ABSTRACT

PRETREATMENT AND HYDROLYSIS OPTIMIZATION OF INDUSTIAL PINEAPPLE JUICE PULP FOR BIOETHANOL PRODUCTION

By

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Industial pineapple juice pulp contains cellulose that can be used as raw material for the second-generation bioethanol. The pulp needs to be pretreated, hydrolyzed, and fermented for producing bioethanol. Objectives of this research were to find out an optimal concentration of NaOH solution for pretreating the pulp into holocellulose (cellulose and hemicellulose), an optimal concentration of cellulase enzymes for hydrolyzing the holocellulose into reducing sugar, and the effects of saccharification and fermentation method on converting the reducing sugar into bioethanol. After drying and grinding, industial pineapple juice pulp was pretreated by immersing in 0, 0.5, 1.0, 1.5, and 2,0 M NaOH solution at temperature of 121°C for 15 minutes. Before and after pretreatment, the pulp was analyzed to determine its lignin, cellulose, and hemicellulose contents. Seven and half percent (7,5%) holocellulose resulting from the best pretreatment was then hydrolyzed with 0, 15, 20, 25 and 30 FPU cellulase enzymes at 50°C, pH 4.8, and 150 rpm for 18 hours. After hydrolisis, filtrate was analyzed to determine its reducing sugar content. Reducing sugar resulting from the best hydrolisis was

fermented with Saccharomyces cerevisiae as starter and incubated at 30°C, for 72 hours (SHF method). In addition to the SHF method, the holocelluloce was simultaneously hydrolyzed with the best hydrolisis enzyme concentration and fermented with Saccharomyces cerevisiae as starter (SSF). The SSF was incubated at 30°C, 150 rpm, for72 hours. The research results showed that the best NaOH concentration for pretreatment was 0.5 M which degraeded 83.44% lignin and increased levels of the pulp cellulose from 27.96% to 77.72%; the best cellulase enzyme concentration for hydrolysis was 25 FPU which produced 4.46 g/L reducing sugar; and SSF method had better effect than SHF one on converting industial pineapple juice pulp into bioethanol. The SSF method yielded 2.0052% bioethanol and the SHF method yielded only 0.9983% bioethanol.

Key words : pineapple industrial pulp, bioethanol, cellulose, emzymatic hydrolysis