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

Heng Lei¹, Huili Wang¹, Tingting Ning¹, Wei Hao¹, Xiaoli Wang², Chuncheng Xu¹*¹

¹College of Engineering, China Agricultural University, Beijing 100083, China
²Chinese Academy of Agricultural Science, Lanzhou Institute of Animal Sciences and Veterinary Pharmaceutics, Lanzhou 730050, China

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 was 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 K₂HPO₄, 0.15 g MgSO₄·7H₂O, 0.075 g MnSO₄·H₂O and 0.015 g Fe₂(SO₄)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 provide 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: potato starch residue, protein nitrogen, optimization, response surface methodology

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*Author to whom all correspondence should be addressed: e-mail: xucc@cau.edu.cn; Phone: +86-(10)-6273-6480; Fax: +86-(10)-6273-6778