# CURRENT RESEARCH AND DEVELOPMENT IN BIOTECHNOLOGY ENGINEERING AT IIUM

VOLUME III

Editors:

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Ahmed Tariq Jameel
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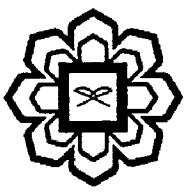

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# BIOETHANOL FROM FERMENTATION OF SAGO STARCH

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## ABSTRACT

Sago starch is widely produced from the sago industry in Malaysia. Using the abundance of excess sago starch as a carbon source for fermentation of bioethanol for energy production has become a challenging area of interest by researchers. A study was conducted to optimize the process condition for hydrolysis of sago starch to glucose with α- amylase and glucoamylase enzyme followed by saccharification to produce ethanol in shake flask experiment using *S. cerevisiae*. For hydrolysis a yield of 23.4% DE using 78U/g glucoamylase, 30% w/v starch substrate with 2 hours saccharification time was achieved. On fermentation using optimum parameters of 150 rpm aeration, 3% (v/v) yeasts inoculums and pH 5 a yield of 28.09 % ethanol was obtained. Further study on improving the ethanol yield can conduct by improving the use of various dextrose equivalent of the hydrolysis starch in future.

***Key words***: Fermentation Sago Starch, Bioethanol, Saccharification.

## INTRODUCTION

The overdependence of using fossil energy is facing depletion in years to come, thus alternative renewable energy using available resources has to be sought. The abundance availability of sago starch can be sought to produce bioethanol. Traditionally, the production of ethanol is usually dependant fermentation of on sugar rich substrates such as sugar cane due the readily fermented available carbohydrate (Abd Aziz, 2001).However, sugar cane is costly and difficult to obtain since it is categorized under seasonal crops. Pretreatment of cellulosic materials to produce ethanol normally involves high cost production rate and uneconomical and thus it is better to use readily available carbohydrate. Sago starch is rich carbon source where the substrate can be easily hydrolyzed into fermentable sugars and fermented for bioethanol production. In Malaysia the state of Sarawak has huge area of sago plantation where it exported annually about 25,000 to 40,000 tones of sago products and accounts for the biggest sago exporter in the world (Abd Aziz, 2002). Sago known as *Metroxylon sagu* belongs to a Palmae family and planted in most South East Asia region including Malaysia (Ratnam et al., 2003) . Starch obtained from the pith of sago palm varies from 18.8% to 38.8% fresh weight for *M. sagu* (Singhal *et al.*, 2008; Ratnam et al.,,2003). Usually α-Amylase is used for liquefaction process and Glucoamylase for saccharification process of starches (Chiaramonti, 2007; Govindasamy et al.,,1995; Nadir et al., 2009). A study was undertaken to optimize the process condition for hydrolysis of sago starch to