

PEMANFAATAN TEPUNG DAUN KELOR (*Moringa oleifera*) SEBAGAI SUMBER N PADA PEMBUATAN PUPUK LEPAS LAMBAT ALGINAT/ZEOLIT/NPK/Cu

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INTISARI

Pemanfaatan tepung daun kelor (*Moringa oleifera*) pada pembuatan komposit alginat/zeolit/NPK/Cu (disingkat A/Z/NPK/Cu) sebagai pupuk lepas lambat dan kajian pelepasan unsur hara telah dilakukan. Tujuan penelitian ini adalah untuk mengetahui pengaruh penambahan tepung daun kelor sebagai sumber N terhadap persentase NPK dan Cu pada komposit A/Z/NPK/Cu, serta mempelajari dan menentukan kinetika pelepasan unsur hara dalam media air. Pembuatan komposit A/Z/NPK/Cu dilakukan melalui pencampuran antara tepung daun kelor dengan variasi berat 5, 10, dan 15 g serta tanpa tepung daun kelor dengan campuran larutan zeolit dan alginat (rasio berat 1:3) serta amonium dihidrogen fosfat dan kalium nitrat (rasio berat 1:1) hingga homogen kemudian ditetaskan ke dalam larutan $\text{CuSO}_4 \cdot 6\text{H}_2\text{O}$ (0,1 M) hingga membentuk bulatan komposit. Pupuk lepas lambat A/Z/NPK/Cu dikarakterisasi menggunakan difraktometer sinar-X dan spektrofotometer inframerah. Kandungan N, P, K, dan Cu dianalisis menggunakan Spektrofotometer Serapan Atom dan spektrofotometer UV-vis. Uji pelepasan unsur hara N, P, K, dan Cu dilakukan selama 720 jam pada interval waktu tertentu dalam akuades.

Difraksi sinar-X dari tepung daun kelor dan komposit A/Z/NPK/Cu menunjukkan sampel bersifat amorf. Spektra FTIR menunjukkan adanya interaksi dari masing-masing karakteristik zeolit, alginat, tepung daun kelor, kalium nitrat, dan amonium dihidrogen fosfat. Penambahan tepung daun kelor dengan variasi berat 5, 10, dan 15 g menurunkan persentase N yaitu 5,95; 5,75; dan 5,90 %, sedangkan persentase K relatif tetap, persentase P dan Cu menurun. Konstanta laju pelepasan N, P, K dan Cu pada variasi tepung daun kelor 15 g mengikuti kinetika orde kedua semu dengan laju pelepasan dari tinggi ke rendah berturut-turut adalah $\text{Cu} (34) > \text{K} (5,78) > \text{P} (5,45) > \text{N} (2,62) \text{ mg}^{-1} \text{ g}^{-1} \text{ jam}^{-1}$.

Kata kunci: tepung daun kelor, alginat, zeolit, NPK dan Cu, pupuk lepas lambat

UTILIZATION OF MORINGA LEAF FLOUR (*Moringa oleifera*) AS A SOURCE OF N IN THE PREPARATION OF ALGINATE/ZEOLITE/NPK/Cu SLOW RELEASE FERTILIZER

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ABSTRACT

Utilization of moringa leaf flour (*Moringa oleifera*) in preparation of alginate/zeolite/NPK/Cu composite (labeled as A/Z/NPK/Cu) as slow release fertilizer and nutrient release kinetics has been conducted. The goals of this research were to determine the effect of the addition of moringa leaf flour as source of N on percentage of NPK and Cu on A/Z/NPK/Cu composites, and to study the kinetics of nutrient release in water. Preparation of A/Z/NPK/Cu composites was done by homogeneous mixing of moringa leaf flour (weight variation 5, 10, 15 g and without moringa leaf flour) with a mixture of zeolite and alginate solutions (weight ratio of zeolite : alginate = 1:3), ammonium dihydrogen phosphate and potassium nitrate (weight ratio 1:1) and then were dropped into a $\text{CuSO}_4 \cdot 6\text{H}_2\text{O}$ solution (0,1 M) to form beads. Composites of A/Z/NPK/Cu were characterized using X-ray diffractometers and infrared spectrophotometer. The total content of NPK and Cu was analyzed using Atomic Absorption Spectrophotometer and UV-vis spectrophotometer. The nutrient release mechanisms of N, P, K, and Cu were carried out for 720 hours with certain interval time in water media.

X-ray diffraction pattern of moringa leaf flour and A/Z/NPK/Cu composites showed that the samples structure were amorphous. FTIR spectra showed the characteristics interaction of each zeolite, alginate, moringa leaf flour, potassium nitrate, and ammonium dihydrogen phosphate characteristics. The addition of moringa leaf flour with weight variations of 5, 10, and 15 g decreased the percentage of N were 5.95; 5.75; and 5.90 % respectively, while the percentage of K was relatively constant, the percentage of P and Cu decreased. Release kinetics of N, P, K and Cu with variation of 15 g moringa leaf flour followed the pseudo second-order kinetics with rate of release from high to low were $\text{Cu} (34) > \text{K} (5.78) > \text{P} (5.45) > \text{N} (2.62) \text{ mg}^{-1} \text{ g}^{-1} \text{ hours}^{-1}$.

Keywords: moringa leaf flour, alginate, zeolite, NPK and Cu, slow release fertilizer