THE EFFECT OF CELLULOSE NANOCRYSTAL (CNC) FROM POMEGRANATE HUSK AS FILLER ON THE PROPERTIES OF CASSAVA STARCH-BASED BIOPLASTICS

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This Final Year Project Report entitled **"The Effect of Cellulose Nanocrystal (CNC) From Pomegranate Husk as Filler on The Properties of Cassava Starch-Based Bioplastics"** was submitted by Muhammad Aiman Syafiq Bin Zamri in partial fulfilment of the requirement for the Degree of Bachelor of Sciences (Hons.) Biology, in the Faculty of Applied Sciences,and was approved by

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ABSTRACT

The environmental problem due to plastic waste had become a serious issue since most plastics could not be recycled and degraded naturally by microbes on land. Thus, the present study produced several bioplastics from cassava starch as the matrix and cellulose nanocrystal (CNC) from pomegranate husk as reinforcing filler. The pomegranate husk-CNC (PH-CNC) was prepared from a series of steps (delignification, bleaching, hydrolysis, and sonication) before being added to the bioplastics at various concentration: 0.5 g (BP2), 1.0 g (BP3), 1.5 g (BP4), and without PH-CNC (BP1) as control. All newly formed bioplastics were analysed using Fourier transform infrared (FTIR) spectroscopy and a series of biological testing including biodegradation, water solubility, and water uptake test were performed. Results showed that the FTIR analysis confirmed an absorption pattern of cellulose in the starch/PH-CNC bioplastic matrix. Adding PH-CNC fillers to the bioplastics reduces the time taken for the bioplastics to fully degrade. The BP4 with the highest amount of PH-CNC (1.5 g) took around 15 days compared to control (BP1) that took over 21 days to totally degrade. Meanwhile, the percentage of solubility increase proportionally as the concentration of PH-CNC increased. BP4 with 1.5 g of PH-CNC has the percentage of 98.80% of solubility in water. Additionally, BP1 with 0 g of PH-CNC has a higher percentage of water uptake than BP4, which contain 1.5 g of PH-CNC with 27.06% of water uptake. Overall, this study proved that the addition of CNC can improve a lot of things towards cassava-starch-based bioplastic specifically.

TABLE OF CONTENT