CURRENT RESEARCH AND DEVELOPMENT IN BIOTECHNOLOGY ENGINEERING AT IIUM

VOLUME I

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CHAPTER 7

OPTIMIZATION OF PROCESS CONDITIONS FOR GLUCOAMYLASE PRODUCTION USING NON-FOOD CASSAVA

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ABSTRACT

A lab study was carried out to optimize the process conditions for glucoamylase production using bitter cassava by employing *Aspergillus niger*. Central composite design from MINITAB software was used and statistical optimization techniques based on ANOVA, t-test, p-values were used to evaluate the model and to determine the effects of linear, quadratic and interactive factors from the regression equation. The maximum glucoamylase activity produced was 19.99 U/ml using the optimum conditions of pH, temperature, agitation, inoculum concentration of 4, 25°C, 100 rpm and 5% respectively using four days of fermentation. The coefficient of determination (R^2) was 93.3% which satisfied the adjustment of experimental data in the model.

Keywords: glucoamylase, *Aspergillus niger*, bitter cassava, optimization

INTRODUCTION

Glucoamylase (1, 4-α -D-glucan glucohydrolase, EC 3.2.1.3) catalyses the release of glucose from the non-reducing ends of starch and related poly- and oligo-saccharides. Like most amylolytic enzymes, fungal glucoamylases are multidomain proteins; the organization of the individual domains along the polypeptide chain in glucoamylases depends on the species (Windish et al., 1965). There are many potential raw materials that can be used as substrate for amylase production. these include rice bran, wheat, barley, sugarcane and other starchy materials.

According to Ghazali and Zaiton (1998), demand of cassava for starch processing utilized in food industries is about 1, 051, 000 tonnes per year. However, bitter cassava (non-edible) is planted mainly for research purposes. To meet the demand of these industries, fermentation of amylase that utilizes a lower cost medium is required. One method is to use cheaper and non conventional raw materials to get a high yield of the desired product. Production of amylase under solid state fermentation and submerged fermentation using agro-industrial residues, agricultural products and by-products are among the methods attempted to reduce the high cost of production of glucoamylase (Wang et al., 2008; Spier et al., 2006; Hernandez et al., 2006).