monterrey 64849, México.

2Tecnólogico de Monterrey, Escuela de Ingeniería y Ciencias, Calle del Puente #222 Col. Ejidos de Huipulco, Tlalpan C.P. 14380, Ciudad de México, México.

Presenting author: chavez.santoscoy@tec.mx.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

Epicatechin and Quercetin gained particular attention for their potential therapeutic activities in noncommunicable chronic diseases (NCDs) [1]. A novel inulin-soy protein nanoparticles (NEQs) was simultaneously loaded with Epicatechin and Quercetin to improve bioavailability of this flavonoids in human body. They were synthesized by spray-drying and the process optimization, nanoparticle characterization, in vitro release, in vitro gastrointestinal digestion, and cytotoxicity effect of NEQs were investigated. Results showed that NEQs are average size of 280.17 ± 13.42 nm and a zeta potential of -18.267 ± 0.83 mV in organic phase. Encapsulation efficiency of Epicatechin and Quercetin reached 97.04 ± 0.01 and 92.05 ± 1.95 %, respectively. The addition of soy protein allowed to obtain nanoparticles with a controlled release, where more than 80% of the flavonoids were released up to 16 hours later. Another research showed that soy protein had a significant effect on the flavonoid release ((-)-Epicatechin and Quercetin microparticles) with a positive impact on the flavonoid release behavior in hexane [2]. The structural characteristics and physicochemical properties of NEQs changed during gastrointestinal digestion in vitro. It was possible to keep the nanoparticles stable under oral and gastric digestion conditions, while at intestinal pH conditions the nanoparticles were degraded, and the flavonoids were released. Also, NEQs presented effects of inhibition in Caco-2, but not in HepG-2 and HDFa cells. These results contribute to the design and fabrication of inulin-soy protein nanoparticles for improving bioavailability for multiple bioactive compounds with beneficial properties.

Keywords: *nanoparticle, bioavailability, flavonoids, inulin, soy-protein, functional ingredients.*

REFERENCES

[1] PAHO/WHO. 2019. Pan American Health Organization. [2] Morel, et al., 2017. European Journal of Lipid Science and Technology, 119(10), 1700041.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Characterization and antioxidant capacity of phenolic compounds of jackfruit genotypes from Nayarit, México

Morelos-Flores D. A.[1]*, Anzaldo-Mendiola L.R.[1], Montalvo-González E.[1], Zamora-Gásga V.M.[1], Santacruz-Varela A.[2], García-Magaña M.L.[1]

[1]*Tecnológico Nacional de México; Instituto Tecnológico de Tepic; Laboratorio Integral de Investigación en Alimentos; Av. Tecnológico #2595 Col. Frac. Lagos del Country, C.P. 63175, Tepic, Nayarit, México.*

[2]*Colegio de Postgraduados, Campus Montecillo, Programa de Recursos Genéticos y Productividad, Montecillo, Km 36.5 Carretera México-Texcoco. C.P. 56230, Texcoco, Estado de México, México.*

Presenting author: mailto:daanmorelosfl@ittepic.edu.mx.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

Jackfruit (*Artocarpus heterophyllus* Lam.) is a source rich of phytochemicals, including phenolic compounds, thus offering a broad perspective in the development of value-added foods for nutritional and nutraceutical purposes for the benefit of human health [1]. The objective of this research was to compare the content of phenolic compounds and their antioxidant capacity among different jackfruit genotypes from Nayarit, Mexico. To work with “Agüitada”, “Rumina”,” Licenciada” and “Virtud” jackfruit, the results obtained in the phenolic profile using HPLC indicated that shikimic acid is the compound with the highest concentration in jackfruit bulbs, flavonoids were also identified [2], with catechin being the most prominent. In the determination of total soluble phenols (TSP), the genotype "Agüitada" showed the highest values of this parameter at the end of storage life and the lowest values was showed for "Rumina" and "Virtud" with 0.99 and 0.87 mg GAE/ g, respectively. The antioxidant capacity of the TSP was evaluated by determining FRAP and ABTS assay, where significant differences ($P < 0.05$) were found. The "Licenciada" genotype obtained the highest values in both determinations, with 244.29 mmol TE/ g (FRAP) and 12.08 mmol TE/ g (ABTS) (DW). By contrast, “Rumina” genotype showed the lowest values in both assays (126.7 and 7.54 mmol TE/ g (DW) for FRAP and ABTS respectively). In general, the obtained results in phenolic profile, TSP and antioxidant capacity showed enough evidence of differences among all genotypes. This information will generate consumer interest and will give a revaluation to this developing crop.

Keywords: *Jackfruit, Phenols profile, Total soluble phenols, Antioxidant capacity, Genotypes, Phytochemicals.*

REFERENCES

[1] Jagtap et al., 2011. Industrial Crops and Products, 34, 1595-1601. [2] Saxena et al., 2009. Food Chemistry , 115, 1443-1449.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Effect of chemical elicitors treatment on the nutraceutical potential of summer squash (*Cucurbita pepo* L. var. cylindrica)

López-Peñuelas, V.M.[1]*, Cuevas-Rodríguez, E.O.[1], López-Valenzuela, J.A.[1], Milán-Carrillo, J.[1], Reynoso-Camacho, R.[2], Figueroa-Pérez, M.G.[3]

[1]*Facultad de Ciencias Químico-Biológicas, UAS, Josefa Ortiz de Domínguez 1558, Culiacán, México.*

[2]*Facultad de Química, UAQ, Cerro de las Campanas S/N, Querétaro, México. 3UTC, Culiacán-Imala, 2 km, Culiacán, México.*

Presenting author: vidamariel.lp@gmail.com

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

Elicitors are compounds capable to induce defense mechanisms when applied during cultivation, activating signaling cascades that promote activation of genes involved in the synthesis of secondary metabolites with nutraceutical potential [1]. These compounds may be used to improve quality of foods, such as yellow summer squash, which has shown high antioxidant potential, related to its bioactive metabolites content [2]. The objective of this work was to evaluate the effect of applying chemical elicitors during cultivation on physicochemical properties and bioactive compounds of yellow summer squash (Cucurbita pepo L., var. cylindrica). The squash was planted under greenhouse (60 plants). After 30 days, salicylic acid, AS (1, 2 and 3 mM), chitosan, Q (1, 1.5, 2 g/L), and jasmonate methyl, JM (0.1, 0.5, 1.5 mM) were foliar applied, preserving a control. Then, 14 days later, fruits were harvested and its yield, physicochemical properties (color, pH, °Brix and acidity), total bioactive compounds (phenols, flavonoids, carotenoids) and antioxidant capacity (DPPH, ABTS, ORAC) were evaluated. A unifactorial (type of elicitor) randomized design (Fisher, $\alpha = 0.05$, $n = 3$) was applied for data analysis and means comparison. The results showed that none of the elicitors affected the plant growth nor physicochemical properties ($p>0.05$). However, the number of fruits and yield increased 62.5% and 75.6%, respectively ($p<0.05$), in plants treated with AS (3 mM), when compared to control. Similarly, total phenolic and flavonoids content were significantly improved (17.17% – 29.50%) in fruits treated with AS (3 mM), JM (0.5, 1.5 mM) and Q (1.5 mM, flavonoids) in regards with control. Furthermore, antioxidant capacity was improved (10.4%) when elicited with AS (3 mM) and JM (1.5 mM) treatments. Therefore, it is possible to recommend the SA (3 mM) and JM (0.5, 1.5 mM) application during squash cultivation to improve the nutraceutical potential of its fruits.

Keywords: *Cucurbita pepo, elicitor, antioxidants, bioactive compounds.*

REFERENCES

[1] Kim, N. et al., 2020. Horticulturae, 6,108. [2] Martínez, D., et al., 2017. Nutrients, 9, 755.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Protein hydrolysis of bread and dietary supplement based on *Pleurotus ostreatus* during in vitro gastrointestinal digestion

Castillo, D.[1]*, Cruz, M.[2], Ruiz, H.[1], Rodríguez, R.[1], Martínez-Hernández, J.L.[1], Belmares, R.[1]*

[1]*Food Research Department, Faculty of Chemistry, Autonomous University of Coahuila, Saltillo, Coahuila, México.*

[2]*Food Science and Technology Department, Antonio Narro Autonomous Agrarian University, Saltillo, Coahuila, México.*

Presenting author: danielacastillorami@uadec.edu.mx.com.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

Pleurotus is the second most cultivated edible mushroom in the world due to its adaptability. It has a high nutritional value and bioactive compounds [1]. The "oyster mushroom" is an important source of amino acids and proteins that can be used for improving human health when integrated into food products since and it has been reported that protein digestibility of mushrooms ranges from 60 to 70% [2, 3]. The aim of this work was to evaluate the protein bioavailability of two products added with *P. ostreatus* in a static in vitro digester. Kinetics from 0 to 242 min were performed with the samples obtained from the oral, gastric, and intestinal phase. Results of 284.5 ppm, 1274.5 ppm and 1037.83 ppm were obtained for the three digested phases of the bread and 2893.12 ppm, 3477.5 ppm and 2140 ppm for the oral, gastric, and intestinal phase of the supplement. These results were compared with those obtained in the physicochemical analysis and it was observed that for both products the highest protein concentration is in the gastric phase, being 1.27g /100g and 34g /100g the results obtained for the gastric phase of bread and protein concentrate while 1.32g /100g and 55.1g /100g was obtained by the Kjeldahl method respectively. The results showed that about 96 % and 61.7 % of bread and protein concentrate were bioavailable for digestion in the gastric phase. *P. ostratus* is a great source of protein which is cheaper than meat and an alternative to animal protein that can be used as a functional ingredient.

Keywords: *In vitro digestion, Pleurotus ostreatus, protein, digestibility.*

REFERENCES

[1] Hassan El-Ramady et al., 2022. Sustainability, 14, 3667. [2] Losoya et al., 2021. Starch, 73, 9-10. [3] González et al. 2021. Food chemistry 346, 128884.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Functional characterization of 27 roselle varieties (*Hibiscus sabdariffa*) grown in Mexico

Díaz-Batalla, L.[1]*, Aguilar-Arteaga, K.[1], Gómez-Aldapa, C.[2]

[1]*Universidad Politécnica de Francisco I. Madero. Agroindustry Engineering. Carr. Tepatepec-San Juan Tepa, km. 2, 42660 Tepatepec, Hidalgo., México.*

[2]*Universidad Autónoma del Estado de Hidalgo, Carr. Pachuca-Tulancingo km 4.5, 42184 Mineral de la Reforma, Hidalgo, México.*

Presenting author: ldiaz@upfim.edu.mx.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

The present research aimed to perform the functional characterization of the extracts of 27 varieties of roselle (*Hibiscus sabdariffa*), a crop of great interest given its nutritional and functional contributions [1], from different producing areas of the states of Colima, Guerrero, Michoacan, Nayarit, Oaxaca, and Puebla. In the first stage, the ethanolic extracts (40% v/v) of the calyxes were obtained from the 27 varieties analyzed, corresponding to the autumn- winter 2016 harvest. Subsequently, the contents of total phenols, flavonoids, and monomeric anthocyanins were quantified in a second stage using spectrophotometric and chromatographic techniques. DPPH radical scavenging was determined using the free radical technique. The amount of myricetin and quercetin was quantified using high- performance liquid chromatography. An analysis of variance was performed using a single- way ANOVA and multiple comparisons. On the other hand, to reduce the dimensionality and generate a possible grouping of samples, considering the parameters analyzed, the data matrix obtained was analyzed through a Principal Component Analysis (PCA). The variables that correlate to a greater degree and positively with Principal Component 1 (PC1) were: DPPH radical scavenging activity (0.504), total phenols (0.498), flavonoids (0.485), and monomeric anthocyanins (0.430). The first 3 PC explain 93.7% of the variance, so the bioactive activity of the varieties can be evaluated by analyzing the first 3 PC; however, the groups did not observe grouping according to the region of origin, showing that the conditions of agronomic management and water stress, pests and/or diseases could explain the differences in the functional activity of the chalices of roselle.

Keywords: *Roselle, Hibiscus sabdariffa, Bioactive compounds, PCA, Radical scavenging.*

REFERENCES

[1] Riaz, G., & Chopra, R.,2018. Biomedicine & Pharmacotherapy, 102, 575-586.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Rice straw as potential source for xylooligosaccharides an emerging prebiotic production

Corrales-Centeno, A., Terán-Hilares, R*.

Bioprocess Laboratory, Pharmaceutical, Biochemical and Biotechnological Department, Catholic University of Santa María – Urb. San José, San Jose s/n, Yanahuara, Arequipa, Perú.

Presenting author: rteran@ucsm.edu.pe.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

Rice is one of the main crops in Peru, reaching an annual production of 2.2 million tons [1]. Therefore, a large volume of waste is generated that symbolizes approximately 20% of the total weight of the grain. But this important waste is not recovered, and its disposal is through burning or use as fertilizer in agricultural fields. Rice husk is mainly composed of cellulose (32%), hemicellulose (28%), lignin (20%) and ash (8%) [2]. Regarding the hemicellulose fraction valorization in a biorefinery context, the hemicellulose component can be hydrolyzed into oligosaccharides called xylooligosaccharides (XOS) by enzymatic or chemical processes. XOS are emerging prebiotics with various functional properties, thermal stability, and pH changes, which facilitates their application in the food industry. In this study, was evaluated the potential of rice husks to produce XOS. Initially, the influence of variables such as: NaOH concentration (1.5M-0.5M), temperature (70°C-120°C) and thermal treatment time (30-90 min), on the hemicellulose content in the powder recovered after precipitation with ethanol was evaluated. For this stage, an experimental Box Behnken design was used with a total of 15 experiments. In the optimized extraction condition (1.5M NaOH, 118.62°C and 76.73 min) 281 mg of hemicellulose per gr of rice husk was reached. In addition, the results were adjusted to a quadratic model with R2 of 0.99. The predicted value by the model was confirmed experimentally. Moreover, in the obtained powder contain 50% of inorganic impurities represented as ash. Subsequent stages of this study correspond to the enzymatic hydrolysis of the hemicellulose obtained and subsequent purification using membranes.

