

ABSTRACT

HYDROLYSIS OPTIMIZATION OF RICE STRAW FOR BIOETHANOL PRODUCTION BY USING SIMULTANEOUS SACCHARIFICATION AND FERMENTATION METHOD

By

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Rice straw is an agro-industrial solid waste that contains high lignocellulosic material and has considerable potential as a raw material for bioethanol production. One of the methods for bioethanol production from rice straw is Simultaneous Saccharification and Fermentation (SSF). SSF is a method where the enzymatic hydrolysis and the microbial fermentation take place at the same place and time, so that the conversion at cellulosic material into ethanol will be more effective and efficiency. The objective of this study were to determine the optimum concentration of substrate and enzyme cellulase that produce the highest sugar reduction concentration in hydrolysis process and to find out the best prehydrolysis time that produce highest ethanol concentration in SSF stage.

This study was conducted in two stages, the first stage is enzymatic hydrolysis optimization and the second stage is SSF process. The enzymatic hydrolysis optimization stage was carried out in two steps, namely optimization of substrate concentration of rice straw (6; 8; 10 and 12% (w / v)) and optimization of enzyme cellulase concentration (20; 25; 30 and 35 FPU/g cellulose). The optimum concentration of substrate and enzyme as resulted from this stage will be applied in SSF process. Prior to the SSF, an enzymatic prehydrolysis of rice straw carried out in different time periods (0, 12 and 24 h) and it performed on the condition of process at 50⁰C, pH 4,8 and rotary shaker 150 rpm. After that, the temperature process was decreased to 38⁰C and each sample was added with 10% (v/v) *Saccharomyces cerevisiae*, then the samples were incubated at 38⁰C, 150 rpm for 72 hours. The results showed that the concentration of substrat 12 % (w/v) and the concentration of enzyme cellulase 35 FPU/g cellulose were the optimal concentration that produce the highest reducing sugars (37,33 g/L) in the 32 h hydrolysis incubation, and the treatment of prehydrolysis 0 h was a treatment that produce the highest ethanol concentration, 16,19 g/L, in the 72 h SSF process.

Keywords: rice straw, bioethanol, hydrolysis enzymatic, SSF, cellulase.