



The Effect of CMC Coating Derived from Cellulose Extracted from Corn Husk on Slowing the Release of Phosphate Adsorbed by Biofertilizers

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Abstract

This project aimed to study the effect of carboxymethyl cellulose (CMC) coating derived from corn husk on the delayed release of phosphate adsorbed by biofertilizers, addressing concerns regarding excessive chemical fertilizer use that leaves persistent phosphate residues in soil. Biofertilizers were first prepared and subsequently used to adsorb phosphate from DI water containing 1.0 M dissolved phosphate ions. The amount of phosphate adsorbed was quantified using the molybdenum blue method with a UV-Vis spectrophotometer and compared with a standard calibration curve, indicating the high phosphate uptake capacity of the biofertilizers. The phosphate-loaded biofertilizers were then coated with CMC extracted from corn husk cellulose, and FT-IR analysis confirmed the presence of characteristic CMC functional groups, with CH₂ stretching at 1,400–1,450 cm⁻¹ and C–O–C stretching vibrations at 1,000–1,200 cm⁻¹, which were consistent with those of commercial CMC. To evaluate the effect of the coating on controlling phosphate release, the coated biofertilizers were immersed in synthetic water for 10 hours. Phosphate concentrations in the water were measured every 2 hours, revealing an average phosphate concentration of 4.386 mg/L, demonstrating a delayed phosphate release effect compared with uncoated biofertilizers. Overall, the findings indicated that CMC coating derived from corn husk effectively slowed phosphate release from biofertilizers and demonstrated strong potential for sustainable applications in agricultural soil management.

Keywords: Biofertilizers, Carboxymethyl Cellulose, Phosphate