Keywords: *Quinoa stalks, xylooligosaccharides, bioproducts, valorization, prebiotic.*

REFERENCES

[1] Sari et al. 2020. Environ Qual Manage. 30, 71-82. [2] Louis et al. 2022. Industrial Crops and Products, 179, 114695.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Antioxidant capacity of beverages formulated with whey from fresh cheese (SQF) with strawberry, guava and/or blueberry extracts

Pérez Martínez, A. M.[1]*, Villa-Cruz, V.[1], Velasco Chavarría, S.[1], Vela Gutiérrez, G.[2]

[1]*Universidad de Guadalajara. Lagos de Moreno. México.*

[2]*Universidad de Ciencias y Artes de Chiapas. Tuxtla Gutiérrez, México.*

Presenting author: mailto:adys.pe.ma@gmail.com.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

Functional foods continue to be a challenge in the food industry. There is an increasing need for nutritional foods that provide components with a favorable response for the organism. Cheese whey, a by-product of the dairy industry, contains components such as lactose, fat, proteins, protein peptides and calcium. These components given positive biological effects on the organism, being highly nutritional and bioavailable [1]. In addition, fruits such as strawberry, guava and blueberry contain polyphenols with antioxidant properties, which help against cell damage. Due to the above, the present work had the purpose of investigating the antioxidant capacity in beverages formulated with fresh cheese whey (SQF) and strawberry (*Fragaria vesca*), blueberry (*Vaccinium corymbosum*) or guava (*Psidium guajava*) extracts, denominating them as SQF-Strawberry, SQF- Strawberry, SQF-Guava. Proximal analysis of the formulated beverages was performed (MilkoScanTM Mars FOSS). For the formulation, 50% SQF and 5% fruit extract were considered, and the formulation was adjusted to the CODEX General Standard (STAN 247-2005). The ABTS method was used to determine the antiradical capacity. The results show higher protein content in SQF-guava (2.16%), followed by SQF-blueberry (2.07%) and finally SQF-strawberry (1.97%). For the results of antioxidant activity, expressed as Trolox equivalent, SQF-Blueberry presented 22.962%, for SQF-Guava it was 19.25% and for SQF-Strawberry it was 19.11%. The ANOVA test indicated that there are significant differences between treatments. Tukey's test indicated that all treatments are different (=0.05). The use of cheese whey in beverages is a food alternative in Mexico, in addition, its use can reduce the negative impact it generates when it is discharged into the environment.

Keywords: *Whey, strawberry, guava, blueberry.*

REFERENCES

[1] Elpidia Poveda E. 2013. Revista chilena de nutrición, 40, 397-403.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Characterization of protein hydrolysates from cooked shrimp by- products with potential bioactivity

Rodríguez-Jiménez, J.M.J.[1]*, Montalvo-González, E.[1], Montaño-Martínez, E.[2,3], Ortíz-Basurto, R.I.[1], López-García, U.M.[1], Zamora-Gasga, V.M.[1], García-Magaña M.L.[1].

[1]*LIIA. Tecnológico Nacional de México/ ITT. Tepic, México.*

[2]*Unidad Académica de Ingeniería en Biotecnología, UPSIN, Mazatlán, Sinaloa, México. 3Cátedras CONACYT, CONACYT, Ciudad de México, México.*

Presenting author: jumirodriguezji@ittepic.edu.mx.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

The consumption of white shrimp generates many by-products based on its production, which have high concentrations of protein that could be used for the production of hydrolysates with bioactive potential, leading to the transformation of a problem into an alternative to give added value. to these by-products. The aim of this research was to characterize protein hydrolysates from cooked shrimp by-products by the action of *Bromelia karatas* (BK), *Bromelia penguin* (BP) and reagent grade bromelain (BRO). The characterization of the protein hydrolysates obtained consisted of the antioxidant capacity, determining the peptide profile by reverse phase chromatography and molecular weight distribution by molecular exclusion chromatography. According to the results of ABTS radical scavenging activity for BK, BP and BRO were 83.6±0.7%, 83.4±1% and 83±.1% respectively. The ferric reducing antioxidant power in BK, BP and BRO were 10,023±168.8 µM Trolox equivalents mL-1, 5,693±213.8 µM Trolox equivalents mL-1 and 2,294±55.1 µM Trolox equivalents mL-1respectively. Results obtained from the molecular weight distribution (<1.35 kDa) show that the protein hydrolysates assisted with BK, BP and BRO had 24%, 36% and 31% of the total area of the chromatograms, respectively. These results are similar to another researcher who hydrolyzed shrimp cooking water waste in which they obtained 56% low molecular weight peptides [1]. Amino acid composition of protein hydrolysates plays a vital role in their physiological benefits. In this research, 14 amino acids were identified for BK and BP hydrolysates, and finally 16 amino acids for BRO. It should be noted that the content of hydrophilic amino acids was high with regarding the total amino acids of each of the 3 treatments: BK with 67%, BP with 74% and BRO with 75%. These results agree with those obtained in other investigations in which 15 amino acids were obtained in hydrolysates of shrimp cooking water [1,2].

Keywords: *By-products, bioactive peptides, hydrolysates, characterization.*

REFERENCES

[1] Djellouli et al.,2021. Waste and Biomass Valorization,12 (7), 3741–3752. [2] Tonon et al., 2016.Food Chemistry,198, 20–27.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Bleaching of canola oil (*Brassica napus* L.) using high power ultrasound

De Jesús, A.C.[1]*, Delgado, R.J.[1], Amador, G.G.[2], Espinosa, H.[3]

[1]*Instituto Politécnico Nacional- Centro de Investigación en Biotecnología Aplicada Ex-Hacienda San Juan Molino Carretera Estatal Tecuexcomac-Tepetitla Km 1.5 C.P. 90700. Tlaxcala, México.*

[2]*CONACYT- Instituto Politécnico Nacional- Centro de Investigación en Biotecnología Aplicada Ex-Hacienda San Juan Molino Carretera Estatal Tecuexcomac-Tepetitla Km 1.5 C.P. 90700. Tlaxcala, México.*

[3]*Benemérita Universidad Autónoma de Puebla- Faculta de Ingeniería Química, C.P. 72570 Puebla, México.*

Presenting author: ale.ciba.ipn@gmail.com.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

Canola seed is widely used in Mexico for vegetable oil extraction due to its high percentage of beneficial fatty acids for consumer health [1]. However, for oil and doble bound configuration preservation, it is necessary that the bleaching process is not aggressive [2]. Based on this, the aim of this study was to employ high-power ultrasound to assist the conventional bleaching method and thus efficiently. A control method used 3% diatomaceous earth, 180 min, and 100 °C, whereas the ultrasonic bleaching consisted of a combination of 60, 75, and 90 min, with 1, 2, and 3% diatomaceous earth at 60 and 80 °C. To assess the efficacy of each, a pigment retention analysis and a Raman spectroscopic analysis were carried out. The ultrasound treatments that used 2% clay in combination with process times and 60 °C decreased approximately 90% of chlorophyll, while the conventional method reduced the highest amount of carotenoids. On the other hand, when using a temperature of 80 °C, it was shown that it does not help to increase the decrease in the analyzed pigments. Finally, the Raman spectra identified important groups in the oil constitution, such as the configuration of cis groups at 1280 cm-1 and 1660 cm-1, the ester group at 1750 cm-1 and methyl in the region of 2970 and 3015 cm-1 [3]. All of them have bands indicating that the treatments do not modify their configuration. High power ultrasound is a viable option for the assistance of the conventional method and thus obtains a stable product, using fewer resources.

Keywords: *Ultrasound, Bleaching, Canola seed, Raman spectra.*

REFERENCES

[1] Giacopini, 2012. Anales Venezolanos de Nutrición, 25(5), 94–99. [2] Aachary et al., 2016. LWT - Food Science and Technology, 72, 439–446. [3] Lafont et al., 2014. European Journal of Lipid Science and Technology, 116, 1451- 1456.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Extraction of evening primrose oil (*Oenothera biennis*) using high voltage electric field and ultrasound-assisted extraction

Salinas-Maldonado, G.V[1]., Rodríguez-Soria, V[1]., Cardoso-Ugarte, G.A[2]., Robles-López, M.R[3]., Meza-Jiménez, M.L.[4]

[1]*Decanato de ciencias biológicas, Facultad de biotecnología, UPAEP 21, sur #1103, Barrio de Santiago C.P. 72410, Puebla, Pue., México.*
[2]*Decanato de Negocios, Facultad de Gastronomía, UPAEP.*
[3]*Centro de Investigación en Biotecnología Aplicada, Ex hacienda San Juan Molino Carretera Estatal Tecuexcomac-Tepetitla Km 1.5, CP 90700, Tlaxcala, México.*
[4]*Decanato de Ciencias de la Salud, Facultad de Nutrición, UPAEP.*

Presenting author: guadalupevladimir.salinas@upaep.mx.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

The evening primrose (*Oenothera biennis*) oil has been used as a supplement in the treatment of diabetic neuropathy [1]. The effect of this oil is given for its high content in gamma-linolenic acid [2]. This oil is obtained by traditional methods that require the use of solvent and high temperatures that could affect its quality. An alternative for reducing the use of these methods are the non-thermal technologies. It has shown improvements in the extraction process reducing the extraction time and the degradation of bioactive compounds [2]. The aim of this study is to evaluate the effect of the application of high voltage electric field (HVEF) and ultrasound-assisted extraction (UAE) in the extraction process, measuring the yields, quality, and composition. The results obtained by HVEF using different variables (time, voltage and frequency) showed an increase in the yield of 21.4% with the conditions of 5 minutes, a voltage of 7.5 Kv and a frequency of 120 Hz. Using an ANOVA to know which variable is important in the extraction, a significant difference ($p<0.05$) was found using the three conditions simultaneously. The best UAE extraction yield was 13.5% at 4 minutes of treatment, with this technology it was not found a significant difference ($p>0.05$) in the increase of extraction yield. In conclusion UAE had no significant effect in the extraction but HVEF increased the extraction yield. The study is important because it creates information on the use of HVEF in the extraction of oils. Finally, the use of these technologies will allow the generation of a nutraceutical supplement that can be useful as a complementary treatment in diabetic neuropathy.

Keywords: *Evening primrose Oil, High Voltage Electric Field, Ultrasound Assisted Extraction, Extraction yield, Nutraceutical Supplement.*

REFERENCES

1] Botas-Velasco, et al., 2017. Angiologia. 69(3), 174-181. [2] Mehmood, Z., et al., 2019.New Look to Phytomedicine, 503–520. [3] Moreira, S.A., et al., 2018. Food Research international, 115, 177-190.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Development and evaluation of a multi-component active coating to prolong the postharvest life of Lulo (*Solanum quitoense*)

Guevara, C.*, Arango, O., Osorio, O.
Grupo de Apoyo a la Investigación y Desarrollo Agroindustrial - GAIDA, Facultad de Ingeniería Agroindustrial, Universidad de Nariño, 520002, Pasto, Colombia.

Presenting author: christiam908@hotmail.com.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

Promising Andean fruits such as lulo (*Solanum quitoense*) represent an important contribution to the economy thanks to its consumption, processing, and diversification of the international exotic fruit market with its export levels [1, 2], however, it faces significant postharvest losses due to inadequate management, climacteric nature, and susceptibility to diseases [3] such as anthracnose, caused by the fungus *Colletotrichum gloeosporioides*. The objective of this study was to determine the effectiveness of hydroxypropyl- methylcellulose (HPMC) and chitosan coatings in synergy with essential oils (EO) to extend the shelf life of lulo. The antifungal activity of 6 EOs was determined under in vitro conditions against *C. gloesporiodes*. Subsequently, dip coating application was evaluated using a Box- Behnken response surface methodology under different concentrations of the biopolymer, beeswax, and glycerol. The efficacy of the coatings was evaluated on weight loss, firmness, color change and respiration rate at room temperature for 20 days, to subsequently apply a sensory evaluation, and evaluate their capacity to prevent and limit fungal attack. It was found that thyme EO achieved 100% inhibition under in vitro conditions with a minimum inhibitory concentration (MIC) of 300 ppm, with thymol being the predominant compound in its composition. Regarding the coatings, the optimal formulation for HPMC was biopolymer=3.5%, glycerol=1%, wax=2.45% and for chitosan, biopolymer=1.5%, glycerol=2.5%, wax=3%. The coatings reduced disease severity in fruits inoculated with a spore suspension, due to a concentration of EO 15 times higher than the MIC. The HPMC and chitosan treatments achieved 24 and 21 days of storage respectively at room temperature, while the control treatment showed significant degradation and rejection of 65% of the sensory panel at day 14. The application of active coatings led to a reduction in postharvest deterioration, establishing a viable alternative for the extension of the fruit marketing period, favoring the competitive projection of the sector.

