

**CURRENT RESEARCH  
AND DEVELOPMENT IN  
BIOTECHNOLOGY  
ENGINEERING  
AT IIUM**

**VOLUME I**

Editors:

Suleyman Aremu Muyibi  
Mohammed Saedi Jami  
Zaki Zainudin



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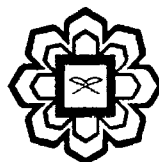
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## CHAPTER 33

### OPTIMIZATION OF PROCESS CONDITIONS FOR GLUCOAMYLASE PRODUCTION USING RICE BRAN

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#### ABSTRACT

The production of glucoamylase was conducted by utilizing rice bran with the aid of *A. niger* O-109A using solid state fermentation. The optimization of process conditions such as temperature, pH, moisture content and inoculum level was carried out by using the central composite design (CCD) formulated by a statistical optimization software MINITAB. A polynomial regression model was developed to determine the optimum conditions. The maximum glucoamylase production (148.66 U/gds) was found while model equation predicted 173.313 U/gds using the optimum conditions: temperature of 25°C, pH of 5, moisture content of 70% and inoculum of 5%. The results indicated that pH and inoculum level was highly significant followed by temperature ( $p < 0.05$ ). The coefficient of determination ( $R^2$ ) was 93.8% which satisfied the adjustment of experimental data in the model.

**Keywords:** optimization, process conditions, glucoamylase, rice bran.

#### INTRODUCTION

Glucoamylase which is also known as amyloglucosidase is an important industrial enzyme used in saccharification steps in both starch enzymatic conversion and in alcohol production. The structures of glucoamylase enable it to convert starch to dextrin and glucose. Due to this reason, the starch processing industry has shifted from traditional acid hydrolysis of starch to the use of this enzyme. In order to fulfill the demand of this industry, the optimization of process conditions to achieve high yield of glucoamylase production is needed. Moreover, to maximize the production and profit, the use of waste products as substrate for glucoamylase production is widely studied.

Among the major sources of starch are rice, wheat, corn, potato and tapioca. All these sources can be used as the substrates to produce glucoamylase. Unfortunately, all of them are food substances which human consume every day. To overcome this problem, waste products or non-edible product will be use as the substrates. Ellaiah et al. (2002) had studied different substrates like wheat bran, green gram bran, black gram bran, corn flour, barley flour, jowar