

Functionality and Application of Rice Bran Protein Hydrolysates in Oil in Water Emulsions: Their Stabilities to Environmental Stresses

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Abstract : Rice bran protein hydrolysates (RBPH) were prepared from defatted rice bran of two different Thai rice cultivars (Plai-Ngahm-Prachinburi; PNP and Khao Dok Mali 105; KDM105) using an enzymatic method. This research aimed to optimize enzyme-assisted protein extraction. In addition, the functional properties of RBPH and their stabilities to environmental stresses including pH (3 to 8), ionic strength (0 mM to 500 mM) and the thermal treatment (30 °C to 90 °C) were investigated. Results showed that enzymatic process for protein extraction of defatted rice bran was as follows: enzyme concentration 0.075 g/ 5 g of protein, extraction temperature 50 °C and extraction time 4 h. The obtained protein hydrolysate powders had a degree of hydrolysis (%) of 21.05% in PNP and 19.92% in KDM105. The solubility of protein hydrolysates at pH 4-6 was ranged from 27.28-38.57% and 27.60-43.00% in PNP and KDM105, respectively. In general, antioxidant activities indicated by total phenolic content, FRAP, ferrous ion-chelating (FIC), and 2,2'-azino-bis-3-ethylbenzthiazoline-6-sulphonic acid (ABTS) of KDM105 had higher than PNP. In terms of functional properties, the emulsifying activity index (EAI) was 8.78 m²/g protein in KDM105, whereas PNP was 5.05 m²/g protein. The foaming capacity at 5 minutes (%) was 47.33 and 52.98 in PNP and KDM105, respectively. Glutamine, Alanine, Valine, and Leucine are the major amino acid in protein hydrolysates where the total amino acid of KDM105 gave higher than PNP. Furthermore, we investigated environmental stresses on the stability of 5% oil in water emulsion (5% oil, 10 mM citrate buffer) stabilized by RBPH (3.5%). The droplet diameter of emulsion stabilized by KDM105 was smaller (d < 250 nm) than produced by PNP. For environmental stresses, RBPH stabilized emulsions were stable at pH around 3 and 5-6, at high salt (< 400 mM, pH 7) and at temperatures range between 30-50°C.

Keywords : functional properties, oil in water emulsion, protein hydrolysates, rice bran protein

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