



Effectiveness Test and Comparison Effect of Oyster Mushroom Baglog Waste Composition (*Pleurotus Ostreatus*) into Alternative Energy for Charcoal Briquettes

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Abstract. Briquettes are one of the alternative energies in the form of solid fuel consisting of powders of small pieces that are compacted and mixed with adhesive materials so that they become a solid form. This study aims to produce briquettes and look for the effectiveness and influence of the composition comparison between mixing oyster mushroom baglog waste, coconut shells and molasses then comparing with SNI 01-6235-2000 to obtain good briquette quality so that it can be used as an alternative fuel.

This research was broadly carried out starting from the authoring with the pyrolysis method, packaging and testing the effectiveness based on the burning rate, the influence of charcoal composition and the quality of briquettes. The variables in this study were the most optimal composition of molasses with levels of 10%, 15%, and 20%. After obtaining the most optimal composition, it is continued to compare the composition of the raw material mixture with the composition of B30 + T70, B40 + T60, B50 + T50, B60 + T40, B70 + T30 and B80 + T20.

From the results of the study, it was concluded that briquettes with a mixture of baglog waste charcoal and coconut shell charcoal have a significant and noticeable influence on ash content and calorific value, do not have a significant effect on water content, volatile matter and combustion rate due to other factors. For a large degree of effectiveness obtained in the ratio of the composition of B30 + T70 of 0.8840 g/min. And the quality of briquettes based on these four parameters still does not meet SNI 01-6235-2000.

Keywords: Oyster · Mushroom · Waste · Alternative · Charcoal

1 Introduction

Gunungkidul Regency is one of the counties that is in the Province of the Special Region Yogyakarta with a large area 1,485.36 km² divided into 18 district. Gunungkidul Regency known as a city of tourism, industry, trade and service centers. With being a city of tourism, industry, centers Trade and Services District Gunungkidul certainly has a lot

of good home-level businesses up to the level of large industries wrong the only is a trading venture oyster mushrooms in Bleberan Village Gunungkidul. Oyster mushroom business in the village this bleberan has established cooperation with Saemaul Undong South Korea since 2016. This oyster mushroom business has become one of the eyes the main livelihood in Bleberan Village. Products from these mushrooms have been sold in Markets like Indomaret in the form of mushroom chips and for raw mushrooms sold in local markets. Kalurahan Bleberan, Kapanewon Playen Gunungkidul Regency has 48 scattered mushroom cultivation groups in 11 padukuhan with one cultivation 500–2500 baglogs. In one groups of 2–5 people who manage from seeding to cultivation of oyster mushrooms.

Baglog is a growing medium mushrooms as a place substrate the growth of mushrooms. By some literature that the composition of mushroom growing medium or frequent called Baglog consists of several mixing between sawdust 80% with 10% bran, lime, cast 1.8% and 0.4% more solids [5]. Mushroom baglog those that are no longer used will be disposed of thus causing waste. Waste oyster mushroom growing medium is material derived from mushroom growing media oysters after harvesting. The composition of waste it has nutritional content such as P 0.7%, K 0.02%, N total 0.6% and C-organic 49.00%, so useful for improving soil fertility [3].

The main problem that faced by residents from Bleberan Village no use of baglogs which is no longer used. Based on observations in the field some residents only accommodate the baglog waste around his house was then afterwards burned down if it feels like it's been quite a lot or accumulates so that it can damage environment. According to the results of the interview with the Secretary of Bleberan Village, that bleberan village has 48 a group of mushroom cultivations that each have a oyster mushroom growing house, with in each oyster mushroom growing house cultivates oyster mushrooms around 500–1000 baglogs with a service life of 4 months. When it has reached its service life then the baglog will be waste, if in 1 oyster mushroom growing house only can produce 500 baglog waste–1000, then if taken the middle value baglog usage of 750×48 Oyster mushroom growing house produces 36,000 baglog waste in Bleberan Village. For baglog waste in Bleberan Village is not collected into one place only, however scattered in each house who owns a farming business oyster mushrooms.

