CONFORMATIONAL DYNAMICS OF SOY PROTEIN ISOLATE UNDER OHMIC HEATING

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Body

Ohmic heating (OH) brings a promise of sustainable thermal processing by assuring high levels of heating efficiency and reduction of water consumption. It is important to gather fundamental knowledge about the way how this emerging heating method technology can affect the biological, functional, and technological properties of important molecules such as proteins during food processing. Vegetable proteins are attracting scientific interest in the food arena, mostly due to the need of a protein transition but also the most recent consumer trends. This work describes the effects of OH on structural aspects of soy protein isolate (SPI). OH was applied at different electrical frequencies (i.e. from 50 Hz to 20 kHz) and moderate electric fields (i.e. from 0 V/cm to 20 V/cm) at the onset denaturation temperature of SPI (95ºC). Different SPI fractions, such as legumins and vicilins, were identified through non-denaturing SDS-PAGE. Through fluorescence spectroscopy it was observed that frequencies below 500 Hz quenches tryptophan emission, suggesting structural rearrangements of the protein folding behavior; this effect is more pronounced with increasing electric field intensity. OH at 50 Hz resulted in a decrease of maximum intrinsic fluorescence intensity (p <0.05) of 27 % and 21 % when compared with the non-heated SPI and heated sample without the presence of an electric field, respectively. At the same time, treatments at 20 kHz presented a higher intrinsic fluorescence intensity than the other treatments (p < 0.05). The exposition of hydrophobic pockets appears to be less dependent on the electrical treatments applied. By reducing the thermal load, OH induces fewer changes on the protein´s structure, but the inherent electrochemical reactions and release of metals from the electrodes surface (confirmed by inductively coupled plasma mass spectrometry) can promote complexation reactions, thus changing protein folding dynamics. OH processing parameters when properly controlled result on differentiated protein binding properties which may be of essential importance regarding their functional properties but also for different applications in bioscience fields.

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Intrinsic fluorescence spectra of soy protein isolate before and after Ohmic Heating treatments performed at different electrical frequencies

Palavras-chave : Electric frequency, Fluorescence spectroscopy, Tryptophan quenching, Electrochemical reactions

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