APPLICATION OF WASTE BANANA PEELS AS BIODEGRADABLE PLASTIC

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RESEARCH HIGHLIGHTS

The world today seems unimaginable without plastics or synthetic organic polymer, however their large-scale production and use only dates back to 1950 (1). The resulting rapid growth in plastics production is remarkable, surpassing most other man-made materials. The study presents the utilization of banana peel as biodegradable plastic to substitute the existing non-biodegradable plastic. The objectives of this research are to aims to develop and produce biodegradable plastic that will substitute the existing non-biodegradable plastic to help in saving the environment as well as to compare the properties of biodegradable plastic based on banana peel with the commercial biodegradable plastic. The use of waste banana peel in this study is mainly to replace the synthetic materials used in the conventional biodegradable plastic. Furthermore, the environmental pollutions can be reduced due to the usage of waste banana peels to produce a new value-added biodegradable plastic.

Keywords: *Banana Peel, Biodegradable Plastic, Pollution, Environment*

RESEARCH OBJECTIVES

It is likely that in the future, the plastic materials we will use would be very different from those used today. The demand by the societies and environment for more 'greener' materials has brought on innovations in the plastic industry to develop new polymers that are derived from renewable biological resources and also polymers that are conceived as biodegradable (2). The usage of biodegradable plastic can help in reducing the dependency on petroleum that involved in the process of plastic-making and also helps in reducing pollution caused by burning and waste of plastics in the sea or soil (3). The motivation for the development of biodegradable plastics is that they will easily disintegrate and biodegrade when inadvertently emitted to the environment (4). Therefore, this study aims to develop and produce biodegradable plastic that will substitute the existing non-biodegradable plastic to help in saving the environment.

MATERIALS AND METHODS

In this study, the fabrication of samples involved several stages where banana peels were separated from the chaff and were chopped into smaller pieces. Then, the peels were grinded and blended until they became delicate and later was mixed with tapioca starch with four different concentration of banana peel which are 20%, 40%, 60% and 80%. The mixture was then poured into a mould and was left under sunlight to dry. A few tests were conducted to evaluate the mechanical and physical properties of the biodegradable plastic.

RESULTS

Degradation and tensile strength test were conducted to analyse the relationship between different concentration of waste banana peel and its mechanical properties. The degradation test was carried out according to standard method ASTM D5988-18. Based on the results related to degradability of the plastic, this study discovers that all of the samples showed the ability to degrade where as the concentration of waste banana peels increases, the degradability of the plastic also increases. The samples slowly decreased in sizes with time and showed clear evidences of degradation with the growth of fungus and disintegration within 5 week (5). According to the findings from the tensile strength test, this study notices that the strength increases with the increasing percentage of tapioca starch ranging from 23.7 Mpa up to 39.3

Mpa where sample with 80% concentration of banana peels exhibited the highest tensile strength.

FINDINGS

This research is significant as it brings forth improvements on the properties of biodegradable plastic based on banana peel. This study clearly demonstrated that this biodegradable plastic based on banana peel gives good performance on its mechanical and physical properties. It is found that 80% concentration of banana peel is the optimum concentration of banana peel due to its robustness and astounding degradability. These findings were considered successful as the plastics are able to show substantial properties that would help with the initiative of “going green” policy.

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REFERENCES

1. Shah, A. A., Hasan, F., Hameed, A., & Ahmed, S. (2008). Biological degradation of plastics: A comprehensive review. *Biotechnology Advances*, 26(3), 246–265. <https://doi.org/10.1016/j.biotechadv.2007.12.005>
2. Mostafa, N. A., Farag, A. A., Abo-dief, H. M., & Tayeb, A. M. (2018). Production of biodegradable plastic from agricultural wastes. *Arabian Journal of Chemistry*, 11(4), 546–553. <https://doi.org/10.1016/j.arabjc.2015.04.008>
3. Padam, B. S., Tin, H. S., Chye, F. Y., & Abdullah, M. I. (2014). Banana by-products: an under-utilized renewable food biomass with great potential. *Journal of Food Science and Technology*, 51(12), 3527–3545. <https://doi.org/10.1007/s13197-012-0861-2>
4. Agamuthu, P., & Faizura, P. N. (2005). Biodegradability of degradable plastic waste. *Waste Management and Research*, 23(2), 95–100. <https://doi.org/10.1177/0734242X05051045>
5. Sudesh, K., & Iwata, T. (2008). Sustainability of biobased and biodegradable plastics. *Clean - Soil, Air, Water*, 36(5–6), 433–442. <https://doi.org/10.1002/clen.200700183>