

ABSTRACT

CHARACTERISTICS OF CHARCOAL FROM CORN WASTE PYROLYSIS

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Corn waste is agricultural waste that can be processed into raw materials that produce energy such as charcoal. To improve the quality of the biomass, it is necessary to carry out pyrolysis before turning it into charcoal, in order to produce biomass fuel with optimal combustion performance. This study aims to analyze the characteristics of biomass charcoal from corn waste and the effect of pyrolysis treatment of materials in the manufacture of charcoal from corn waste. This research was conducted in January – March 2022 at the Laboratory of Agricultural Machinery and Equipment (DAMP) and the Laboratory of Water and Land Resources Engineering (RSDAL), Department of Agricultural Engineering, Faculty of Agriculture, University of Lampung. This study used a completely randomized design (CRD) with 4 treatments, namely, T1 (temperature 300°C and time 30 minutes), T2 (temperature 350°C and time 15 minutes), T3 (temperature 400°C and time 10 minutes), and T4 (temperature 450°C and time 7 minutes). Each treatment was repeated 3 times to obtain 24 experimental samples. Parameters observed included material shrinkage, yield, water content, density (mass density and bulk density), water absorption, ash content, volatile matter, fixed carbon, and calorific value.

The results of this study indicate a significant effect on the parameters used. Material shrinkage in corn cob charcoal has an average diameter of 6.51 %, length 4.70 %, and volume 10.87 %, material shrinkage in corn stover charcoal is 1.59 % diameter, 5.00 % length, and volume 6.49 %, corn cob charcoal yield has an average of 43.07 %, corn stover charcoal yield 49.76 %, corn cob charcoal moisture content has an average of 1.16 %, corn stover charcoal moisture content 2.37 %, mass density and the bulk density of corn cob charcoal has an average of 0.063 g/cm³ and 0.0443 g/cm³, the mass density and bulk density of corn stover charcoal are 0.022 g/cm³ and 0.0255 g/cm³, the water absorption capacity of corn cob charcoal has an average of 3.71 %, corn stover charcoal water absorption is 3.58 %, corn cob charcoal ash content has an average of 7.47 %, corn stover charcoal ash content is 8.26 %, corn cob charcoal volatile matter content has an average of 0.57 %, corn stover charcoal volatile matter content 0.86 %, corn cob charcoal fixed carbon content has an average is 90.79 %, the fixed carbon content of corn stover charcoal is 88.50 %, the calorific value of corn cob charcoal has an average of 25.04 MJ/kg, and the calorific value of corn stover charcoal is 19.13 MJ/kg.

Keywords : Corn waste, charcoal, pyrolysis, temperature, time.

ABSTRAK

KARAKTERISTIK ARANG DARI PIROLISIS LIMBAH JAGUNG

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Limbah jagung merupakan limbah pertanian yang dapat diolah menjadi bahan baku yang menghasilkan energi seperti arang. Untuk meningkatkan kualitas biomassa bahan perlu dilakukan pirolisis sebelum menjadi arang, agar dihasilkan bahan bakar biomassa dengan performa pembakaran yang optimal. Penelitian ini bertujuan untuk menganalisis karakteristik arang biomassa dari limbah jagung dan pengaruh perlakuan pirolisis bahan dalam pembuatan arang dari limbah jagung. Penelitian ini dilaksanakan pada bulan Januari – Maret 2022 di Laboratorium Daya Alat dan Mesin Pertanian (DAMP) dan Laboratorium Rekayasa Sumber Daya Air dan Lahan (RSDAL), Jurusan Teknik Pertanian, Fakultas Pertanian, Universitas Lampung. Penelitian ini menggunakan rancangan acak lengkap (RAL) dengan 4 perlakuan yaitu, T1 (suhu 300°C dan waktu 30 menit), T2 (suhu 350°C dan waktu 15 menit), T3 (suhu 400°C dan waktu 10 menit), dan T4 (suhu 450°C dan waktu 7 menit). Setiap perlakuan dilakukan 3 kali ulangan sehingga diperoleh 24 sampel percobaan. Parameter yang diamati meliputi penyusutan bahan, rendemen, kadar air, massa jenis (*mass density* dan *bulk density*), daya serap air, kadar abu, kadar zat terbang (*volatile matter*), kadar karbon (*fixed carbon*), dan nilai kalor.

Hasil penelitian ini menunjukkan adanya pengaruh nyata terhadap parameter yang digunakan. Penyusutan bahan pada arang tongkol jagung memiliki rerata yaitu diameter 6,51 %, panjang 4,70 %, dan volume 10,87 %, penyusutan bahan pada arang batang jagung yaitu diameter 1,59 %, panjang 5,00 %, dan volume 6,49 %, rendemen arang tongkol jagung memiliki rerata sebesar 43,07 %, rendemen arang batang jagung 49,76 %, kadar air arang tongkol jagung memiliki rerata sebesar 1,16 %, kadar air arang batang jagung 2,37 %, *mass density* dan *bulk density* arang tongkol jagung memiliki rerata sebesar 0,063 g/cm³ dan 0,0443 g/cm³, *mass density* dan *bulk density* arang batang jagung 0,022 g/cm³ dan 0,0255 g/cm³, daya serap air arang tongkol jagung memiliki rerata sebesar 3,71 %, daya serap air arang batang jagung 3,58 %, kadar abu arang tongkol jagung memiliki rerata sebesar 7,47 %, kadar abu arang batang jagung 8,26 %, kadar *volatile matter* arang tongkol jagung memiliki rerata sebesar 0,57 %, kadar *volatile matter* arang batang jagung 0,86 %, kadar *fixed carbon* arang tongkol jagung memiliki rerata sebesar 90,79 %, kadar *fixed carbon* arang batang jagung 88,50 %, nilai kalor arang tongkol jagung memiliki rerata sebesar 25,04 MJ/kg, dan nilai kalor arang batang jagung 19,13 MJ/kg.

Kata kunci : Limbah jagung, arang, pirolisis, suhu, waktu.