SUMMARY

The objective of this work is to investigate the factors that affect the hydrolysis of rice straw, and compare the effectiveness of commercial enzyme with mixed crude enzyme from *Trichoderma reesei* and *Aspergillus niger*. The work is divided into two steps, the first is cellulase productions from rice and corn straw, and the second is enzymatic hydrolysis. Two activity unit of cellulase from *Trichoderma reesei* and one unit of cellulase from *A. niger* were mixed. Enzymes were prepared by solid fermentation. Five grams of 100 mesh rice straw were mixed with 25 mL nutrient solution containing (all in g/L except CMC) 1.4 (NH$_4$)$_2$SO$_4$, 2 KH$_2$PO$_4$, 0.005 FeSO$_4$, 0.5 ekstrak ragi, 1.5 pepton dan 5 mL 1% CMC solution. *T. reesei* dan *A. niger* were inoculated and then incubated for 4, 6 dan 8 days. Before hydrolized, the rice straw is grinded and sieved to 80 – 100 and 120 – 140 mesh then heated at 85 °C with 2% sodium hydroxide for six hours. Hydrolyses was conducted in 300 mL beaker glass equipped by mechanical stirrer. Samples were analyzed by dinitrocalycilic acid and measured by spectrophotometer.

According to the study of enzyme production, it can be concluded that cellulases enzyme activity of rice straw is higher than corn straw, either using *T. reesei* strain or *A. niger*. The quality of *T. reesei* cellulase of rice straw is as good as *A. niger* cellulase of straw. After being incubated for four days with rice straw substrate, *T. reesei* gives higher enzyme productivity than *A. niger*.

Based on the study of hydrolysis, it can be concluded that the higher the enzyme ratio to substrate was, the higher the glucose concentration obtained, but enzyme efficiency become smaller. Straw particle for 120 – 140 mesh is optimum enough to be chosen for rice straw hydrolysys. Decreasing pH from 5.52 to 3.92 will decrease the time of optimum hydrolysis from 6 to 3 hours. For a smaller scale hydrolysis, the change of speed of stirring from 160 rpm to 250 rpm did not give a significant effect to glucose concentration obtained. Increasing hydrolysis temperature from 40 °C to 46 °C increased the glucose production to 15%. The highest glucose concentration that can be made by hydrolysis using cellulose enzyme from *A. niger* produced by Fluka Biochemika was obtained at temperature
46 °C, propeller speed of 160 rpm, enzyme ratio of 28 U/g straw, pH 3.92 and straw particle 120 – 140 mesh. Enzyme from *T. reesei* dan *A. niger* that produced from mixture of *Trichoderma reesei* and Aspergillus niger with a ratio of 2 : 1 (unit/unit) was more effective to hydrolyze rice straw than using cellulose enzyme of *Aspergillus niger* from Fluka Biochemika production.