Abstract

Brewer's spent yeast (BSY) is a major by-product of the brewing industry that contains a substantial amount of protein but remains underutilized. This study investigated the effects of mechanical pretreatments, namely homogenization (HPH), sonication (SNC), and a combination of homogenization and sonication (HPH + SNC), on the extraction yield, physicochemical characteristics, and functional properties of yeast protein concentrate (YPC) produced through pH-shift extraction. Yield, proximate composition, protein molecular profile, and functional properties, including water-holding capacity (WHC), oil-binding capacity (OBC), emulsifying properties, foaming properties, and solubility, were evaluated. Homogenization produced the highest protein pellet yield (24.26%) and dry YPC yield (2.34%) ($p \leq 0.05$), while HPH + SNC achieved the significantly highest protein content (65.54%) ($p \leq 0.05$). SDS-PAGE analysis indicated that homogenization altered the protein molecular profile by increasing the intensity of protein bands around 35 kDa which would directly affect the protein functional characteristics. Functional property analysis showed that HPH and HPH + SNC significantly improved WHC and foam stability around 3.4 g/g ($p \leq 0.05$), SNC exhibited the highest OBC (9.27 ml/g) ($p \leq 0.05$), foaming capacity (51.27 %) ($p \leq 0.05$), and solubility (86.85 %) ($p \leq 0.05$), whereas HPH + SNC demonstrated significantly superior emulsion stability around 81.75% ($p \leq 0.05$). These findings indicate that homogenization is the most effective pretreatment for maximizing protein recovery, while different pretreatments tailor the functional properties of YPC for specific industrial applications.

Keywords: *Brewer's spent yeast, yeast protein concentrate, alternative protein, pH-shift extraction, Mechanical Pretreatment, functional properties*