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# Kinetics Analysis of Lignocellulose Hydrolysis and Glucose Consumption Using Aspergillus niger in Solid State

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**Abstract :** One decisive stage in bioethanol production from plant biomass is the hydrolysis of lignocellulosic materials into simple sugars such as glucose. The produced glucose is then fermented into ethanol. This stage is popularly done in biological method by using cellulase that is produced by certain fungi. As it is known, glucose is the main source of nutrition for most microorganisms. Therefore, cutting cellulose into glucose is actually an attempt of microorganism to provide nutrition for itself. So far, this phenomenon has received less attention while it is necessary to identify the quantity of sugar consumed by the microorganism. In this study, we examined the phenomenon of sugar consumption by microorganism on lignocellulosic hydrolysis. We used oil palm empty fruit bunch (OPEFB) as the source of lignocellulose and Aspergillus niger as cellulase-producing fungus. In Indonesia, OPEFB is plantation waste that is difficult to decompose in nature and causes environmental problems. First, OPEFB was pretreated with 1% of NaOH at 170 oC to destroy lignin that hindered A.niger from accessing cellulose. The hydrolysis was performed by growing A.niger on pretreated OPEFB in solid state to minimize the possibility of contamination. The produced glucose was measured every 24 hours for 9 days. We analyzed the kinetics of both reactions, i.e., hydrolysis and glucose consumption, simultaneously. The constants for both reactions were assumed to follow the Monod equation. The results showed that the reaction constant of glucose consumption (μC) was higher than of cellulose hydrolysis (μH), i.e., 11.8 g/L and 0.62 g/L for glucose consumption and hydrolysis respectively. However, in general, the reaction rate of hydrolysis is greater than of glucose consumption since the cellulose concentration as substrate in hydrolysis is much higher than glucose as substrate in the consumption reaction.

**Keywords :** Aspergillus niger, bioethanol, hydrolysis, kinetics
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