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THE PHYSICAL CHARACTERISTICS OF BIOCHARCOAL BRIQUETTE MADE FROM DURIAN SKIN

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Abstract. Biocharcoal briquettes have been made as an alternative fuel with durian skin and tapioca flour adhesive. Variation in the composition of durian skin and tapioca flour adhesives are: 70%:30%, 65%:35% and 60%:40% and drying time is 3 days. The parameters of the testing include: density, moisture content and calorific value. The test result shows that the composition at 65%:35 % is the optimal result. On this composition, the obtained briquettes produce a density value at 0.570 g/cm^3, a moisture content of 8.11%, and calorific value of 5002 cal/g which matches the quality standard of indonesian briquettes so that the produced briquettes should be used for household scale.

Keywords: briquettes, durian skin and calorific value

INTRODUCTION

Biomass is an alternative energy which the type material is produced from a photosynthetic process, for example: grass, agricultural waste, twigs, leaves, weeds, and forestry waste. The benefits of biomass can be used in various processes, including alternative fuels. One example of biomass that can be utilized is durian skin waste.

Durian is a fruit that exists in Indonesia and is very well known for its distinctive smell and taste, so that many people like it. Among the various benefits of durian skin, it can be processed as an alternative energy material that is environmentally friendly. The contents of the composition of the small durian skin ashes are 4% and the other compositions found in durian skin are very suitable for energy, just like coal energy. (Wildan, 2011).

This research aims to utilize durian skin which will be processed into a solid fuel and will be used to replace alternative fuels, namely biocharcoal briquettes. There are two processes in making biocharcoal briquettes made from durian skin, namely the first process of making biocharcoal briquettes made from durian skin by varying the mixture of durian skin with the binder. After that the second process is carried out by a briquette test in accordance with the value of the Indonesian briquette quality standard. Where the test carried out on the sample variation is the density test, moisture content and calorific value.

LITERATURE REVIEW

Biocharcoal briquettes are chunks of charcoal or lumps of charcoal made from soft materials (biocharcoal). Biocharcoal is classified as a soft material, where it is carried out a special process and is processed into a hard charcoal material which has a special shape.

The quality of the biocharcoal obtained is very good with other types of charcoal (coal). The word "Briquetting" is the process of obtaining the desired size and shape so that it can be used for specific purposes. (Josep and Hilson, 1981).

The charcoal briquette processing comes from plantation waste and agricultural waste, where the process is with the addition of adhesive, and the raw material is previously carried out by a charcoal process, then milled or refined and then mixed with the adhesive. After that, the molding process is carried out manually or hydraulically, then drying it naturally under the sun.

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Table 1. Indonesian Charcoal Briquettes Quality Standards

Nature	Quality Standards
	SNI
Densty (g/cm^3)	0.5 – 0.6
Moisture Content (%)	8
Calorific Value (kcal/g)	5000

(Ringkuangan, 1993)

In this study, the adhesive used is tapioca adhesive (starch), where tapioca flour has the following advantages:

1. Has absorption in water
2. Has good adhesive strength, easy to obtain and does not endanger health.

The following types of adhesive material can be seen in Table 2.

Table 2. Types of Adhesives Material

Types of Adhesives Material	Water (%)	Ash (%)	Fat (%)	Protein (%)	Crude fiber (%)	Carbon (%)
Tapioca Flour	9.84	0.36	1.50	2.21	0.69	85.20
Cornstarch	10.52	1.27	4.89	8.48	1.04	73.80
Rice Flour	7.58	0.68	4.53	9.89	0.82	76.90
Wheat flour	10.70	0.86	2.00	11.50	0.64	74.20
Sago Flour	14.10	0.67	1.03	1.12	0.37	82.70

(Anonymous, 2009)

As for many people who take advantage of durian skin because remembering durian skin has a chemical compound composition in the form of saponins, phenolics, flavonoids, these tannins are cytotoxic, which means they are toxic to the fungus (Setyowati, 2013).

Of the various benefits of durian skin that exist, among them, it can be processed as an alternative energy material which is very good for the environment, where the composition of the small durian skin ashes is 4% and other compositions found on durian skin are very suitable for energy, just like coal energy.

RESEARCH METHODOLOGY

The method used in this study is an experimental method. In this research, tools are used, namely: calipers, beaker glass, stopwatch, 100 mesh sieve, thermometer, oven, porcelain cup, digital scales, briquette molding tools, furnace, UTM (Universal Testing Machine), and Bomb Calorimeter. While the ingredients are: tapioca flour, durian skin and demineralized water.

