

Effects of sequential alkaline pH-shifting and ultrasound pretreatment on the structural and functional properties of soy protein isolate (SPI)?citrus pectin (CP) conjugates

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This study investigated the effects of sequential alkaline pH-shifting and ultrasonication on the structural and functional modifications of soy protein isolate (SPI) and SPI?citrus pectin (CP) conjugates. Results revealed that combined alkaline shifting/ultrasound pretreatment drastically increased the degree of graft of SPI?CP conjugates during the wet-heating process. Ultrasound pretreatment (22 kHz, 25 °C) at a power density of 13.5 W/mL and ultrasound duration of 6 min enhanced the degree of graft of SPI?CP conjugates, which was 79.57% higher than groups without any pretreatment and 15.87% higher than groups without ultrasound pretreatment. In addition to the grafting process, ultrasound was also observed to play a marked role in dissociating large SPI nano-aggregates into smaller ones and unfolding the SPI resulting in more favorable structures for the Maillard reaction and smaller particle size of Maillard products. Analysis of the protein secondary and tertiary structures suggested that the attachment of CP changed the spatial conformation of SPI and led to a looser protein structure. Furthermore, the combined application of alkaline shifting and ultrasound significantly elevated protein solubility adjacent to the protein isoelectric point and improved emulsifying properties of SPI with more fine microstructures of coarse emulsion droplets, indicating that sequential alkaline pH-shifting and ultrasound pretreatment can be a desirable method for protein-polysaccharide conjugation.