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The Husk Charcoal Biobriquettes as Alternative Energy Based on Rice Husk Waste

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ABSTRACT

The decrease in the availability of gas and oil fuels has prompted government policy regulations that lead to the development and use of alternative energy. In Indonesia, there are many natural vegetable resources that can be used as alternative energy raw materials, one of which is rice husk waste. The Rice husk waste can be processed and utilized into bio-briquette husk charcoal which is environmentally friendly and has relatively high energy potential. This experiment aims to produce quality husk charcoal bio-briquettes with a neat and uniform shape, a solid structure, and not easy to break, as well as good combustion and composing power. Experimental treatments: The structure of husk charcoal (S) : S1 = mashed and S2 = not mashed. The composition of the adhesive dough (which is the ratio between tapioca flour and water) (A): A1 = 1 part tapioca: 5 parts water and A2 = 1 part tapioca: 7 parts water. The experimental results show that there are differences in physical characteristics between husk charcoal briquettes using mashed and unmashed husk charcoal as raw materials. The composition of the dough and the consistency of the adhesive also affect the quality of the husk charcoal briquettes. The combustion power and coals produced by briquettes from husk charcoal are better than those that are not mashed. The husk charcoal briquettes from a mixture of husk charcoal that were mashed with 1:5 dough composition and 1:7 had relatively the same characteristics. The combustion power of briquettes from the 1:5 dough composition is better than the 1:7 dough composition.

Keywords: Alternative energy, bio-briquettes, husk charcoal, husk waste

Introduction

The declining availability of gas and oil fuels has prompted government policy regulations that lead to the development and use of alternative energy as a substitute. In Indonesia, there are many natural vegetable resources that can be used as alternative energy raw materials, one of which is rice husk waste.

Indonesia has a very wide area of rice fields and is spread over almost all islands. For a long time, people have been cultivating rice in irrigated and non-irrigated rice fields. Even today, the rice cultivation business has expanded extensively to suboptimal lands such as lowland swamps, tidal swamps, and peat lands. The existence of this vast rice field has encouraged the development of a rice milling business that produces rice husk waste. There is a lot of rice husk waste in various areas that have not been utilized optimally. Utilization by the community is still very little which, among others, is used as a mixture of nursery or planting media. The utilization of rice husk waste is still very low to produce products with higher economic value. If it is used as a new processed product, the potential utilization of rice husk waste is very high.

Rice husk waste that is not managed properly will have the potential to pollute the environment, so it should be processed and utilized into more useful products. One of the processed products of rice husk waste is an alternative fuel that can be used as a substitute for gas, kerosene, and other fossil fuels (Baderan & Hamidun, 2016; Saleh et al., 2021). Rice husk waste can pollute the living environment because it is very easily blown and carried away by the wind, so it can interfere with breathing and health. Husk waste from rice mills on the banks of rivers and swamps has the potential to contaminate

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and silt up because, during the rainy season, a number of husk wastes are often washed away and pollute rivers and swamps.

Rice husk is a biomass that is often disposed of or burned as waste, but actually, rice husk is a potential carbon source that can be used as an alternative energy source (Yuliah et al., 2017). One of the alternative fuels from processed rice husk waste is husk charcoal briquettes which is also an environmentally friendly fuel. If husk waste has a low economic value, then husk charcoal briquettes have a relatively high economic value (Sutisna et al., 2021). The utilization of rice husk waste will also reduce environmental pollution because it is a zero-waste product (Abdullahi and Mustafa, 2016; Rahmiati et al., 2019). Husk charcoal briquettes can be used as daily fuel for household and cottage industries, as well as commercial industries. If the production of husk charcoal briquettes is carried out consistently and on a large scale, it will become a source of income for the community and industry. Although it comes from vegetable resources, the energy potential of husk charcoal briquettes is relatively high so it is suitable to be used as alternative energy. As an environmentally friendly fuel, husk charcoal briquettes are categorized as bio-briquettes.

Rice husks can be processed into bio-briquettes which can be an alternative fuel to reduce and replace the use of firewood (Saleh et al., 2021). Biobriquettes from a mixture of rice husk charcoal and coconut shells have a calorific value of 50% of the calorific value of coal fuel. This shows that husk charcoal briquettes are the potential as an alternative fuel and a substitute for petroleum and gas fuels (Yuliah et al., 2017). Making briquettes can be done by mixing husk charcoal and adhesive made from tapioca flour, then printing according to the desired shape (Agricultural Research and Development Agency of the Ministry of Agriculture, 2018).

Processing of rice husk waste into energy source products has been carried out, with various processes and procedures, with the final form in the form of husk charcoal or husk charcoal briquettes. Each business uses different raw materials, equipment, and processing techniques, so the quality of the final product is also relatively different. However, some community businesses treat husk waste simply by burning husks directly so that a lot of husk ash is produced. Whereas husk ash cannot be used as raw material for bio-briquettes. The community also prints briquettes manually with makeshift tools, so it takes longer, and a lot of manpower, and the briquettes are not attacked and are less dense. There are also people who mix husk charcoal with other ingredients in order to produce a variety of briquette products.

