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PREPARATION AND CHARACTERIZATION OF TAPIOCA STARCH BIOPLASTIC ENHANCED WITH CELLULOSE ACETATE DERIVED FROM PINEAPPLE CROWN

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This Final Year Project Report entitled **"Preparation and Characterization of Tapioca Starch Bioplastic Enhanced with Cellulose Acetate Derived from Pineapple Crown"** was submitted by Sheela Aida Binti Mokhtar in partial fulfilment of the requirements for the Degree of Bachelor of Science (Hons.) Chemistry with Management in the Faculty of Applied Sciences, and was approved by

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ABSTRACT

PREPARATION AND CHARACTERIZATION OF TAPIOCA STARCH BIOPLASTIC ENHANCED WITH CELLULOSE ACETATE DERIVED FROM PINEAPPLE CROWN

This study investigates the development of an eco-friendly bioplastic derived from tapioca starch, reinforced with cellulose acetate extracted from pineapple crown. The aim is to prepare and characterize the tapioca starch bioplastic enhanced with cellulose acetate. To enhance the flexibility and mechanical properties of bioplastics, glycerol is used as plasticizers and varying concentration of acetic acid are incorporated and water absorption are thoroughly analyzed as part of characterization process. The cellulose extraction from pineapple crown to modified cellulose acetate contributes to reinforcing the bioplastic, improving its strength and durability. Molecular compatibility between the components is assessed using Fourier-transform infrared (FTIR) spectroscopy. To further evaluate its mechanical behaviour, tensile test for example tensile strength, elongation at break, and Young' modulus are performed on the bioplastic formulation. The results provide insights into the influence of cellulose acetate, glycerol, and acetic acid on the overall quality of the bioplastic. The tensile strength test revealed that bioplastic cellulose acetate of 7.5% acetic acid exhibited the highest tensile strength with a value of 0.5929 MPa. Besides, the highest Young's modulus value is achieved by adding 2.5% acetic acid, was 13.6643 MPa, signifying increased rigidity and stiffness of the film material. For elongation at break, a concentration of 5.0% of acetic acid yielding 12.8337% was found to be the optimal concentration for maximizing flexibility. Finally, the water absorption test showed that BCA with 2.5% acetic acid, exhibiting a water absorption value of 46.33%, had the most favourable water absorptivity. In conclusion, the preparation and characterization of tapioca starch bioplastic enhanced with cellulose acetate derived from pineapple crown, alongside the addition of glycerol and varying concentrations of acetic acid, represent a significant step towards sustainable plastic alternatives. This research offers significant contribution to the development of biodegradable materials, supporting a greener approach to packaging and reducing the environment impact of conventional plastics.