Indonesian Journal of Chemical Science and Technology (IJCST)
State University of Medan, https://jurnal.unimed.ac.id/2012/index.php/aromatika

IJCST-UNIMED 2023, Vol. 07, No. 2 Page; 141 – 146
Received : Apr 29th, 2024 Accepted : July 23th, 2024 Web Published : July 31st, 2024

The effect of bound calorific value and burning rate on biobriquettes from salak skin with starch adhesive

Irving Josafat Alexander[1*], Ramlan Silaban[2], Gloria Sirait[3]

[1] Department of Natural Science Education, Faculty of Teaching and Education, Universitas HKBP Nommensen, Medan, Indonesia
[2] Department of Chemistry, Faculty of Mathematics and Science, Universitas Negeri Medan, Medan, Indonesia
[3] Department of Biology Education, Faculty of Teaching and Education, Universitas HKBP Nommensen Pematangsiantar, Pematangsiantar, Indonesia
*Corresponding author : irving.alexander@uhn.ac.id

ABSTRACT

Massive technological development is something that cannot be avoided in this life, because technological development is in line with scientific progress. Indonesia is a country that has abundant energy of various kinds source. Currently, energy use in Indonesia still comes from oil and gas earth, as well as coal which is non-renewable resources. Dependence on energy becomes main problem in energy supply national. Considering the need for it fuel every year continues has increased and is necessary anticipation of the availability of energy sources which is getting thinner while the price fuel oil increases. Every country in the world is now focusing on energy production through non-conventional sources. Biomass is an alternative energy source to replace fossil fuels (oil earth) because it has several beneficial properties, including being able to be utilized economically sustainable because of its renewable nature, no contains sulfur so the biomass does not cause air pollution. Besides being able to reduce waste, if managed properly biomass has high potential to be used as an alternative energy source in the form of biobriquettes. The method used in this research includes the preparation of salak skin raw materials, the carbonisation stage of salak skin, the starch adhesive preparation stage and the salak skin analysis stage, namely the analysis of calorific value and burning rate. Based on the results of the calorific value analysis and combustion rate analysis, it can be concluded that the biobriquette sample of salak skin with starch adhesive has met the provisions of the SNI No. 01-6235-2000 on charcoal biobriquettes. From the results of the study, it was also found that the Biobriket B sample, namely by using adhesive, has a high calorific value and burning rate compared to Biobriket A, namely without using adhesive.

Keywords: biobriquette, salak skin, starch, calorific value, burning rate

e-ISSN : 2622-4968, p-ISSN : 2622-1349

1. INTRODUCTION

Massive technological development is something that cannot be avoided in this life, because technological development is in line with scientific progress[1]. Indonesia is a country that has abundant energy of various kinds source. Currently, energy use in Indonesia still comes from oil and gas earth, as well as coal which is non-renewable resources. Dependence on energy becomes main problem in energy supply national[2]. Considering the need for it fuel every year continues has increased and is necessary anticipation of the availability of energy sources which is getting thinner while the price fuel oil increases. Loss the use of fossil fuels besides damages the environment, is also non-renewable and unsustainable[3]. Energy security, as well as effective reduction of the greenhouse gas emissions leading to the reduction in the environmental challenges, has been globally encouraging countries to use renewable energy. Lignocellulosic biomass is a renewable, environmentally friendly, and potentially sustainable source compared to the fossil fuels and coal[4].

Exploration of plant secondary metabolites through adventitious root culture is a focal point in improving the commercial industry[5]. Every country in the world is now focusing on energy production through non-conventional sources[6]. Biomass is an alternative energy source to replace fossil fuels (oil earth) because it has several beneficial properties, including being able to be utilized economically sustainable because of its renewable nature, no contains sulfur so the biomass does not cause air pollution[7]. Besides being able to reduce waste, if managed properly biomass has high potential to be used as an alternative energy source in the form of biobriquettes[8].

Biobriquettes are defined as materials burnt in a solid, tasteful form; from remnants of organic material that has been undergo processing in a certain way. Biobriquettes can replace non-renewable energy sources, namely materials burning fossils. Apart from that, in the area rural areas, biobriquettes can replace potential use of firewood destroying forest ecology[9]. Salak fruit produces waste in the form of salak skin which is brownish and slightly prickly, then the salak seeds have a very hard texture which is black and brown. Salak seeds have a very hard texture so they are suitable as a basic ingredient for making briquettes[10].

2. EXPERIMENTAL

2.1. Chemicals, Equipment and Instrumentation

The tools and materials used in this research are as follows : aquadest, starch, salak skin (merck), bomb calorimeter, furnace, Bunsen, stopwatch, methanol

2.2. Research Procedure

The method used in this research includes the preparation of salak skin raw materials, the carbonisation stage of salak skin, the starch adhesive preparation stage and the salak skin analysis stage, namely the analysis of calorific value and burning rate.