RESULTS AND DISCUSSION

This biocharcoal briquette has been made, namely from mixing durian skin charcoal powder and tapioca starch adhesive, then the drying process is carried out naturally under the sun for 3 days. Then tested the physical properties of the biocharcoal briquettes that have been obtained. To determine the characteristics of the biocharcoal briquettes, it is necessary to test the physical parameters, including: density, moisture content, and calorific value.

Table 3. Test Results of Biocharcoal Briquettes Made From Durian Skin For Sample A (70%: 30%)

No	Physical Test	Test Result	Quality Standards SNI
1.	Density (g/cm^3)	0.497	0.5 – 0.6
2.	Moisture Content (%)	8.00	8
3.	Calorific Value (cal/g)	4855	5000

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Table 4. Test Results of Biocharcoal Briquettes Made From Durian Skin For Sample B (65%:35%)

No	Physical Test	Test Result	Quality Standards SNI
1.	Density (g/cm^3)	0.570	0.5 – 0.6
2.	Moisture Content (%)	8.11	8
3.	Calorific Value (cal/g)	5002	5000

Table 5. Test Results of Biocharcoal Briquettes Made From Durian Skin For Sample C (60%:40%)

No	Physical Test	Test Result	Quality Standards SNI
1.	Density (g/cm^3)	0.639	0.5 – 0.6
2.	Moisture Content (%)	8.08	8
3.	Calorific Value (cal/g)	4951	5000

The results of the measurement of the density value of durian skin biocharcoal briquettes can be seen in Figure 1. Figure 1 shows that sample A produces a density value of 0.497 g/cm^3, sample B is 0.570 g/cm^3, and sample C is 0.639 g/cm^3. From the test results of the three samples, the density values that meet the Indonesian Briquette Quality Standards are obtained, where the density values in accordance with the SNI are 0.5 - 0.6 g/cm^3.

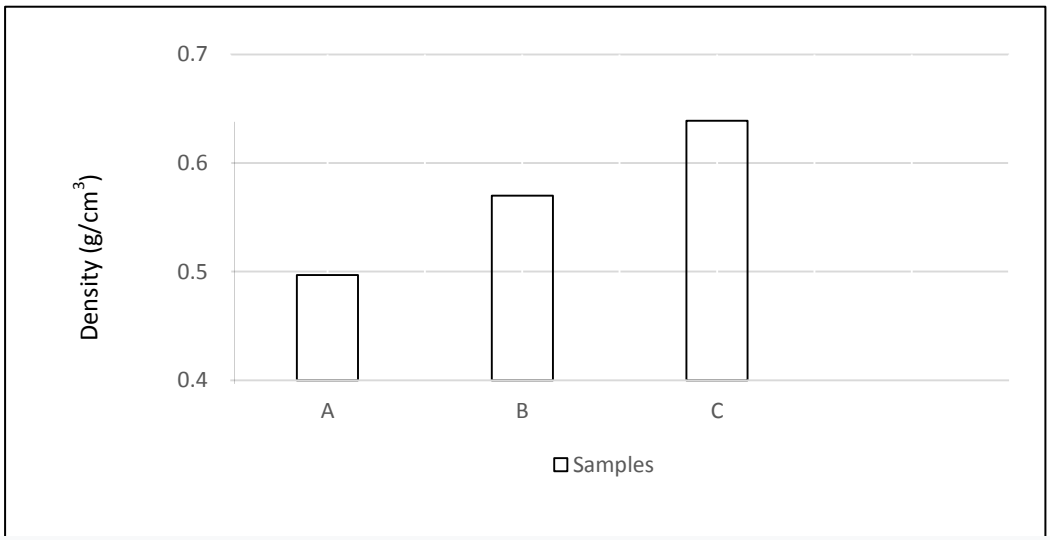

Figure 1. Graph of Density of Samples

The results of the biocharcoal briquette density analysis showed that the biocharcoal briquettes that had been obtained would have an effect on the increase in density values. This is because the briquette sample at the time of printing is given a manual compressive force, which will produce briquette samples with different compaction. The greater the compressive force for compaction, the tighter the briquette particles are thus spaced so that the resulting briquettes will also be solid. Meanwhile, the briquette volume which has a constant state will also obtain a large

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density. (Nasruddin, 2011)

The results of measuring the moisture content of durian skin biocharcoal briquettes can be seen in Figure 2. Figure 2 shows that sample A produces a moisture content of 8.00%, sample B is 8.11% and sample C is 8.08%. From the test results of the three samples, it was obtained the moisture content value that had met the Indonesian Briquette Quality Standards, where the water content value according to the SNI was 8%.

