

Optimization of Protein Extraction Conditions and its Impact on the Optimum Complexation pH of Bambara Protein-Gum Arabic Complexes

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Abstract

This study optimized protein extraction conditions for improved protein yield and its impact on optimum complexation pH (pH_{opt}) of Bambara protein-gum arabic complexes. Response surface methodology was used to generate experimental design varying pH (2-9) and NaCl concentration (0.0- 0.6 M). The resultant Bambara protein isolates (BPI) were complexed with gum arabic to determine their turbidity profile. Then, physicochemical properties of the BPI extracted at optimum conditions were evaluated. The optimum complexation pH (pH_{opt}) for the BPI-GA complexes were formed around pH 4.2. The pH_{opt} shifted from 4.0 to 3.4 as extraction pH of BPI moved from alkaline to acidic region with coacervate yield of ~ 70% at pH 2.95, 0.28 M NaCl. Highest basic amino acids recorded in the protein extract pH 2.95, 0.28 M NaCl coupled with the positive zeta potential values obtained at pH 4 below the protein pI resulted into strong interaction at the optimum complexation pH. Zeta potential for the BPI had different isoelectric points (which indicates differences in amino acid composition) with the lowest value at pH 4 (BPI of 2.95, 0.28 M) while BPI extracted at 2.57, 0.25 M occurred at pH 5. Increase in protein yield was observed at acidic and alkaline pH with increase in ionic strength. The optimization of the extraction conditions (pH and NaCl concentration) significantly influenced the composition of Bambara proteins which impacted on their complexation behaviour with gum arabic. The coacervates formed have great potential for acidified beverages.