Because in the baglog there is organic matter named Miselia, which can make baglogs rot and releases Methane gas (CH_4) into the air. Free release of Methane gas can pollute the air [2]. Baglog rots when discarded indiscriminate, potentially becoming nesting of pests and diseases. Certainly alone can damage the seedling process and the growth of white oyster mushrooms, can attack agricultural crops others, or may even interfere livestock and human health. Besides that, pile up rotten baglog waste can damage the beauty of the environment. If you look closely, that baglog is capable of releases methane gas, meaning in chemical baglog waste still has energy content due to the presence of the content of such organic matter. Thus, when processed chemical and precise composition will be can be converted as an energy source alternatives that have economic value the higher one of them making Charcoal Briquettes [8].

Charcoal briquettes are a form of renewable energy from biomass of plant or plant origin which is currently very much available in environment. Scraping is wrong one

compaction technology where a material is subjected to pressure certain to form a product that has a higher density, so lower water content, as well as size the uniform and properties- properties of the material. Treatment of baglog waste into charcoal briquettes are a development the right business sector. Baglog waste it is processed in such a way so that it can be used and utilized as an energy source Alternatives to domestic use or industries that are able to updated. Briquettes will yield three benefits, including: (1) eliminates potential pollution environment and air, (2) being a material burn for sterilization of baglog media grow white oyster mushrooms, (3) valuable high economy because it sells well as a substitute for fuel oil and gas or can be used for groups in the replacement of materials burn oil and gas to manage processed food products [8]. Determination quality of briquettes with reference SNI 01-6235-2000 performed against parameters such as moisture content, ash content, volatile matter, bound carbon content as well as calorific value. Baglog waste utilization be fuel of course brings high economic value, based on previous research on the value of highest heat to aim at carbonization treatment of chimneys with value $4280.72 \text{ cal/g cm}^2$ [6]. Briquettes will get more and more either the quality is indicated by the higher the calorific value, then from the need for mixing other materials to increase its calorific value. In this study, researchers using coconut shell as a blending ingredient for increases the calorific value, as such as which is known that the coconut shell have good abilities in binding heat with returns a calorific value of up to $7,486 \text{ kal/g}$ [1]. Due to the shape of the charcoal briquettes have a selling point that higher, then expected will make greater contributions in economic growth in Kalurahan Bleberan, Kapanewon Playen, Gunungkidul Regency. With noting the prospects of charcoal briquettes a fairly bright one of economic value which is quite high, then it is very necessary conducted research on utilization of baglog waste into briquettes as an alternative energy substitute fuel oil and gas.

2 Experimental

This research is a study experimentally conducted in laboratory scale where in this research researchers look for influence from the comparison of charcoal composition baglog waste, coconut shell charcoal and adhesive using molasses with quality briquettes and test The effectiveness of briquettes in the rate of combustion briquettes as well as comparing qualities briquettes in accordance with SNI 01-6235-2000 (moisture content, ash content, mass density, and heat value).

The process of making briquettes is the same with a process in general, namely:

1. An already unproductive baglog again selected, then dried in the sun under the sun first used to make the process easier burning for 5 days
2. Baglog that has dried later put in the furnace combustion, in this process researchers using the process slow pyrolysis with a temperature of $400 \text{ }^\circ\text{C}$ for approximately 6–8 hours
3. Combustion by working the same to make coconut shell as charcoal, however with burning time which is shorter for less more 2–3 hours
4. Ginding up to obtained small particles by manual with pounding later filtered by pass size 60 mesh

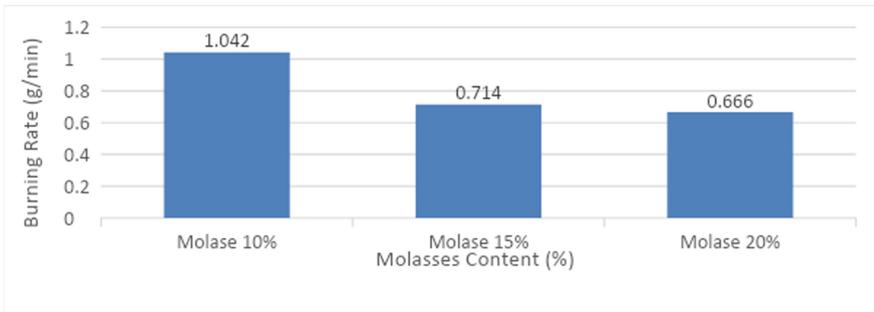


Fig. 1. Effect of Molasses Variations on Combustion Rate

- Next is done baglog charcoal powder mixing, coconut shell charcoal powder and molasses adhesive with through two The stage is to find molasses levels the most optimal with the composition then continued By composition comparison baglog charcoal and shell charcoal coconut.
- Charcoal briquettes that have been donated then printed in cylindrical shape and pressed to a solid state
- Charcoal briquettes drying is carried out that has been printed with drying in the sun for 2–3 days.

