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BIODEGRADABILITY STUDY OF ECO-FRIENDLY BIOPLASTIC FROM *MUSA ACUMINATA* PEEL FOR SUSTAINABLE FRUIT WASTE MANAGEMENT

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ABSTRACT

BIODEGRADABILITY STUDY OF ECO-FRIENDLY BIOPLASTIC FROM *MUSA ACUMINATA* FOR SUSTAINABLE FRUIT WASTE MANAGEMENT

Amid growing global concern over plastic waste and environmental sustainability, the search for biodegradable alternatives to conventional plastics has intensified. Agricultural waste, particularly fruit peels, offers a promising source of raw materials for eco-friendly bioplastic production. The increasing worldwide production of *Musa acuminata* creates major difficulty in controlling fruit peel waste, with 30% being discarded as waste. Landfill overflow and greenhouse gas emissions are among the environmental issues this waste contributes to. Bioplastics from *Musa acuminata* fruit peel waste can be a promising solution, offering a renewable alternative to petroleum-based plastics. However, the biodegradability of these bioplastics remains underexplored and requires further study. Plastic pollution poses severe environmental and health risks due to the persistence of synthetic polymers, which can last for centuries. This study explores the development of biodegradable bioplastic films derived from *Musa Acuminata (*banana) peels, aiming to provide an eco-friendly alternative to conventional plastics. The research investigated the effects of varying ripening stages (unripe, ripe and overripe) and soil types (loamy and sandy soil) on the biodegradability, mechanical and physical properties of the bioplastic. Films were prepared by casting *Musa Acuminata* peel paste combined with polyvinyl alcohol (PVA) (50% w/w), oxalic acid, and glycerol, followed by drying. The mechanical, physical, and biodegradability properties were characterized, revealing that increasing starch content enhanced tensile strength but also increased water solubility. The highest biodegradability was observed after seven days for a formulation containing 10 ml glycerol, 20 g polyvinyl alcohol (PVA) and 2 g oxalic acid. The films demonstrated thickness of 0.52–0.57 mm. These results indicate that banana peel-based bioplastics exhibit promising mechanical and degradability characteristics suitable for bioplastic applications, potentially reducing reliance on synthetic plastics and paper. The study highlights the potential of utilizing fruit waste to create sustainable bioplastic materials, contributing to environmental conservation and waste reduction.

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