ABSTRACT

Excessive fertilizer application can cause environmental pollution while reducing nutrient efficiency for plants. To overcome this problem, slow-release fertilizer (SRF) can be a solution by releasing nutrients in a controlled manner according to plant needs, thereby increasing fertilization efficiency and reducing negative impacts on the environment. Therefore, in this study, a modification was carried out on ammonium phosphate fertilizer by encapsulating silica gel and bentonite. Silica gel and bentonite were chosen as matrices because they can slow down the release of nutrients through the presence of pores and hydrophilic properties. SRF synthesis begins with the manufacture of ammonium phosphate through the reaction between NH_3 and H_3PO_4. Meanwhile, silica gel synthesis is carried out through the sol gel process. ammonium phosphate is inserted into silica by a batch process. Ammonium phosphate that is immersed in silica is then coated with bentonite. The results of SRF synthesis have been formed as evidenced by Fourier Transform Infrared (FTIR) and Scanning Electron Microscopy Energy Dispersive X-Ray (SEM-EDX) characterization. To determine the release of nutrients, a phosphate release test was carried out on SRF by taking filtrate from the soil sprinkled with synthetic SRF and distilled water. The results obtained in this study were ammonium phosphate fertilizer coated with brownish silica-bentonite. FTIR analysis showed that it contained several functional groups such as OH, Si-OH, Si-O-Al, P-OH, and NH4 + respectively at wave numbers 3411 cm^{-1}; 874 cm^{-1}; 462 cm^{-1}; 531 cm^{-1}; 1030 cm^{-1}; 1434 cm^{-1}. There was a change in the number of waves in the encapsulated sample which indicated an interaction between the matrix and ammonium phosphate fertilizer. The results of SEM-EDX analysis showed similar morphology and diverse element composition. Meanwhile, the best phosphate release test results were obtained in sample APSB 3 with the smallest desorption efficiency. Encapsulation of ammonium phosphate fertilizer with silica and bentonite affected the release of phosphate in ammonium phosphate. The slowest release was possessed by the APSB 3 sample, as evidenced by the lowest desorption efficiency value, namely 68.69%.

Keywords: *slow-release fertilizer, ammonium phosphate, silica gel, bentonite*