3 Results and Discussion

3.1 Optimum Molasses Composition

Analyzing the burning rate done to be able to know the effectiveness of a fuel like charcoal briquettes where this burning rate is also very useful to know worth it or not a briquette for used as fuel.

As for based on Fig. 1, the rate the highest burning is found in sample 1 with 10% molasses i.e. of 1,042 g/min while for the lowest burning rate found in sample 3 with 20% molasses of 0.666 g/min. This can be caused by higher adhesive content or molasses in binding briquettes then the higher the density which is generated so that reduce the porosity of briquettes. Due to his ability to powder binding particles increasingly strong. Thus resulting in on the pores of briquettes are not bypassed or given space for oxygen can quickly propagate the heat and the fire. Then the thing of it can also be caused by high water content found in briquettes ranging from water content caused by adhesive or less length of time drying briquettes charcoal so that it causes also heat propagation is getting slower and slower. And can be affected by the shape briquettes where the cylindrical briquettes form full in the absence of cavities causes the density to get more and more large and increasingly oxygen flow narrow.

3.2 Water Content Test Results

The moisture content is the value of the percentage of water content that contained in an object or material. These levels can be expressed on the basis of wet weight and

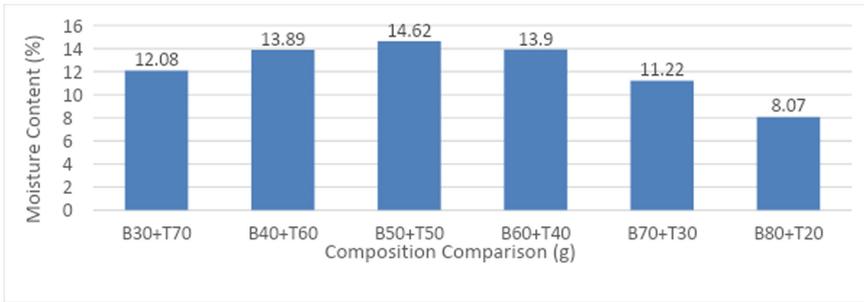


Fig. 2. Effect of Composition Comparison on Water Content

heavy weight dry. Parameters of moisture content inside doing charcoal scraping very influential on quality of briquettes produced.

Figure 2 shows that the lowest moisture content value generated by a sample with B80 + T20 ratio of 8% where the result has been meets SNI quality standards of 8% then for the highest water content generated by a sample with B50 + T50 comparison i.e. 14,62%. In the results of this study shows the average of composition comparison is not meets SNI standards of 8%

This can be caused by lack of drying time of briquettes wet after printing due to the longer the drying done then the more reduced moisture content, then other things that can cause high moisture content, namely adhesive used contains levels high water also so that effect on the quality of briquettes. The mesh size used also has an effect to the ability of charcoal in absorbs moisture content, the finer the mesh size used then ability to absorb levels the water is getting bigger. Although the value of test rate of each the composition has a variety that different, if noticed that the value of moisture content is decreasing If the composition of the baglog waste getting bigger and bigger. In accordance with research [9] the states that the moisture content is deep a very charcoal briefing. Affects quality briquettes produced where if the smaller the moisture content value on briquettes, the quality of briquettes is getting more good. This is because if the value the higher the water content, the more it can be inhibits the ignition of briquettes.

3.3 Ash Content Test Results

Ash is one of the remaining part of the result combustion that is no longer has a calorific value or element carbon again. One of the elements constituents on the ash are silicates which is where the presence of ashes effect on calorific value to be generated [11].