Keywords: *Solanum quitoense, coatings, shelf life, essential oils, Colletotrichum gloeosporioides.*

REFERENCES

[1] Jaime-Guerrero, M, et al., 2022. Revista de Investigación Agraria y Ambiental, 13, 131–148. [2] Ramírez, F, et al., 2018. Scientia Horticulturae, 238, 163-176. [3] García, M, et al., 2001. Corporación Colombiana de Investigación Agropecuaria – CORPOICA, 1, 28-30.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Development and evaluation of an extruder feed with the addition of huizache (*Acacia* ssp.) which allows the reduction of gases produced at rumen level

García-Domínguez, M.F.[1]*, Páez-Lerma, J.B.[1], Reyes-Jáquez, D.[1], Guerra- Rosas, M.I.[1], Araiza-Rosales, E.E.[2], Carrete-Carreón, F.O.[2]

[1]*TNM/ITD, Boulevard Felipe Pescador 1830 Ote.*

[2]*UJED, Facultad de Medicina Veterinaria y Zootecnia, Carretera Mezquital km 11.5, Durango, México.*

Presenting author: 21040489@itdurango.edu.mx.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

Livestock farming generates greenhouse gas (GHG) emissions, which contribute to global warming. Methane emissions derive from rumen digestion, due to low-quality feed, however, species such as huizache (*Acacia* ssp.), can modulate GHG emissions, by being incorporated into unconventional feed for livestock, using technologies such as extrusion. Therefore, the objective of this project is to develop and evaluate an extruded feed with the addition of huizache that allows the reduction of GHG. Eight balanced foods were formed at 12% protein, where huizache was included in percentages of 0-10%. Each food was determined neutral detergent fiber (FDN) and in vitro digestibility. The food was then processed in an extruder at different temperatures (90-150°C) and humidity (14-18%), according to an experimental D-optimal design. The extruded were then determined to evaluate the effect of the extrusion on the fiber. In the feed with 10% huizache before being extruded, an FDN content of 62.6% was obtained, lower than the percentage of low-quality forages (65%) and an in vitro digestibility of 79.8%, above the value of good quality forages (70%). However, when extruded at 150°C and 14% humidity, FDN is reduced to 48.8%, due to the hydrolysis of hemicellulose. The decrease in FDN in extruding means an increase in in vitro digestibility, so tests are expected for verification. It is concluded that the extrusion process decreases the FDN of the feed added with huizache, improving its nutritional quality, giving potential for use as feed for cattle, which can reduce the emission of GHGs, such as methane.

Keywords: *methane, huizache, extrusion, FDN.*

REFERENCES

[1] Cardona et al., 2016. Journal Mesoamerican Agronomy, 28, 273-288. [2] Di Marco, 2011. Argentine Site of Animal Production 20, 1-3. [4] Torres et al., 2018. Journal Archives of Zootechnics, 67, 55-59. [4] Van Soest et al., 1991. Journal of Dairy Science, 74, 3583–3597.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Thermosonication effect on bioactive compounds and microbiological inactivation of strawberry nectar (*Fragaria ananassa*)

Sotelo-Lara, D.M.[1]*, Amador-Espejo, G.G.[2], Zamora-Gasga, V.M.[1], Gutiérrez- Martínez, P.[1], Velázquez-Estrada R.M.[1]

[1]*TecNM-Instituto Tecnológico de Tepic, Av. Tecnológico 2595, Col. Lagos del Country, Tepic, Nayarit, México.*

[2]*CONACYT-Centro de Investigación en Biotecnología Aplicada, Carretera Estatal Tecuexcomac-Tepetitla Km 1.5, Tlaxcala, México.*

Presenting author: damasotelola@ittepic.edu.mx.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

The achene (seeds) is the part of the strawberry with around 81% antioxidants [1] and these are eliminated in the production of nectars. Ultrasound with a moderate temperature (thermosonication) is an alternative to replace heat treatment [2]. The objective was to determine the effect of thermosonication (TS) on bioactive compounds and E. coli inactivation compared to heat-treatment in strawberry nectar. TS treatments were performed at 0, 10 and 20 % pulp/achene for 8 minutes at 50 °C with an amplitude of 70 and 80 % (400 W probe, 24 kHz). An increase in phenolic compounds, ascorbic acid and anthocyanins was observed as the different percentages of pulp/achene increased. In ascorbic acid, the pasteurized samples presented a reduction of 82%. In addition, the content of anthocyanins increased, reaching 111,325 mg Cy3gl/gr in the 20% pulp/achene treatment with 80% amplitude. Finally, the inactivation of *E. coli* (ATCC 8739) in nectar (20% pulp/achene) by TS (80% amplitude/8 minutes) showed a reduction of 1 Log CFU/mL, which is not enough to meet the 5 Log CFU/mL inactivation level required by the FDA. Nevertheless, after 5 days of storing, an increase in lethality was observed in TS nectar (from 0.915 to 5.86 Log CFU/mL), which can be related to the food matrix [3]. With a performed kinetics, a lethality of 4.15 Log CFU/mL of E. coli was obtained by TS for 20 min. The addition of pulp/achene and the TS technology allow the obtaining of nectars with a high content of bioactive compounds and longer times are recommended for bacterial reduction.

Keywords: *Thermosonication, Strawberry nectar, Pulp/achene, Microbial inactivation.*

REFERENCES

[1] Investigación y Formación Agraria y Pesquera, 2016. [2] Anaya et al., 2017 Trends in Food Science & Technology, 61, 26-37. [3] Knorr et al., 2011, Annual Review of Food Science and Technology 2(1).

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Optimization of ultrasound-assisted extraction from pomegranate peel: a sustainable-antioxidant to apply in poultry meat burgers

Ordaz-Rodríguez, SB.[1]*, Abadía-García, L.[2], Mendoza-Sánchez, M[1]

[1]*Facultad de Ingeniería, Universidad Autónoma de Querétaro, Cerro de las Campanas, S/N. CP 76010. Querétaro, México.*

[2]*Facultad de Química, Universidad Autónoma de Querétaro, Cerro de las Campanas, S/N. CP 76010. Querétaro, México.*

Presenting author: silviaord.85@gmail.com.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

Pomegranate peel, as agro-food byproducts, is a potential source of bioactive compounds, such as phenolic compounds [1]. Ultrasound-assisted extraction (UAE) is used as a green extraction method; in addition, the Food Drug Administration has recommended the use of environmentally friendly solvents. [2], [3]. In this research, a Box-Behnken design was carried out to optimize the antioxidant potential of pomegranate peel, using UAE and water as the solvent. Time, temperature, and ultrasound amplitude were the independent variables. Once the best UAE conditions were obtained, these were compared to a conventional extraction method. The best extraction conditions were T1:15 min, 40 °C, amplitude- 50%. Additionally, the antioxidant capacity was tested on 0,1,2,4 and 7 days in chicken burgers using two concentrations (0.1% and 0.8%). Vitamin C (0.05 %) and non-extract addition were used as controls. The extracts with the best antioxidant capacity (T1 at 0.8%- DPPH 56.90 mg TEAC/g, ABTS 79.48 mg TEAC/g) were obtained by ultrasound, while those extracted conventionally showed the least antioxidant capacity. Besides, in chicken burgers, the antioxidant activity was significantly better ($p < 0.05$), in those treated with extracts obtained by ultrasound in extraction times equal to 15 min in both concentrations (0.1% and 0.8%), even higher than the ascorbic acid control at days 1,2,4 and 7. Variables such as amplitude and temperature at 50 % and 40 °C were the best extraction conditions for all dependent variables. Finally, the extracts obtained are high- quality to be applied to perishable products and be an alternative to synthetic preservatives.

Keywords: *pomegranate peel extract, ultrasound assisted-extraction, natural antioxidants, response surface methodology, meat products.*

REFERENCES

[1] García et al., 2021. Foods,10,1–17. [2] Bhargava et al., 2021. Ultrasonics sonochemistry, 70,105293. [3] Živković et al., 2018. Separation and Purification Technology, 194, 40–47.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Physicochemical and sensorial stability of guava and ginger beverage treated by microwave

Hernández-Hernández, H. M.*, Gutiérrez-Salomón, A. L.

CONACYT – Centro de Investigación y Asistencia en Tecnología y Diseño del Estado de Jalisco, A.C. (CIATEJ), Av. Normalistas 800, Colinas de la Normal, 44270, Guadalajara, Jalisco, México.

Presenting author: hhernandez@ciatej.mx.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

Currently, the food industry not only seeks to produce safe food but also with a significant nutritional contribution, good sensory properties, innocuous and with an optimal shelf life, these characteristics are what consumers demand these days [1]. Emerging technologies have emerged to meet these needs, either replacing or improving conventional technologies [2]. Microwave technology for pasteurization of fruit juices has shown advantages over conventional processes [3]. The objective of this work is to evaluate the effect of microwave application on the quality parameters of a drink based on guava and ginger. The beverages were treated by microwave at two power levels in batches of 150 mL until reaching the target temperature for the inactivation of the pectin methyl esterase enzyme (90°C), as a control the beverage was treated by conventional pasteurization. Thermal images were taken after the treatments to study the heating uniformity. The processing time by conventional pasteurization was 840 s, that was reduced by 83% when the beverage was treated by microwave at 50% power while at 100% it was reduced by around 93%. There were no significant changes in pH, titratable acidity and total soluble solids in guava and ginger beverage in comparison with untreated simple. However, microwave and conventional pasteurization affected sensory attributes and color in the beverage during self-life study. The pectinmethylesterase enzyme was deactivated at 50 s in the case of the beverages treated at 100% power, while under conventional pasteurization 480 s of treatment were required to achieve the objective. The microwave pasteurization technology can be an innovative option for extend the food shelf life of guava and ginger beverage.

Keywords: *microwave pasteurization, Sensory characteristics, Pectinmetilesterase, emerging technologies.*

REFERENCES

[1] Hernández-Hernández, H. M. et al., 2019. Innovative Food Science and Emerging Technologies, 58, 102233. [2] Jadhav, H. B. et al., 2021. Frontiers in Nutrition, 8, 1–14. [3] González-Monroy, A. D. et al., 2018. Innovative Food Science and Emerging Technologies, 49, 51–57.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Effect of thermosonication on physicochemical and microbiological parameters of an oats-based drink (*Avena sativa* L.)

Álvarez-Araiza, D.F[1]*, García-Magaña, M.L[1], Gutiérrez-Martínez, P.[1], Cruz-Cansino, N.[2], Velázquez-Estrada, R.M.[1]

[1]*TecNM-Instituto Tecnológico de Tepic, Laboratorio integral de Investigación en Alimentos. Av. Tecnológico 2595, Lagos del Country, Tepic, Nayarit*

[2]*Centro de Investigación Interdisciplinario, Área Académica de Nutrición, Instituto de Ciencias de la Salud, Universidad Autónoma del Estado de Hidalgo, Circuito Ex Hacienda La Concepción S/N, Carretera Pachuca-Actopan, C.P. 42160 San Agustín Tlaxiaca, Hidalgo, México.*

Presenting author: difralvarezar@ittepic.edu.mx.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

In Mexico, the consumption of plant-based beverages has increased by 33.5% in the last 5 years [1]. Mainly due to lactose intolerance, allergy to milk proteins or lifestyle of the consumers [2]. At an industrial level, there has been an interest in offering alternatives to dairy products using new technologies and manufacturing processes. On the other hand, oat is considered a food with great nutritional value and bioactive compounds that prevent diseases [3]. The objective of this research is to evaluate the effect of thermosonication (TS) on quality attributes of an oat-based beverage (Oatmeal sativa L.) compared to its pasteurized counterpart. A 5-point hedonic test was carried out as sensory evaluation with 4 formulations: control, stevia sweetened, honey sweetened, and honey and stevia sweetened. The honey and stevia formulation presented the best acceptability with significant differences ($p<0.05$) in flavor, this being the one selected for the TS.TS treatments were applied at different times (15, 20 and 25 min) and temperatures (45, 55 and 60°C) in ultrasonic processor (Hielscher UP400S, Germany), using a H22 sonotrode (400 W, 24 kHz). TS significantly increased ($p<0.05$) the pH compared to the pasteurized counterpart, ranged from 5.87 to 6.52, respectively. The total soluble solids didn't present significant differences ($p>0.05$) between the TS, pasteurized and control samples. A complete reduction (2.79 Log CFU/mL) was obtained for fungi and yeasts by TS at 55ºC and 60°C without showing significant differences with pasteurization sample. For aerobic mesophiles a complete reduction (2.880 Log CFU/mL) was observed by TS at 60°C, because to good hygiene practices no presence of enterobacteria was observed. TS could be an alternative to process plant-based beverages such as oatmeal since it preserves its quality.

Keywords: *oats-based beverages, thermosonication, microorganisms.*

REFERENCES

[1] Expansión., 2019. El boom de la leche que no es leche. Fecha de consulta 4 de enero 2022. Disponible en: https://expansion.mx/empresas/2019/04/05/el-boom-de-la-leche-que- noes-leche.[2] García., 2017. (Trabajo de Fin de Grado, Universidad Complutense de Madrid, 147.96.70.122. [3] Martínez et al., 2017. Food Science, 14, 26-31.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Use of two cryogel coatings and their effect on color and shear force in pork meat (*Longissimus thoracis*)

Coria-Hernández, J.*; Salinas-Vergara, N.J.; Arjona-Román, J.L.; and Meléndez- Pérez, R.

Laboratory 13 Thermal and Structural Analysis of Materials and Foods. National Autonomous University of Mexico-Superior Studies Faculty at Cuautitlán (UNAM– FESC) Campus 4. Multidisciplinary Research Unit, Cuautitlán Izcalli 54714, Mexico.

Presenting author: jonathancoria@outlook.com.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

The food industry constantly seeks to innovate, which is why, in recent years, the possibility of studying new materials has been extended to minimize damage because of the processes of conservation, transformation, and storage of products, primarily meat. In this sense, cryogels are materials produced mainly by cryostructuring, rearranging their molecular structure, allowing the modification and improvement of their physical, chemical, and thermal properties. We worked with pork from the Longissimus thoracis muscle which was added by immersion (1) waxy maize starch cryogel [1], and (2) native maize starch cryogel. The color profile parameters were determined in the samples obtained in the CIE system with an EZ reflectance spectrophotometer (HunterLab) and the shear force with a CT3 (Brookfield) [2]. It was found that there were important changes ($p < 0.05$) in the tri-stimulus values, mainly in L* between the samples. It was also found that the use of cryogels in meat increased the values of maximum shear force compared to the sample without treatment, affecting the time between them, thus demonstrating that there may be interactions between meat proteins, free water, and cryogels. In this sense, the use of this type of cryostructured coatings can be considered an industrial alternative to minimize the damage that can be caused to meat by the effects of traditional chamber freezing, where ice crystals mainly modify protein structures and therefore have a direct effect on some aspects of final quality for the consumer.

