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Ultrasonic agglomeration applied to mixtures of macro and microalgae flours and its effect on microstructural properties, conformational changes and in vitro protein digestion

Ultrasonic agglomeration (UA) technology was used to develop protein matrices from macroalgae (*Durvillaea antarctica*) and microalgae (*Arthrospira platensis*), creating a novel agglomerated food system. This process combines physical compression with ultrasonic vibration, solidifying the particle surfaces to permanently agglomerate them. The microstructural properties, textural parameter (Young's modulus) and in vitro static digestion model of the protein matrices subjected to UA were evaluated. The UA process conditions were optimized using response surface methodology, considering amplitude (70-90%), time (20-30 s) and cycles (3-5) as factors, while Young's modulus was the response variable. Different scanning electron microscopies (SEM), confocal (CLMS), optical and X-ray computed microtomography were performed. Secondary structural changes in the proteins were evaluated using Fourier transform infrared spectroscopy (FTIR). The optimal conditions were 90% amplitude, 30 seconds and 5 cycles, achieving an 80% increase in strength and elasticity in Young's modulus. The application of UA induced the unfolding of the protein secondary structure, decreasing the β-sheet content while increasing the α-helix and parallel β-sheet structures. In the microstructure images, the agglomerated matrices subjected to higher amplitudes (90%) showed more homogeneous and less porous surfaces in the microtomography images. An increase in protein hydrolysis using an in vitro static digestion model. In conclusion, the most significant factors in the UA process were the amplitude and the ultrasound cycles, improving the mechanical and microstructural stability of the matrices. UA represents a promising tool for designing new food systems with improved functional properties.

Biography:

Mario Osvaldo Pérez Won is a full professor at the Universidad del Bío-Bío, Chillán, Chile. He is a Food Engineer with a master's degree in Fisheries Science from Kagoshima University, Japan and a PhD in Agriculture from Kyushu University. Dr. Pérez-Won works in the food, emerging technologies, seafood process engineering, physical properties of food, biotechnology and functional properties of proteins. Dr. Pérez-Won has been awarded for around 18 research projects. His career includes a hundred scientific publications, one of the latest published in Food Chemistry and Journal of Food Engineering.