Figure 3 shows that the lowest ash content value generated by a sample with B70+T30 ratio of 28.5% then for the highest ash content generated by a sample with the ratio of B30+T70 is 50%. In the results of this study show comparison the composition does not meet the standards SNI is 8%.

It is affected by time drying on briquettes where the higher the water content then also affects the level of sisated ash. In accordance with research [4] states that in addition to of inorganic element factors on composition of the constituent ingredients of briquettes, the size of the ash content is also affected by drying temperature from briquettes. Where,

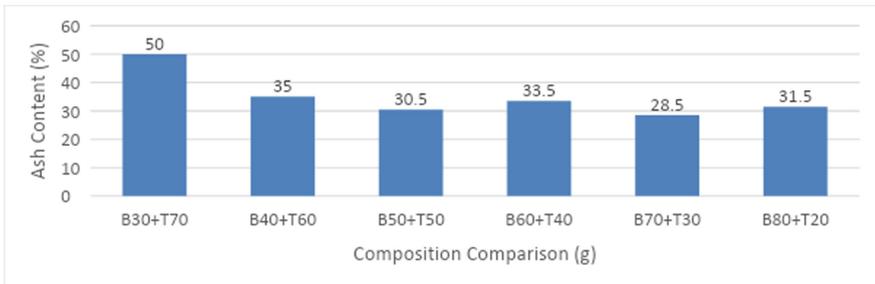


Fig. 3. Effect of Composition Comparison on Ash Content

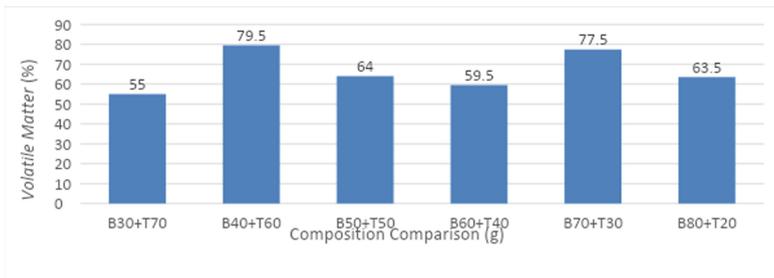


Fig. 4. Effect of Composition Comparison on Volatile Matter

if the temperature the higher the ash content the resulting will decrease further as this relates to moisture content in briquettes where the higher the moisture content then the higher the ash content generated.

3.4 Volatile Matter Test Results

Volatile matter is part of from briquettes where will change become volatile matter (product) when such briquettes are heated without oxygen at a temperature of approximately 950 °C.

Figure 4 shows that the lowest volatile matter value generated by a sample with B30 + T70 ratio of 55% then for the highest ash content generated by a sample with B40 + T60 comparison i.e. 79,5%. In the results of this study show comparison the composition does not meet the standards SNI is 15%.

Volatile matter content very instrumental in determine the nature of combustion. More volatile content matter then the easier it will be for burning raw materials and ignites, so the rate of combustion the faster. Volatile content high matter has some of the advantages include, over-ignition and combustion easy but has the weakness is the carbon content tied low.

3.5 Calorific Value Test Results

The calorific value is one of the key parameters in the test the quality of charcoal briquettes due to the calorific value is decisive quality of charcoal briquettes. If the value

