

Potential Waste Rice Husks in the Acid Hydrolysis Reaction

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Abstract: Rice husks waste is one can be utilized as an alternative fuel, because rice husks have contained relatively big composition the cellulose. In Malang area East Java of Indonesia is still a lot of rice husks, that is a great potential to make useful product. To be alternative fuel, rice husk must through several stages of the process a pretreatment process or delignification lignin, hydrolysis, fermentation and destillation. For this research, author focus on a hydrolysis process. Hydrolysis is carried out by acid hydrolysis using HCL and H₂SO₄ catalyst, with variation of concentrations acid and comparison rice husks and water. The results obtained from the highest glucose concentration obtained at a ratio of 1:10 and the concentration of HCL 9 % is 88,625 %.

Keywords : acid hydrolysis, glucose, hydrolysis, rice husks.

1. Introduction

Waste can be defined as waste material or residual material that can not used again. Every each rice milling process always result much rice husks, which can interfere the surrounding environment and also impair human health. Generally the rice milling process has result obtained husks ranges from 20 %, rice milled around 65 % of the initial weight of grain and 15 % is disappear¹. A lot of the chaff can lead to environmental problems, beside we need more energy and the decreasing reserves oil and gas. And now exploration of alternative energy is getting intensified by all parties. Bioethanol is one of renewable energy have much research. Bioethanol can result from material cashew juice apple fermentation used *Saccharomyces cerevisiae* with variation temperature and pH. Result optimum at temperature 32 C, pH 4.5 with 32 hour².

Another material also can use cassava, glucose can result from tuber mix enzymon hydrolysis process continued fermentation process used *Saccharomyces cerevisiae* have result is 2.56 %³, Bioethanol can result from lignocellulosa. Lignocellulosa is material with carbohydrate contain (cellulosic and hemicellulosic)⁴.

Diversity of value added products from pretreated lignocellulosa waste. Various pretreated and production system providing technical and economic feasibility to harness the renewable material while at the same time cleaning up the environment.⁵ Oil palm trunk have much cellulosa and can be used material to make bioethanol 2nd generate⁶. Pretreatment is to remove hemicelluloses and lignin, to increase the accessible surface area for enzymes and to decrystallize cellulose⁷.

Research and developed alternative energy and renewable energy that has properties. The research used rice husk with composition as follows :

Table 1. The Initial Composition of Rice Husk

No	Component	% Weight
1	Watercontent	10,55
2	Fiber	20,37
3	Ash	13,36
4	Cellulose	34,34
5	Lignin	21,40

To reduce part of lignin in the rice husk, authorised pretreatmen process in physics. And the stage of the process, the first method : rice husks washed, dried using sunlight and heating an oven with temperatur 120°C for 1 hour, while the second method rice husks washed, drained and crushed, heated by the sun and finally dried in oven the same conditions as the first method.



Figure1. The First Method of processing rice husks



Figure 2. The Second Method of processing rise husks

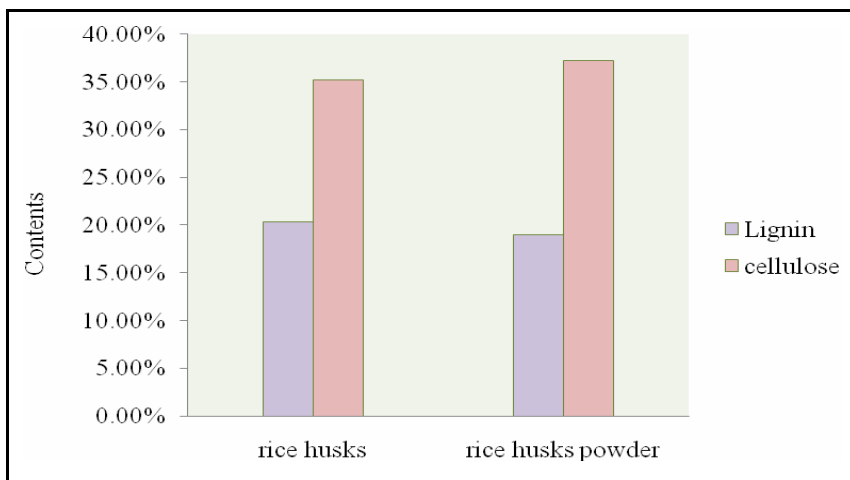
Tabel 1. Lignin With a Variation Time

No	Time (menit)	Rice Husks		Rice Husks (Powder)	
		Sunlight	Oven	Sunlight	Oven
1	0	21,40	21,40	21,40	21,40
2	15	21,40	21,40	21,00	21,00
3	30	21,22	20,60	20,02	19,90
5	45	20,80	20,40	19,88	19,40
6	60	20,30	20,30	19,60	19,02

Tabel 2. Cellulose With a Variation Time

No	Time (Menit)	Rice Husks		Rice Husks (Powder)	
		Sunlight	Oven	Sunlight	Oven
1	0	34,34	34,34	34,34	34,34
2	15	34,34	34,34	35,00	35,12
4	30	34,36	34,40	35,56	35,80
5	45	35,00	35,12	35,90	36,06
6	60	35,14	35,14	36,01	37,20

And the next step, the process pretreatment conducted, showed for reducing the lignin content used the second method results were better. because with the destruction, lignin content can be separated in rice husks.