2.2.1. Raw material preparation stage

In this preparation stage, raw materials are prepared, namely salak skin cut into small pieces first and then cleaned from impurities first and then dried in the sun for ± 5 days so that the impurities disappear.

e-ISSN : 2622-4968, p-ISSN : 2622-1349

2.2.2. Carbonisation stage

In this stage, raw material was burned to create Biomass, Biomass production by burning the salak skin that has been prepared earlier by using used cans.

2.2.3. Starch adhesive preparation stage

- Weighing the adhesive material, namely starch, first using an arm balance.
- Diluting the starch with water into a beaker container with a measure of 160 grams of starch and 200 mL of distilled water.
- The results of the mixture of starch and distilled water are stirred until smooth, then heat it using a Bunsen heater until the mixture becomes thick.

2.2.4. Analysis stage

Samples of salak skin biobriquettes that have been produced are then tested for calorific value and combustion rate to determine whether they meet the requirements of the SNI No. 01-6235-2000 or not.

3. RESULTS AND DISCUSSION

3.1. Analysis of Characterization Results

The processing of salak skin resulted in salak skin that was already in the form of charcoal. The biobriquette samples were then separated into two samples, namely Biobriquet A (salak skin biobriquet sample without adhesive) and Biobriquet B (salak skin biobriquet sample with adhesive). The resulting biobriquette products were then analysed by calorific value test and burning rate test. The results of the analysis are shown in the explanation below.

- Calorific value analysis results

Analysis of the calorific value contained in snake fruit peel biobriquettes using a Bomb Calorimeter. The amount of heat is measured in calorific units and the result of complete oxidation of the salak bark biobriquettes in the Bomb Calorimeter device is called the calorific value of the biobriquettes. The results of the calorific value analysis can be seen in the following tables and graphs.

Table 1. Calorific value analysis results

Sample	Calorific value (Cal/gr)
Biobriquette A	5132
Biobriquette B	5329

e-ISSN : 2622-4968, p-ISSN : 2622-1349

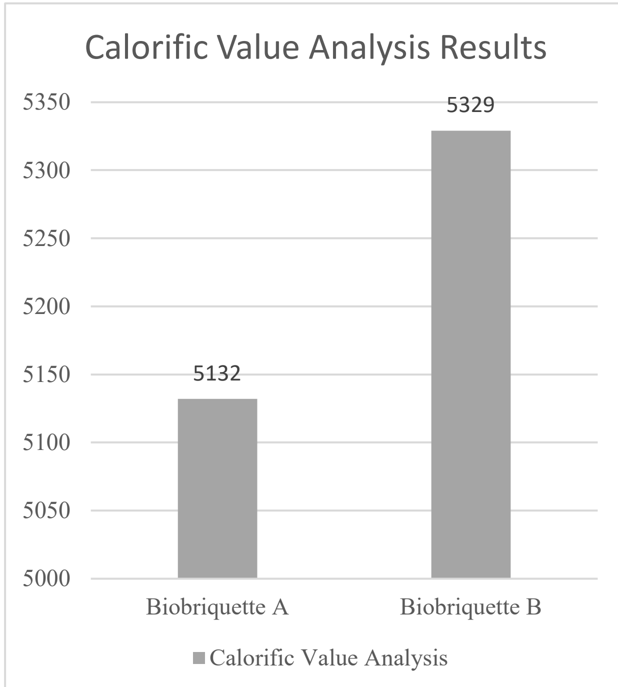

Figure 1. Calorific Value Analysis Results Graph

The calorific value determines the quality of the briquettes. The higher the calorific value, the better the quality of the biobriquettes[11]. Based on the results of the analyses studied, it was found that both biobriquette samples, namely Biobriket A and Biobriket B, had fulfilled the provisions of SNI No. 01-6235-2000 at least 5000 Cal/gram.

- Burning rate analysis results

Burning rate analysis was conducted by burning the previously carbonised salak skin biobriquettes to determine the length of time a biobriquette burns. After that, the burnt snake fruit peel biobriquettes were weighed using digital scales. The duration of ignition time was calculated using a stopwatch.

The results of the burning rate analysis can be seen in the following tables and graphs.

