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Renewable Energy Alternatives: Bioethanol in Cassava as Energy

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Abstract

The study aimed at investigating the use of cassava as potential alternative renewable energy. The study method utilized is a descriptive method of making bioethanol from cassava on a research facility scale. 50 kg of new cassava, include 1.5 ml of alpha-amylase protein at that point warm for 30-60 minutes Include 1 g of bread yeast, 65 g of urea, and 14 g of NPP (Nitrogen, Phosphorus, Potassium). The efficiency of cassava at the cultivate level is 14.3 - 18.8 to/ha, in spite of the fact that information from the inquire about center reports that efficiency can reach 30-40 tons/ha. It is prescribed that cassava as a biofuel fabric comes from assortments that have the taking after properties: tall starch substance, tall abdicate potential, safe to biotic and abiotic stresses, adaptability in cultivating and collecting age.

Keywords: Renewable Energy, Cassava, Bioethanol

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Introduction

Cassava is the most optimal plant for the prospect of making bioethanol. In addition, consideration of using cassava as raw material for bioethanol production process is also based on economic considerations. This article discusses renewable energy alternatives, namely bioethanol in cassava as one of the energies. The research method used is descriptive method of making bioethanol from cassava on a laboratory scale. The average pH of the bioethanol solution is 6.9. The use of bioethanol as vehicle fuel can be a safe alternative because it comes from plants and can reduce environmental pollution. There are internal characteristics of ethanol that make the use of ethanol in the engine better than gasoline. The use of bioethanol as vehicle fuel can be a safe alternative because it comes from plants and can reduce environmental pollution (Cooney et al., 2009). The use of ethanol from cassava as an energy alternative needs to be seriously supported (Uchechukwu-Agua et al., 2015). Intensive maintenance of cassava plants at the farmer level needs to be encouraged in order to create abundant production so that it can produce a lot of ethanol in order to create energy independence in various countries.

According to Ellabban et al. (2014) renewable energy is a type of energy obtained from the earth's natural resources which are unlimited or inexhaustible, such as wind and sunlight. Renewable energy is a traditional energy alternative that relies on fossil fuels, and tends to be less harmful to the environment. Along with the increasing progress of world civilization, where the dependence on energy is increasing. The energy crisis problems facing the world's countries, including Africa, are waiting to be resolved soon. As we know, almost 80% of all energy use in Africa uses non-renewable energy supplied from fossil fuels, whereas if we continue to use this non-renewable energy source, it is predictable that the world will experience an energy crisis in the span of half a century.

To answer this problem, it is necessary to develop renewable energy sources in order to ensure the sustainability of world energy. Bioenergy is not an alternative best for all countries, either because of limited land or competitive use for other uses. However, the

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Volume 2, Issue 1(Page 14-17)
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world knows that things like this do not seem very applicable to countries. The alternative answer can be solved through the development of biofuels, especially ethanol, where ethanol is a chemical produced from plant raw materials that contain carbohydrates such as cassava, sweet potato. , corn, sorghum, rice, canna and sago. Other raw materials are plants or fruits that contain sugar such as sugar cane, sap, mango, pineapple, papaya, grapes.

This raw material is a food crop that is commonly planted by people in almost all regions of Africa, so that this type of plant is a potential plant to be considered as a source of raw material for making bioethanol (Hadar, 2013). However, of all these types of plants, cassava is the most optimal crop for the prospect of bioethanol production. In addition, consideration of using cassava as raw material for bioethanol production process is also based on economic considerations. These economic considerations not only include the price of plant production as raw material, but also include crop management costs, production costs for raw material procurement, and raw material costs for producing per liter of ethanol.

Methods

The research method used is descriptive method of making bioethanol from cassava on a laboratory scale. 50 kg of fresh cassava, add 1.5 ml of alpha-amylase enzyme then heat for 30-60 minutes Add 1 g of bread yeast, 65 g of urea, and 14 g of NPP (Nitrogen, Phosphorus, Potassium). The simple technique of processing cassava into ethanol can be easily applied to the general public because it requires simple equipment.

Results and Discussion

Cassava is a plant that has been known for a long time by African farmers, although not native to Africa, the cassava plant can thrive even though it is not treated intensively. Cassava can survive in various types of soil and grow optimally in fertile, well-aerated soil. ph 5.5 - 6.5. The average temperature is more than 25-30˚C with rainfall above 760-1.015 mm / year (Do et.al, 2009). The productivity of cassava at the farm level is 14.3 - 18.8 to / ha, although data from the research center reports that productivity can reach 30-40 tons / ha. It is recommended that cassava as a biofuel material comes from varieties that have the following properties: high starch content, high yield potential, resistant to biotic and abiotic stresses, flexibility in farming and harvesting age (Uchechukwu-Agua et al., 2015).

There are internal characteristics of ethanol that make the use of ethanol in the engine better than gasoline. Ethanol has a research number of octane 108.6 and an octane motor of 89.7. This figure (especially the research octane) exceeds the maximum value possible for gasoline (research octane 88 and generally the octane motor is lower than research octane) even after adding certain additives. The octane number is a property of the fuel's resistance not to burn itself due to pressure or temperature (Szybist & Splitter, 2017).).

