

Statistical Optimisation of Fermentation Conditions for Citric Acid Production from Pineapple Peels

Amenaghawon, N. A.,* Oronsaye, J. E. and S. E. Ogbeide.

Department of Chemical Engineering, Faculty of Engineering, University of Benin, PMB 1154, Benin, Edo State, Nigeria

Abstract

*This study investigated the optimisation of fermentation conditions during citric acid production via solid state fermentation (SSF) of pineapple peels using *Aspergillus niger*. A three-variable, three-level Box-Behnken design (BBD) comprising 17 experimental runs was used to develop a statistical model for the fermentation process while response surface methodology (RSM) was used for the optimisation of fermentation conditions. Increasing the fermentation temperature and the moisture content of the solid substrate enhanced the production of citric acid. Increasing the broth pH did not favour citric acid production as higher citric acid concentrations were recorded at low pH values. These results showed that citric acid production was influenced by these variables (i.e. temperature, moisture content and pH). The optimal fermentation conditions were determined as follows: fermentation temperature, 35°C; broth pH, 2 and initial moisture content, 84.56%. The maximum concentration of citric acid produced under these conditions was 72.41 g/l. These results imply that the metabolic activity of the fermenting organism (*Aspergillus niger*) used in this study was maximum at these optimised conditions. Validation of the statistical model indicated no difference between predicted and observed values as seen in the high correlation between model predicted results and experimental results.*

Keywords: Box-Behnken Design, Solid State Fermentation, *Aspergillus niger*, Citric Acid

E-mail*: andrew.amenaghawon@uniben.edu

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