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Characteristics Flavored Briquettes from Waste Wood Treatment Industry Woloan Houses on Stilts In Tomohon Indonesia

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Abstract: *Characteristics flavored briquettes from waste wood treatment industry Woloan houses on stilts in Tomohon Indonesia has been investigated. This study aims to determine the nature of therapeutic scented charcoal briquettes from waste wood and iron wood houses on stilts on the industry mix in Tomohon Woloan that have been through the process of authoring. Experimental method used was CRD factorial, while properties such as charcoal briquettes physical properties (density) and chemical properties (moisture content, ash content, volatile matter content, carbon content and calorific value bound) used a model approach LSD. Briquette-making process that is by using a compression clamp tool manual hydraulic capacity of 10,000 kg/cm^2. Treatment of waste composition between wood charcoal iron and wood mix is 40:60 (A1), 50:50 (A2), 60:40 (A3), each treated charcoal composition cinnamon extract 2% (B1), 3% (B2), 4% (B3) and was not given the extract (B0) as a control variable. The results showed that the charcoal briquettes have a density from 0.52 to 0.56 g/cm^3, water content ranged from 1.54 to 5.57%, from 5.25 to 6.32% ash content, volatile matter content of 8.89-9.96%, 83.74 to 85.77% bonded carbon content and calorific value ranges between 5,440,67-5,650,67 cal/g. Briquettes best based on the results of the LSD treatment of waste composition 60% charcoal and 40% iron wood charcoal wood waste mix with the addition of cinnamon extract 4%.*
Key words*: Briquettes, wood waste, cinnamon, industrial houses on stilts*

I. Introduction

Waste is the residue of a business and/or activity (Basic Law of the Environment No.23, 1997). Left over wood pieces in various shapes and sizes that had to be sacrificed in the production process because it cannot produce the product (output) of high value in terms of the economy with a certain level of treatment technology is waste wood (Bahri, 2007). The waste wood is wood waste or wood parts that are considered more economic value in a particular process, at certain times and certain places that may still be used in the process and at different times (Riadi, 2013).

Waste wood has not been fully exploited, while wood waste biomass with a relatively high calorific value. If waste wood charcoal formed at pyrolysis then mixed with an adhesive glue from starch, it will be the briquettes as an alternative fuel that is renewable. Potential waste wood processing industry based on the comparison of output and inputs as well as referring to the research Center for Research and Development of Forest Bogor showed that industrial waste plywood can reach 60%, while the sawmill industry waste could reach 50.2% of the raw materials processed (Department of Forestry, 1990).

Home industry Woloan stage in Tomohon in North Sulawesi is not optimally utilize industrial waste wood houses on stilts, a tendency even just burned or thrown away. It resulted in the accumulation of waste processed forest products are expected to have economic value if used to produce other products, such as charcoal briquettes. Activated charcoal briquette charcoal is the result of the carbonization process at a certain temperature which solidified after going through the process of pulverization into charcoal powder, mixing adhesives, and printing (Pari, 2002). The raw materials used for the manufacture of charcoal briquettes or wood charcoal generally is sawdust obtained from sawmill waste or other waste timber (Embun daun, 2008; Hartoyo dan Roliadi, 1978).

Processing of wood waste into alternative fuels industry requires a process of authoring and treatments such as extract of cinnamon scented therapy into fuel. Aroma therapy is a type of alternative medicine that uses plant materials volatile liquids, namely essential oils and other aromatic compounds from plants, aiming to

