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Glucose Content of Sago Waste After Chloride Acid Pre-Treatment Hydrolysis For Bioethanol Production

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Abstract. Indonesia is a country with abundant agricultural biological resources. One of the plants as a biological source is sago. Sago processing wastes such as bark and waste about 72%. Jepara district has rich sago waste, piled on the side of the road and the river so it is very disturbing. In generally, sago industrial wastes utilization is still lacking, especially as a source of energy. Sago waste consists mainly of cellulose and has the potential to be processed into bioethanol. Glucose contained in cellulosic biomass is the main ingredient in the manufacture of bioethanol and need to know the glucose content after of sago waste cellulose hydrolysis process to determine the highest amount of ethanol. This study aims to determine the glucose content of sago wastewater using acid catalysis with different concentrations of the hydrolysis process, and to know the appropriate concentration of acid to produce the highest glucose and bioethanol in all type of waste. The result showed that type of waste had no effect on glucose content. Glucose content of sago waste showed no difference between the effect of chlorida acid concentration with glucose content. However, hydrolysis at concentration tends to produce the highest glucose.

Key word: sago waste, bioethanol, hydrolysis, glucose, chloride acid

Introduction

Indonesia is rich in agricultural resources, biological, one of the plants as a biological source is sago. Sago processing by products that would leave the bark and sago. Sago hard skin can be dried and used as an alternative to the board, while the soft leather is dried is used as fuel for cooking. Processing of waste from sago, fiber and cork stem pith of sago, will leave the decay [1]. Sago waste from the district of Jepara, available in abundance. Uninformed citizens to dispose of or utilize solid and liquid waste generated from industrial waste sago plants, so the solid waste that piled up so that disrupt road users and local communities. Solid waste sago has a component that is cellulose which can be processed into bioethanol. High cellulose content of sago waste requiring preparation stage before further processing into ethanol. Cellulose is hydrolysed aims to convert cellulose into simple components. Acid will break down the cellulose molecule randomly and sugar largely reducing sugar [2]. Cellulose hydrolysis can be carried out by means of a combination of acid catalyst acid and enzymes, and enzymes and enzyme combinations. Research on hydrolysis previously been done by [2] stating the type and concentration of the acid did not significantly affect the glucose levels of starch hydrolysis. This study aims to determine glucose levels sago waste water using an acid catalyst HCl with different concentrations of the hydrolysis process, and to determine the exact concentration of acid to produce the highest glucose and bioethanol in all types of waste.

Methods

This research was conducted at Greenhouse FSM and the Laboratory of Biological Structure and Function of Plants Faculty of Science and Mathematics, University of Diponegoro in January-June 2015. The waste material used is taken from the sago Plajan, Jepara, with some samples, namely: dry samples (A), half-wet (B), wet (C) and black (D), HCl, alcohol 80%, Glucose standard, DNS. Tools waste dryer, blender, appliance for hydrolysis, equipment for refining, Alkoholmeter, spektrophotometry UV.

Research design

This study consisted of two stages. The first phase using laboratory experimental method

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with quantitative data. Draft design used was completely randomized design single factor. The second phase using a completely randomized design (CRD) factorial 3 x 4, the first factor is the type of waste sago while the second factor is the concentration of hydrochloric acid each treatment with repeat 3 times. I use the test used four types of sago waste: dry samples (A), half-wet (B), wet (C) and black (D). a fourth dry type of waste is left for 1 month in closed containers.

Hydrolysis of sago waste by modifying several methods.

Solid sample crushed using a blender. The sample is weighed as much as 200 grams, then the sample is introduced into the strong acid HCl concentration used 10%, 20%, and 30% are heated in the bath for 60 minutes. The samples were then tested their glucose content

Analysis of glucose

Samples added alcohol 80% by weight based on the ratio of 1: 1 sample. The sample is filtered using a cotton swab, and the remaining solids are washed with 80% alcohol until all the sugar is dissolved. the pH of the filtrate was measured, if the acid added enough NaOH to neutral or alkaline. The filtrate was heated at 100 ° C water bath for 30 minutes so it does not smell of alcohol, then filtered using filter paper so that no deposits. 3 ml sample is introduced into a test tube, then add 3 ml of DNS reagent. Samples were placed in a boiling water bath for 5 minutes, allowed to cool to room temperature. Included in the sample cuvettes, measured with a spectrophotometer at a wavelength of 540 nm so that the known concentration of glucose.

Results And Discussion

A. Hydrolysis Waste Sago

Sago waste hydrolysis results show that the greater the concentration of HCl will affect the glucose results sago waste, but inversely proportional to the wet samples which showed that the concentration of HCl with the lowest levels had the best results on wet samples. Hydrolysis is the reaction of an organic or inorganic substance with water. The water will be decomposed into two ion and react with other compounds, hydrogen ions form a single component, while the hydroxyl ions to form other compounds. Hydrolysis with pure water is slow and the reaction product is not complete, so the need to add a catalyst to accelerate the reaction and improve selectivity. This can be seen in Table 1 and Figure 1.

Table 1. Comparison Sample Waste Sago against HCl concentration

Sample Type	Consentration HCl Acid		
	10%	20%	30%
Dried	41,85	44,78	44,78
Half wet	43,89	44,78	44,78
Wet	45,78	42,9	33
Black	37,4	42,9	44,78

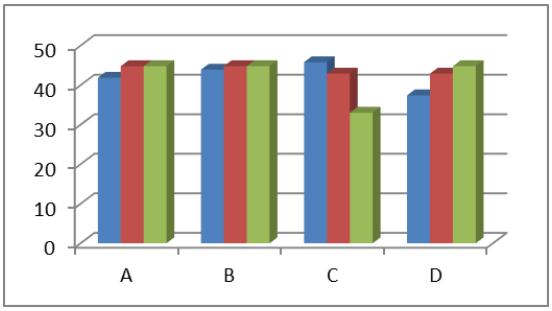

Figure 1. Data Hydrolycys HCL Description: A = Dry, B = Half Dry, C = Wet, D = Black

Another study by [3] hydrolysis sago waste by using H_2SO_4 stated that the addition of H_2SO_4 concentration is too much glucose is produced precisely decreased. Enchancement concentration of H_2SO_4 solution will form groups more radical than cellulose, but the addition of H_2SO_4 concentration causing less water in the composition of the hydrolysis solution. Thus requiring a binder OH - free radicals is reduced cellulose and glucose produced less and less. Can be seen in Table 2.

Table 2. Comparison Table Sago Waste Samples of the concentration of H_2SO_4

Treatment	H_2SO_4 Consentration		
	0,2	0,4	0,6
Dry Waste (S1)	80,05	80,68	71,61
Wet Spring (S2)	56,60	46,21	81,82
Wet (S3)	69,81	63,4	63,35
Black compost (S4)	44,48	75,06	42,37

The concentration of hydrogen ions (H^+). The more H^+ ions accelerated termination of the hydrolysis reaction. hydrogen bonds lead to higher conversion increased hemicellulose into xylose and glucose. The higher the concentration of air conditioning id could cause damage that would terkonvesi cellulose fractions of glucose. Hydrolysis mixture of xylose and glucose is known as total reducing sugars.

Conclusion

High concentrations of HCl will produce high glucose on sago waste, but will be inversely proportional to the use of HCl on the substrate wet waste.

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