Ethanol has one OH molecule in its molecular arrangement. The oxygen that binds in the ethanol molecule helps complete combustion between the air and fuel mixture in the cylinder. Coupled with a wide flammability range, namely 4.3 - 19 vol% (compared to gasoline which has a fire range of 1.4 - 7.6 vol%), the combustion of the mixture of air and ethanol fuel is better. This is believed to be a factor in the relatively low CO emission compared to combustion of air and gasoline, which is around 4%. Ethanol also has a high heat of evaporation, which is 842 kJ / kg. The high heat of evaporation causes the peak temperature in the cylinder to be lower in combustion of ethanol compared to gasoline.

The simple technique of processing cassava into ethanol can be easily applied to the general public because it requires simple equipment. The processing of fresh cassava takes place as follows: (1) Peel 50 kg of fresh cassava, then wash and grind it with a grinding machine.

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Volume 2, Issue 1(Page 14-17)
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Then filter the results of the mill to get cassava pulp. Put the cassava pulp into the drum that is fully open at the top and add 40-50 liters of water and stir while heating on the fireplace (2) Add 1.5 ml of alpha-amylase enzyme then heat for 30-60 minutes at a temperature of about 90˚C. Cool it to 55-60 C then add 0.9 ml of gluco-amylase enzyme and keep the temperature in the range 55-60 ˚C for 3 hours, then cool to a temperature below 35 ˚C (3) Add 1 g of bread yeast, 65 g urea, and 14 g of NPP (Nitrogen, Phosphorus, Potassium). Leave for 72 hours in a closed state but not tightly so that the CO2 gas formed can escape (4) Transfer the liquid containing 7-9% bioethanol into another drum which is designed as an evaporator. Cook on the stove until the steam escapes into the distillator. Turn on the water flow in the bioethanol vapor condenser (condenser). Hold the top temperature of the distillation column at 79˚C when the bioethanol liquid starts to come out. The 90-95% bioethanol fraction will stop flowing slowly (Labeckas et al., 2014).

Power generation engines with bioethanol fuel can produce electric power measuring 110-120 volts. Four liters of hydrated ethanol can generate electric power for 1 hour. According to Bernardo Ospina in Sinar tani 2010, if rural communities provide 3-5 ha of land to plant cassava, the ethanol produced can provide electricity for 6 hours a day throughout the year (Zvinavashe et.al, 2011; Oo et al., 2015). Cassava can survive in various types of soil and grow optimally in fertile, well-aerated soil, ph 5.5 - 6.5. The average temperature is more than 25-30˚C with rainfall above 760-1.015 mm / year.

Type of measurement	**Distillation (1)**	**Distillation (2)**	**Distillation (3)**
The amount of solution before distillation	7	7	7
Ethanol content before distillation (%)	6,8 %	6,8 %	6,8 %
Amount of solution after distillation	6,43	6,44	6,46
Ethanol content after distillation (%)	5,43 %	5,44 %	5,46 %
Amount of bioethanol from distillation (ml)	217 ml	218 ml	116 ml
pH of the bioethanol solution	6,911	6,912	6,914

The amount of solution before distillation (1) 7 then distillation (3), 7, the ethanol content before distillation was 6.8%, 6.8%, the amount of solution after distillation, 6.43 and 6.46 levels of ethanol after distillation (%) 5.43% and 5.45%. The amounts of distilled bioethanol (ml) were 217 ml and 186 ml, the pH of the bioethanol solution was 6.911 and 6.986. The high starch content in cassava is better to make cassava as the main ingredient for bioethanol production. Distillation (2) pH of bioethanol solution is 6.912; Average pH of bioethanol solution is 6.9. The use of bioethanol as vehicle fuel can be a safe alternative because it comes from plants and can reduce environmental pollution. Cassava can survive in various types of soil and grow optimally in fertile, well-aerated soil, ph 5.5 - 6.5. The average temperature is more than 25-30˚C with rainfall above 760-1.015 mm / year.

It is recommended that cassava as a Fuel Grade Ethanol (FGE) material comes from varieties that have the following properties: high starch content, high yield potential, resistant to biotic and abiotic stress, and flexible in farming and harvesting time. For a mixture ratio of ethanol and gasoline reaching 60: 40%, an increase in efficiency of up to 10% was noted. The use of

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 Volume 2, Issue 1(Page 14-17)
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ethanol from cassava, as an energy alternative, needs to be seriously supported. Intensive maintenance of cassava plants at the farmer level needs to be encouraged in order to create abundant production so that it can produce a lot of ethanol in order to create national energy independence. Development of cassava to support the bioethanol industry, this program needs the support of all stakeholders, including entrepreneurs or industry as well as serious policies from the Government to encourage its realization.

Conclusion

Cassava is the most optimal plant for the prospect of making bioethanol. In addition, consideration of using cassava as raw material for bioethanol production process is also based on economic considerations. The average pH of the bioethanol solution is 6.9. The use of bioethanol as vehicle fuel can be a safe alternative because it comes from plants and can reduce environmental pollution. There are internal characteristics of ethanol that make the use of ethanol in the engine better than gasoline. Ethanol has one OH molecule in its molecular arrangement. The oxygen that binds in the ethanol molecule helps complete combustion between the air and fuel mixture in the cylinder.

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