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OPTIMIZATION OF SOLID STATE FERMENTATION PROCESS FOR PROTEIN ENRICHMENT OF POTATO STARCH RESIDUE WITH MIXED STRAINS

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Abstract

This study was to optimize the fermentation process for protein enrichment of potato starch residue (PSR) by solid state fermentation with mixed strains. Three single-factor experiments were conducted to optimize the fermentation conditions, and a Plackett-Burman design followed by a central composite design of response surface methodology was investigated to optimize the medium constituents. The optimal fermentation conditions were fermentation temperature 28°C, fermentation period 72 h and solids content was 40%. A combination medium of 19.75 g potato starch residue, 6.38 g wheat bran, 2.86 g corn meal, 2.62 g urea, 0.15 g K_2HPO_4, 0.15 g $MgSO_4 \cdot 7H_2O$, 0.075 g $MnSO_4 \cdot H_2O$ and 0.015 g $Fe_2(SO_4)_3$ was optimum for maximum protein nitrogen content (3.75%) of fermented PSR, which was 3.4 fold over the raw material. The determination coefficient R^2 (0.9889) and the adjusted determination coefficient R^2(0.9790) indicated that the response equation provides a reasonable model for the central composite design experiment, and the lack of fit (P=0.0582) indicated that the model was adequate for prediction within the range of variables employed. Due to the high-yield of protein nitrogen obtained and the low-cost nature of the optimal medium, this study indicates a possibility to establish production of protein feed using PSR as a basic substrate.

Key words: optimization, potato starch residue, protein nitrogen, response surface methodology

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