Biobriquettes will be of higher quality and have high economic value if they are produced with the right composition of materials and processing techniques, accompanied by printing techniques that will produce quality, dense, neat, and uniform bio-briquettes. Based on this, this experiment was carried out to produce quality pure husk charcoal bio-briquettes with a neat and uniform shape, a solid structure, and not easy to break, as well as good combustion and composing power.

Material and Methods

This experiment was carried out at the Laboratory of the Technology Application Agency (BAT) of the University of IBA, in Palembang. The materials used are rice husk waste, tapioca flour, kerosene, and wood charcoal. The tools used are a husk charcoal maker, briquette press, stove, pan, scale, tarpaulin, basin, stirrer, sieve, and pounder.

The husk charcoal bio briquettes that we want to produce is pure bio briquettes from husk charcoal. When making briquette dough, only the husk charcoal and adhesive are mixed. There were two treatments, namely the structure of the husk charcoal and the composition of the adhesive dough. The details of the treatments that were tried were: The structure of the husk charcoal (S): S1 = mashed and S2 = not mashed. The composition of the adhesive dough (which is the ratio between tapioca flour and water) (A): A1 = 1 part tapioca: 5 parts water, and A2 = 1 part tapioca: 7 parts water.

The experiment began with taking rice husk waste in Pemulutan Ilir Village, Pemulutan District, Ogan Ilir Regency, South Sumatra Province. Then the husk waste is dried by drying, followed by making husk charcoal by burning the husk waste. Furthermore, the husk charcoal produced is dried in the sun to dry ready for use. Refining husk charcoal is done by pounding the husk charcoal until smooth, then sifting. Making the adhesive dough is done by mixing tapioca flour and water. The amount of water

added according to the predetermined treatment. The adhesive mixture is stirred until smooth and cooked over low heat until the desired consistency or thickness is achieved. Next, the husk charcoal is mixed with the adhesive and stirred evenly. The briquette dough is printed with a printer and dried in the sun to dry. The observed variables were the characteristics and quality of the resulting bio-briquettes, combustion power, and post-combustion composition

Results and Discussion

The experimental results show that there are differences in physical characteristics between husk charcoal briquettes using mashed and unmashed husk charcoal as raw materials. The composition of the dough and the consistency of the adhesive also affect the quality of the husk charcoal briquettes. The combustion power and coals produced by briquettes from husk charcoal are better than those that are not mashed. The husk charcoal briquettes from a mixture of mashed husk charcoal with a mixture composition of 1:5 and 1:7 have relatively the same characteristics. The combustion power of briquettes from 1:5 adhesive dough composition is better than 1:7 dough composition.

The success of making bio-briquettes is largely determined by the adhesive. This is the basis for testing the composition. The results of the experiment showed that the composition of the adhesive dough with a ratio of 1 part flour: 5 parts water cooked for 10 minutes on low heat resulted in an adhesive dough consistency whose thickness was suitable for making husk charcoal bio-briquettes. While the consistency of the adhesive dough from the dough composition of 1 part flour: 7 parts water cooked for 10 minutes over low heat has a viscosity that is not suitable for making husk charcoal briquettes because it is not thick enough.

Furthermore, this experiment also tested and compared the quality of husk charcoal bio-briquettes whose husk charcoal structure was mashed and not mashed. The experiment was carried out by applying adhesive mixtures of different compositions to the bio-briquette mixture. The results of the experiment showed that there were differences in the characteristics and quality of the bio briquettes of husk charcoal in the structure of the husk charcoal and the composition of the different mixtures. Biobriquette dough derived from the structure of pulverized husk charcoal mixed with adhesive from a dough composition of 1:5 is easier to blend and has better characteristics than bio-briquettes mixed with adhesive from a dough composition of 1:7.

The husk charcoal bio-briquette dough made from husk charcoal with an unmashed structure mixed with a 1:7 adhesive mixture composition was easier to blend than the bio-briquette mixture mixed with an adhesive mixture of 1:5 composition.

Biobriquettes made from pulverized husk charcoal mixed with adhesive from a mixture composition of 1:5 have better characteristics and quality than bio-briquettes made from unrefined husk charcoal with the same composition and consistency of adhesive dough (1:5) and bio-briquettes made from pulverized husk charcoal. with the dough composition 1:7.

Biobriquettes made from pulverized husk charcoal mixed with adhesive from a 1:5 dough composition have better combustion and composing power compared to bio-briquettes made from unrefined husk charcoal with the same composition and consistency of adhesive and husk charcoal bio-briquettes made from mashed husk charcoal mixed with an adhesive of a 1:7 dough composition with a less thick adhesive consistency. According to Yulia et al. (2017), husk charcoal is very appropriate to be used as briquettes because it has higher combustion energy so it can be used as an alternative fuel. According to the results of Patabang's research (2012), the calorific value of rice husk charcoal briquettes is 2789 cal/g. The results of the research by Qistina et al. (2016) which compared the quality of rice husk and coconut shell charcoal briquettes showed that based on the briquette burning test, the thermal efficiency of rice husk briquettes was higher at 31.13% and coconut shell 22.28%.

Conclusion

Based on the results of the experiment, it was concluded that bio-briquettes made from agricultural waste husk charcoal can be used as an alternative energy to replace petroleum and gas fuels because they have good combustion and composing power. Biobriquettes from pulverized husk charcoal mixed with a 1:5 mixture composition have better characteristics and quality.

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