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OPTIMIZATION OF ULTRASONIC EXTRACTION CONDITIONS FOR EXCESS SLUDGE PROTEIN USING RESPONSE SURFACE METHODOLOGY

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Abstract

Response surface methodology and central composite experimental design were used to model and optimize the operational parameters of the excess sludge protein extraction yield by ultrasonic wave-assisted extraction. The three variables involved in this research were the ultrasonic extraction time, pH, and temperature. In the range studied, statistical analysis of the results showed that selected variables had a significant effect on protein extraction yield. The optimized extraction conditions contained: extraction time 36.72min, pH 8.98, and temperature 34.14°C. The protein extraction yield approached 78.61% under optimal conditions. Regression analysis with an R^2 value of 0.9942 indicated a satisfactory correlation between the experimental data and predicted values (response). In addition, based on a feasibility analysis, the ultrasonic wave-assisted extraction method can improve odor and color of the protein solution. Compared with the conventional method, the ultrasonic wave-assisted extraction method was more cost-effective, convenient, and potentially applicable.

Key words: central composite design, optimization, protein extraction yield, response surface methodology, ultrasound

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