Complex Coacervation Of Pumpkin Protein Isolate and Low Molecular Weight Chitosan

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Protein–polysaccharide interactions play an essential structure-controlling role in foods and biomaterials. Complex coacervation is primarily controlled by the charge density of the biopolymers, which is primarily influenced by pH of the dispersion (Turgeon et al., 2007).By modify the pH, the formation of protein–polysaccharide complexes is believed to follow a two-step nucleation and growth-type kinetic process associated with the formation of soluble (pHc) and insoluble complexes (pHϕ1)followed by their dissolution at pHϕ2 when one of the biopolymers becomes extensively protonated. Biopolymer complexes or coacervates have a high potential in food industry as they can improve dispersion stability, texture and interfacial properties as well as the sensorial characteristics via the masking of odd flavor (Zeeb et al. 2018; Yavuz-Düzgün et al. 2020).In addition, they have the possibility to be used as encapsulation wall materials for delivery of bioactive components in food matrices (Moschakis and Biliaderis 2017). The objective of this work was to investigate of the coacervation mechanism between pumpkin protein isolate (PSPI) and low molecular weight Chitosan (Ch) in function of the pH and of PSPI -Ch mixing ratio. Different PSPI-Ch ratios (1:1 48:1 120:1) were prepared and titred from pH 3,5 to pH 10,5 whit 0.1N NaOH and 0.1 N HCl. To each pH unit the samples were analyzed using nephelometry to evaluate the changes in turbidity, particle size and zeta potential to evaluate the complex formation. The pH of the medium strongly affects the charge density of biopolymers and in turn, the strength of coacervation. Because PSPI carries negative charges only at pH values greater than its pI and chitosan dissolves only in acidic solutions, the coacervation between PSPI and chitosan occurs in a narrow pH range.The coacervation between the two biopolymers was observed at the pH 4.5 and the maximum coacervate turbidity was obtained at the pH 7.5, which is below the dislocation constant of chitosan (pKa = 7.0) and above the pI of PSPI. This pH range agrees well with that of the SPI–chitosan pair (Guo-QingHuang, 2012), in which, the pI of soy protein isolate (pH 4.8) is very close to that of PSPI.In pH greater than 7.5, the coacervate turbidity decreased significantly due to low degree of ionization and insolubility of chitosan resulting in aggregation and following by dissolution of the complex at pH 8.5 , confirmed by DLS. The pHopt value of coacervate corresponds to the electrical equivalence point pH (EPP), in which both polymers carry equal, but opposite charges. Hence, the EPP of the PSPI–chitosan system was 7,5.In summary, our results show that it be possible to obtain complex coacervation between PSPI and chitosan however, further studies are necessary to investigate on their stability, functional and technology properties of PSPI—chitosan coacervates in food applications.

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