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ETHANOL CONTENT OF FERMENTED JACKFRUIT SKIN (*Artocarpus haterophyllus* Lmk) ON DIFFERENT SALT LEVELS

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Abstract
Jackfruit skin often considered as by product immediately after the fruit being used or consumed. However, if processed further this jackfruit skin can actually be fermented and has the potential to be a biofuel. Traditionally wastewater from fermented jackfruit skin can produce bioethanol. Bioethanol is ethanol (ethyl alcohol) whose production process uses natural raw materials and biological processes. Considering the current condition, namely fossil fuels in Indonesia are getting scarce, especially motor vehicle fuel, so naturally this bioethanol from fermented jackfruit skin has the opportunity to become a substitute energy. This study aimed to determine the ethanol content of jackfruit skin fermentation. Anaerobic fermentation was done with the addition of 600 of water and one month incubation. The resulting bioethanol levels were measured with an alcohol meter. The results showed that different levels of salt produced an amount of ethanol which was also different from the fermentation of jackfruit skin. The difference in the amount of ethanol produced is thought to be due to the influence of the growth of lactic acid bacteria.
Keywords: *bioethanol, fermentation, jackfruit skin, salt content.*

Abstrak
Kulit nangka sering dianggap sebagai produk sampingan segera setelah buahnya digunakan atau dikonsumsi. Namun, jika diolah lebih lanjut kulit nangka ini sebenarnya bisa difermentasi dan berpotensi menjadi biofuel. Secara tradisional air limbah dari kulit nangka yang difermentasi dapat menghasilkan bioetanol. Bioetanol adalah etanol (etil alkohol) yang proses produksinya menggunakan bahan baku alami dan proses biologis. Mengingat kondisi saat ini yaitu bahan bakar fosil di Indonesia semakin langka khususnya bahan bakar kendaraan bermotor, maka secara alami bioetanol dari kulit nangka yang difermentasi ini berpeluang menjadi energi pengganti. Penelitian ini bertujuan untuk mengetahui kadar etanol kulit nangka fermentasi. Fermentasi anaerobik dilakukan dengan penambahan 600 air dan inkubasi satu bulan. Kadar bioetanol yang dihasilkan diukur dengan alkohol meter. Hasil penelitian menunjukkan bahwa kadar garam yang berbeda menghasilkan jumlah etanol yang juga berbeda dengan fermentasi kulit nangka. Perbedaan jumlah etanol yang dihasilkan diduga karena pengaruh pertumbuhan bakteri asam laktat.
Kata kunci: bioetanol, fermentasi, kulit nangka, kadar garam.

INTRODUCTION

The problem of waste or industry waste is still a problem that has not found a long-term solution. Nowadays, people are getting confused looking for solutions in reducing the volume of waste that is around. One of them is household industrial waste (Graha, *et all*. 2015).

One of the household wastes that often exists is fruit skin waste, especially jackfruit skin. Jackfruit skin is often discarded because it is considered unhelpful,

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and such disposal can interfere with the environment. Jackfruit skin is a waste that still contains polypathic and cellulose ingredients (Wulandari, 2015).

The content contained in the skin of jackfruit can later be a source of making vegetative based fuel. Traditionally wastewater from fermentation of jackfruit skin can be sterilized bioethanol. Bioethanol is generally made from starchy plants but can also be made from sugary plants (Mardiani, 2010).

Research and development of bioethanol production has actually been done a lot. LIPI has even developed bioethanol made from empty palm bunches since 2008. Many challenges in the implementation of bioethanol as fuel. Currently, bioethanol is used mostly from foodstuffs so that it must compete between bioethanol raw materials and food (Haryono, 2018).

The use of bioethanol in addition can increase the *volume* of fuel, it can also increase the value of octane because ethanol can replace the role of Tetra *Ethyl Lead* (TEL) as an octane value-enhancing additive that is currently widely used as an additive in gasoline / premium. Ethanol is one of the alternative fuels that can be renewed, environmentally friendly and produce low carbon emission gas compared to gasoline or the like up to 85% lower (De idral, *et all*. 2012).

According to Hidayat (2009) ethanol needs are increasing with the increasing number of pharmaceutical factories and pharmaceutical schools and chemical sciences agencies in Indonesia that use ethanol products. Various products can be produced from ethanol, especially those closely related to the chemical industry, both for medical and cosmetic purposes. Raw materials containing a lot of glucose can be directly converted into bioethanol through the fermentation process.

The content contained in the skin of jackfruit can later be a source of making vegetative fuel. Traditionally wastewater from fermentation of jackfruit skin can be sterilized bioethanol. Based on the description above, then conducted a study with the title "Ethanol Content Of Fermented Jackfruit Skin (*Artocarpus haterophyllus* Lmk) On Different Salt Levels".

MATERIALS AND METHODS

Research method "Ethanol Content Of Fermented Jackfruit Skin (*Artocarpus haterophyllus* Lmk) on Different Salt Content" as follows:

1. Research Subjects

The subject of this study was the fermentation of jackfruit skin. Fermentation is carried out anaerobically with the addition of 600 ml of water, the duration of incubation for one month. The reference material that is used as a benchmark in the provision of salt content is the local community in the treatment of salt for the manufacture of mandai (jackfruit skin) as their daily confectionery.

