PRE-TREATMENTS OF SAGO FIBER FOR ETHANOL FERMENTATION

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ABSTRACT

The efficiency of different pre-treatment methods on dried sago fiber: steaming, alkaline boiling followed by suspending in diluted acid and alkaline boiling followed by boiling in diluted acid - prior to enzymatic hydrolysis was studied. The effects of pre-treatments in the separated liquid and solid fractions along with its degree of convertibility were examined. Steaming was shown to be the most effective method for preparation of sago fiber prior to enzymatic hydrolysis, producing relatively high recovery of solid fraction (50.6%), cellulose content (38%) with high convertibility degree of fiber (42%), high lignin reduction (6%) and significant concentration of starch (12.8 g/L) in the liquid fraction upon filtration. The results of pretreatment using alkaline was lower at 21.3%, 51%, 2% and 3.3g/L when suspended in diluted acid and at 19%, 49%, 3% and 0.1g/L when boiled in diluted acid, for recovery of solid fraction, cellulose content, lignin reduction and starch content, respectively.

Key words: cellulosic wastes, alkaline pre-treatment, enzymatic hydrolysis, sago fiber

INTRODUCTION

The hydrolysis of cellulose was introduced from 1950 and was later further modified to employ many raw materials for production of sugars (Chao and Tan, 2005). In order to gain sugars from cellulosic materials, many treatments had been proposed and developed parallel in the main goal as to reduce the total cost of the hydrolysis process. In Malaysia, the use of sago fiber - a fine cellulosic waste in sago effluent from the starch extraction process - is a potential candidate for production of biofuel from biomass. It is abundantly produced from the numerous sago mills and discharged daily as wastewater into the waterways. In the absence of proper treatment and enforcement, sago fiber is potentially polluting to the environment since the fiber degrade slowly while reducing water quality from the increasing amount of suspended solid in the water (Apun *et al*, 2000; Aziz, 2002; Bujang *et al*, 2004).

Therefore, utilization of sago fiber as feedstock for biofuel will not only provide cost effective feedstock for production of fermentable sugars but concomitantly will minimize its polluting effects to the environment. The extraction of sugars however requires pre-treatment procedures which will provide access for enzymatic action. In this research, pre-treatment methods on sago fiber were quantified from the recovery of cellulose and hemicelluloses, reduction of lignin content after each treatment and the degree of conversion of treated sago fiber to sugars. The latter is an important indicator on the capacity of sugars to be released from the fiber.