Keywords: *Coating, Cryogel, Pork Meat, Starch.*

REFERENCES

[1] Coria et al., 2018. Polymers, 10(359), 1-13. [2] Coria et al., 2020. Revista Mexicana de Ciencias Pecuarias, 11(3), 651-668.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Effect of operating spray drying conditions in antioxidant and anti-inflammatory polyphenols in microcapsules of ultrasound assisted extract of salvilla (*Buddleja scordioides* Kunth)

Macías-Cortés, E.[1]*, Gallegos-Infante, J.A.[1], Rocha-Guzmán, N.E.[1], Moreno- Jiménez, M.R.[1], Villanueva-Fierro, I.[2], Ochoa-Martínez, L.A.[1], Candelas-Cadillo, M.G.[3], Rodríguez-Herrera, R.[4], González-Laredo, R.F.[1]

1TecNM/ITD, Felipe Pescador 1830 Ote., Nueva Vizcaya, 34080 Durango, Dgo., México.

2CIIDIR-IPN, Calle Sigma 119, Fracc. 20 de noviembre II, 34220 Durango, Dgo., México.

3FCQ-UJED, Calle Artículo 123 s/n, Col. Filadelfia, 35010, Gómez Palacio, Dgo., México.

4FCQ-UAdeC, Venustiano Carranza 935, Col. República, 25280, Saltillo, Coah., México.

Presenting author: eli.macias@live.com.mx.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

The use of natural products to treat gastrointestinal disorders is growing. Although there are drug options, most of them cause side effects; therefore, new alternatives are explored [1]. Traditionally, salvilla has been employed as treatment due mainly to its phenolic content [2]. Thus, those compounds may be obtained by ultrasound assisted extraction (UAE) [3] and microencapsulated by spray drying (SD) to conserve them [4], thus the aim was to establish the microencapsulation conditions by spray drying (MSD) of salvilla extract (SE) obtained by UAE. SE was obtained by UAE and microencapsulated by SD. MSD were evaluated for antioxidant activity, phenolic compounds quantification, powder flow, spectrometry tests, extract release and COX-2 inhibition using a factorial design 22. As a results, all treatments presented high antioxidant activity (74.8–93.4%). UPLC analysis indicated a high phenolic compounds preservation. Release was up to 80%. Additionally, microencapsulation was proven with an inhibition of 55% of COX-2. Treatment SD8/160 showed the highest phenolic content with antioxidant and anti-inflammatory activities. Microcapsules showed good protection for bioactive compounds of SE and COX-2 inhibition thus, MSD is a good option to use in the formulation of a nutraceutical product.

Keywords: *salvilla, microencapsulation, phenolic compounds, spray drying, COX-2.*

REFERENCES

[1] Rojas-Jiménez et al., 2015. Biosalud 14, 91-103. [2] Díaz-Rivas et al., 2015. J Ethnopharmacol 169, 280-286. [3] Macías-Cortés et al., 2022. Ultrason Sonochem 83, 1-10. [4] Medina-Torres et al., 2013. LWT 50, 642-650.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

High hydrostatic pressures on passion fruit Passiflora edulis juice: effect on *Escherichia coli* O157:H7 inactivation and volatile profile

Calderón-Santoyo, M.[1], Barros-Castillo, J.C.[1]*, Ramos-Hernández, J.A.[2], Calderón-Chiu, C.[1], Ramírez-de-León, J.A.[3], Ragazzo-Sánchez, J.A.[1].

[1]*Laboratorio Integral de Investigación en Alimentos, Tecnológico Nacional de México/Instituto Tecnológico de Tepic, Tepic, Nayarit, México.*

[2]*Universidad Politécnica de la Región Laguna, Coahuila, México.*

[3]*Departamento de Ciencia y Tecnología de Alimentos, UAM Reynosa Aztlán, Reynosa, Tamaulipas, México.*

Presenting author: jbarros@ittepic.edu.mx.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

Passion fruit (*Passiflora edulis*) is a highly appreciated fruit due to its flavor and aroma, which give it the characteristic of exotic tropical fruit [1]. The non-fermented beverage industry faces the drawbacks of high thermal processes that modify sensory properties. Thus, high hydrostatic pressures (HHP) are an alternative for processing, due to their ability to inactivate microorganisms and enzymes in foods without additives, besides, their effect could be enhanced in combination with low heat treatments [2]. Thereby, the objectives of this study were to evaluate the effect of HHP on *Escherichia coli* O157:H7 inactivation in inoculated passion fruit juice, as well as the physicochemical properties and aromatic profile changes. A statistical design 33 (150, 200, 250 MPa; 0, 10, 20 min; 25, 35, 45 °C) and optimization quadratic model was applied. *E. coli* was determined in stocked juice (3 days, 4 ºC). The concentration of aroma compounds characteristics of passion fruit such as 1- hexanol, 1-octanol, linalool, α-terpineol, ethyl hexanoate, hexyl butanoate, and hexyl hexanoate was evaluated during treatments. The results of the analysis of variance did not show a significant effect ($p>0.05$) of pressure or time on the concentration of the aromatic compounds analyzed. However, the temperature did affect ($p<0.05$), a decrease of 16% in the concentration of alcohols and esters at 45 ºC was observed. The pH and SST were not affected with treatments. The optimal conditions to obtain a microbiological safe passion fruit juice, with high aromatic composition as well as acceptable pH and TSS were 190.11 MPa, 30.91 ºC, and 6.15 min. The combination of HHP and low thermal treatment improves the quality characteristics of the juice. The impact of these findings is valuable for the juice processing industry as a desirable technology for obtaining innocuous passion fruit juice while maintaining the aroma without thermal sterilization.

Keywords: *Passion fruit, High hydrostatic pressures, Escherichia coli, Volatile compounds, Tropical fruits.*

REFERENCES

[1] Cazarin et al., 2015. Journal of Functional Foods, 17, 575-86. [2] Buzrul, 2019. International Journal of Food Microbiology, 309, 108330.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Physicochemical parameters of ultrasonicated *Semimembranosus* beef inside cavitation-intensifying and vacuum bags

Blanco-Hernández, J.E.[1], García-Galicia I. A.[2]*, Zetina-Córdoba P.[1], Huerta- Jiménez M.[2,3], Alarcón-Rojo A. D.[2]

[1]*Polithecnic University of Huatusco, Calle 9 Sur entre Av. 7 y 9 s/n, Centro Huatusco. C.P. 94100, Veracruz, México.*

[2]*School of Animal Science and Ecology, Autonomous University of Chihuahua, Perif. Fco. R. Almada km 1, C.P. 31453, Chihuahua, México.*

[3]*Mexican Council of Science and Technology (CONACyT). Av. Insurgentes Sur 1582, C.P. 03940, Ciudad de México, México.*

Presenting author: igarciag@uach.mx.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

Several studies have explored the use of high-intensity ultrasound (HIU) in meat [1]. This study evaluated the effect of HIU (37 KHz, 600 W for 20 min) and type of containing bags on the physicochemical parameters of beef. Thirty-six pieces of m. Semimembranosus (2.5 x 1.5 x 7 cm) were randomly allocated to one of five treatments; Control (N=4), meat allocated in distilled H2O (6°C) for 20 min; NA (n=8), "naked" meat ultrasonicated in distilled H2O without packaging; B35 (n=8), meat sonicated inside vacuum bags with 0.35 mm caliber; VB (n=8) meat sonicated inside commercial vacuum bags with 0.6 mm caliber; and BB (n=8) meat sonicated inside cavitation intensifying bags (Bubclean®). For all treatments, distilled H2O was used as acoustic transmission medium. We evaluated color (L*, a*, b*, and C*), change of color (ΔE) and weight loss after sonication and cooking, shear force, and total energy to cut. HIU promoted the ΔE ($P<0.05$), increasing L* and reducing a*, regardless the type of bag. Nevertheless, B35 and BB had the higher ΔE ($P<0.05$) after ultrasonication. HIU reduced ($P<0.05$) the weight loss after cooking. In general, the ultrasonication or immersion and cooking process affected ($P<0.05$) all parameters regardless of the treatment. The shear force and total energy was reduced by HIU but no differences ($P>0.05$) were observed among bags. In conclusion, no important differences in physicochemical parameters of beef ultrasonicated inside bags or naked. The type of bag produced relevant changes on tenderness and water holding capacity of meat.

Keywords: *High-intensity ultrasound, Beef quality, Shear force, Cavitation intensifying bags, Shear force.*

REFERENCES

[1] Alarcon-Rojo et al., 2019. Ultrasonics Sonochemistry, 55, 369-382.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Effect of spray-dried pomegranate husk polyphenols on the inhibition of lipid oxidation

Martínez-Torres, P.F.[1], Michel, M. R.[1], Aguilar-Zárate, M.[2], Aguilar-Zárate, P.[1]*

[1]*Departamento de Ingenierías, Tecnológico Nacional de México/I. T. de Ciudad Valles, Ciudad Valles, S.L.P, México.*

[2]*School of Chemistry-CIEP, Universidad Autónoma de San Luis Potosí. Av. Dr. Manuel Nava 6, Zona Universitaria, San Luis Potosí, México. C.P. 78210.*

Presenting author: igarciag@uach.mx.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

The pomegranate (*Punica granatum*) belongs to the Punicaceae family and is a fruit in which there is a wide range of compounds. Currently pomegranate fruit has gained importance for its antioxidant properties, 70 % of which are concentrated in the peel and membranes of the fruit. Polyphenolic compounds are found in the peel, where punicalagin stands out, responsible for half of the antioxidant activity [1]. The main objective of the present work was to optimize the spray-drying conditions of pomegranate peel polyphenols and evaluate its antioxidant activity based on the lipid oxidation inhibition. The polyphenols were extracted and purified with a column filled with Amberlite XAD-16. For process optimization, a Taguchi L9 arrangement was used where factors feed flow (3.0 mL/min, 4.5 mL/min 6.0 mL/min), temperature (125 °C, 150 °C, 200 °C), and air flow (30 m3/h, 35 m3/h, 40 m3/h) were evaluated in order to find the combination of elements that provided the higher performance in relation to lipid oxidation inhibition [2]. The experimental design was analyzed by Statistica 10 software. The optimal conditions for the drying of polyphenols were determined and experimentally validated. It was found that the most influential factor with 37.65 % was the temperature. The conditions that presented the best results were feed flow, 4.5 mL/min; temperature, 125 °C; and air flow, 35 m3/h. According to the lipoperoxidation analysis, an inhibition of 87.40 % was obtained, which means that the lower the drying temperature, the higher the antioxidant activity. The present study demonstrated that the use of pomegranate peel polyphenols can be an alternative to the use of synthetic antioxidants in edible oils.

Keywords: *Optimization, Taguchi, Edible oil, Purification.*

REFERENCES

[1] Álvarez-Díaz, 2021. Tesis, Tecnológico Nacional de México campus Ciudad Valles [2] Castro-López, et al., 2019. Molecules, 24, 173.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

In vitro digestion study of microencapsulated procyanidins extracts from coffee pulp and litchi shell

Vázquez-Núñez, M.A.[1], Aguilar-Zárate, P.[2], Reyes-Munguía, A.[1], Carranza-Álvarez, C.[1], Wong-Paz, J.E.[1], Espinosa-Solís, V.[3], Michel, M.R.[2]*

[1]*Facultad de Estudios Profesionales Zona Huasteca, Universidad Autónoma de San Luis Potosí. Romualdo del Campo 501, Rafael Curiel, Ciudad Valles, San Luis Potosí. México.*

[2]*Departamento de Ingenierías, Tecnológico Nacional de México/I. T. de Ciudad Valles. Carretera al Ingenio Plan de Ayala Km. 2, Col. Vista Hermosa Ciudad Valles, San Luis Potosí. México.*

[3]*Coordinación Académica Región Huasteca Sur de la Universidad Autónoma de San Luis Potosí, km 5 carretera Tamazunchale- San Martín, Tamazunchale, San Luís Potosí. México.*

Presenting author: mariela.michel@tecvalles.mx.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

At present, the accumulation of agro-industrial wastes generates great economic and environmental problems [1,2]. Therefore, their use to obtain bioactive compounds with high antioxidant activity such as procyanidins [3,4] from these residues is of great interest [2]. The objective was to determine the changes in encapsulated procyanidins obtained from litchi and coffee agro-industrial wastes before and after an in vitro digestion process. The results showed that 98.29 ± 4.35 % and 96.58 ± 5.31 % of litchi and coffee procyanidins were preserved, respectively, as well as their ability to inhibit lipid peroxidation. However, the antioxidant capacity evaluated with the DPPH technique showed a considerable decrease in both encapsulates, conserving only 9 % of the total antioxidant activity of the encapsulated litchi extract before complete digestion and a total loss of the antioxidant capacity of the extract of encapsulated coffee. The results allow postulating a sustainable alternative for the encapsulation and digestion in vitro of procyanidins.

