

STUDI FRAKSI HUMIN DALAM HUMUS SINTETIS HASIL KARBONISASI HIDROTERMAL LIMBAH BULU AYAM

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INTISARI

Penelitian humin sintetis dalam *biochar* 2:1 dan hidrolisat padat hasil konversi limbah bulu ayam dengan metode karbonisasi hidrotermal telah dilakukan. Tujuan penelitian ini adalah isolasi dan karakterisasi humin berdasarkan metode *International Humic Substances Society* (IHSS). Humin diisolasi dalam larutan NaOH 0,1 M dan DMSO:H₂SO₄. Karakterisasi humin menggunakan *Fourier Transform Infrared Spectroscopy* (FTIR), *X-Ray Diffraction* (XRD), *Transmission Electron Microscopy* (TEM), *Scanning Electron Microscopy with Energy Dispersive X-Ray* (SEM-EDX) dan *Atomic Absorption Spectroscopy* (AAS).

Hasil analisis menunjukkan hidrolisis bulu ayam menghasilkan humus sintetis supramolekul yang mengandung humin. Rendemen humin dari *biochar* 2:1 adalah 44,5%, sedangkan dari hidrolisat padat adalah 12,7%. Humin dianalisis dengan FTIR menunjukkan gugus fungsi -OH, -NH, -CH alifatis, -CH₃, C=C aromatis, C-H aromatis, -C-O- aromatis, -CN aromatis, Si-O, dan Fe-O. Difraktogram humin menunjukkan struktur karbon amorf. Citra TEM menunjukkan adanya nanopartikel superparamagnetik (<14 nm). Morfologi permukaan humin dari *biochar* 2:1 adalah kombinasi kasar dan halus dengan luas permukaan besar sedangkan humin dari hidrolisat padat berbentuk bola-bola mikrosfer yang acak. Analisis EDX menunjukkan adanya unsur C, N, O, Si, Cu, S, Mg, Ca, Zn, dan K. Analisis kuantitatif AAS melengkapi data konsentrasi Ca, K, Fe, Cu, dan Zn. Hasil karakterisasi humin sintetis dari *biochar* 2:1 dan hidrolisat padat seperti humin alami sehingga dapat mengakselerasi pembentukan humus di tanah.

Kata Kunci: humin, humus sintetis, *biochar*, hidrolisat

STUDY OF THE HUMIN FRACTION IN SYNTHETIC HUMUS BY HYDROTHERMAL CARBONIZATION OF CHICKEN FEATHER WASTE

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ABSTRACT

Research on synthetic humin in biochar 2:1 and solid hydrolyzate from the conversion of chicken feather waste by hydrothermal carbonization method has been carried out. The purpose of this study was the isolation and characterization of humin based on the method of the International Humic Substances Society (IHSS). Humin was isolated in 0.1 M NaOH solution and DMSO: H₂SO₄. Humin characterization was carried out using Fourier Transform Infrared Spectroscopy (FTIR), X-Ray Diffraction (XRD), Transmission Electron Microscopy (TEM), Scanning Electron Microscopy with Energy Dispersive X-Ray (SEM-EDX), and Atomic Absorption Spectroscopy (AAS).

The results of the analysis showed that hydrolysis of chicken feathers produced supramolecular synthetic humus containing humin. The humin yield of biochar 2:1 was 44.5%, while the humin of solid hydrolyzate was 12.7%. Humin analyzed by FTIR showed the functional groups -OH, -NH, -CH aliphatic, -CH₃, C=C aromatic, C-H aromatic, -C-O- aromatic, -CN aromatic, Si-O, and Fe-O. The humin diffractogram showed the amorphous carbon structure. The TEM image showed the presence of superparamagnetic nanoparticles (<14 nm). The surface morphology of humin from biochar 2:1 is a combination of rough and fine with a large surface area, while humin from solid hydrolyzate showed the random shape of microspheres. EDX analysis showed the presence of elements C, N, O, Si, Cu, S, Mg, Ca, Zn, and K. Quantitative analysis of AAS complemented the concentration data of Ca, K, Fe, Cu, and Zn. The results of the characterization of synthetic humin from biochar 2:1 and solid hydrolyzate such as natural humin can accelerate the formation of humus in the soil.

Keywords: humin, synthetic humus, biochar, hydrolyzate