

## Response Surface Methodology to Optimize Protein Extraction from Defatted Rice Bran Using a Microwave-Assisted Alkaline Extraction Process for Protein-Based Drug Delivery Applications

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### Abstract:

Rice bran, a by-product of rice milling, contains 10-16% protein, 15-22% lipids, and 7–11.4% fiber. The protein content of rice bran has been shown to be hypoallergenic, and studies have indicated that it can aid in cancer prevention, making it a nutritious material with potential applications in food and pharmaceuticals. The objective of this study was to extract proteins using an alkaline solution assisted with microwave in a shorter time that can be used further for pharmaceutical application with or without modification. Four parameters were investigated, including microwave power, extraction time, the pH, and the ratio of solvent to defatted rice bran, on the optimization of protein yield using response surface methodology. The results of this study indicate that the optimal conditions for maximizing protein yield through the application of microwave-assisted alkaline extraction are as follows: an extraction power of 200 watts for a duration of 150 seconds at a pH of 12, in conjunction with a solvent-to-defatted rice bran ratio of 5:1. The analysis yielded results indicating that the particles size of rice bran protein were about 285.13 nanometers, with polydispersic 0.33, and a zeta potential of -33.33 millivolts, suggesting that the protein is stable. In addition, SDS-PAGE analysis showed that glutelin was the main protein fraction, confirming that the method effectively isolates specific protein fractions.

### Keywords:

Rice Bran, Protein Extraction, Response Surface Methodology (RSM), Optimization.