

KOMPOSIT ALGINAT-KITOSAN-ASAM HUMAT SEBAGAI PEMBAWA PUPUK LEPAS LAMBAT NPK

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INTISARI

Penelitian komposit alginat-kitosan-asam humat sebagai pembawa pupuk lepas lambat NPK telah dilakukan. Penelitian ini bertujuan untuk mempelajari pelepasan NPK dari komposit berdasarkan variasi massa asam humat dalam media akuades dan asam sitrat. Komposit dibuat dengan mencampurkan alginat, kitosan, asam humat, larutan pupuk NPK dan larutan CaCl_2 0,5 M. Pelepasan NPK dari komposit diuji dalam media akuades dan asam sitrat 0,33 M selama 14 hari. Pelepasan unsur N dan P diuji menggunakan spektrofotometer UV-Vis dan pelepasan unsur K menggunakan AAS (*Atomic Absorption Spectroscopy*). Komposit dikarakterisasi menggunakan spektrofotometer FTIR (*Fourier Transform Infra Red*) dan SEM (*Scanning Electron Microscopy*). Kinetika pelepasan NPK dalam asam sitrat dikaji menggunakan model orde nol, orde satu, orde dua, Higuchi, dan Korsmeyer-Peppas.

Hasil karakterisasi FTIR dan SEM menunjukkan adanya interaksi antara alginat, asam humat dan kitosan melalui gugus fungsi $-\text{COOH}$, $-\text{OH}$ dan $-\text{NH}_2$. Hasil penelitian menunjukkan bahwa komposit dengan penambahan asam humat 0,1 g merupakan penambahan massa optimum yang mampu menghambat pelepasan NPK dalam akuades. Massa N, P dan K terlepas lebih cepat dalam media asam sitrat dibandingkan dalam media akuades. Proses pelepasan NPK dalam media asam sitrat mengikuti kinetika pelepasan Korsmeyer-Peppas dengan konstanta laju pelepasan (k) untuk N, P dan K berturut-turut 0,046; 0,115 dan $0,073 \text{ mg g}^{-1} \text{ hari}^{-1}$.

Kata kunci: alginat, asam humat, kitosan, NPK, pupuk lepas lambat

ALGINATE-CHITOSAN-HUMIC ACID COMPOSITE AS CARRIERS FOR SLOW-RELEASE FERTILIZER OF NPK

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ABSTRACT

Alginate-chitosan-humic acid composite as carriers for slow-release fertilizer of NPK research had been done. The aims of this study were to study the release of NPK from composite with the variation of humic acid mass in aquades and citric acid media. Composite was made by mixing alginate, chitosan, humic acid, NPK fertilizer solution and 0.5 M CaCl_2 solution. Composite was analyzed for its NPK release ability by using distilled water and citric acid 0.33 M for 14 days. The released N and P were analyzed by spectrophotometer UV-Visible, while the released K was analyzed by AAS (Atomic Absorption Spectroscopy). Characterizations were done by using spectroscopy FTIR (Fourier Transform Infra-Red) and SEM (Scanning Electron Microscopy). The release kinetics of NPK in citric acid were studied by using zero order, first order, second order, Higuchi, and Korsmeyer-Peppas models.

The results of FTIR and SEM characterization showed an interaction among alginate, humic acid and chitosan through the $-\text{COOH}$, $-\text{OH}$ and $-\text{NH}_2$ functional groups. The results showed that the composite with the addition of 0.1 g humic acid was the optimum mass addition that was able to inhibit the release of NPK in distilled water. N, P and K masses were released faster in citric acid media than in distilled water media. The process of releasing NPK in citric acid media followed the release kinetics of Korsmeyer-Peppas with the release rate constant (k) for N, P and K were 0.046; 0.115 and 0.073 $\text{mg g}^{-1} \text{day}^{-1}$, respectively.

Keywords: alginate, chitosan, humic acid, NPK, slow-release fertilizer