Keywords: *Encapsulation, In vitro digestion, Antioxidants, Agroindustrial wastes.*

REFERENCES

[1] Ríos et al., 2020. Ciencias Agropecuarias, 6, 5-7. [2] Vargas et al., 2018. Fac of Basic Sciences, 5, 59-72. [3] Ottaviani et al., 2018. Mol Aspects Med, 8, 1-13. [4] Ngamsuk et al., 2019. 8 1-13.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Structure changes of allergen *β*-lactoglobulin by thermosonication

Millan-Quintero, K.G.[1]*, Blancas-Benitez, F.J.[1]. Gutiérrez-Martínez, P.[1], Suárez-Jacobo, A.[2], Velázquez-Estrada, R.M.[1]

[1]*TecNM-Instituto Tecnológico de Tepic, Laboratorio integral de Investigación en Alimentos. Av. Tecnológico 2595, Lagos del Country, Tepic, Nayarit.*

[2]*Centro de Investigación y Asistencia en Tecnología y Diseño del Estado de Jalisco. Av. Normalistas 800 Colinas de La Normal, Guadalajara, Jalisco.*

Presenting author: kagumillanqu@ittepic.edu.mx.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

Food hypersensitivity affects the human health of about 30,000 people a year [1]. Among these, cow's milk protein allergy (CMPA) is found with a prevalence of 5-15% in children under 3 years of age [2]. The main allergen involved is β-lactoglobulin [3,4]. Changes in the structure of β-lactoglobulin through processing could affect its allergenicity [3]. The objective of this research was to study the changes in the structure of β-lactoglobulin due to thermosonication (TST). TST were applied at different times (10, 20 and 30 min) and temperatures (50, 60 and 70°C). TST significantly increased ($p<0.05$) the total amino acid content (AAC) from 8.6 to 18 µg/ml of glycine. The degree of hydrolysis of β-lactoglobulin increased significantly ($p<0.05$) from 3.07 to 6.77% when the temperature was raised. Free sulfhydryl and disulfide bonds were also quantified in β-lactoglobulin TST samples and compared with a control (β-lactoglobulin without TST). TST for 70°C significantly decreased ($p<0.05$) the content of free SH groups from 10.72 to 9.18 µmol/g respectively, while that SS content was not significantly modified ($p>0.05$). The changes of β-lactoglobulin structure are attributed to acoustic cavitation phenomenon (micro-streaming currents, high energy, temperature, pressure, shear energy, free radicals, and turbulence) and heat-induced which produces a more uniform and an intense acoustic field. Our results demonstrate the thermosonication has the potential to induce structural changes in β-lactoglobulin and, as consequence, affect its allergenicity. However, further studies should be carried out to clarify the mechanisms involved in thermosonication-induced protein unfolding and aggregation and its effect on allergenicity.

Keywords: *Thermosonication, β-lactoglobulin, structural changes, allergenicity.*

REFERENCES

[1] Pu et al., 2021. Food Chemistry, 339,128106. [2] Balasa et al., 2019. ARS Medica Tomitana, 25, 129-131. [3] Liang et al., 2021. Journal of Food Engineering, 292, 110365. [4] Kurpiewska et al., 2019. Food Chemistry, 270, 315-321.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Evaluation of the postharvest quality of strawberries immersed in a fermentation extract rich in kojic acid

Tomasa Quiterio-Gutiérrez[1,2]*, Armando Robledo-Olivo[2], Susana González-Morales[3], José Antonio González-Fuentes[4], Adalberto Benavides-Mendoza[4], Ana Verónica Charles-Rodríguez[2], Fabián Fernández-Luqueño[5] Jacobo, A.[2], Velázquez-Estrada, R.M.[1]

[1]*Protected Agriculture Doctorate Program, UAAAN, Saltillo, Coahuila, México.*

[2]*Bioprocess Agrofood Group. Food Science and Technology Department, UAAAN, Saltillo.*

[3]*CONACYT-UAAAN, Saltillo.*

[4]*Horticulture Department, UAAAN, Saltillo.*

[5]*Cinvestav- Unidad Saltillo, Coahuila, México.*

Presenting author: t.quiterio@hotmail.com.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

Strawberries are berry-type fruits that contain bioactive compounds such as sugars, ascorbic acid, and phenolic compounds [1], however, due to their physical characteristics, being fruits with delicate skin, their storage period becomes limited [2]. The objective of the present work was to evaluate the effect of a fermentation extract rich in kojic acid (EKA) on the postharvest quality of strawberry fruits. The different treatments were applied: T0: control with distilled water only, T1: 1 mL/L, T2: 2 mL/L, T3: 4 mL/L, T4: 8 mL/L (EKA), T5: kojic acid 0.5% reagent grade. The strawberries were stored in polyethylene trays at a temperature of 4 ± 1°C for 10 days. Physical and chemical variables (weight loss, total soluble solids (TSS), color, vitamin C, among others) were evaluated as a sensory attribute of the fruit. According to the results obtained, the weight loss (WL) during the storage period of the treatments increased continuously, however, in the application of T2 and T3, the weight loss was lower after two days. In the TSS, there was no significant difference when applying the treatments, staying at 6.5 to 7.5 °Br. For firmness, T4 decreases by 48% from day 6, while when applying T5, firmness is reduced by 31% on day 4. The application of the different treatments before the storage process modifies the physical properties of the fruits in postharvest, helping them efficiently, postponing their deterioration and loss of bioactive compounds.

Keywords: *strawberry, fruit quality, physical-chemical properties, antioxidants.*

REFERENCES

[1] Galli et al., 2016. LWT,72, 693-699. [2] Zhang et al., 2018. Polymers (Basel), 10(8):894.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Characterization, and bioactivity of HPMC electrosprayed microcapsules containing extracts from Rhus microphylla fruit and their influence in strawberry decay

Guía-García J.L[1], Charles-Rodríguez A.V.[1]*, Reyes-Valdés M.H[1], Robledo-Olivo A.[1], García-Osuna H.[1], Cerqueira M.A[2], Flores-López M.L[3]

[1]*UAAAN. Calzada Antonio Narro 1923. Buenavista, Saltillo Coah., México CP 25315.*

[2]*Int. Iberian Nanotech. Lab., 4715-330 Braga Portugal.*

3UIEPA, 73330, Ahuacatlán.

Presenting author: anavero29@gmail.com.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

The search for natural alternatives to meet the needs of the agro-food industries has been directed to the use of bioactive compounds (BC) from plants. Recent studies of *Rhus mycrophylla* (RmA), a plant from semi-arid zone of Mexico, demonstrate the presence of BC of industrial interest. Electrospray is a novel method to obtain micro capsules to encapsulate extracts containing thermolabile compounds [1]. The aim of the present study was to develop and characterize microcapsules containing extracts from RmA fruit using food- grade hydroxypropyl-methylcellulose (HPMC) through electrospray to reduce the decay in strawberries. Morphology (SEM), particle size, FTIR, XRD, TGA, TFC (Folin-Ciocalteu), radical scavenging capacity (DPPH, ABTS, FRAP) analysis were used to characterize the microcapsules. Strawberry fruits were used for shelf-life test (weight loss, fungal decay, texture analysis). Microcapsules containing extracts from fruit of RmA were developed using electrospray method with a spheric shape and particle size between 2.05-2.41µm. TGA analysis demonstrate the capability of HPMC to bring thermal protection to the extract. The microcapsules containing RmA extract showed the best antioxidant and antifungal activity (*F. oxysporium* and *R. stolonifer*). The microcapsules containing RmA extract extended the shelf life of strawberry at 4°C for 14 d, the fruit treated with these showed a decrease in weight loss (22%), fungal decay (53%), and firmness (decay in 5%) in comparison with the control treatment at 0.25 and 0.5% (p/v). In conclusion, our research indicated that the use of microcapsules functionalized with RmA extract could help to reduce postharvest losses in strawberry fruits maintaining their quality attributes, being an ecological and novel alternative.

Keywords: *Rhus microphylla; microcapsules; antifungal activity; shelf life; strawberry.*

REFERENCES

[1] Machado, A. R., et al., 2019. Food Research International, 120, 656–667.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Analysis of amaranth protein isolates treated with supercritical carbon dioxide

Delgado-García, Y.I.*, Morales-Camacho, J.I.

Department of Chemical, Food and Environmental Engineering, Universidad de las Américas Puebla, San Andrés Cholula, Puebla 72810, México.

Presenting author: yolanda.delgadoga@udlap.mx.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

The current increase in the consumption of plant-based proteins has led to study of different sources rich in this nutrient, such as amaranth. *Amaranthus hypochondriacus* is one of the most recognized species for its high-protein content [1]. The Osborne method was developed to classify seed proteins by precipitation of the fractions present using a solvents series [2]. However, to obtain protein isolates, it is necessary to defeat the plant material previously. In this work, amaranth flour was defatted by supercritical extraction with CO_2, at different pressure conditions (2900-4350 psi) and temperatures (40-60°C), hexane defatted flour and non-defatted flour were used as controls. The aim was to analyze the supercritical CO_2 (SC-CO_2) effect on the amaranth proteins. Until now, the study of the SC-CO_2 effects on the other food matrix components that are not the extracted oil is almost null. The albumin- globulin fraction was extracted using a 0.5M NaCl pH 7.5 buffer from all flours. The protein content of isolates (API) was determined by BCA, protein analysis was performed by SDS- PAGE and Western blot. Results showed that the API that received the treatment with SC- CO_2 at 50°C and 3630 psi had the highest protein content (15.357 mg/mL), while the API from Blank had the lowest protein content (9.923 mg/mL). In the SDS-PAGE gel, three main bands were observed in all API, the largest with a low molecular weight (approximately 12 kDa), followed by the one near 31 and 38 kDa. Regarding the Western blot, a band around 12 kDa was observed for all the API, and a faint band between 31-38 kDa, although with major intensity in the API subjected to SC-CO_2 at 50°C and the three pressures, which suggest that SC-CO_2 treatment modify protein structure and induce protein hydrolysis which can be used to improve techno-functional properties of food matrix.

Keywords: *Amaranthus hypochondriacus, supercritical CO_2, amaranth protein isolate, globulin-albumin fraction, Western blot.*

REFERENCES

[1] Bojorquez-Velázquez et al., 2018. Journal of Cereal Science, 83, 222-228. [2] Janssen et al., 2017. Comprehensive Reviews in Food Science and Food Safety 16, 39-58.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Effect of calcium nanoparticles on the postharvest quality of minimally processed watermelon (*Citrullus lanatus*)

Jacuinde-Guzmán, J.K.[1]*, Escalona-Buendía, H.B.[1], Rivera-Cabrera, F.[2], Raddatz-Mota, D.[2], Soriano-Melgar, L.A.[3]

[1]*Departamento de Biotecnología.*

[2]*Departamento de Ciencias de la Salud, Universidad Autónoma Metropolitana Unidad Iztapalapa, Ferrocarril San Rafael Atlixco 186, Leyes de Reforma 1ª Sección, Alcaldía Iztapalapa, 09310, Ciudad de México, México.*

[3]*Cátedras- CONACyT, Universidad Autónoma de Coahuila, Blvd. Venustiano Carranza 935, República, 25280, Saltillo, Coahuila, México.*

Presenting author: cbs2212801228@izt.uam.mx.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

Watermelon is one of the most attractive fruits due to its refreshing flavor and texture [1], however, its large size makes it a difficult fruit to select as a snack, making it ideal to be marketed as a minimally processed product (MPP). MPP fruits and vegetables are prepared through a series of operations such as washing, cutting, packaging, and they are refrigerated until consumption [2]. The processing induces stress due to cutting, reducing its shelf life. The postharvest technologies used to extend the useful life of MPP combine the application of natural additives and refrigeration, related to the development of off-flavours [3]. On the other hand, nanoparticles (NP) are a wide class of materials that range from 1 to 100 nm, classified by their shape, size, and properties [4]. There are different types of NP, metallic oxides include calcium oxide (CaO) and calcium hydroxide (CaOH), which are of interest for their biocidal capacities against common pathogens in food. The objective was to evaluate the effect of calcium-NPs (CaO-NP and CaOH-NP), at three different concentrations (100, 150, and 200 ppm) in MPP watermelon fruits, using as controls treatment without NP and another with 1% CaCl2. Seedless watermelon (Citrullus lanatus) fruits were used, which were selected, washed, dried, weighed, and cut into quarters (triangles); treatments were applied, and quality parameters were determined. The treated fruits were stored in a clamshell dome at 5 °C. The results showed that the CaOH-NP treatment was the one that maintained the best commercial acceptability, firmness, and quality parameters (SST, pH and AT), likewise, it maintained similar levels of dehydration to that of the fruits treated with CaCl2 at 1 % (that is, it showed less PFP) and less leachate was produced. Therefore, it is concluded that the application of NaOH-NP is an alternative to maintain the postharvest quality of MP watermelons.

Keywords: *Nanoparticles, Postharvest, Watermelon, Minimally processed product, shelf life.*

REFERENCES

[1] Mendoza-Enano et al., 2019. Postharvest Biology and Technology, 154, 137-147l. [2] Soriano- Melgar et al., 2019. Postharvest Biology and Technology, 156,1109953. [3] Rincón-Pérez y Martínez- Quintero, 2015. Alimentos Hoy, 23, 3-25. [4] Khan et al., 2019. Arab. J. Chem, 12, 908-931.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Use of betalain as an indicator in edible smart packaging to monitor the freshness of food and extend its shelf life

Takebayashi-Caballero, N.[1]*, Escamilla-García, M.[1], Regalado-González, C.[1], Castaño-Meneses V.[2]

[1]*Universidad Autónoma de Querétaro. Cerro de las Campanas s/n, Centro Universitario 76010, Querétaro, Querétaro, México.*

[2]*Universidad Nacional Autónoma de México, Boulevard Juriquilla 3001, Querétaro 76230, México.*

Presenting author: noemitakebayashicaballero@gmail.com.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

Smart packaging allows for monitoring food freshness [1]. Traditionally, smart packaging used synthetic dyes. However, they may represent a hazard to both the environment and the customer [2], hence the need to use natural colorants instead. The objective of the study is to produce an edible film using chitosan and starch while adding beetroot pigments that serve as freshness indicators. Color changes of beetroot pigments were determined at different pH scales. The results indicate that beetroot pigments changed color as different pH solutions were added. Different tones of red were appreciated while adding a solution of pH 2 and pH 7, however, a drastic change was noticed with pH 13 as it turned yellow immediately. Another significant result was the antimicrobial properties of beetroot pigments against *L. innocua*. *Listeria*'s growth speed was similar for the control (*Listeria* broth) and Listeria broth with 1% of beetroot pigments (0.1065 ± 0.1572 and 0.1129 ±.0.0123 h-1). This suggests that beetroot pigments above 1% slow down the growth speed of *Listeria* by approximately 10 times. Moreover, the doubling time for the broth with 2-5% with beetroot pigments was higher (3.89, 3.64, 3.62, 3.13 h) than the plain broth and the broth with 1% beetroot pigments (1.47 and 1.46 h). This indicates that beetroot pigments above 1% have the capacity of slowing down the time it takes for one cell to divide. This can be significant as we could exploit beetroot pigments for two purposes: as an acid-base indicator and as an antimicrobial agent, which could reduce the cost of the final product.