2. Tools and Materials

The tools used in this study are knife, plastic container, mixer, measuring cup, beaker glass, analytical balance, pH Meter, a set of distillation tools, aluminum paper, and alcohol meter. The ingredients used in this study are jackfruit skin, salt, and mineral water.

3. Research Methods and Design

This study was conducted experimentally using fermentation monofactor treatment. The design of this research used is a Complete Randomized Design

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(RAL) with three repetitions. The free variables used are salting consisting of 3 levels of treatment, namely: salt content 10%, 20%, and 30% ($^{w}/_{w}$).

4. **Data Collection Techniques**

Data collection on kadar bioethanol resulting from fermentation of jackfruit skin is done by measuring it using a tool called *alcohol meter* after completion of distillation.

5. **Data Analysis and Interpretation**

Data analysis of bioethanol levels with SPSS 17 application using fingerprint analysis (ANOVA). If the F count is greater than or equal to the F table then it is continued with a real difference test *duncan's Multiple New Range Test* (DMNRT) at the level of 5%. The data is interpreted in the form of a table.

RESULTS AND DISCUSSIONS

The results of the study entitled "Ethanol Content Of Fermented Jackfruit Skin (*Artocarpus haterophyllus* Lmk) On Different Salt Levels" can be seen in Table 1.

1. **Result I**

Based on Table 1. salt content treatment of 10%, 20%, 30% of three repetitions resulted in average ethanol levels of 0%, 2% and 0.66%.

Table 1. Resulting Ethanol Levels

Salt content treatment (%)	Fermented water content	Deuteronomy Code	Distillation Duration	The resulting ethanol contents %	Average Ethanol Levels %
10%	250 ml	1	1 jam	0%	0%
	250 ml	2	1 jam	0%	
	250 ml	3	1 jam	0%	
20%	250 ml	1	1 jam	2%	2%
	250 ml	2	1 jam	2%	
	250 ml	3	1 jam	2%	
30%	250 ml	1	1 jam	1%	0,66%
	250 ml	2	1 jam	1%	
	250 ml	3	1 jam	0%	

Table 1. shows that the highest ethanol levels obtained in the treatment of salt content 20% long distillation time 1 hour with an average ethanol content of 2% and the lowest ethanol content obtained in the treatment of salt content 10% long distillation time 1 hour with an average ethanol content of 0%. This indicates that many salt levels have an effect on the amount of ethanol produced and the difference in the amount of ethanol produced is suspected to have the influence of lactic acid bacterial growth.

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2. Result II

Based on duncan test results, it was obtained that 30% of the treatment had a real effect. The results of the variety analysis showed sig 0.00 < 0.05 which means there is a noticeable difference. Through the Duncan test can be seen in Table 2. that the salt content in the 95% confidence hose that is the treatment of salt content of 10% and 20% does not have a real influence, however, the treatment of 30% shows a noticeable difference in which the hose of trust reaches 3.9133

Table 2. Duncan Treatment Different Test Results

Salt content treatment %	Deuteronomy	95% confidence hose	
		1	2
10%	3	2.8433	
20%	3	2.9267	
30%	3		3.9133
itself.		.186	1.000

Based on Table 2, it appears that based on the Duncan test showed a marked difference in which the confidence lapse reached 3.9133 at 30% treatment. The treatment of salt content of 10% and 20% does not have a noticeable effect. This proves that the higher the concentration of salt added during fermentation, the more influential it is to the growth of lactic acid bacteria that produce ethanol.

The higher the concentration of salt added during fermentation, with different salt levels indicating an environmental influence on the growth of lactic acid bacteria (Meilana, D.P et al., 2015). In the presence of salt, microorganisms that can grow only can tolerate salt. It was also reported by Bautista–Gallego et al. (2013) that the higher the salt added to the fermentation of olives, the less lactic acid bacteria can grow.

The influence of salt content on the growth of lactic acid bacteria during fermentation was also reported by Ji et al. (2007) namely in cabbage fermentation, an increase in salt levels followed by a decrease in the total count of lactic acid bacteria. Verluyten et al. (2004) also reported that in fermented sausages with higher levels of NaCl salts.

Salt can affect the growth of microorganisms by decreasing the availability of water in cells (Nuriana, et al. 2014). The presence of salt also lowers the potential for reduction thus limiting the growth of aerobic microorganisms. In contrast, the presence of salt supports the growth of microorganisms that are microaerophilic and anaerobic (Madigan, *et al.* 2011).

CONCLUSIONS

Based on the results of research and analysis of data that has been conducted in the study entitled "Ethanol Content Of Fermented Jackfruit Skin (*Artocarpus haterophyllus* Lmk) On Different Salt Levels" then it can be concluded that the salt content in the 95% trust hose that is the treatment of salt content 10% and 20% does not give a real influence while the treatment of 30%

shows a noticeable difference in which the lapse of trust reaches 3.9133. The best salt concentration to produce ethanol in this study is at a concentration of 20% with an average ethanol content of 2%.

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