UNIVERSITI TEKNOLOGI MARA
Cawangan Terengganu
Kampus Bukit Besi

TITLE:

PREPARATION AND CHARACTERIZATION OF BIOPASTIC FROM CORN STARCH AND ITS DEGRADATION IN SOIL

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2025

AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out accordance with the regulations of Universiti Teknologi MARA. It is original and the result of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any other degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

The growing environmental awareness about the excessive use of petroleum-based plastics has driven the urgent need to find biodegradable and sustainable alternatives. Corn starch has become one of the most promising in bioplastic production due to its sustainability, renewability and biodegradability. The practical feasibility and actual application of corn starch-based bioplastics depend heavily on their physical and chemical properties. The biodegradation behaviour of bioplastics in soil is one of the most important factors that can determine their environmental impact and the possibility of their complete replacement with conventional plastics. This study aimed to investigate certain characteristics of corn starch-based bioplastics through various test methods (soaking in water, water absorption, moisture absorption, and solubility test). In addition, Fourier transform infrared (FTIR) spectroscopy was performed on the functional groups present in bioplastic samples in soil. Soil samples were taken from two different locations, UiTM Terengganu Branch, Kuala Terengganu Campus (5°15'48.5"N 103°09'53.7"E) and Al-Muktafi Billah Shah (AMBS) (4°36'12.8"N 103°12'38.3"E), and were exposed to plastic for a certain period of time. The results showed that soaking in water for four weeks showed results where it swelled and slightly dissolved. Water absorption and moisture absorption show 28.72% and 6.99% respectively. The solubility tests conducted showed that although the bioplastic remained insoluble in water, it interacted with alcohol-based and alkaline solutions when tested at room temperature and at elevated temperatures of 60°C. These results were also expected and in accordance with the literature for bioplastics treated under the same conditions. Accordingly, the peaks from the FTIR spectrum analysis in the range of 3200-3600 cm^{-1}, 1640-1740 cm^{-1} and 1000-1200 cm^{-1} can be assigned to O-H stretching, C=O stretching-carbonyl group and C-O-C stretching, respectively. This shows that the presence of corn starch-based bioplastic is in the sample soil. In conclusion, this study provides excellent insights from both application and environmental perspectives into the bioplastics of corn starch-based bioplastics. Further studies need to be conducted to determine the long-term effect on soil quality through the degradation process of bioplastics, so that its sustainability can be ensured as an environmentally friendly alternative to conventional plastics.

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