

## ABSTRAK

### **PRODUKSI DAN KARAKTERISASI BIOCHAR DARI BIOMASSA CANGKANG BUAH AREN DAN PEMANFAATANNYA SEBAGAI MEDIA TUMBUH**

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Di Indonesia, limbah pertanian seperti cangkang buah aren (*Arenga pinnata* Merr.) banyak tersedia dan belum dimanfaatkan secara optimal. Limbah cangkang buah aren memiliki kandungan lignin, selulosa, dan hemiselulosa yang tinggi, sehingga berpotensi sebagai bahan baku biochar. Cangkang buah aren yang lambat terdekomposisi secara alami karena kandungan ligninnya dapat diolah menjadi biochar yang memiliki manfaat sebagai pembenah tanah dan sumber nutrisi bagi tanaman. Penelitian ini bertujuan untuk mengetahui karakteristik biochar yang dihasilkan dari limbah cangkang buah aren, pengaruh aplikasinya terhadap sifat fisik tanah, serta dampaknya pada pertumbuhan dan hasil tanaman sayuran sawi hijau. Biochar diproduksi melalui pirolisis pada suhu 350°C selama 2 jam dari cangkang buah aren yang telah dikeringkan. Karakterisasi biochar meliputi analisis proksimat, luas permukaan spesifik (BET), morfologi (SEM), nilai pH, konduktivitas listrik, dan kandungan N, P, K. Aplikasi biochar diuji pada dosis 0, 5, 10, 15, dan 20 t/ha dengan rancangan acak kelompok. Hasil penelitian menunjukkan biochar cangkang buah aren memiliki kadar air rendah (2,29%), kadar abu tinggi (26,38%), kadar zat terbang 30,06%, dan karbon terikat 43,56%. Luas permukaan biochar mencapai 5.821 m<sup>2</sup>/g dengan pori berukuran 21,6 nm. Biochar ini memiliki pH alkali 9,06 dan kandungan nitrogen rendah 0,64%, tetapi fosfor dan kalium cukup tinggi. Penerapan biochar mampu menurunkan bobot isi dan berat jenis tanah, meningkatkan porositas dan kapasitas lapang secara signifikan. Dosis biochar berpengaruh pada peningkatan tinggi tanaman dan jumlah daun sawi, dengan dosis 20 t/ha menunjukkan hasil terbaik walau bobot segar, dan indeks panen tidak berbeda signifikan secara statistik namun cenderung meningkat. Biochar limbah cangkang buah aren efektif memperbaiki kualitas tanah dan mendukung pertumbuhan sayuran secara berkelanjutan.

Kata kunci: Biochar, cangkang aren, pirolisis, sifat fisik tanah, pertumbuhan tanaman, sawi hijau.

## **ABSTRACT**

### **PRODUCTION AND CHARACTERIZATION OF BIOCHAR FROM SUGAR FALM FRUIT SHELL BIOMASS AND ITS USE AS A GROWING MEDIUM**

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In Indonesia, agricultural waste such as palm fruit shells (*Arenga pinnata* Merr.) is widely available and has not been optimally utilized. Palm fruit shells contain high levels of lignin, cellulose, and hemicellulose, making them a potential raw material for biochar. Palm fruit shells, which decompose slowly due to their lignin content, can be processed into biochar, which has benefits as a soil conditioner and source of nutrients for plants. This study aims to determine the characteristics of biochar produced from palm fruit shell waste, the effect of its application on soil physical properties, and its impact on the growth and yield of green mustard vegetables. Biochar was produced through pyrolysis at 350°C for 2 hours from dried palm fruit shells. Biochar characterization included proximate analysis, specific surface area (BET), morphology (SEM), pH value, electrical conductivity, and N, P, K content. Biochar application was tested at doses of 0, 5, 10, 15, and 20 t/ha using a randomized block design. The results showed that palm fruit shell biochar had low moisture content (2.29%), high ash content (26.38%), volatile matter content of 30.06%, and fixed carbon content of 43.56%. The surface area of biochar reaches 5,821 m<sup>2</sup>/g with pores measuring 21.6 nm. This biochar has an alkaline pH of 9.06 and low nitrogen content of 0.64%, but phosphorus and potassium are quite high. The application of biochar can reduce soil bulk density and specific gravity, significantly increasing porosity and field capacity. The dose of biochar affects the increase in plant height and the number of mustard leaves, with a dose of 20 t/ha showing the best results in terms of fresh weight, while the harvest index is not statistically significant but tends to increase. Biochar from palm fruit shell waste effectively improves soil quality and supports sustainable vegetable growth.

**Keywords:** Sugar falm fruit shell, biochar, green mustard, plant growth, pyrolysis, soil physical properties.