influence a person's mood or health, reduce stress, calm the mind and awaken the spirit and passion, and some have to clean up toxins in the body (http://id.wikipedia.org/wiki/Aromaterapi). One therapy material containing aroma is cinnamon. Cinnamon (Cinnamomumverum, Synonym C.zeylanicum) is a kind of spice trees are aromatic, sweet, and spicy; usually used in sweet baked food, hot wine. Cinnamon is used as a spice in food, supplement ingredients (mixed with honey) for a variety of diseases, such as for the treatment of inflammatory diseases of the joints, skin, heart. This plant is widely used for adding flavor of a dish and add the aroma of food (http://agrobiosolution.blogspot.com/2010/02/ cinnamomum-verum-kayu-manis.html). The content contained in cinnamon is cinnamaldehyde, eugenol, trans-cinnamic acid; phenol group; tannins; catechins; oligomericproanthocyanidins; limonene and alpha-terpineol; pinene; monoterpenoid calcium oxalates; gum; mucilages; resins; starch; complex sugars. Coumarin in very small quantities can also be found. Minerals present in cinnamon include calcium, magnisium, iron, potassium, sodium, chromium (cr), selenium, copper (Cu), and zing (Zn). Even in small amounts, cinnamon also contains vitamin A, riboflavin (B2), niacin (B3), and vitamin K. The content of cinnamaldehyde is what gives a distinctive flavor and aroma of the cinnamon. Besides being used as a spice for cooking, it turns cinnamon has many health benefits. Cinnamon oil is obtained from the bark and leaves of the cinnamon tree. Cinnamon oil has no application in aromatherapy, but not as popular as other essential oils such as pine essential oil, basil essential oil, essential oils of rosemary and lavender essential oils. Cinnamon essential oil obtained from skin, twigs, and leaves, by means of distillation. The content of essential oils in cinnamon bark from 1.3 to 2.7 percent. Meanwhile, oleoresin obtained by extraction using organic solvents particular (Ma'mun , 2010).

Investigation of the nature of such therapies flavored charcoal briquettes physical properties (density) and chemical properties (moisture content, ash content, volatile matter content, carbon content bound, and calorific value) are made of iron and wood waste material timber with a mixture of cinnamon extract on stilts industry WoloanTomohon in North Sulawesi, Indonesia needs to be done.

II. Research Methods

Making do with burning charcoal briquettes indirectly, use small drums and cans are modified with the size of each diameter of 47 cm with a height of 37 cm and a diameter of 25 cm with a height of 15 cm. Sawdust put into cans, then sealed and a hole in the lid for evaporation. Cans containing sawdust put into the given buffer drum bottom as high as 8 cm for heat circulation then filled with fuel-coconut shell or other wood residues. Research process to obtain charcoal briquettes can be seen in Figure 1.

Figure 2 shows the waste treatment process wood into charcoal briquettes. Fuel burned and the fire is lit with a steady left and left until about 1-2 hours for the pyrolysis process. After sufficient time for the pyrolysis process, which is still in the tin charcoal cooled. This procedure is done for each type of raw material that is a mixture of iron and wood waste. Charcoal wood milled in a milling machine (Grinder driven by electro motor capacity of 1.5 hp 2,000 rpm watt to 2,400) to form a powder and then sieved using a 60 mesh sieve. This procedure is done separately for iron and wood charcoal mixture. Cinnamon extraction is done through the following stages, cinnamon dried in an oven and then crushed using a grinder and sieved using a 60 mesh sieve. Sifting weighed 50 grams then put into 500-ml Erlenmeyer then added with 95 % ethanol into a flask containing powdered cinnamon 250 ml (ratio 1:5) and sealed using aluminum foil. Enter the Erlenmeyer flask into the water bath at a temperature of 50 ° C for 3 hours. After enough time, the extract was filtered using What man filter paper No. 1 filter paper. And the results obtained were separated using a solvent with a rotary evaporator Heidolph until the solvent runs. Extracted and stored in a sealed container. Cinnamon extract used at a concentration of 2%, 3%, and 4% of the dry weight of charcoal. Mixing cinnamon extract made by dissolving into water used for tapioca prior to each treatment. While the adhesive used is tapioca flour first made into starch, ie by mixing with water and heating it up into starch. The amount of starch is 5% of the dry weight of charcoal (about 300 grams) per batter. Furthermore, starch is mixed with charcoal powder until the dough is evenly distributed. The dough is put into the mold tool (made of steel pipe with a diameter of 5 cm and 10 cm high), then compressed using a hydraulic clamp manual (hydraulic jack) with a capacity of 10 tons or 10,000 kg/cm^2 which is equipped with a buffer made of iron thickness of 1 cm and 60 cm high. Furthermore, charcoal briquettes that are still wet dried in an oven at a temperature of 105^0C for 12 hours.

Quality tested briquettes include physical properties such as density and chemical water content, ash content, volatile matter content, carbon content bound (American Society For Testing And Materials, 1959) and calorific value (American Society For Testing And Materials, 1984). Type of raw material used is waste/sawdust iron (I) and waste/sawdust mixture (II). Treatment of raw material composition is as follows (A) : A1 = 40% charcoal raw material (I) and 60% charcoal raw material (II), A2 = 50% charcoal raw material (I) and 50 % charcoal raw material (II), and A3 = 60% charcoal raw material (I) and 40% charcoal raw material (II). For each treatment composition charcoal given cinnamon extract (B) at a concentration of 2% = B1 , B2 = 3% , B3 = 4% of the dry weight of the raw materials and B0 that cinnamon extract without treatment as a control variable composition of each treatment charcoal timber. Each treatment was repeated three times, so there are 36

combinations of treatments. The study design used was Completely Randomized Design (CRD) with Factorial Experiment (Factorial).