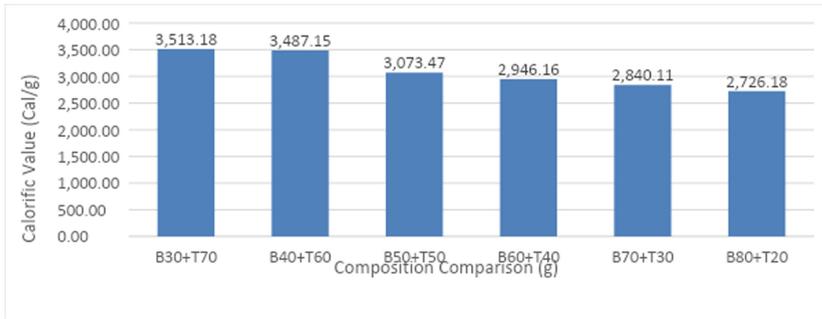


Fig. 5. Effect of Composition Comparison on Calorific Value

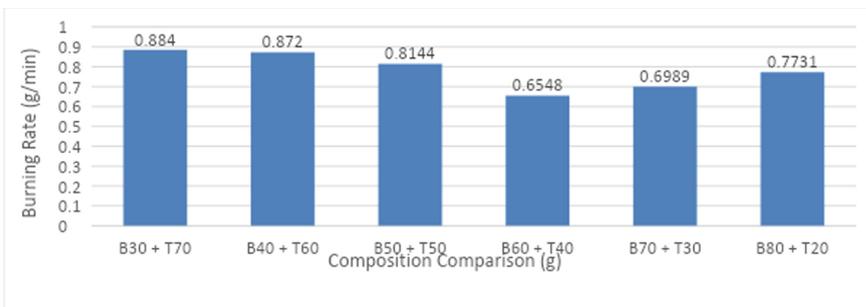


Fig. 6. Combustion Rate based on Composition Comparison

heat on charcoal briquettes is getting more and more high then the quality of charcoal briquettes pun also the better because ability to move and generates heat that getting bigger so that the briquettes are viable to be an alternative fuel [7].

Figure 5 shows that the highest calorific value samples by comparison B30 + T70 which is 3,513.18 Cal/g while calorific value lowest found in the sample with a ratio of B80 + T20 2,726.18 Cal/g.

By composition which is different if noticed on chart, addition of raw materials coconut shell charcoal is enough effect on the increase calorific value, the higher the composition coconut shell charcoal given the higher the value resulting heat. This happens because of the presence of oxygen and nitrogen content high briquettes on the shell coconut which can be causes the combustion process in coconut shell briquettes more easy as well as if more and more oxygen and nitrogen content then the faster the process burning takes place [10].

3.6 Effectiveness of the Combustion Rate

Analyzing the burning rate done to be able to know the effectiveness of a fuel like charcoal briquettes where this burning rate is also very useful to know worth it or not a briquette for used as fuel.

As for based on Fig. 6, the rate the highest burning is found in sample by comparison B30 + T70 which is 0.8840 g/min while for rate lowest burning is found on samples by comparison B60 + T40 which is 0.6548 g/min.

This can be caused by high water content found in briquettes ranging from water content caused by adhesive or less length of time drying briquettes charcoal so that it causes also heat propagation is getting slower and slower. And can be affected by the shape briquettes where the cylindrical briquettes form full in the absence of cavities causes the density to get more and more large so that the porosity of the briquettes getting smaller and the flow of oxygen getting narrower. The faster the pace the resulting combustion then the greater the degree of effectiveness of a fuel, then comparison of composition with the best effectiveness is B30 + T70 ratio to rate burning by 0.8840 g/min. This research is a study experimentally conducted in laboratory scale where in This research researchers look for influence from the comparison of charcoal composition baglog waste, coconut shell charcoal and adhesive using molasses with quality briquettes and test the effectiveness of briquettes in the rate of combustion briquettes as well.

4 Conclusion

Based on the results of the study can It is concluded that:

1. Effect of composition comparison the specified relates to very significant and noticeable on ash content and calorific value. With the higher the composition of charcoal coconut shell will then increases calorific value and also ash content. Then a comparison the specified composition is not relate significantly against moisture content, volatile matter and also the rate of combustion, this can be caused by the presence of other factors outside of giving charcoal composition like time less long drying so that the moisture content contained still quite high, the adhesive used contains moisture content the high, mass density and compressive strength from briquettes.
2. Fuel effectiveness rate shown faster and faster the rate of combustion then the more high effectiveness of the fuel is based on results research shows that the rate of the highest burning is found in sample by comparison B30 + T70 which is 0.8840 g/min.
3. Based on the results of the study by using comparison of compositions that have been specified, moisture content parameters, ash content, volatile matter, and value calor quality charcoal briquettes still has not met the quality of briquettes based on SNI 01-6235-2000. But on the moisture content with composition comparison B70 + T30 and B80 + T20 is almost close to SNI with levels the maximum is 8%. On the value of the grade ash and volatile matter still very far from the quality of briquettes based on SNI. And on the value of Heat has exceeded 60% close to quality based on SNI.

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