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Optimisation of Enzymatic Treatment for Cassava Root Peeling

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Abstract

This study examined the optimisation of enzymatic treatment of cassava roots for improving the peeling process. The peels of the cassava roots (purchased from a local market in Stuttgart) were used. A mixed enzyme was applied on the cassava root peels. The operational parameters were temperature (40°C, 45°C, 50°C, 55°C and 60°C), pH (3.5, 4, 4.5, 5, 5.5), incubation time (1 hour, 2 hours, 3 hours, 4 hours and 5 hours), and a dose of enzyme (0 ml, 1.25 ml, 2.5 ml, 3.75 ml and 5 ml). Response surface methodology by the central composite design was applied to optimise the enzymatic treatment of cassava peels. The sugar content (saccharose, glucose, galactose and mannose) of the applied enzyme solution, in which the cassava peels were incubated, was measured using HPLC with refractive index (RI) detector. The glucose content was determined as a response factor for screening the enzymatic treatment efficacy assuming that breakdown of cellulose and hemicellulose will result in an increase of glucose. After 30 runs of enzyme treatment in the central composite design, multivariate correlation of the glucose content was established through reduced quadratic model with $R^2 = 0.9543$ and MAPE=1.08. Results showed glucose content was significantly affected by the enzyme dose and incubation time. Under optimal conditions (pH of 4.5, temperature of 49.8°C, incubation time of 3.8 hours, and 3.75 ml mixed enzyme), the maximum glucose content was 21.2%. Through the maximising glucose content, the application of mixed enzyme has increased the softening of the cassava peels. The results suggest that the enzymatic treatment could be used to improve the peeling process by increasing loosening the cassava root peels.

Keywords: Cassava root peeling, Central composite design, Enzymatic treatment, Glucose, Optimisation