World Academy of Science, Engineering and Technology
International Journal of Nutrition and Food Engineering
Vol:18, No:02, 2024

Ultrasonic Agglomeration of Protein Matrices and Its Effect on Thermophysical, Macro- and Microstructural Properties

Authors : Daniela Rivera-Tobar Mario Perez-Won, Roberto Lemus-Mondaca, Gipsy Tabilo-Munizaga

Abstract : Different dietary trends worldwide seek to consume foods with anti-inflammatory properties, rich in antioxidants, proteins, and unsaturated fatty acids that lead to better metabolic, intestinal, mental, and cardiac health. In this sense, food matrices with high protein content based on macro and microalgae are an excellent alternative to meet the new needs of consumers. An emerging and environmentally friendly technology for producing protein matrices is ultrasonic agglomeration. It consists of the formation of permanent bonds between particles, improving the agglomeration of the matrix compared to conventionally agglomerated products (compression). Among the advantages of this process are the reduction of nutrient loss and the avoidance of binding agents. The objective of this research was to optimize the ultrasonic agglomeration process in matrices composed of Spirulina (Arthrospira platensis) powder and Cochayuyo (Durvillae Antartica) flour, by means of the response variable (Young's modulus) and the independent variables were the process conditions (percentage of ultrasonic amplitude: 70, 80 and 90; ultrasonic agglomeration times and cycles: 20, 25 and 30 seconds, and 3, 4 and 5). It was evaluated using a central composite design and analyzed using response surface methodology. In addition, the effects of agglomeration on thermophysical and microstructural properties were evaluated. It was determined that ultrasonic compression with 80 and 90% amplitude caused conformational changes according to Fourier infrared spectroscopy (FTIR) analysis, the best condition with respect to observed microstructure images (SEM) and differential scanning calorimetry (DSC) analysis, was the condition of 90% amplitude 25 and 30 seconds with 3 and 4 cycles of ultrasound. In conclusion, the agglomerated matrices present good macro and microstructural properties which would allow the design of food systems with better nutritional and functional properties.

Keywords : ultrasonic agglomeration, physical properties of food, protein matrices, macro and microalgae
Conference Title : ICFSN 2024 : International Conference on Food Science and Nutrition
Conference Location : Tokyo, Japan
Conference Dates : February 26-27, 2024