PEMBUATAN KOMPOSITKARBOKSIMETIL SELULOSA/BENTONIT/N, P, K, Cu, Fe DENGAN TEKNIK EKSTRUSI SEBAGAI MODEL PUPUK LEPAS-LAMBAT

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19/448788/PPA/05871

INTISARI

Studi pembuatan komposit karboksimetil selulosa/bentonit/N, P, K, Cu, Fe sebagai model pupuk lepas-lambat telah dilakukan. Pembuatan komposit dilakukan dengan teknik ekstrusi menggunakan ekstruder ulir ganda. Pada proses pembuatan komposit dilakukan variasi temperatur alat (80° dan 100 °C), kecepatan putar alat (300 dan 600 rpm), dan penambahan air (b/v) dengan rasio (0,5; 1; 1,5) dari total massa bahan. Massa karboksimetil selulosa (CMC), N, P, K, Cu dan Fe dibuat konstan. Massa bentonit divariasikan yaitu 10, 50, dan 100 g. Komposit yang terbentuk dikarakterisasi dengan spektrometer FTIR dan XRD. Sifat mekanik diuji menggunakan *Universal Testing Machine*. Selain itu, laju pelepasan N, P, K, Cu dan Fe dari komposit juga dikaji.

Hasil penelitian menunjukkan bahwa kondisi ekstruder lebih baik pada temperatur 100 °C, putaran ulir 600 rpm, dan rasio penambahan air 1 (b/v) dari massa total bahan. Hasil menunjukkan bahwa penambahan bentonit meningkatkan kapasitas absorpsi air dan kestabilan komposit dalam air, namun penambahan dengan massa 50 g dapat menurunkan kuat tekan dan kuat tarik komposit. Pada media air, kinetika pelepasan N, P, K, Cu, Fe pada komposit mengikuti model kinetika orde kedua semu. Pada media tanah, kinetika pelepasan N mengikuti model Korsmeyer-Peppas sedangkan P dan K mengikuti model kinetika orde dua semu.

Kata kunci : CMC, bentonit, ekstruder ulir ganda, pupuk lepas-lambat N, P, K,Cu dan Fe

FABRICATION OF CARBOXYMETHYL CELLULOSE/BENTONITE/N, P, K, Cu, Fe COMPOSITE BY EXTRUSION TECHNIQUE AS SLOW-RELEASE FERTILIZER MODEL

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ABSTRACT

The synthesis of carboxymethyl celullose/bentonite/N, P, K, Cu, Fe composite as slow-release fertilizer (SRF) model has been carried out. The synthesis of composite was conducted using double twin extruder. The process of composite synthesis was performed at varied condition during extrusion i.e temperatures (80 and 100° C), screw rate (300 and 600 rpm), and ratios of water added in formulation 0,5; 1; 1,5 (wt%) based on the total weight of composite materials. The proportion (wt%) of carboxymethyl cellulose (CMC), N, P, K, Cu and Fe for each composite formulations was constant, while bentonite's was varied at 10, 50, and 100 g. The composites were then characterized using infrared (IR) spectroscopy and X-ray diffraction (XRD). The mechanical properties were evaluated through tensile and compressive strength, water absorption capacity and stability test in water. In addition, the release kinetic of N, P, K from composite was also studied.

The result showed that SRF composite was obtained at conditions of twin screw extrusion were set up at 100 °C , the screw rate at 600 rpm, and water addition at a 1(w/v) from the total mass of composite materials. The addition of bentonite increased water absorption capacity and stability of the composite in water but decreased the tensile and compressive strength at the addition of 50 g. The release of N, P, K, Cu, Fe in water of the SRF composite was in accordance to the release kinetic model of pseudo-second-order. The release of nutrient in soil for N kinetic release was in accordance to the korsmeyer-Peppas, P and K followed model of Pseudo-second-order.

Keywords: CMC, bentonite, N, P, K, Cu, Fe slow-release fertilizer, twin screw extruder.