RINGKASAN

Bahan bakar minyak atau lebih dikenal dengan sebutan BBM semakin meningkat harganya, hal ini disebabkan oleh ketersediaan bahan bakar fosil yang semakin langka. Agar bisa mengurangi konsumsi bahan bakar minyak maka diperlukan sumber energi alternatif. Salah satu sumber energi alternatif adalah energi biomassa. Limbah pertanian dari tongkol jagung, batang jagung, dan daun jati adalah salah satu sumber biomassa yang dapat diolah menjadi biopelet. Biopelet merupakan bahan bakar padat yang memanfaatkan biomassa sebagai bahan baku dengan tambahan sedikit perekat. Penggunaan perekat tanah liat dikarenakan harga lebih murah dan mudah didapatkan. Penelitian ini bertujuan untuk mengetahui karakteristik biopelet yang terbuat dari limbah tongkol jagung, batang jagung, dan daun jati dengan perekat tanah liat sebagai bahan bakar alternatif.

Penelitian ini menggunakan Rancangan Acak Lengkap (RAL) dengan kombinasi perlakuan sebanyak 9 variasi percobaan. Pengulangan dilakukan sebanyak 3 kali sehingga mendapatkan 27 unit percobaan. Faktor perlakuan yang digunakan dalam penelitian ini adalah komposisi bahan baku (K1 = tongkol jagung 50%; batang jagung 20%; dan 30% daun jati, K2 = tongkol jagung 60%; batang jagung 15%; dan daun jati 25%; dan K3 = tongkol jagung 70%; batang jagung 10%; dan daun jati 20%) dan persentase perekat tanah liat (P1 = 10% perekat, P2 = 20% perekat, dan P3 = 30% perekat). Variabel yang diamati dalam penelitian ini adalah kerapatan, kadar air, kadar abu, kadar zat terbang, laju pembakaran, dan daya tahan biopelet karbonisasi. Hasil data dianalisis dengan menggunakan uji *Analysis of Variance* (ANOVA) dan uji lanjut *Duncan's Multiple Range Test* (DMRT) pada taraf 5%.

Hasil penelitian menunjukkan bahwa karakteristik biopelet karbonisasi berbahan campuran tongkol jagung, batang jagung, dan daun jati dengan perekat tanah liat yaitu kerapatan 0,49-0,56 g/cm^3, kadar air 5,34-6,82%, kadar abu 20,38-34,24%, kadar zat terbang 66,82-79,88%, laju pembakaran 0,03-0,05 g/menit, dan daya tahan 43,72-55,03%. Komposisi bahan baku memberikan pengaruh sangat nyata untuk parameter kerapatan, kadar air, kadar abu, kadar zat terbang dan berpengaruh tidak nyata untuk parameter laju pembakaran serta daya tahan biopelet karbonisasi. Parameter perekat memberikan pengaruh sangat nyata untuk semua perlakuan, kecuali daya tahan hanya berpengaruh nyata. Hasil biopelet karbonisasi berbahan baku tongkol jagung, batang jagung, dan daun jati dengan perekat tanah liat untuk parameter kadar zat terbang dan kadar air sudah memenuhi acuan standar SNI 8021:2014, sedangkan parameter kerapatan dan kadar abu belum memenuhi standar.

SUMMARY

The price of oil, more commonly known as BBM, increased due to the decreasing availability of fossil fuels. To reduce oil consumption, alternative energy sources were needed, and one of them was biomass energy. Agricultural waste such as corn cobs, corn stalks, and teak leaves were processed into bio-pellets as a solid fuel with a small amount of clay as a binder, which was cheaper and more easily obtained. This research aimed to evaluate the characteristics of bio-pellets made from corn cobs, corn stalks, and teak leaves with clay as an alternative fuel.

The research used a Completely Randomized Design (CRD) with 9 experimental variations. Each variation was repeated 3 times, resulting in a total of 27 experiments. The treatment factors in this research were the composition of raw materials (K1 = 50% corn cobs, 20% corn stalks, and 30% teak leaves; K2 = 60% corn cobs, 15% corn stalks, and 25% teak leaves; K3 = 70% corn cobs, 10% corn stalks, and 20% teak leaves) and the percentage of clay binder (P1 = 10% binder, P2 = 20% binder, and P3 = 30% binder). The observed variables included density, moisture content, ash content, volatile matter content, burning rate, and carbonization endurance of bio-pellets. The data from the research were analyzed using Analysis of Variance (ANOVA) and Duncan's Multiple Range Test (DMRT) at a significance level of 5%.

The research results showed that the characteristics of carbonized bio-pellets made from a mixture of corn cobs, corn stalks, and teak leaves with a clay binder were as follows: density 0,49-0,56 g/cm^3, moisture content 5,34-6,82%, ash content 20,38-34,24%, volatile matter content 66,82-79,88%, burning rate 0,03-0,05 g/minute, and endurance 43,7162-55,0265%. The composition of raw materials had a very significant effect on density, moisture content, ash content, and volatile matter content parameters, but had no significant effect on burning rate and carbonization endurance parameters. The binder parameter had a very significant effect on all parameters, except for endurance, which had a significant effect. The carbonized bio-pellets made from a mixture of corn cobs, corn stalks, and teak leaves with a clay binder met the SNI 8021:2014 standard for volatile matter and moisture content parameters, while the density and ash content parameters did not meet the standard.