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EFFECT OF FIBRE TREATMENT ON BIODEGRADATION AND AGRONOMIC PERFORMANCE OF KENAF/SODIUM ALGINATE BIOPOTS

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EFFECT OF FIBRE TREATMENT ON BIODEGRADATION AND AGRONOMIC PERFORMANCE OF KENAF/SODIUM ALGINATE BIOPOTS

MAISYARAH BINTI MUHAMMAD

Final Year Project Report Submitted in
Partial Fulfillment of the Requirement for the
Degree of Bachelor of Science (Hons.) Chemistry with Management
in the Faculty of Applied Sciences
Universiti Teknologi MARA

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This Final Year Project Report entitled "**Effect of Fibre Treatment on Biodegradation and Agronomic Performance of Kenaf/Sodium alginate Biopot**" was submitted by Maisyarah binti Muhammad in partial fulfillment of the requirements for the Degree of Bachelor of Science (Hons.) Chemistry with Management in the Faculty of Applied Science, and was approved by

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ABTRACT

The extensive use of petroleum-based plastic nursery pots has contributed significantly to long-term environmental pollution due to their poor biodegradability and accumulation in soil and landfills. In response to increasing demand for sustainable agricultural materials, biodegradable biopots derived from natural fibres and biopolymers have emerged as a promising alternative. However, the performance of natural fibre-based biopots is often limited by weak fibre-matrix interaction, excessive water absorption, and insufficient durability during plant growth, particularly when untreated fibres are used. This study was conducted to develop and evaluate biodegradable biopots based on kenaf fibre reinforced with sodium alginate (NaAg) at varying concentrations (5%, 10%, and 15%), and to investigate the effect of fibre surface treatment on their biodegradation behaviour and agronomic performance. Kenaf fibres were subjected to alkaline and silane treatments to enhance fibre-matrix adhesion before biopot fabrication via a controlled moulding and drying process. The biopots were characterized through physical testing (density, moisture content, and water absorption) and chemical analysis using Fourier Transform Infrared Spectroscopy (FTIR). Biodegradation behaviour was evaluated using a soil burial test over 30 days, while agronomic performance was assessed through seed germination and early-stage plant growth tests using mung bean seeds. The results demonstrated that fibre surface treatment significantly improved biopot performance. Treated kenaf/NaAg biopots exhibited higher density and enhanced fibre-matrix interaction compared to untreated biopots. FTIR analysis confirmed the modification of functional groups associated with fibre treatment. Soil burial testing revealed that treated biopots showed a higher biodegradation rate, with the treated biopot containing 15% NaAg achieving a maximum weight loss of 38.9% after 30 days, compared to 26% for the untreated counterpart. Agronomic evaluation indicated that all biopots were non-toxic, achieving 100% seed germination. Notably, treated biopots with 10% sodium alginate provided the most favourable conditions for early plant growth, exhibiting superior root length, shoot length, biomass, and leaf area. Overall, this study demonstrated that the combination of fibre surface treatment and optimized sodium alginate content effectively balanced structural integrity during cultivation with enhanced biodegradability after use. The findings highlight the potential of treated kenaf/sodium alginate biopots as eco-friendly alternatives to conventional plastic nursery pots, contributing to sustainable material development and greener agricultural practices.

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