Mixing process for wood charcoal composition A1 which weighed 300 g 40% of waste wood charcoal iron (I) and 60% of the 300 g of waste wood charcoal mixture (II) and then mixed thoroughly, and put cinnamon extract solution (2%) of the dry weight starch sample plus 5% of the dry weight of sample (300 g), then the solution is heated above konfor to form starch, enter charcoal that has been mixed earlier (I + II) and mixed thoroughly to form a dough and ready to be molded into briquettes. This applies equally to each treatment and replications. Date analysis was performed by ANOVA RAL Model, Model LSD test (Steel and Torrie, 1995).

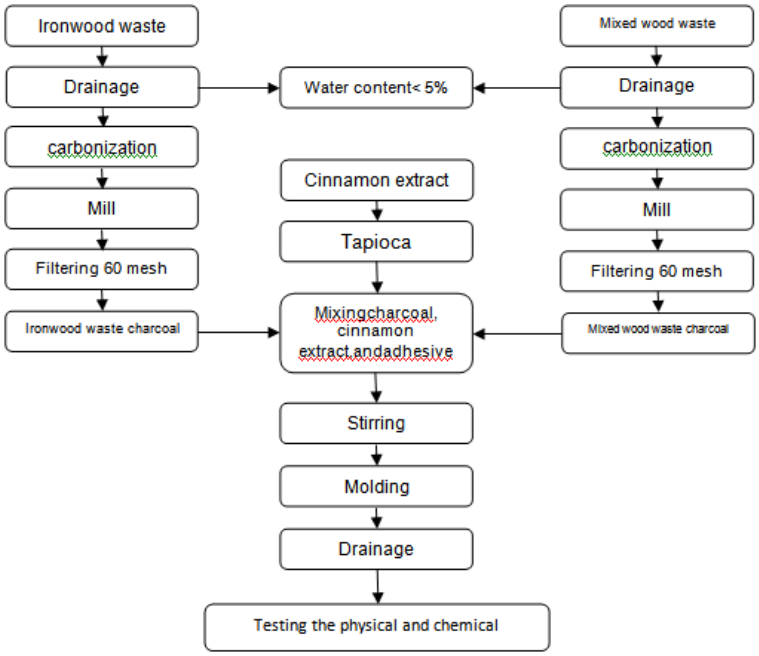

Figure 1. Research scheme

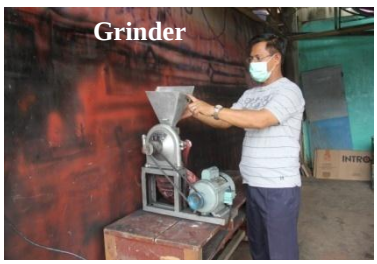

Figure 2.The process of making charcoal briquettes

III. Results And Discussion

1 . Charcoal Briquette density

Results of analysis of variance showed density values ranged from 0:52 to 0:56 (Table 1). Treatment of waste wood and charcoal composition of cinnamon extract significant effect on alpha (significance level 5%). The LSD showed the highest density values obtained from the treatment of waste charcoal composition of 60% iron and 40% wood charcoal wood waste mixture and cinnamon extract additional 4%.

Table 1 shows that the composition of charcoal treatment and the best cinnamon extract that is the composition of the waste wood charcoal 60% iron and 40% waste wood charcoal mixture with the addition of 4% on levels of density briquettes produced is 0.56 gr/cm^3. Lowest density value of 0.52 gr/cm^3 treatment composition contained in the charcoal iron wood waste : waste wood charcoal mixture (50% : 50%) by treatment with cinnamon extract 4%, while the highest density value of 0.56 gr/cm^3 contained in treatment of waste wood charcoal iron composition : wood waste charcoal mixture (60% : 40%) with treatment of cinnamon extract 4%. Between the treatment of waste wood charcoal and cinnamon extract had a significant effect on the alpha (5% level). The bond between the wood waste charcoal becomes more compact and robust so as to increase the density briquettes. This is in line with what is proposed Masturin (2005) which states that the size of the sawdust tends to be more smooth and uniform bonding between the particles resulting ashes are maximal.