Table 2. Burning rate analysis results

Sample	Burning rate (minute)
Biobriquette A	143,71
Biobriquette B	164,22

e-ISSN : 2622-4968, p-ISSN : 2622-1349

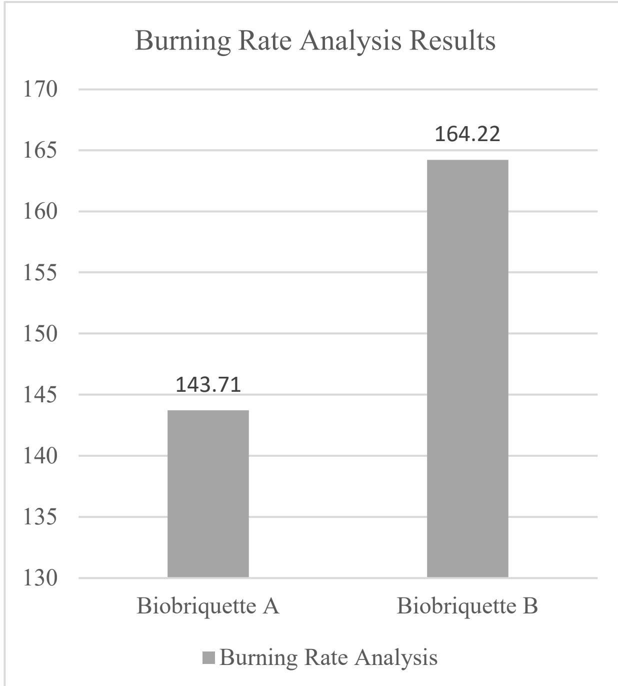

Figure 2. Burning Rate Analysis Results Graph

Burning time is the ability of biobricks expressed in the time interval from first ignition to complete combustion to ash[11]. In this analysis, researchers used a stopwatch to determine the time of change of the briquette from starting to ignite until it became ash. This burning rate affects the calorific value produced. The higher the calorific value of the briquette, the better the combustion rate of the briquette[9]. The adhesive is needed as a binder for the biomass to form more homogeneous biobriquettes during compression and not easily crushed when removed from the mould.

4. CONCLUSION

Based on the results of the calorific value analysis and combustion rate analysis, it can be concluded that the biobriquette sample of salak skin with starch adhesive has met the provisions of the SNI No. 01-6235-2000 on charcoal biobriquettes. From the results of the study, it was also found that the Biobriket B sample, namely by using adhesive, has a high calorific value and burning rate compared to Biobriket A, namely without using adhesive.

ACKNOWLEDGEMENT

The researcher would like to thank everyone who was involved and helped the researcher during this research.

REFERENCES

1. Alexander, I. J., Sinurat, H., Nainggolan, J. R., & Sirait, G. (**2024**). Edukasi Permasalahan Hoaks dan Cyberbulling Pada Remaja Gereja Pentakosta Indonesia (GPI) Sidang Paya Kapar Kota Tebingtinggi. Jurnal Pengabdian kepada Masyarakat Nusantara, *5*(2), 2379-2383.
2. Pamungkas, A. S., Hanifarianty, S., & Pranata, D. E. (**2022**). Kajian variasi komposisi perekat terhadap karakterisasi biobriket kayu karet. Jurnal Penelitian Karet, 107-116.
3. Ningsih, A., & Hajar, I. **(2019**,). Analisis kualitas briket arang tempurung kelapa dengan bahan perekat tepung kanji dan tepung sagu sebagai bahan bakar alternatif. In *Seminar Nasional Industri dan Teknologi* (pp. 60-69).
4. Afra, E., Abyaz, A., & Saraeyan, A. (**2021**). The production of bagasse biofuel briquettes and the evaluation of natural binders (LNFC, NFC, and lignin) effects on their technical parameters. Journal of Cleaner Production, 278, 123543.
5. Sirait, G., Alexander, I. J., & Silaban, R. (**2023**). Analysis of the Utilization of Hydroponic Media in Welsh Onion Cultivation (Allium fistulosum L.). Al-Hayat: Journal of Biology and Applied Biology, 6(2), 147-157.
6. Kaur, A., Kumar, A., Singh, P., & Kundu, K. (**2017**). Production, analysis and optimization of low cost briquettes from biomass residues. Advances in Research, 12(4), 1-10.
7. Setyono, M. Y. P., & Purnomo, Y. S. (**2022**). Analisis Kadar Air dan Kadar Abu Briket Lumpur IPAL dan Fly Ash dengan Penambahan Serbuk Gergaji Kayu. INSOLOGI: Jurnal Sains dan Teknologi, 1(6), 696-703.
8. Brando, M., Rojaki, M., & Nurjanah, N. (**2024**). Pemanfaatan Limbah Bekas Litter Yang Dikombinasikan Dengan Batubara Dalam Pembuatan Briket Sebagai Alternatif Pemanas Ayam Broiler. Jurnal Media Akademik (JMA), 2(1).
9. Putri, F. E., Mawardi, R. H., Darmawan, M. F., & Kurniawan, M. F. (**2022**). Biobriket Limbah Kulit Singkong (Manihot Esculenta), Inovasi Sumber Energi Alternatif Di Wonogiri: Biobricket Of Cassava Peel Waste (Manihot Esculenta), Innovation Of Alternative Energy Sources In Wonogiri. Jurnal Jaringan Penelitian Pengembangan Penerapan Inovasi Pendidikan (Jarlitbang), 113-122.
10. Harahap, N. S., & Jumiati, E. (**2023**). Analisis sifat fisika dan kimia terhadap pembuatan briket arang limbah biji salak dengan variasi perekat tepung tapioka dan tepung sagu. Jurnal Fisika Unand, 12(1), 116-124.
11. Muhlis, A. M., Sahara, S., & Fuadi, N. (**2019**). Uji Kualitas Biobriket Campuran Tempurung Kelapa, Tongkol Jagung, dan Sekam Padi Dengan Tepung Sagu Sebagai Perakat. JFT: Jurnal Fisika dan Terapannya, 6(1), 80-88.

e-ISSN : 2622-4968, p-ISSN : 2622-1349