

Pengaruh Ukuran Partikel dan Suhu Torefaksi pada Karakteristik Pelet Tempurung Biji Nyamplung (*Calophyllum inophyllum*)

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INTISARI

Pembuatan pelet merupakan salah satu opsi konversi bahan biomassa. Jenis biomassa yang dapat menjadi bahan baku pelet beragam, termasuk limbah industri seperti tempurung biji Nyamplung (*Calophyllum inophyllum*). Penelitian ini bertujuan untuk mengetahui pengaruh interaksi variasi ukuran partikel dan suhu torefaksi yang berbeda pada karakteristik pelet tempurung biji Nyamplung.

Penelitian ini menggunakan metode rancangan acak lengkap dengan faktor ukuran partikel (20-40 *mesh*, 40-60 *mesh*, dan 60-80 *mesh*) dan suhu torefaksi (200°C, 225°C, dan 250°C) dengan 3 kali pengulangan pada tiap faktor. Bahan baku tempurung biji Nyamplung dalam kondisi kering udara diayak menjadi partikel. Partikel seberat ± 1 g dikempa menjadi pelet dengan *single pelletizer* dalam tekanan 150 kg/cm². Pelet ditorefaksi selama 15 menit. Parameter kualitas pelet yang diteliti meliputi kekuatan tekan radial, berat jenis, sifat proksimat (kadar air, kadar zat mudah menguap, kadar abu, dan kadar karbon terikat), dan nilai kalor. Hasil penelitian kemudian dibandingkan dengan standar pelet yang berlaku, yaitu SNI, DIN EN, JAS, dan PFI.

Hasil penelitian menunjukkan interaksi faktor ukuran partikel dan faktor suhu torefaksi berpengaruh signifikan terhadap kualitas pelet tempurung biji Nyamplung, yaitu pada parameter kekuatan tekan radial, kadar zat mudah menguap, dan kadar abu. Pelet dengan kombinasi perlakuan ukuran partikel bahan baku 60-80 *mesh* yang ditorefaksi pada suhu 225°C memiliki nilai kalor terbaik sebesar 4519,67 kal/g. Nilai kalor pelet kombinasi tersebut memenuhi ketentuan SNI, DIN EN, JAS, dan PFI.

Kata kunci: Biopelet, tempurung biji Nyamplung, ukuran partikel, suhu torefaksi

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The Influence of Particle Size and Torrefaction Temperature on the Characteristics of Nyamplung (*Calophyllum inophyllum*) Seed Shell Pellets

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ABSTRACT

Pelletizing is one of the options for converting biomass materials. There are various biomass types that can be used as raw materials for pellets, including industrial wastes such as Nyamplung (*Calophyllum inophyllum*) seed shells. This study aims to determine the effect of different variations in particle size and torrefaction temperature on the characteristics of Nyamplung seed shell pellets.

This study used Completely Randomized Design (CRD) method with particle size factors (20-40 *mesh*, 40-60 *mesh* and 60-80 *mesh*) and torrefaction temperature factors (200°C, 225°C and 250°C) repeated 3 times for each factor. Nyamplung seed shell materials in air-dried conditions were grinded into particles. Particles weighing ± 1 g were pressed into pellets with single pelletizer at a pressure of 150 kg/cm². The pellets' quality parameters studied were radial compressive strength, specific gravity, proximate properties (moisture content, volatile matter content, ash content and fixed carbon content) and calorific value. The results were then compared with existing pellet standards, namely SNI, DIN EN, JAS and PFI.

The results showed that the interaction between particle size factor and torrefaction temperature factor had a significant effect in determining the quality of Nyamplung seed shell pellets, namely on the parameters of radial compressive strength, volatile matter content and ash content. Pellets with the combination factors of particle size at 60-80 *mesh* and torrefaction temperature at 225°C had the best calorific value at 4519.67 cal/g. The calorific value result of this combination met the requirements of SNI, DIN EN, JAS, and PFI.

Keywords: Biopellet, Nyamplung seed shell, particle size, torrefaction temperature

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