



KOMPOSIT MANIK ALGINAT-GELATIN SEBAGAI MATERIAL PUPUK LEPAS LAMBAT NPK

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INTISARI

Penelitian sintesis komposit alginat-gelatin sebagai material pupuk lepas lambat NPK telah dilakukan. Penelitian ini bertujuan untuk mempelajari pengaruh perbandingan massa alginat dan gelatin terhadap pelepasan nutrisi NPK dalam media akuades dan asam sitrat. Komposit dibuat dengan menggunakan alginat, gelatin dan larutan pupuk NPK, diteteskan ke dalam larutan CaCl_2 0,5 M dan direndam ke dalam larutan glutaraldehid 2%. Karakterisasi komposit dilakukan menggunakan spektrofotometri FTIR (*Fourier Transform Infrared*) dan SEM (*Scanning Electron Microscope*). Kinetika pelepasan nutrisi NPK dikaji menggunakan model orde satu semu, dua semu, Higuchi dan Korsmeyer-Peppas.

Spektra FTIR pada komposit alginat-gelatin menunjukkan adanya bilangan gelombang 1539, 1612 dan 1339 cm^{-1} yang menunjukkan adanya vibrasi tekukan gugus N-H dan vibrasi regangan C-N; gugus $-\text{CONH}_2$ dan regangan simetris $-\text{COO}^-$ yang merupakan ikatan yang terjadi didalam komposit alginat-gelatin. Hasil menunjukkan bahwa komposit alginat-gelatin dengan perbandingan massa 8:2 merupakan massa optimum dapat menghambat pelepasan nutrisi NPK dalam akuades. Nutrisi N, P dan K terlepas dari komposit alginat-gelatin dengan perbandingan massa 8:2 dan laju pelepasannya dalam larutan asam sitrat 0,33 M lebih besar daripada akuades. Pada penelitian ini, larutan asam sitrat dipilih sebagai media desorpsi dengan alasan bahwa setiap tanaman mampu mensekresikan mikronutrisi seperti asam sitrat. Kinetika pelepasan nutrisi N, P dan K pada larutan asam sitrat 0,33 M mengikuti model kinetika orde dua semu. Nilai konstanta laju pelepasan (k) untuk nutrisi N, P dan K berturut-turut sebesar 0,258; 0,011 dan 0,029 $\text{mg g}^{-1}\text{hari}^{-1}$.

Kata kunci: Alginat, Gelatin, NPK, Pupuk Lepas Lambat



ALGINATE-GELATIN BEADS COMPOSITE AS MATERIALS OF NPK SLOW RELEASE FERTILIZER

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ABSTRACT

The synthesis of alginate-gelatin beads composite as materials of NPK slow release fertilizer had been conducted. This study aimed to find the effect of alginate and gelatin mass on the release of NPK nutrients in water and citric acid medium. Composite was prepared by mixing alginate, gelatin and NPK fertilizer solution, dripping it into CaCl_2 0.5 M solution and then immersing it into glutaraldehyde 2% solution. Characterization of the composite was done by using spectrophotometry FTIR (Fourier Transform Infrared) and SEM (Scanning Electron Microscope) methods. The kinetics study of N, P and K nutrient release was evaluated by using pseudo-first order, pseudo-second order, Higuchi and Korsmeyer-Peppas equation models.

The FTIR characterization results showed that the wavenumbers of 1539, 1612 and 1339 cm^{-1} indicated respectively the existence of N-H bending vibration and C-N stretching vibration; $-\text{CONH}_2$ functional group and $-\text{COO}^-$ symmetric stretching, e.g. the bonds that occurs in alginate-gelatin composite. Result of release study showed that alginate-gelatin composite with mass ratio of 8:2 gave the optimum performance in inhibiting NPK nutrients release in water. The N, P and K nutrients can be released from alginate-gelatin composite with mass ratio of 8:2 by water and citric acid and the release rate in citric acid 0.33 M solution was higher than that in water. In this study, citric acid solution was selected as desorption medium because each plant was capable of secreting citric acid micronutrients. The release kinetics of N, P and K nutrients in citric acid 0.33 M solution follow pseudo-second order kinetic model. The values of the release constant (k) for N, P and K nutrients were respectively 0,258, 0,011 and 0,029 $\text{mg g}^{-1}\text{day}^{-1}$.

Keywords : Alginate, Gelatin, NPK, Slow Release Fertilizer