# PEMBUATAN BIOPLASTIK DARI KARBOKSIMETIL SELULOSA, BENTONIT, PUPUK NPK, DAN GLISEROL SEBAGAI MODEL PUPUK NPK LEPAS LAMBAT

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## INTISARI

Pembuatan bioplastik sebagai model pupuk NPK lepas lambat telah dilakukan dengan tujuan untuk memperoleh informasi terkait pengaruh penambahan bentonit dan gliserol terhadap sifat mekanik produk bioplastik dan memperoleh informasi terkait kinetika pelepasan NPK dari produk bioplastik. Proses pembuatan bioplastik dilakukan pada suhu kamar menggunakan pengaduk magnet. Massa bentonit divariasi, yaitu 0,1; 0,5; 1,0; dan 2,0 g. Massa NPK divariasi 0,1 dan 0,8 g sedangkan massa karboksimetil selulosa (CMC) dan volume gliserol dibuat konstan. Campuran bahan dikeringkan dengan suhu 55 °C selama 24 jam. Bioplastik yang terbentuk dikarakterisasi dengan spektrometer FTIR dan XRD. Sifat mekanik diuji menggunakan Universal Testing Machine. Selain itu, laju pelepasan NPK dari produk bioplastik juga dikaji.

Hasil penelitian menunjukkan bahwa penambahan bentonite meningkatkan kuat tarik sedangkan penambahan gliserol menurunkan kuat tarik tetapi meningkatkan persen elongasi bioplastik. Kinetika pelepasan NPK dari bioplastik CMC/bentonit/NPK mengikuti model kinetika orde kedua semu. Pada bioplastik CMC/bentonit/NPK/gliserol, pelepasan NPK juga mengikuti model yang sama kecuali K pada variasi bioplastik dengan berat bentonit 2,0 g. Pelepasan K dari variasi bioplastik ini mengikuti model pelepasan Kosmeyer-Peppas.

Kata kunci: bentonit, CMC, gliserol, NPK

# SYNTHESIS OF BIOPLASTICS FROM CARBOXYMETHYL CELLULOSE, BENTONITE, NPK FERTILIZER, AND GLYCEROL AS MODEL OF SLOW-RELEASE NPK FERTILIZER

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## ABSTRACT

Synthesis of bioplastics as model of NPK slow-release fertilizer had been conducted, in order to obtain information concerning the effect of bentonite and glycerol addition to mechanical properties of bioplastic and obtain information concerning the release of NPK from bioplastics product. The process of bioplastics synthesis was conducted under room temperature by using magnetic stirrer. The mass of bentonite was varied in 0.1; 0.5; 1.0; and 2.0 g. The mass of NPK was varied in 0.1 dan 0.8 g while the mass of carboxymethyl cellulose (CMC) and volume of glycerol were kept in constant. Mixtures of raw materials were dried up under temperature of 55 °C for 24 hours. Bioplastics product were characterized by FTIR spectroscopy and XRD difractometer. Mechanical properties were characterized by Universal Testing Machine. Besides, the kinetic release of NPK from bioplastics was also studied.

Result of research showed that the addition of bentonite increased the tensile strength while the addition of glycerol decreased the tensile strength but increased the elongation percentage. The release kinetic of CMC/bentonite/NPK bioplastics followed the release kinetic model of pseudo second order. The release of NPK from CMC/bentonit/NPK/glycerol also followed the same model except for K in bioplastic with 2.0 g of mass bentonite that followed the release kinetic model of Kosmeyer-Peppas.

Keywords: bentonite, CMC, glycerol, NPK