2 . Water levels Charcoal Briquettes

Results of analysis of variance showed water content ranged from 1.54 to 5.57 (Table 1). Treatment of waste wood and charcoal composition of cinnamon extract significant effect on alpha (significance level 5%). The LSD showed the highest water content values obtained from wood charcoal treatment composition 60% charcoal iron wood waste and wood waste 40% charcoal mix and cinnamon extract additional 4%.

Moisture content briquettes effect on calorific value. the smaller the value the better the water content of calorific value. Charcoal briquettes have high hygroscopic, so the calculation aims to determine the water content of the hygroscopic properties of charcoal briquettes research results. Lowest water content of 1.54% in the treatment composition contained charcoal iron wood waste : waste wood charcoal mixture (60% : 40%) without the addition of cinnamon extract, while the highest value of 5.57% water content present in the composition of charcoal waste treatment iron wood : wood waste charcoal mixture (60% : 40%) with the addition of cinnamon extract 4%. The occurrence of significant differences due to the number of pores in the briquettes are still quite a lot and is able to absorb water. This is in line with the statement Triono (2009) the high moisture content in wood dust caused by the amount of wood dust has pores more, and also contains chemical components such as cellulose, lignin and hemicellulose.

3 . Charcoal Briquette Abu levels

Results of analysis of variance showed ash content values ranged from 5.25 to 6.32 (Table 1). Treatment of waste wood and charcoal composition of cinnamon extract had no significant effect on alpha (significance level 5%). The LSD showed the highest ash content values obtained from the treatment of waste charcoal composition of 40% iron and 60% wood charcoal wood waste mixture and cinnamon extract additional 4%.

Ash is the remaining part of the result in this case is the burning of combustion of charcoal briquettes. One of the constituent elements of the ash is silica. Its influence is less well against the calorific value of charcoal produced. High ash content can lower heating value of charcoal so that the quality of the charcoal briquettes decreased (Masturin, 2005). Value of the lowest ash content of 5.25% in the treatment composition contained charcoal iron wood waste : waste wood charcoal mixture (60% : 40%) with the addition of cinnamon extract 4%, while the highest value of 6.32% ash content present in the composition of the treatment charcoal iron wood waste : waste wood charcoal mixture (40% : 60%) with the addition of cinnamon extract 4%. The higher composition of waste wood charcoal iron and the addition of cinnamon extract the lower the ash content of charcoal produced .

4 . Levels of volatile substance

Results of analysis of variance showed the value of volatile substances ranged from 8.89 to 9.96 (Table 1). Treatment of waste wood and charcoal composition of cinnamon extract had no significant effect on alpha (significance level 5%). The LSD showed the highest values of volatile substances obtained from the composition of the treatment of waste wood charcoal 40% iron and 60% charcoal with a mixture of wood waste without the addition of cinnamon extract. Levels of volatile substances are substances (volatile matter) that can evaporate as a result of decomposition of the compounds that are still present in the water in addition to charcoal. According to Henderson (2007) high and low levels of volatile substances produced charcoal briquettes are influenced by the type of raw material, so that different types of raw materials significantly affect the levels of volatile substances charcoal briquettes. Value of the lowest levels of volatile substances of 8.89 % in the treatment composition contained charcoal iron wood waste : waste wood charcoal mixture (60% : 40%) with the addition of cinnamon extract 3%, while the value of the highest levels of volatile substances 9.96 % treatment composition contained in the charcoal iron wood waste : waste wood charcoal mixture (40% : 60%) without the addition of cinnamon extract. According Triono (2009) high and low levels of volatile substances on charcoal briquettes thought to be caused by the perfection of the carbonization process and also influenced by time and temperature on the authoring process.

5. Carbon Levels Tied

Results of analysis of variance showed values ranging between bonded carbon from 83.74 to 85.77 (Table 1). Treatment of waste wood and charcoal composition of cinnamon extract had no significant effect on alpha (significance level 5%). The LSD showed the highest value obtained from the bonded carbon composition of 40% charcoal treated wood waste and 60% charcoal iron wood waste mixture and cinnamon extract additional 3%.