**Figure 3. Component lignin and cellulose from rice husks**

The serial process of delignification followed by hydrolysis process. Hydrolysis process usually using sulfuric acid (H_2SO_4) and hydrochloric acid (HCL). This method very friendly environmentally and the other method will corotion, hydrolysis enzymatic is better method for enviromental. Research which has been done to replace acid used white rot fungi. Hydrolysis cellulose used enzym cellulose to be glucose⁸.

This research orientation on a hydrolysis process. Hydrolysis using HCL and H_2SO_4 catalyst with variation concentrations acid and comparison rice husks and water. Rice husk is one of a material lignocellulose and have contained lignin, hemicellulose and cellulose. Lignocellulosic is biomass can be change to be ethanol by pretreatment, hydrolysis and subsequent fermentation process. And another thermo chemical processes can be used to result ethanol like : gasification followed either by fermentation, or by a catalysed reaction however, there are not discussed here. Hydrolysis fermentation of lignocellulose is more complicated than fermentation of sugar. In hydrolysis process, a part cellulosic in the biomass is converted to sugars, and fermentation made this sugars to be ethanol. To increase the yield of hydrolysis, need pre-treatment process with better. Sometimes the biomass and breaks down large cell structures. Especially the pre-treatment and hydrolysis sections allow for many process configurations : Pre-treatment processes used primarily chemically catalysed. Environmental opinion drive the development of physical pre-treatments. The pretreatment technology chosen affects the yield of both pre-treatment and subsequent process steps. Acid reliant hydrolysis processes have been used.

2. Material dan Metode

This research use material like : rice husk, aquadest, HCL, H_2SO_4 with through the following step is :

Pretreatment : Because the rice husk have a lignin content so starting process is pretreatment or lignin delignification is carried out using physical and chemical process using oven and microwave. Acid hydrolysis stage is then performed by using mix hydrochloric acid at various concentrations so using sunlight and heater

oven in certain circumstances. The Concentration of acid used 1, 3, 5, 7, and 9 %. Hydrolysis can used Chesson Datta Method for lignin, hemicellulocic and cellulocic analysis.

3. Result and discussion

Lignocellulosic by acid hydrolysis is commonly applied to produce sugar as raw material for fermentation into biofuel. Acid hydrolysis operating conditions used in this research was 120°C until 1 hour and the results obtained are as follows :

Tabel 3. Glucose Content With Kind of Acid

Sample	Comparation Rice Husks : water	Acid Concentrat (%)	Glucose (%)	
			HCL	H2SO4
1	1:8	1	83,205	79,063
		3	83,324	81,403
		5	84,211	82,445
		7	85,099	85,099
		9	85,099	85,099
2	1:9	1	83,256	79,063
		3	85,099	80,256
		5	87,320	82,445
		7	86,202	84,512
		9	86,202	84,928
3	1:10	1	80,420	78,582
		3	86,202	78,582
		5	87,320	81,403
		7	88,602	84,512
		9	88,625	85,099
4	1:12	1	87,320	78,582
		3	83,022	79,603
		5	84,400	81,403
		7	86,620	85,099
		9	84,400	85,186

Looks kind of acid effect on glucose, it is seen that high glucose obtained by using HCL. HCL is the most potent acid so easily ionized in water bedises HCL have the nature of a larger electronegativity than H₂SO₄ makin the higher the glucose produced, this is due to it easier to release the hydrogen ion.

Seen from the acid concentration that the higher the concentration of acid used the high concentration will accelerate the reaction resulting in the higher conversion into glucose. Sometimes result from hydrolisis process not same with theory, because be affected situation not stable and the other factor.

4. Conclusion

Result from the research that rise husks can be used one of renewable alternative energy. So rise husks utilization can reduced impact for enviromental. Rise husks an ingredient ligloسلucose, and so must separated lignin content. Can produce lignin content 19.02% from rise husks powder or 11,12% separated lignin. A while from hydrolisis process can higher glucose used HCL acid with 9% concentration, have result 88,625% glucose.

The results obtained from the highes glucose concentration obtained at a ratio of 1:10 and the concentration of HCL 9 % is 88,625 %.

5. Acknowledgment

We are very grateful to the 2015 decentralization grant (Hibah Bersaing) from Dikti Kemendiknas, so we can carry out research properly and smoothly.

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