Keywords: *smart films, beetroot, pigments, antimicrobial, acid-base indicator.*

REFERENCES

[1] Schaefer et al., 2018. Procedia CIRP, 72, 1022-1027. [2] Mohammadian et al., 2020. Trends in Food Science & Technology, 105, 93-144.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Increase of pulque shelf life through the application of accrescent calyx extract of *Physalis ixocarpa*

Durán-Segura, D.[1]*, Escamilla-García, M.[1], Regalado-González, C[1]., Amaro- Reyes, A.[1]

[1]*Facultad de Química. Universidad Autónoma de Querétaro, Centro Universitario, Cerro de las Campanas S/N. Colonia las Campanas, 76010, Querétaro, México.*

Presenting author: ddurans15@hotmail.com.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

Pulque is a traditional Mexican fermented beverage that is obtained through the *Agave salmiana* plant; this drink has been of great interest due to the number of microorganisms responsible for fermentation and flavor. Due to the high microbial load contained in pulque, it has a shelf life of less than 3 days, studies have shown that after this time the drink becomes very acidic, bitter, and not recommended for consumption [1]. The raw extract of the accrescent calyx of the green tomato (*Physalis ixocarpa*) has been reported to contain physalins which possess antimicrobial activity.[2]. Heat treatments have been one of the most used methods in food preservation, as they provide a safe product for consumption and with a high efficiency in the elimination of microorganisms [3], however, in the conservation of pulque this type of treatment when reaching temperatures greater than 80°C affects the organoleptic properties of the product. The objective of this work is to determine the antimicrobial activity of the free and microencapsulated physalins obtained from *Physalis ixocarpa* against *Leuconostoc mesenteroides*, *Saccharomyces cerevisiae*, and *Zymomonas mobilis* to extend the shelf life of pulque. Concentrations (2.5, 3 and 3.5% (w/v)) of physalin microencapsulate were added to cultures of *L. mesenteroides*, *Z. mobilis*, and *S. cerevisiae* observing a significant inhibition in the growth of these microorganisms. A decrease in growth rate of 3 times lower compared to the growth rate of control is observed for the three microorganisms studied. A relevant inhibitory effect of the physalines obtained from the accrescent calyx of *Physalis ixocarpa* was observed against *L. mesenteroides*, *S. cerevisiae*, and *Z. mobilis*, with these results we can increase the shelf life of pulque trying not to alter its organoleptic properties.

Keywords: *pulque, inhibition, tomato, bacteria, yeast, alcohol.*

REFERENCES

[1] Alcántara-Zavala et al.,2019. Food and bioproducts processing 118,139-148. [2] Helvaci et al., 2010. Pharmaceutical biology, 48 (2), 142-150. [3] Rodríguez-Salinas et al., 2021. Biotecnia, 23 (1), 92-101.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Structural modification of jackfruit leaf protein by enzymatic hydrolysis and their effect on the emulsifier properties

Calderón-Chiu, C.[1], Calderón-Santoyo, M.[1], Barros-Castillo, J.C.[1], Díaz, J.A.[2], Ragazzo-Sánchez, J.A.[1]*

[1]*Laboratorio Integral de Investigación en Alimentos, Tecnológico Nacional de México/Instituto Tecnológico de Tepic, Av. Tecnológico #2595, C.P. 63175, Tepic, Nayarit, México.*

[2]*Departamento de Química Física e Inorgánica, Escuela de Química, Facultad de Ciencias Naturales y Matemáticas, Universidad de El Salvador Ciudad Universitaria, San Salvador, El Salvador.*

Presenting author: carolinachiu@outlook.com.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

LPC was modified by enzymatic hydrolysis with pepsin (H-Pep) and pancreatin (H-Pan) at different hydrolysis times. The protein hydrolysates obtained showed emulsifying properties significantly improved concerning the LPC [1]. Nevertheless, knowledge of the structure and its relationship with functional properties of protein hydrolysates still unidentified. Thus, the effect of enzyme type and hydrolysis time (30-240 min) of LPC on the amino acid profile (GC-MS), structural (FTIR) and thermal properties (TGA and DSC) and its relationship with the formation of oil-in-water (O/W) emulsions were evaluated. The results indicated that the highest release of amino acids (AA) occurred after 240 min for H-Pep and H-Pan. H-Pan showed the greatest content of essential and hydrophobic amino acids. Lower-sheet contents had greater influence on the emulsifier properties. In H-Pep, the sheet fraction increased, while in H-Pan decreased as a function of hydrolysis time, indicating that H-Pan showed structures more flexible. The temperatures of glass transition and decomposition were highest in H-Pep due to their high content of sheet. The stabilized emulsions with H-Pan with 180 min of hydrolysis showed homogeneous distributions and smaller particle sizes, owing to the low-sheet contents [2]. Finally, the changes in secondary structure and AA composition by the effect of enzyme type and hydrolysis time influence the emulsifying properties of protein hydrolysates.

Keywords: *jackfruit, leaf protein concentrate, enzymatic hydrolysis, amino acid profile, secondary structure, thermal properties, O/W emulsions.*

REFERENCES

[1] Calderón-Chiu, et al., 2021. Food Hydrocolloids, 2021, 112, 106319. [2] Fu et al., 2020. Food Hydrocolloids, 2020, 105, 105763.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Use of jackfruit (*Artocarpus heterophyllus* L.) leaf protein hydrolysates as a stabilizer of the pentacyclic triterpenes-rich extract loaded nanoemulsions

Calderón-Chiu, C.[1]*, Calderón-Santoyo, M.[1], Barros-Castillo, J. C.[1], Damasceno- Gomes, S.[2], López-García, U.M.[1], Ragazzo-Sánchez, J.A.[1]

[1]*LIIA-TecNM/Instituto Tecnológico de Tepic, Av. Tecnológico #2595, C.P. 63175, Tepic, Nayarit, México.*

[2]*Center of Exact and Technological Sciences, State University of West Paraná, Cascavel, Brazil.*

Presenting author: carolinachiu@outlook.com.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

Coccoloba uvifera L. leaf extract is a source of pentacyclic triterpenes (PTs), which are high-value biological compounds (HVBC) with biological activities. The low water solubility of PTs makes their application difficult [1]. Oil in water (O/W) nanoemulsions (NEs) offer great potential to maintain/release lipophilic HVBC. The jackfruit leaf protein hydrolysate (LPH) has good emulsifying properties [2], and in this context, it is suggested that the extract of *Coccoloba uvifera* leaf could be encapsulated by NEs stabilized with LPH. The objective of this research was to obtain an NE loaded with triterpenic extract and stabilized with LPH. Response surface methodology (RSM) was used to optimize the conditions of an optimal nanoemulsion (NE-Opt). The effect of protein hydrolysate (0.5-2%), oil loaded with extract (2.5-7.5%), and ultrasound time (5-15 min) on the polydispersity index (PDI) and droplet size of the emulsion (D [3,2] and D [4,3]) was evaluated. The encapsulation efficiency (EE%) and loading (EL%), the color, and the stability at simulated and thermal conditions were examined. RSM revealed that 1.25% protein hydrolysate, 2.5% oil, and an ultrasound time of 15 min produced the NE-Opt with the lowest PDI (0.85), D [3,2] (330 nm), and D [4,3] (360 nm). The EE% and EL% of the NE-Opt were 40.15 ± 1.46 and 18.03 ± 2.78% respectively. The NE-Opt was relatively stable during storage (at 4 and 25 °C), pH, temperature, and ionic strength. Thermal analysis showed that the NE-Opt with extract was more thermally stable than the emulsion without extract. Then, the protein hydrolysate could be used as an alternative to conventional emulsifiers.

Keywords: *pentacyclic triterpenes extract, nanoemulsion O/W, jackfruit leaf, leaf protein hydrolysates, Coccoloba uvifera L.*

REFERENCES

[1] Ramos-Hernández et al., 2018, Journal of Food Science and Technology, 55 (7), 2377–2383. [2] Calderón-Chiu et al., 2021. Food Hydrocolloids, 2021, 112, 106319.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Effect of chitosan-TiO2 and chitosan-TiO2-ZnO-MgO hybrid coatings on the conservation of fresh-cut jackfruit

Ramírez-Conception H.R.[1]*, Anaya-Esparza L.M.[2], García-Magaña M.L.[1], Meza- Espinoza L.[3], García-Galindo H.S.[4], Pérez- Larios A.[2], Montalvo-González E.[1]*

[1]*Tecnológico Nacional de México/Instituto Tecnológico de Tepic, Tepic, Nayarit, México.*

[2]*CUAltos-Universidad de Guadalajara, Tepatitlán, Jalisco, México.*

[3]*Universidad Tecnológica de la Costa, Santiago Ixcuintla, Nayarit, México.*

[4]*UNIDA-Tecnológico Nacional de México/Instituto Tecnológico de Veracruz, Veracruz, Veracruz, México.*

Presenting author: heruramirezco@ittepic.edu.mx.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

In this work, the objective was to evaluate the effect of chitosan-TiO_2 and chitosan-TiO_2- ZnO-MgO hybrid coatings on changes in quality and shelf-of fresh-cut jackfruit. Jackfruit bulbs were previously immersed in 1% citric acid and 0.1% calcium chloride solutions [1]. They were then separated in four treatments: control bulbs, bulbs with chitosan coating (CS), bulbs with the chitosan-TiO_2 hybrid coating (CSTiO_2), and bulbs with chitosan TiO_2-ZnO- MgO hybrid coating (CSTZM). All samples were stored under refrigeration at 4 °C. All coatings retarded the changes in physiological and physicochemical parameters ($p<0.05$) during storage in comparison with control bulbs. CSTZM bulbs exhibited a slow ripening during of storage ($p<0.05$). In addition, CSTZM bulbs had a weight loss of <1%, the highest content of vitamin A, vitamin E and vitamin C, total carotenoids, antioxidant capacity by DPPH assay ($p<0.05$) and seventeen phenolic compounds were identified including phenolic acids and flavonoids. Applying coatings to jackfruit bulbs allowed them microbiological stability with a shelf-life of 10, 13, and 15 days for bulbs coated with CS, CSTiO_2, and CSTZM, respectively, to 4±2 °C while control bulbs exhibited only 3-4 days of shelf-life. All bulbs coated were considered non-toxic according to the Artemia salina test. The new chitosan-TiO_2-ZnO-MgO hybrid coating has a potential impact on extending the shelf-life of fresh-cut jackfruit and different fresh-cut or whole fruits.

Keywords: *Chitosan-hybrid coatings, fresh-cut jackfruit, quality, shelf-life.*

REFERENCES

[1] Vargas-Torres et al., 2017. Scientia Horticulturae, 214, 221-227. [2] Anaya-Esparza et al., 2022. Periodica Polytechnica Chemical Engineering, 1, 1-15.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Electrospinning: a technology to obtain nanofibers in water purification

Morales-Alvarado, A.B.*, Santacruz-Vázquez C., Santacruz-Vázquez, V.

Facultad de Ingeniería Química, Benemérita Universidad Autónoma de Puebla, Ciudad Universitaria, 72570, Puebla, Puebla, México.

Presenting author: anabelmoal@gmail.com.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

Among the new technologies, is the electrospinning process, it is an electrostatic fiber manufacturing technique, which has aroused interest and attention in recent years [1]. In the present work, polyvinyl alcohol nanofibers were developed, including biocidal components, which were characterized using different techniques and applied in a pilot water purification device based on nanofiltration, with the aim of obtaining water suitable for human consumption, evaluating with the current Mexican regulations. The electrospinning technique allowed the formation of PVA nanofibers in which the encapsulation of NPs-Ag, NPs-ZnO and a mixture of both % by weight was possible. The electrospinning conditions were Voltage 12 KV, injection flow of 1.0±0.05 ml/h, collector speed of 250±10 rpm and distance between injector and collector of 12 cm. The diameter of the fibers obtained ranges between 340-424 nm and characterized by different techniques. The obtained fibers were evaluated to verify their bactericidal effect with E. Coli, one of the bacteria most present in the water, giving favorable results, with greater inhibition for zinc oxide nanoparticles, finally the pilot device was built that allows the water purification process to be carried out to evaluate the effectiveness of the material. Inclusion components such as silver and zinc oxide are considered efficient nanobicides for biological applications and processes related to water disinfection [2].

Keywords: *Electrospinning, nanotechnology, nanofibers, water purification.*

REFERENCES

[1] Travis, 2008. Electrospinning: Applications in drug delivery and tissue engineering Biomaterials, 1989-2006. [2] Fahimirad et.al., 2019. Synthesis and therapeutic potential of silver nanomaterials derived from plant extracts. Ecotoxicol. Environ. Saf. 168,260–278.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Circular economy in food production: sugar industry case

Montiel-Rosales, A.*; Montalvo-Romero, N., Fernández-Lambert, G.

