# THE EFFECT OF CELLULOSE NANOCRYSTAL (CNC) FROM POMEGRANATE PEEL AS FILLER ON THE PROPERTIES OF CORN STARCH-BASED BIOPLASTICS

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This Final Year Project Report entitled **"The Effect of Cellulose Nanocrystal (CNC) From Pomegranate Peel as Filler on The Properties of Corn Starch-Based Bioplastics"** was submitted by Syafiqah Nurzalia binti Zabidi 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

Because of growing environmental concerns/legislative pressure for plastic waste, as well as quick increases in the price of petroleum, the production of "environmentally friendly" materials has piqued the interest of many. Bioplastics are one of the most revolutionary environmentally friendly materials that have recently been developed. Thus, in this study, series of bioplastics were produced by using corn starch as the matrix and cellulose nanocrystal (CNC) derived from pomegranate peel as reinforcing filler. There are few methods that were used to prepared the pomegranate peel-CNC (PP-CNC) including delignification, bleaching, acid hydrolysis and sonication process, before being added into bioplastics at different concentration which are 0.5 g for BP 1, 1.0 g for BP 2, 1.5 g for BP 3 and zero PP-CNC as a control. All the bioplastics formed were analysed using Fourier transform infrared (FTIR) spectroscopy, and a number of biological tests, including degradability, water solubility, and water uptake tests, were carried out. The FTIR analysis results revealed a cellulose absorption pattern in the starch/PP-CNC bioplastic matrix which the bioplastics that have PP-CNC fillers added take the least amount of time taken for degradation to totally degrade. From the study, it shows that the BP 4 that contain the highest amount of PP-CNC (1.5 g) consumes about 15 days to degrade compared to the control BP 1 which took 21 days to fully degrade. Furthermore, As the concentration of PP-CNC increased, the percentage of solubility increased correspondingly. BP 4 with 1.5 g of PP-CNC has a water solubility rate of 98.80%. Furthermore, BP 1 with 0 g of PP-CNC has a larger percentage of water uptake than BP 4 with 1.5 g of PP-CNC, which has 27.06% of water uptake. Overall, this research shown that the inclusion of CNC can improve a variety of aspects of corn-starch-based bioplastics in particular.

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