Levels of bound carbon (fixed carbon) is the fraction of carbon (C) bound in charcoal in addition to the fraction of water, volatile substances, and ash content. The existence of bonded carbon in the charcoal briquettes are influenced by the value of ash content and volatile matter content. Levels would be valuable if the ash content and volatile matter content of the charcoal briquettes low. Carbon bound to affect the calorific value of charcoal fuel. High calorific value of briquettes will be high if the value of the bound carbon. The higher levels of carbon bonded to the wood charcoal charcoalcharcoal is good (Abidin, 1973 in Masturin, 2005). Value of the lowest carbon content of 83.74% bound contained in the composition of the treatment of waste iron wood charcoal: charcoal wood waste mixture (40%: 60%) with the addition of cinnamon extract 4%, while the highest levels of bound carbon contained 85.77% in treatment composition of waste iron wood charcoal: charcoal wood waste mixture (40%: 60%) with the addition of cinnamon extract 3%.

6. Calor Value

The result of variant analysis showed calor value ranging from 5440.67 to 5650.67 (Table 1). It showed that the treatment of the composition of wood waste charcoal and cinnamon extract had significant effect on alpha (5% significance level). BNT test result showed the highest calor value obtained from the treatment of the composition of 60% ironwood waste charcoal + 40% mixed wood waste charcoal and 4% cinnamon extract.

Table 1. Average Value and BNT Test Result

Composition of Wood Waste Charcoal (A)	Cinnamon Extract (B)	Average					
		Density (gr/cm^3)	water Content (%)	Ash Content (%)	Volatile Matter Content (%)	Fixed Carbon Content (%)	Calor Value (cal/gr)
A1	B0	$0,55^{b}$	$1,64^{a}$	$5,51^{a}$	$9,96^{a}$	$84,52^{a}$	$5440,67^{a}$
	B1	$0,53^{a}$	$2,80^{b}$	$5,65^{a}$	$9,06^{a}$	$85,29^{a}$	$5530,33^{ab}$
	B2	$0,54^{a}$	$4,65^{cd}$	$5,30^{a}$	$8,92^{a}$	$85,77^{a}$	$5593,00^{ab}$
	B3	$0,53^{a}$	$4,94^{d}$	$6,32^{a}$	$9,94^{a}$	$83,74^{a}$	$5584,67^{ab}$
A2	B0	$0,55^{b}$	$1,84^{a}$	$5,69^{a}$	$9,47^{a}$	$84,84^{a}$	$5472,00^{ab}$
	B1	$0,54^{a}$	$2,95^{b}$	$5,75^{a}$	$9,85^{a}$	$84,40^{a}$	$5560,67^{ab}$
	B2	$0,53^{a}$	$4,24^{c}$	$5,69^{a}$	$9,76^{a}$	$84,54^{a}$	$5580,33^{ab}$
	B3	$0,52^{a}$	$4,30^{c}$	$6,03^{a}$	$9,88^{a}$	$84,09^{a}$	$5620,67^{ab}$
A3	B0	$0,53^{a}$	$1,54^{a}$	$5,59^{a}$	$9,81^{a}$	$84,60^{a}$	$5538,00^{ab}$
	B1	$0,54^{a}$	$2,73^{b}$	$6,18^{a}$	$9,91^{a}$	$83,91^{a}$	$5617,00^{ab}$
	B2	$0,52^{a}$	$4,39^{c}$	$5,96^{a}$	$8,89^{a}$	$85,15^{a}$	$5582,33^{ab}$
	B3	$0,56^{b}$	$5,57^{e}$	$5,25^{a}$	$9,66^{a}$	$85,09^{a}$	$5650,67^{b}$

IV. Conclusion

Characteristics flavored briquettes from waste wood treatment industry Woloan houses on stilts in Tomohon Indonesia can be concluded that the charcoal briquettes produced have the properties of density from 0.52 to 0.56 g/cm^3, water content ranged from 1.54 to 5.57%, ash content 5.25 to 6.32%, volatile matter content of 8.89 to 9.96%, from 83.74 to 85.77% bonded carbon content and calorific value ranges between 5440.67 to 5650.67 cal/g. Results of LSD analysis showed that the best properties in the treatment of waste wood charcoal 60% iron and 40% waste wood charcoal mixture and 4% cinnamon extract which has a density of 0.56 g/cm^3 briquettes, water content 5.57%, ash content 5, 25%, volatile matter content of 9.66%, 85.09% bonded carbon content and calorific value of 5650.67 cal/g.

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