Tecnológico Nacional de México/ITS de Misantla, Km. 1.8 Carretera a Loma del Cojolite C.P. 93821, Misantla, Veracruz-México.

Presenting author: ar.chimedes@hotmail.com.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

Sugar is the food that provides energy to the human being through carbohydrates. In Mexico, sugar production is mainly from sugarcane (Saccharum officinarum), the main perennial crop with the most significant extension of land used for this crop [1,2]. Unfortunately, it is also one of the main industries that pollute the most due to a large amount of organic matter that cogenerates along the value chain, i.e., agricultural crop residues, bagasse, cachaça, molasses, and vinasse [3]. The indiscriminate discharge of this waste generates negative impacts on the environment. The study addresses a design supported by the Circular Economy strategy, which allows the closure of the value chain of the sugar industry. Therefore, it has been identified that other industries have benefited from the recovery of waste properties; however, the sugar industry must redesign its processes so that they are reintegrated into the same value-generating chain. Therefore, in this study, a conceptual design has been developed in a mill in the state of Veracruz-Mexico as an approach that allows reintegrating waste from the sugar value chain, possibly reducing its negative impact. The proposed design has been developed from the characterization of each waste and reincorporation into the production processes of the generating chain. Finally, waste management from the Circular Economy strategy is feasible, thus reducing the negative impact of agro-industrial discharges. Thus, allowing the development of environmentally friendly production systems, sustainable and sustainable.

Keywords: *Circular Economy, Sugar Industry, Co-products, Environment.*

REFERENCES

[1] INEGI, 2022. Agricultura. [2] SADER et al., 2021. Comité Nacional para el Desarrollo Sustentable de la Caña de Azúcar. [3] SEMARNAT, 2022. Consulta temática.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Experimental study of the freezing kinetics in nopal (*Opuntia* spp)

Román-Aguilar, R., De Santiago-Herrera, J.*, Delgadillo-Ávila W.M., Aparicio- Burgos, J.E., Valle-Hernández, J.

ESAP-UAEH. Col. Chimalpa, C.P. 43920 Apan, Hidalgo, México.

Presenting author: de382597@uaeh.edu.mx.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

Freezing is a process used as a food preservation method, based on the elimination of heat to create ice crystals from the water present [1]. The study of the freezing kinetics in products such as Nopal *Opuntia* spp is important and necessary for the handling of foods in conservation at low temperatures. The *Opuntia* spp nopal, due to its high moisture content, greater than 90%, requires specific management and conservation conditions [2]. The objective of this work is to experimentally study the freezing kinetics of Nopal *Opuntia* spp. In this study, three tests with three samples each are evaluated, recording the behavior of the temperature for a time greater than 6 hours and varying the reading intervals in 5, 4 and 3 seconds. The results show the behavior of the freezing kinetics, in which it is observed that the beginning of the freezing point is between -0.44 to -1.7 °C, while the end of freezing occurs at an average temperature of -3.22 °C. Finally, the temperature at which equilibrium with the cold medium was reached was around -21 °C. The results obtained may be an important factor in predicting freezing times in Nopal *Opuntia* spp, which could optimize storage conditions at low temperatures and help avoid product losses.

Keywords: *Freezing, Freezing point, Solutes, Ice, Crystallization.*

REFERENCES

[1] Garnica, M., et al., 2015. Alimentos Hoy, 23(36), 21-30. [2] Maki, G., et al., 2015. AgroSciences 49: 31-51.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Effect of furfural and acetic acid in biomass fermentation sugars using *Scheffersomyces stipitis* and *Saccharomyces cerevisiae* in bioethanol production

Saucedo Gutiérrez, J.J.[1]*, Granados Arvizu, J.A.[1], Regalado González, C.[1], Escamilla García, M[1], González Hernández, J.C.[2]

[1]*Universidad Autónoma de Querétaro, C.U. Cerro de las Campanas s/n, 76010, Querétaro, Querétaro, México.*

[2]*Instituto Tecnológico de Morelia, Av. Tecnológico de Morelia 1500, 58120, Morelia, Michoacán, México.*

Presenting author: jsaucedo22@alumnos.uaq.mx.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

Most agro-industrial wastes are lignocellulosic biomass, composed by cellulose, hemicellulose, and lignin [1]. Pretreatment is a fundamental step to transform the biomass into fermentable sugars [2]. The challenge during pretreatment is the generation of inhibitors that affect fermentation rate [3]. The aim of this study was to evaluate the effect of the furfural, and acetic acid on growth and fermentation parameters of *Scheffersomyces stipites* and *Saccharomyces cerevisiae*. Growth kinetics and fermentations were carried using YP medium with 0.5 M of glucose at 250 rpm for 48 h. The furfural and acetic acid concentration tested were 0.1, 0.2 and 0.3% v/v. It was measured the doubling time (dt), specific growth rate (μ), biomass, and glucose consumption during fermentation. The kinetic growth showed that furfural decreased the growth of *S. stipitis*, but acetic acid at 0.2, and 0.3% inhibited it. In case of *S. cerevisiae*, the presence of furfural or acetic acid caused inhibition, except at 0.1% of furfural. The furfural in all concentration tested decreased more than 60% the μ of *S. stipitis* compared to control, while the dt increased 2.5 times more than control. For acetic acid, the 0.1% decreased about 50% of μ value, and almost 80% with 0.2 and 0.3% compared to control. The dt of *S. stipitis* was affected by acetic acid causing an increase of 2 or 3 times more than control. In case of fermentation, there were no significant differences in sugar consumption between the treatments, except for acetic acid at 0.3%, while biomass production was reduced with the increase of furfural or acetic acid. At difference of *S. cerevisiae*, *S. stipitis* is capable to tolerate the presence of furfural and acetic acid. The characterization of this strain can help to find the better conditions to take advantage of sugars from biomass waste.

Keywords: *Fermentation inhibitors, Crabtree negative, biofuels, agro-industrial-wastes.*

REFERENCES

[1] Galbe et al., 2012. Biomass and Bioenergy, 46, 70–78. [2] Abo et al., 2019. Reviews on Environmental Health, 26; 34(1) 57 – 68. [3] Vanmarcke et al., 2019. Biotechnology for Biofuels, 14(92).

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Factorial experimental design applied to the surfactant assisted extraction of *Agastache mexicana* essential oil

Botello-Ojeda, A.G.*, Conde-Hernández, L.A., Osorio-Lama, M.A., Rivera- Márquez, J.A.

BUAP - Facultad de Ingeniería Química, Av. San Claudio y 14 sur, Puebla, Pue., México

Presenting author: anettegisela@hotmail.com.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

Agastache mexicana subsp. xolocotziana is a mexican endemic plant known as “toronjil blanco”. This plant is grown under cultivation and commercialized over the country, however there are just a few publications about its biological properties [1]. The objective of this research was to analyze the influence of three process variables: Tween 20 concentration (A), solid-liquid ratio (B) and extraction time (C) on the antioxidant activity of the *Agastache mexicana* subsp. xolocotziana essential oil (AMEO) obtained by surfactant assisted hydrodistillation. The results demonstrated that all the main factors and interactions have a significant effect on the antioxidant activity expressed by the IC50 value measured by the ABTS chemical assay. About the main effects, the Tween 20 concentration increased the IC50 value, and the other two factors demonstrated a negative influence. About interactions, AB and AC showed a negative influence and BC and ABC interactions increased the IC50 value. So, the best antioxidant activity was obtained when the three factors were at the high level (IC50 = 0.0223 g/mL). Also, the antioxidant activity of AMEO was compared with three synthetic antioxidants considered as standard (BHT, ascorbic acid, and Trolox). In conclusion, these findings show the impact of the three process variables on the AMEO antioxidant activity. Besides the results show that the obtained AMEO has a moderate antioxidant activity and could have applications in the food or cosmetic industry. Although *Agastache mexicana* subsp. xolocotziana is commercially important in México, to the best of our knowledge, there are no reports about the antioxidant activity of its essential oil in the literature.

Keywords: *Agastache mexicana subsp. xolocotziana, Tween 20, hydrodistillation, antioxidant activity.*

REFERENCES

[1] Palma-Tenango et al., 2021. Molecules, 26, 3751.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Use of solid organic coffee waste to obtain microcellulose fibers from the municipality of Cuetzalan, Puebla

Rodríguez-Quiroz E. S.[1]*, Santacruz-Vázquez C.[1], Santacruz-Vázquez V.[1], Juárez- Rubio E.[1], Pérez-Armendáriz B.[2]

[1]*BUAP1, Ciudad Universitaria Av. Sn. Claudio y, Blvd. 18 sur Col, Jardines de San Manuel, Puebla, Pue., México.*

[2]*UPAEP5, 21 sur #1103, Barrio de Santiago, Puebla, Pue., México.*

Presenting author: eliudsalvador.rodriguez@alumno.buap.mx.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

One of the main conflicts of agribusiness is pollution problems, one of which is the generation of organic solid waste. One of the most important crops in Mexico is coffee and 21% of its production comes from the state of Puebla. If we analyze the parts of the coffee fruit, we find that only 55% is the coffee bean while the remaining 45% is organic waste [1]. In this work, the cellulosic content was used by means of a 23 factorial experimental design that determined the alkaline conditions that favor delignification. A bleaching process was proposed and finally an acid hydrolysis was applied to obtain microcellulose fibers. The fibers were characterized by X-ray diffraction (XRD), scanning electron microscopy (SEM) and Fourier transform infrared (FT-IR) and lignocellulosic content. The results show cellulosic fibers with an average diameter of 111 µm that can be observed by SEM. The crystalline phase of the fibers and the changes produced in the functional groups detected by FT-IR can be appreciated by XRD. Finally, the lignin content was 15.8%, hemicellulose 17.7% and cellulose 19.1% before the treatments, with the application of the alkaline treatment an average lignin content of 11.31%, hemicellulose 12.75% and cellulose 23.37%, after bleaching a decrease in lignin of 5.05% and hemicellulose of 4.37% was still observed, compared to cellulose of 29.3% and with acid hydrolysis it was indicated that it is the best treatment to obtain the maximum cellulose content 32.3%.

Keywords: *Coffee pulp, Cellulose content, Delignification, Microcellulose.*

REFERENCES

[1] Collazo Bigliardi S., et al., 2018. Carbohydrate Polymers, 191, 205-215.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Semi-desert plant extracts as biostimulants for growth, yield and fruit quality in bell pepper (*Capsicum annuum* L.)

Rocha-Rivera, M.F.[1]*, Jasso de Rodríguez, D[1], Ramírez-Rodríguez H.[1], Villarreal-Quintanilla, J.Á.[1], Díaz-Jiménez, L,[2], Rodríguez-García, R.[1]

[1]*Universidad Autónoma Agraria Antonio Narro, Calzada Antonio Narro 1923, Saltillo, 25315, Coahuila, México.*

[2]*Cinvestav-Saltillo, Ramos Arizpe, 25900, Coahuila, México.*

Presenting author: martin10rocharivera@gmail.com.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

The objective of this study was to evaluate the effect of four plant extracts from the semi- desert of northeastern Mexico: R*hus muelleri*, *R. virens*, *Flourensia microphylla* and *F. retinophylla*, as biostimulants for growth, yield and fruit quality in bell pepper, Cannon variety, under soilless cultivation. The *F. retinophylla* extract stimulated a greater number of fruits (7.4), fruit weight (212.9 g) and fruit yield per plant (1.57 kg/plant), which is in agreement with what was reported by [1], who, when using a methanolic extract of *Rhus muelleri*, had a greater increase in weight and number of fruits in tomato, these results also agree with those obtained by [2], who used a natural biostimulant (Radifarm), to improve yield in the fruit of *Capsicum annuum*. The extract of *F. microphylla* promoted the content of vitamin "C" 100.17 mg/100 g, with respect to the control that was 66.14 mg/100 g, this is attributed to bioactive polyphenols, which contribute to pigmentation and antioxidant activity [3]. Regarding the Electrical Conductivity of pulp, the results of extracts and bioregulators were similar, and different from the control. The extract of *R. muelleri* increased the total soluble solids in the fruit, 8.61 °Brix with respect to the control, which was 7.41 °Brix, which is attributed to the hydrolysis of the starch in the ripening of the fruit [4]. The extracts promoted growth, yield and quality. México is an important producer of organic bell pepper, reaching an annual production of 3. 780 t [5], therefore, plant extracts from the semi-desert are an alternative to produce chemical-free and environmentally friendly fruits.

Keywords: *biostimulants, extracts, R. muelleri, F. microphylla, F. retinophylla.*

REFERENCES

[1] Jasso de Rodríguez et al., 2020. Eco. Rec. Agr. 7 (1). [2] Paradikovic et al., 2018. Food Energy Sec. 8: 1-17. [3] Stingu et al., 2012. Ind. Crops Prod. 35: 53-60. [4] Mejía et al., 2009. J. Food Quality 32: 735-746. [5] SADER. 2019. Gobierno de México. https://www.gob.mx/agricultura/articulos/cinco-cosas-que-hay-que-saber-del-pimiento-morron.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Quantification, causes and uses of losses and waste of melon (*Cucumis melo*) under different stages of planting and harvesting

Espinoza-Arellano, J.[1]*, Fabela-Hernández, A.[1], Uzcanga-Pérez, N.[2], Sánchez- Toledano, B.[3]

[1]*Facultad de Contaduría y Administración, Boulevard Revolución 153 ote. Torreón, Coah. Mexico.*

[2]*Campo Experimental Mocochá (INIFAP). Mocochá, Yucatán, Mexico.*

[3]*Campo Experimental Zacatecas (INIFAP). Calera de Víctor Rosales, Zacatecas, México.*

Presenting author: jesusespinoza_612@yahoo.com.mx.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

Globally, about 1.3 billion tons of food are lost and wasted each year, which represents about a third of world production [1]. Reducing loss and waste is a fundamental means of ensuring the availability of food to supply the world's growing population. There are huge data gaps about food losses and waste around the world. This work was carried out in the Comarca Lagunera, which contributed to the year 2020 with an area of 4,565 hectares and a production of 165,663 ton [2]. Melon sowing in the region is carried out in three stages: a) early (sowing period January-February), b) intermediate (sowing period March-April), and c) late (sowing period June-July). The objective of this work was to quantify the losses and waste of cantaloupe melons, their causes and uses in the production and distribution stages. Unlike other works that take annual averages, in this one an analysis was made of the production losses by sowing and harvesting stage (early, intermediate, and late). The methodology used to quantify the losses was the structured survey applied in the links of production, packaging, transportation, wholesale, and retail sales. The results indicate that the greatest losses are recorded in late sowings, in the production and packaging links. The main causes of losses and waste were fruits of inadequate size, with physical damage caused by pests, diseases, and spots on the fruit caused by humidity and sun.