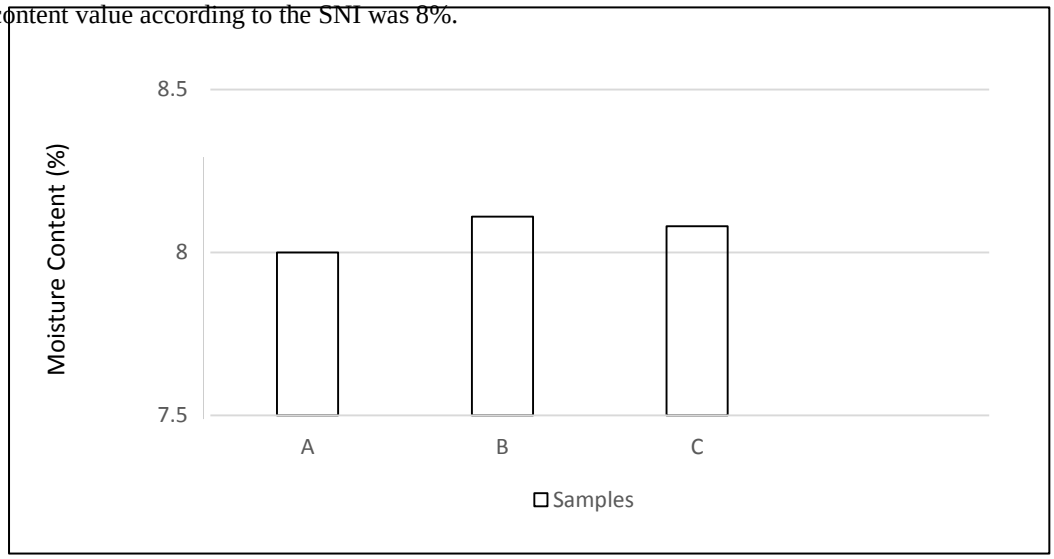

Figure 2. Graph of Moisture Content of Samples

The moisture content value of sample A is lower than samples B and C, this is because the briquettes are less dense when the sample is printed and the presence of air factors outside the environment can affect the drying process.

The results of the measurement of the calorific value of durian skin biocharcoal briquettes can be seen in Figure 3. Figure 3 shows that the calorific value in sample A is 4855 cal/g, sample B is 5002 cal/g and sample C is 4951 cal/g. From the test results of the three samples, the calorific value that has met the Indonesian Briquette Quality Standard is obtained, where the heating value according to the SNI is 5000 cal/g.

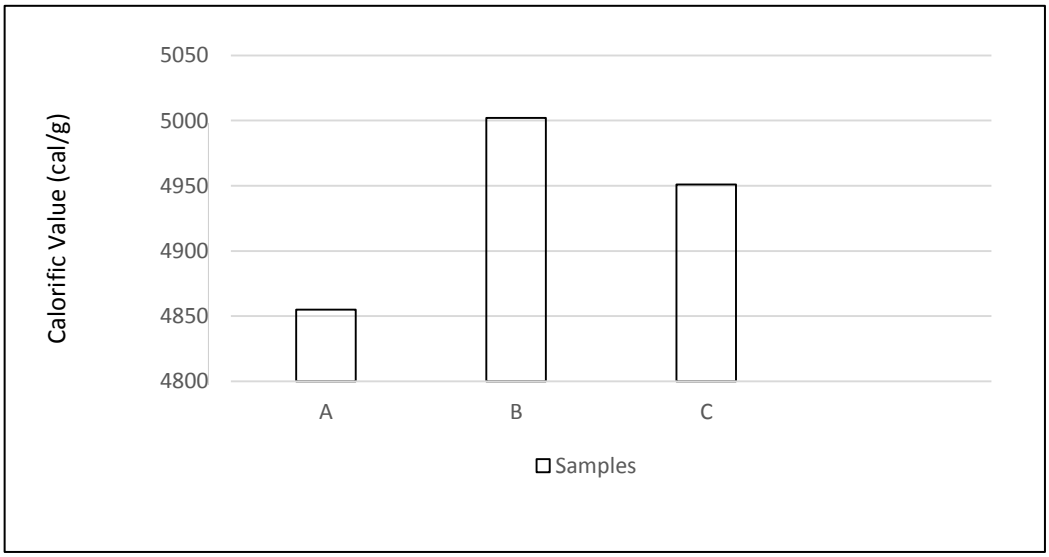

Figure 3. Graph of Calorific Value of Samples

From the results of the analysis carried out for the three samples, it turns out that the calorific value obtained has met the briquette quality standard. This is because the durian skin is soft and

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the high composition of the adhesive used results in a high calorific value. (Bagaskoro, 2010).

CONCLUSION

The optimal quality of biocharcoal briquettes was obtained in sample B with the composition of 65%:35% which has a density value of 0.570 g/cm^3, moisture content value of 8.11%, and calorific value of 5002 cal/g which is in accordance with the quality standards of Indonesian briquettes.

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