

Surfactant-Assisted Aqueous Extraction of Residual Oil from Palm-Pressed Mesocarp Fibre

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Abstract : The extraction of vegetable oil using aqueous extraction process assisted by ionic extended surfactant has been investigated as an alternative to hexane extraction. However, the ionic extended surfactant has not been commercialised and its safety with respect to food processing is uncertain. Hence, food-grade non-ionic surfactants (Tween 20, Span 20, and Span 80) were proposed for the extraction of residual oil from palm-pressed mesocarp fibre. Palm-pressed mesocarp fibre contains a significant amount of residual oil (5-10 wt %) and its recovery is beneficial as the oil contains much higher content of vitamin E, carotenoids, and sterols compared to crude palm oil. In this study, the formulation of food-grade surfactants using a combination of high hydrophilic-lipophilic balance (HLB) surfactants and low HLB surfactants to produce micro-emulsion with very low interfacial tension (IFT) was investigated. The suitable surfactant formulation was used in the oil extraction process and the efficiency of the extraction was correlated with the IFT, droplet size and viscosity. It was found that a ternary surfactant mixture with a HLB value of 15 (82% Tween 20, 12% Span 20 and 6% Span 80) was able to produce micro-emulsion with very low IFT compared to other HLB combinations. Results suggested that the IFT and droplet size highly affect the oil recovery efficiency. Finally, optimization of the operating parameters shows that the highest extraction efficiency of 78% was achieved at 1:31 solid to liquid ratio, 2 wt % surfactant solution, temperature of 50°C, and 50 minutes contact time.

Keywords : food-grade surfactants, aqueous extraction of residual oil, palm-pressed mesocarp fibre, interfacial tension

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