

PUPUK LEPAS LAMBAT NPK BERBASIS KOMPOSIT GELATIN-PATI

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INTISARI

Penelitian sintesis pupuk lepas lambat NPK berbasis komposit gelatin pati telah dilakukan. Penelitian ini bertujuan untuk mempelajari pengaruh variasi massa gelatin dan pati terhadap pelepasan NPK dalam media akuades serta asam sitrat. Sintesis komposit dilakukan dengan metode emulsi dimana digunakan variasi perbandingan massa gelatin:pati (6:4; 7:3; 8:2 dan 10:0). Gelatin dan pati dilarutkan dalam larutan NPK dan diikat silang dengan glutaraldehid. Pelepasan nutrisi N, P dan K dari komposit diuji dalam media akuades dan asam sitrat 0,33 M selama 18 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, satu, dua, satu semu, dua semu dan Korsmeyer-Peppas.

Spektra FTIR dari komposit gelatin-pati menunjukkan pada bilangan gelombang 3271; 2926; 2360 dan 1634 cm^{-1} masing-masing menunjukkan adanya pembentukan ikatan OH, C-H alifatik asimetris dan simetris dan ikatan C=N yang didapatkan dari pembentukan ikatan antara gelatin, pati, dan glutaraldehid. Penelitian menunjukkan bahwa komposit dengan perbandingan massa gelatin:pati 6:4 merupakan 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 pelepasan asam sitrat mengikuti kinetika pelepasan orde dua semu dengan konstanta laju pelepasan (k) untuk N, P dan K berturut-turut 0,0288, 0,0016 dan 0,0065 $\text{mg g}^{-1} \text{hari}^{-1}$.

Kata kunci : gelatin, pati, NPK, pupuk lepas lambat

NPK SLOW RELEASE FERTILIZER BASED ON GELATIN-STARCH COMPOSITE

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ABSTRACT

The study of synthesis NPK slow release fertilizer based on gelatin-starch composite had been conducted. The aims of this study were to find the effect of variation on both gelatin and starch mass on the release of NPK in aquades and citric acid media. Composite synthesis was made through emulsion method which used variation in the ratio between gelatin:starch mass (6:4; 7:3; 8:2 and 10:0). Gelatin and starch were dissolved in NPK solution and crosslinked with glutaraldehyde. Composite was analyzed for its N, P and K release ability by using distilled water and citric acid 0.33 M for 18 days. Amount of released N and P were analyzed by using spectrophotometer UV-Visible and K were analyzed by using AAS (Atomic Absorption Spectroscopy). Characterizations were done by using spectrophotometer 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, pseudo-first order, pseudo-second order and Korsmeyer-Peppas kinetic models.

The infrared spectra of gelatin-starch composite showed that the wave numbers 3271, 2926, 2360 and 1634 cm^{-1} assigned to the formation of -OH bonds, asymmetrical and symmetrical C-H aliphatic bonds and C=N bonds respectively. The absorption bands were obtained from the formulation of bonds between gelatin, starch and glutaraldehyde. Results of the study showed that the composite with ratio gelatin:starch 6:4 was the optimum mass capable to inhibit the release of NPK in distilled water. N, P and K mass was released faster in citric acid media than in distilled water media. The process of releasing NPK in citric acid release media followed pseudo second order release kinetics with release rate constants (k) for N, P and K were 0,0288, 0,0016 dan 0,0065 $\text{mg g}^{-1} \text{ hari}^{-1}$, respectively.

Keywords: gelatin, NPK, starch, slow release fertilizer