

**SUBMISSION FOR EVALUATION
FINAL YEAR PROJECT 2 - RESEARCH PROJECT**

**EVALUATION OF NUTRIENT RELEASE BEHAVIOR IN
MONTMORILLONITE-MODIFIED HYDROGEL FERTILIZERS**

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**EVALUATION OF NUTRIENT RELEASE BEHAVIOR IN
MONTMORILLONITE-MODIFIED HYDROGEL FERTILIZERS**

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**Final Year Project Submitted in Partial
Fulfilment of the Requirements for the
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ABSTRACT

EVALUATION OF NUTRIENT RELEASE BEHAVIOR IN MONTMORILLONITE-MODIFIED HYDROGEL FERTILIZERS

Controlled-release fertilizer (CRF) has been developed to address the environmental pollution due to nutrient leaching. However, most substances used in current CRF still have poor performance, including low strength and not environmentally friendly. All this weakness makes it difficult to produce a good CRF. To overcome these issues, this study aimed to synthesize the hydrogel fertilizer by using cellulose as the main component and montmorillonite (MMT) clay as an additive. The hydrogel was prepared by varying the MMT loading (1, 3, 5 and 10 wt.%) in the cellulose-based hydrogels. The prepared MMT/cellulose hydrogels were evaluated for group functionalities, surface morphology, water absorption, thermal stability, biodegradability, and nutrient release performance. It was found that increasing the MMT loading results in surface heterogeneity of the hydrogel and also increases the water absorption capacity from 5.78% to 8.96%. The addition of MMT improved the thermal stability and delayed the degradation rate of the cellulose hydrogel, which could prolong the hydrogel's lifetime in soil. Additionally, an increase in MMT loading from 1 to 10 wt.% has reduced phosphate cumulative release from 27.17 to 16.86 % within 24 hours. The pH release test showed the phosphate release was dependent on pH, where higher release rates were observed under acidic conditions (pH 4) compared to neutral conditions. Overall, the result shows that MMT acts as an eco-friendly additive which able to sustain the nutrient availability according to the nutrient uptake by crops.

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