

## PEMBUATAN HUMUS SINTETIK DARI LIMBAH DARAH DAN BULU AYAM UNTUK PEMBENAH KARBON TANAH DAN PUPUK PENYEDIA FOSFOR

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### INTISARI

Penelitian pembuatan humus sintetik dari limbah darah dan bulu ayam sebagai pembenah karbon tanah dan pupuk fosfor telah dilakukan. Tujuan penelitian ini adalah untuk membuat humus sintetik yang kaya akan C-organik dan fosfor dari bahan dasar limbah bulu dan darah ayam.

Pembuatan humus sintetik dilakukan dengan proses hidrolisis alkali pada pH 12-13 sekaligus *hydrothermal carbonization* (HTC) parsial pada temperatur 160-170 °C dan tekanan 9-10 atm dari bahan bulu dan darah ayam sehingga diperoleh produk *hydrochar* sebagai humus sintetik dan produk samping berupa produk cair. Humus sintetik dikarakterisasi dengan spektroskopi FTIR beserta bahan mentahnya sebagai pembanding dan dilakukan pencitraan dengan TEM sedangkan produk cair dianalisis secara kualitatif dan kuantitatif kandungan asam aminonya dengan HPLC. Baik produk humus sintetik dan produk cair dianalisis kadar C-organik dan P dengan metode spektrofotometri UV-Vis.

Hasil karakterisasi FTIR dari humus sintetik menunjukkan adanya serapan C-H aromatis, C=C aromatis, O-H, N-H, C=O, C-O, dan Fe-O yang mana merupakan gugus identitas humus alami. Karakterisasi TEM menunjukkan keberadaan partikel besi oksida dan analisis HPLC mengkonfirmasi adanya asam amino. Asosiasi supramolekul dari *hydrochar* poliaromatik, partikel paramagnetik Fe, dan asam amino membentuk humus sesuai dengan konsep humus modern. Humus sintetik memiliki kadar C sebesar 49,47-57,58% dan produk cair sebesar 15,82-21,08% serta kadar P untuk humus sintetik sebesar 1,53-2,49% dan produk cair 0,23-0,61%.

Kata kunci: bulu, darah, humus sintetik, *hydrothermal carbonization*, pupuk fosfor

## **SYNTHESIS OF SYNTHETIC HUMUS FROM CHICKEN BLOOD AND FEATHER WASTE FOR SOIL CARBON AMENDMENT AND PHOSPHORUS FERTILIZER**

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### **ABSTRACT**

Synthesis of synthetic humus from chicken blood and feather waste for soil carbon amendment and phosphorus fertilizer research had been conducted. The purpose of this research was to synthesize synthetic humus rich in carbon and phosphorus from chicken feathers and blood.

The synthesis was carried out by alkaline hydrolysis at a pH of 12-13 simultaneously with partial hydrothermal carbonization at a temperature of 160-170 °C and a pressure of 9-10 atm of chicken feathers and blood in order to obtain solid hydrochar as synthetic humus and liquid product as by-product. Synthetic humus was characterized using FTIR spectroscopy as well as its raw materials for comparison and then the image was recorded using TEM, whereas the liquid product was analyzed qualitatively and quantitatively for its amino acids using HPLC. Both synthetic humus and liquid product were analyzed for their C and P content using UV-Vis spectrophotometry.

FTIR characterization of synthetic humus showed that there were absorptions of aromatic C-H, aromatic C=C, O-H, N-H, C-O, and Fe-O bonds which were the representative groups in natural humus. TEM characterization indicated the presence of iron oxide particles and HPLC analysis confirmed the presence of amino acids. Supramolecular association of polyaromatic hydrochar, paramagnetic Fe particles, and amino acids formed humus as defined by the modern humus concept. The synthetic humus products contained %C of 49.47-57.58% and 15.82-21.08% for the liquid products and the P content was 1.53-2.49% for the synthetic humus products and 0.23-0.61% for the liquid products.

**Keywords:** blood, feather, hydrothermal carbonization, phosphorus, synthetic humus