

Hydrolysis of alkalinepretreated banana peel

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Abstract.Banana peel is one of food wastes that are rich in carbohydrate. This shows its potential as fermentation substrate including bio-ethanol. This paper presents banana peel alkaline pre-treatment and enzymatic hydrolysis. The pre-treatment was intended to prepare banana peel in order to increase hydrolysis performance. The alkaline pre-treatment used 10, 20, and 30% w/v NaOH solution and was done at 60, 70 and 80°C for 1 hour. The hydrolysis reaction was conducted using two commercial cellulose enzymes. The reaction time was varied for 3, 5, and 7 days. The best condition for pre-treatment process was one conducted using 30% NaOH solution and at 80°C. This condition resulted in cellulose content of 90.27%, and acid insoluble lignin content of 2.88%. Seven day hydrolysis time had exhibited the highest reducing sugar concentration, which is 7.2869 g/L.

1. Introduction

The environmental damage and fossil fuel reserve decline issues have led to the quest for renewable and environmentally friendly fuel. Bio-ethanol is one of both renewable and environmentally more-friendly fuel compared to fossil fuel. Many carbohydrate-rich agricultural and food waste can be converted biochemically into more economic valuable products through fermentation including bio-ethanol.

Naturally abundant carbohydrate-rich wastes are grouped into lignocellulosic materials as they contain lignin, cellulose and hemicelluloses. These materials are difficult to degrade in nature as they are strong structure and therefore compose the outer parts of plants and plant products[1].Nevertheless, with proper processing, lignocellulosic materials are useful to produce fuels, enzymes, organic acids, bio-sorbents, bio-composites, feeds, and medicines [2]. Many researches currently had focused on the utilization of lignocellulosic waste to produce bio-ethanol as renewable fuel. Banana peel is one of lignocellulosic agricultural food waste and therefore can be able to be used as fermentation substrate including bio-ethanol. This waste is produced by several Banana flour industries in Indonesia as well as other banana processing small business. However, current banana peel utilization in Indonesia seems only limited for livestock feeds.

Bioconversion of lignocellulosic material into bio-ethanol is a three step process. The steps are pre-treatment, hydrolysis and fermentation. The pre-treatment process is conducted to disrupt lignin-carbohydrate bond, lower cellulose degree of crystallinity, improve cellulose surface and therefore increase the enzyme access to cellulose [3,4]. Alkaline and acid pre-treatment are widely used method to treat lignocellulosic material prior to hydrolysis [5,6]. Alkaline pre-treatments results in less hemicelluloses solubilisation and inhibitory compounds formation compared to acid pre-treatment