

KOMPOSIT BIOPLASTIK KARBOKSIMETIL SELULOSA/ASAM SITRAT/UREA/ARTIFISIAL HUMUS SEBAGAI MODEL PUPUK NITROGEN LEPAS-LAMBAT

RAMLAH
22/502162/PPA/06420

INTISARI

Pembuatan komposit bioplastik karboksimetil selulosa/asam sitrat/urea/artifisial humus sebagai model pupuk nitrogen lepas lambat telah dilakukan. Penelitian ini bertujuan untuk mengetahui pengaruh penambahan artifisial humus terhadap sifat mekanik, derajat penggembungan, sudut kontak, kemampuan pelepasan pupuk nitrogen dari sistem bioplastik serta kinetika pelepasannya. Komposisi bioplastik meliputi karboksimetil selulosa, asam sitrat, dan urea yang digunakan secara berturut-turut sebesar 4,5; 3; dan 3%. Variasi konsentrasi artifisial humus (AH) yang digunakan sebesar 0, 5, 10, 15, dan 20% (b/v). Metode yang digunakan dalam pembuatan bioplastik adalah metode *solvent casting*. Analisis dan karakterisasi komposit bioplastik meliputi uji kuat tarik, uji sudut kontak air, uji *swelling*, uji degradasi, *Fourier Transform Infrared* (FTIR), *X-Ray Diffraction* (XRD), *Scanning Electron Microscopy* (SEM), dan pengujian pada tanaman sawi hijau.

Hasil analisis uji mekanik menunjukkan bioplastik dengan konsentrasi artifisial humus 10% memberikan sifat kuat tarik tertinggi yaitu sebesar 13,90 MPa dan *elongasi* 29,92%, sudut kontak air sebesar 30,16° serta nilai *swelling* paling rendah (39%). Kinetika pelepasan nitrogen dari bioplastik dengan konsentrasi artifisial humus 10% mengikuti kinetika Korsmeyer-Peppas dengan konstanta pelepasan (K) sebesar 7,0762 jam^{-0,33} dan eksponen pelepasan (n) sebesar 0,33 (*Fickian diffusion*). Hasil pengujian pada tanaman sawi hijau (*Brassica chinensis* var. *parachinensis*) menunjukkan bahwa penggunaan bioplastik dengan konsentrasi AH 10% memberikan pertumbuhan tanaman paling baik yang meliputi tinggi tanaman, jumlah dan lebar daun, panjang akar, massa segar tajuk dan kandungan klorofil.

Kata kunci: Karboksimetil selulosa, asam sitrat, urea, pupuk lepas-lambat, artifisial humus

***CARBOXYMETHYL CELLULOSE/CITRIC ACID /UREA/ARTIFICIAL
HUMUS BIOPLASTIC COMPOSITE AS A MODEL OF SLOW-RELEASE
NITROGEN FERTILIZER***

RAMLAH

22/502162/PPA/06420

ABSTRACT

Preparation of carboxymethyl cellulose/citric acid/urea/artificial humus bioplastic composite as a model of slow-release nitrogen fertiliser has been created. This study aimed to determine the effect of artificial humus addition on mechanical properties, degree of swelling, water contact angle, release ability of nitrogen fertiliser from bioplastic system and its release kinetics. The composition of bioplastics included carboxymethyl cellulose, citric acid, and urea which were used at 4,5; 3; and 3%, respectively. The variation of artificial humus (AH) concentration used was 0, 5, 10, 15, and 20% (b/v). The method used in making bioplastics is the solvent casting method. Analysis and characterisation of bioplastic composites include tensile strength test, water contact angle test, swelling test, degradation test, Fourier Transform Infrared (FTIR), X-Ray Diffraction (XRD), Scanning Electron Microscopy (SEM), and testing on mustard plants.

The results of mechanical test analysis showed that bioplastics with 10% artificial humus concentration gave the highest tensile strength properties of 13.90 MPa and elongation of 29.92%, water contact angle of 30.16° and the lowest swelling value (39%). Nitrogen release kinetics from bioplastics with 10% artificial humus concentration followed Korsmeyer-Peppas kinetics with a release constant (K) of 7,0762 h^{-0,33} and a release exponent (n) of 0.33 (Fickian diffusion). The test results on mustard plants (*Brassica chinensis* var. *parachinensi*) showed that the use of bioplastics with 10% AH concentration gave the best plant growth which included plant height, number and width of leaves, root length, crown fresh mass and chlorophyll content.

Keywords: Carboxymethyl cellulose, citric acid, urea, slow-release fertiliser, artificial humus