Keywords: *melon losses; melon waste; early sowings; late sowings.*

REFERENCES

[1] FAO. (2012). Pérdidas y desperdicio de alimentos en el mundo – Alcance, causas y prevención. Roma. http://www.fao.org/3/i2697s/i2697s.pdf. [2] SADER Región Lagunera, (2021). Servicio de Información Estadística. [En línea]. Disponible en: https://www.gob.mx/sagarpa/regionlagunera. Fecha de consulta: 26 de marzo de 2021.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Corn leavened bread, its gluten-like and rheological properties all enhanced by the nixtamalization technology

Canelo-Álvarez, F.[1]*, Figueroa-Cárdenas, J.D.[1], Martínez-Cruz, E.[2], Pérez-Robles, J.F.[1], Arámbula-Villa, G.[1], Véles-Medina, J.J.[1]

[1]*Centro de Investigación y de Estudios Avanzados IPN Unidad Querétaro. Libramiento Norponiente 2000, Fracc. Real de Juriquilla, Querétaro, Qro., México. 76230.*

[2]*Campo experimental Valle de México, INIFAP. Carretera Los Reyes-Texcoco, 13.5. Coatlinchán, Texcoco Estado de México, C. P. 56250.*

Presenting author: fatima.canelo@cinvestav.mx.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

Recently, increase of grain costs makes corn attractive for production of leavened bread of good quality. The functionality of corn bread with spongy texture is still a technological challenge due to the absence of gluten. However, nixtamalization processes has four different major factors pH, temperature, and steeping time in wet (in grain) or dry (in flour) form that, when combined they can enhance dough and bread functionality [1]. The objective of this work was to determine the effect of traditional nixtamalization with Ca $(OH)_2$ and ecological nixtamalization (Ca-Salts: $CaCl_2$, ashes) on corn-gluten with loaf volume and quality compared to wheat bread from whole and refined flour. Results show for first time ever the formation of corn wet gluten-like using nixtamalization. The loaf volume increases with the nixtamalization in all the cases compared with control without nixtamalization. The basic pH increases significantly the α-helix and antiparallel β- sheet (1685 cm-1) band specially in nixtamalization with Ca $(OH)_2$ compared with control without nixtamalization. However, the combination of basic pH and heat treatment (water 60°C) increases gelatinization and fermentable sugars. The electropherogram of nixtamalized non-reduced corn shows a new band at top about 75kD and a duplex band about 20-24kD zein. That suggests an increase in zein molecular weight. Ca-salts and Ca $(OH)_2$ can promote Ca-zein and zein-Ca-zein interactions that enhance protein polymerization by calcium bridges [2, 3]. Besides, the nixtamalized corn bread volume has a significant increase in the water absorption, protein, fiber, ash, and calcium. Generally, the consumers have a higher acceptability of nixtamalized corn bread compared than the non-nixtamalized control bread.

Keywords: *corn bread, corn gluten-like, nixtamalization, rheological properties, protein secondary structure, electrophoresis.*

REFERENCES

[1] Rincón-Aguirre et al., 2021. Journal of Cereal Science, 101,103-271. [2] Santiago-Ramos et al., 2018. Journal of Cereal Science, 81,108-117. [3] Quintanar-Guzmán et al., 2010., Journal of Cereal Science, 52, 152-160.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Assessment of ethanolic extracts from *Plectranthus amboinicus* leaves from backyards in the central zone of the state of Veracruz, Mexico

Castillo, R.I.[1]*, Malpica, S.B.[1], Osorio, F[1], Acosta, A.A.[2], Benedito, J.J.[3], Villanueva, J.A.[1], Decuir, J.Y.[2]

[1]*Colegio de Postgraduados, Campus Veracruz, km 88.5 Carr. Fed. Xalapa- Veracruz, Veracruz, México.*

[2]*TECNM/Instituto Tecnológico de Veracruz, Unidad de Investigación y Desarrollo en Alimentos (UNIDA), Av. Miguel Ángel de Quevedo 2779, Col. Formando Hogar, Veracruz, México.*

[3]*Universidad Politécnica de Valencia, Departamento de Tecnología de Alimentos, Camí de Vera, s/n, 46022 Valencia, Valencia, España.*

Presenting author: rosychely@colpos.mx.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

The objective of the work was to evaluate ethanolic extracts of oreganon leaves obtained by three methods under standardized conditions. Ethanol was used in a 1:10 ratio at a temperature of 35 ± 2°C. Oreganon (*Plectranthus amboinicus* (Lour.) Spreng) leaves were collected from backyard orchards in the central zone of Veracruz, Mexico. Phenolic compounds and antioxidant capacity of the ethanolic extracts obtained by the conventional method [1] and assisted extraction with an ultrasound bath according [2]. The yield of ultrasound probe-assisted extraction (20.44%) was significantly ($p<0.05$) higher than that obtained with conventional extraction (16.89%) and ultrasound bath (10.11%). The highest concentration of phenolic compounds was obtained by conventional extraction (12.82 mgEAG/g dm). Regarding the antioxidant capacity, the highest values were obtained in the extraction with an ultrasound bath (8.82 mgET/g dm). Power ultrasound-assisted extraction was useful for obtaining bioactive compounds from *P. amboinicus*. The extracts made from backyard plants such as oreganon, represent a natural alternative for the control of some horticultural diseases.

Keywords: *Bioactive, phenolic, yield, antimicrobial activity.*

REFERENCES

[1] Ramírez-Reyes et al., 2015. Journal of Chemical Ecology, 31: 47-52. [2] Corona Jiménez et al., 2016. Agrociencia, 50:403-412.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Image texture and color analyses of beef meat as a potential predictor of quality in terms of its freshness

Rodríguez-Cervantes, I.G.[1], López-Hernández, L.H.[2], Mendoza-Sánchez, M.[1]*

[1]*Faculty of Engineering, Autonomous University of Querétaro, C.U., Cerro de las Campanas, S/N. Querétaro, Querétaro.76010. México.*

[2]*Centro Nacional de Investigación Disciplinaria en Fisiología y Mejoramiento Animal, Km 1 carretera a Colón, Ajuchitlán, Querétaro, México.*

Presenting author: magdalena.mendoza@uaq.mx.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

Mexico is an important consumer and producer of meat [1]; the quality of this is a multifactorial aspect that defines the trend of its production and consumption; its evaluation is an important challenge in the meat industry [2, 3]. Instrumental methods are used to assess the meat quality; however, they are invasive, destructive, expensive, laborious, and time-consuming. Therefore, objective, and efficient methods, such as image analysis, have been explored [4, 5]. This investigation analyses physicochemical parameters, such as color, pH, and water retention capacity, as well as image texture, using the co-occurrence matrix (GLCM), of beef samples, to obtain the parameters angular second momentum (ASM), contrast, correlation, the inverse difference of momentum (IDM) and entropy. The correlation between the textural characteristics extracted from the images, and the physicochemical parameters, was examined, and the behavior allowed establishing a mathematical prediction model using the nominal logistic adjustment, which showed that the color variables a*, b*, C*, h* with the texture variables of the images ASM and IDM are the statistically significant parameters for the estimation of meat freshness, in this study. This research shows a possible potential for using image and color analysis to predict beef quality in terms of its freshness.

Keywords: *Meat, Image, Analysis, Quality, Prediction.*

REFERENCES

[1] Comecarne. 2021. Consejo Mexicano de la Carne. Compendio estadístico 2021. [2] Troy D. J. et al. 2010. Consumer perception and the role of science in the meat industry. Meat Science, 86(1), 214-226. [3] Joo, S.T et al. 2013. Control of fresh meat quality through manipulation of muscle fiber characteristics. Meat Science, 95 (2013) 828–836. [4] Narsaiah, K. et al. 2020. Nondestructive methods for carcass and meat quality evaluation. In Meat Quality Analysis (pp.37-49). Academic Press. [5] Chen, Q. et al. 2020. Non-destructive prediction of texture of frozen/thaw raw beef by Raman spectroscopy. Journal of Food Engineering, 266, 109693.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Hydrothermal processing and bioethanol production using brown macroalgae *Sargassum* spp.

González-Gloria, K.D.*, Ruiz, H.A., Rodríguez Jasso R.M., Loredo A., Chávez- González M.

Biorefinery Group, Food Research Department, School of Chemistry, Autonomous University of Coahuila, Saltillo, Coahuila 25280, Mexico.

Presenting author: gonzalezk@uadec.edu.mx.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

Sargassum spp. found on the coasts of México country as accumulated biomass that can be potentially used as an alternative for bioethanol production of their rich polysaccharides content [1]. Pretreatment and pre-saccharification and fermentation (PSSF) are processes to fractionate the algae biomass into glucan to become more accessible cellulose and the use of enzymes to convert them into their monomeric sugars and be fermented [2]. *Sargassum* was pretreated by a hydrothermal reactor carried out at 190ºC for 50 min and this was used as a substrate for enzymatic hydrolysis and fermentation. PSSF was performed in a bioreactor with a working volume of 150 mL, enzyme loading Cellic CTec2/Cellic HTec2 at a ratio of 1:2 (v/v) and solid loading rate was 10 FPU/g glucan, this process carried out to 72 h. The kinetic samples were analyzed by HPLC to calculate glucose and ethanol yield. The hydrothermal pretreatment effect in pretreated biomass obtained was 34.89% of glucan on a dry basis. In PSSF glucose concentration obtained was 21.79 g/L and ethanol concentration of 12.01 g/L corresponding to 57.69 %. The combination of enzymes increases algae fiber porosity in the obtained glucose. This increases the availability of cellulases to convert glucose and be fermented to ethanol using Sargassum. This macroalga can be considered a raw material in the development of the third generation of biorefinery.

Keywords: *Sargassum, Bioethanol, Biorefinery, Hydrothermal pretreatment, Enzymatic hydrolysis.*

REFERENCES

[1] Aguilar et al. 2018. Bioresource Technology, 263, 112–119 [2] Aparicio et al. 2020. Sustainable Seaweed Technologies.

JBCT Journal of BioProcess and Chemical Technology
2023 Volumen 15, No. 29
Revista Científica de la Universidad Autónoma de Coahuila

Kinetic parameters estimation from the *Spirulina platensis* growth by using unstructured models

Rosero-Chasoy, G.[1]*, Cabello Galindo, A.[1], Rodríguez-Jasso R.M.[1], Aguilar C.N.[1], Butrón G.[2], Chairez I.[3], Ruiz H. A.[1]

1Autonomous University of Coahuila, Saltillo, Coahuila 25280, México.

2 Autonomous University of México, Querétaro, México.

3Nacional Polytechnic Institute, Ciudad de México, México

Presenting author: grosero@uadec.edu.mx.

Recibido: 5 de octubre de 2022
Aceptado: 16 de noviembre de 2022

Abstract

Spirulina platensis is a blue-green cyanobacterium of great biotechnology interesting because they can grow in alkaline wastewater, whereas they take up nitrogen, phosphorus, and carbon during their growth phase to produce carbohydrates, proteins, and chlorophyll for applications in the food field [1]. This study aimed to evaluate the Spirulina platensis growth in synthetic wastewater by using a closed bubble column photobioreactor and determining the kinetic model with the highest fit grade from the experimental data of grown. *Spirulina platensis* LEB-52 was growing inside a closed bubble column photobioreactor of 3 L with a working volume of 2.7 L at room temperature by using a synthetic wastewater that contains 0.325 g/L Na_2CO_3, 0.99 g/L NaNO3, 0.036 g/L K_2HPO_4 as macronutrients, a light intensity of 73 µmol m-2 s-1, an air flow input of 10 vvm, and a photoperiod of 13 h per day. During the growth kinetic, biomass concentration was measured by dry weight and Verhulst or logistic, logistic with lag phase, and Gompertz models were used to estimate the specific growth rate and lag phase [2]. The results show a specific growth rate (µ) of 0.24, 0.193, 0.187 days-1 for logistic, logistic with lag phase, and Gompertz, receptibility. The logistic model with lag phase and Gompertz model shows a lag phase (λ) of 4.42 and 4.04 days. The fit grade (R2) shows values of 0.908, 0.980, and 0.975 for the logistic, logistic with lag phase, and Gompertz, respectability. The logistic with lag phase model was found to be most efficient to fit Spirulina platensis growth kinetic grown in synthetic wastewater. High-added-value compounds such as phycocyanin can be produced through a biorefinery concept from microalgae biomass.

Keywords: *Kinetic modelling, Microalgae, Cyanobacterium, Wastewater.*

REFERENCES

[1] Khoo, C. G et al., (2019). Advances in feedstock conversion technologies for alternative fuels and bioproducts, 1-19. [2] Dammak, M et al., (2018). Bioresource technology, 249, 510-518.