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Glucose Enzymatic Hydrolysis from Pretreated Low Lignin and Low hemicellulose Sugarcane Leaves

Jimmy[1]*, Tri Poespowati[1], Sidik Noertjahjono[2]

[1]Chemical Engineering Department, Faculty of Industrial Technology, InstitutTeknologiNasional Malang, Indonesia
[2]Electrical EngineeringDepartment, Faculty of Industrial Technology, InstitutTeknologiNasional Malang Jln. BendunganSigura-gura No 2 Malang, East Java, Indonesia

Abstract: One of the second-generation alternative energy and renewable energy which is relatively cheap in its production aspects is bioethanol from cellulosic biomass. Waste sugarcane leaves contain high enough cellulose that can be converted into sugars that are then fermented into ethanol in several steps, i.e. pretreatment, delignification, hydrolysis, fermentation and product purification. The existence of hemicellulose and lignin will decrease the efficiency of hydrolysis, therefore pretreatment procedure should be done prior to enzymatic hydrolysis. Dilute sulfuric acid and sodium bisulfite pretreatment generate high cellulose content material. Enzymatic hydrolysis has several advantages over acid hydrolysis. It will not degrade sugar hydrolysis, can be operated under milder conditions and more environmentally friendly. This study aims to determine the effect of lignin content and hemicellulose content in enzymatic hydrolysis. The best result of pretreatment procedure (low lignin and low hemicellulose) was hydrolyzed using cellulase enzymes derived from *Trichodermareseei*. Three grams powdered sugarcane leaves was dissolved in 100 mL of buffer solution and was addedwith distilled water until 200 mL, then set its corresponding variable pH level (4; 4.5; 5; 5.5 and 6) by using a solution of citric acid 1 M. After pH level conditions were achieved, cellulase enzymes was added in accordance with a variable ratio of substrate-enzyme (1:0.01, 1:0.03, 1:0.06 and 1:0.09 in gram substrate/ gram enzyme). A mixture of sugarcane leaves and enzyme was hydrolyzed with stirring for 45 hours. The highest glucose content (4.777 mg/ mL) was obtained from the enzyme-substrate ratio of 1:0.09, pH level of 5.5 and40.832% glucose yield to the sugarcane leaves powder. Enzymatic hydrolysis at various stages of the sample contained sugarcane leaf powder (without pretreatment), pretreated sulfuric acid material, Na-bisulfite delignification material and pure cellulose which produced glucose respectively 4.36%, 5.13%, 7.70% and 8.45%. The higher cellulose content was hydrolyzed, the greater glucose was produced. This suggests that the presence of lignin and hemicellulose was inhibiting hydrolysis process.
Keywords:sugarcane leaves, lignin, hemicellulose, enzymatic hydrolysis.

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