



The study of the ratio of zeolite and humic acid to the properties and nutrient release of hydrogel synthesized from okra mucilage

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Abstract

This study aimed to investigate the effect of different zeolite-to-humic acid ratios on the properties of hydrogel synthesized from okra mucilage for use as a slow-release fertilizer, as well as their influence on nutrient release. The hydrogel was prepared primarily from natural materials by using okra mucilage as the base material and enhancing its performance through the incorporation of zeolite and humic acid at different ratios. The hydrogel was then evaluated for its water-holding capacity, gel fraction, and nutrient release behavior of NPK fertilizer in soil. The results indicated that the addition of zeolite significantly improved the water retention capacity and structural stability of the hydrogel, making it more suitable for controlled nutrient release. Meanwhile, the incorporation of humic acid enhanced nutrient transfer from the soil to plants, thereby improving nutrient uptake and utilization. An appropriate ratio of zeolite to humic acid enabled the hydrogel to effectively regulate nutrient release while prolonging its degradation period. Therefore, the developed hydrogel shows strong potential as a slow-release fertilizer system that can reduce nutrient loss, improve fertilizer use efficiency, and minimize environmental impacts.

Keywords: okra mucilage, hydrogel, zeolite, humic acid, slow-release fertilizer