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Optimization of Ultrasound-Assisted Extraction of Okra Polysaccharides Using Response Surface Methodology

Okra (*Abelmoschus esculentus*) polysaccharides are valuable bioactive compounds with potential applications in food processing and functional foods. This study aimed to investigate the drying behavior of okra using a cross-flow dryer at 60℃, 70℃, and 80℃, evaluate the physicochemical properties of the resulting powders, and optimize polysaccharide extraction. Drying kinetics were studied using zero-, first-, and second-order equations, with first-order kinetics providing the best fit (R^2 = 0.9862, 0.9292, and 0.931 for 60℃, 70℃, and 80℃, respectively). Okra powder dried at 60℃ exhibited the highest swelling index 179.80 ± 22.65%) and solubility (37.67 ± 7.37%), indicating better retention of okra polysaccharide structure. Okra Polysaccharide extraction was performed using conventional solvent extraction (CSE) and ultrasound-assisted extraction (UAE) at 5, 15, and 30 minutes using ultrasonic probe system. FTIR analysis identified UAE at 15 minutes as the most effective method based on functional group retention. Further optimization was carried out using Response Surface Methodology with a Central Composite Design, varying sample-solvent ratio (1:30 to 1:50 w/v) and extraction time (10 to 20 minutes). The model predicted maximum polysaccharide yield at a sample-to-solvent ratio of 1:50 (w/v) and an extraction time of 20 minutes, with experimental validation yielding 17.64% (predicted 16.997%, R^2 = 0.9435). Future work will focus on characterizing the functional properties of the optimized polysaccharides to explore their application as natural emulsifiers and stabilizers in food systems.

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