

KARAKTERISASI *BIOCHAR* DARI *SLUDGE OIL* KELAPA SAWIT DENGAN VARIASI TEMPERATUR KARBONISASI

Abstrak

Sludge oil kelapa sawit merupakan salah satu limbah yang berasal dari pengolahan kelapa sawit yang diolah menjadi *biochar* agar menjadi sumber bahan pembenah tanah. Produksi *biochar* melalui pemanasan menggunakan alat pirolisis dilakukan pada temperatur 150°C dan dilakukan variasi temperatur karbonisasi menggunakan alat tanur pada temperatur 300°C, 400°C, dan 500°C. Pembuatan *biochar* dilakukan dengan pirolisis sederhana pada produksi *biochar* sedangkan karakterisasinya yaitu analisis kadar abu, kadar air, rendemen, penentuan bilangan iodin, penentuan daya serap metilen blue, SEM-EDX (*Scanning Electron Microscope-Energi Dispersive X – Ray Spectroscopy*), KTK (Kapasitas Tukar Kation), dan SAA (*Surface Area Analyzer*). Hasil yang diperoleh dari penelitian ini yaitu: rendemen *biochar* diperoleh yaitu (81,82%). Hasil analisis kadar abu, kadar air dan daya serap metilen biru dari *biochar* memenuhi syarat standar nasional indonesia. Hasil penentuan bilangan iodin pada *biochar* temperatur berturut turut 766,81 mg/g, 520,22 mg/g, 717,49 mg/g, dan 470,90 mg/g. Nilai Kapasitas Tukar Kation hasil dari penelitian pada temperatur berturut-turut yaitu 17,23 cmol(+)kg⁻¹, 16,51 cmol(+)kg⁻¹, 25,13 cmol(+)kg⁻¹, dan 21,54 cmol(+)kg⁻¹. Hasil karakterisasi *biochar sludge oil* kelapa sawit menggunakan SEM, hasil yang diperoleh terlihat partikel dari *biochar* ini pada pembesaran 5000 X menunjukkan bahwa banyak terbentuknya partikel pada *biochar* dengan ukuran yang berbeda-beda. Sedangkan hasil EDX *biochar* terdapat unsur N, P, dan K dalam *biochar* yang termasuk senyawa anorganik termasuk kation dan unsur hara makro esensial terbatas. Hasil karakterisasi *biochar* menggunakan SAA yaitu luas permukaan dan pori radius *biochar* pada temperatur 300°C paling besar dibandingkan dengan *biochar* pada temperatur 150°C, 400°C dan 500°C. Luas permukaan dan jari jari pori *biochar* pada temperatur 300°C, yang menunjukkan peningkatan ukuran pori-pori yang terbentuk. Hal ini menunjukkan *biochar* dikonversi dari *sludge oil* kelapa sawit, dengan karakteristik fisik-kimianya yang memiliki struktur mikro sangat porous, dan kandungan utama karbon (C), N, P, dan K jika diaplikasikan kedalam tanah dapat memiliki banyak fungsi khususnya dalam bidang pertanian.

Kata kunci: *biochar*, pirolisis, SEM-EDX, SAA, *sludge oil* kelapa sawit

CHARACTERIZATION OF BIOCHAR FROM PALM OIL SLUDGE WITH VARIATIONS IN CARBONISATION TEMPERATURE

Abstract

Palm oil sludge is one of the wastes resulting from the conversion of palm oil into biochar so it becomes a source of soil amendment. Production of biochar by heating using a pyrolysis tool is carried out at a temperature of 150°C and various carbonization temperatures are carried out using a furnace at temperatures of 300°C, 400°C, and 500°C. The production of biochar is carried out by simple pyrolysis for biochar production while the characterization is an analysis of ash content, moisture content, yield, determination of iodine number, determination of absorption capacity of methylene blue, SEM-EDX (Scanning Electron Microscope-Energy Dispersive X-Ray Spectroscopy), CEC (Cation Exchange Capacity), and SAA (Surface Area Analyzer). The results showed: the yield of biochar was 81.82%. The results of the analysis of ash content, water content, and methylene blue from biochar have met Indonesian national standards. The results of determining the iodine number at temperature biochar were 766.81 mg/g, 520.22 mg/g, 717.49 mg/g, and 470.90 mg/g respectively. Cation Exchange Capacity values resulting from research at successive temperatures are 17.23 cmol(+)kg⁻¹, 16.51 cmol(+)kg⁻¹, 25.13 cmol(+)kg⁻¹, and 21.54 cmol(+)kg⁻¹. The results of the characterization of palm oil biochar sludge using SEM, the results obtained showed that the pores of this biochar at 5000 X magnification showed many pores formed in biochar with different sizes. While the results of EDX biochar contained N, P, and K elements in biochar which included inorganic compounds including cations and limited macro-essential nutrients. The results of the characterization of biochar using SAA are the surface area and pore radius of biochar at a temperature of 300°C which is the largest compared to biochar at temperatures of 150°C, 400°C, and 500°C. The surface area and pore radius of biochar at 300°C showed an increase in the pore size formed, namely 31.958m²/g and 13.1519 nm. This shows that biochar converted from palm oil sludge, with its physical-chemical characteristics which have a very porous microstructure, and the main content of carbon (C), N, P, K when applied to the soil can have many functions, especially in agriculture

Keywords: biochar, pyrolysis, SEM-EDX, SAA, palm oil sludge