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DEVELOPMENT OF PACKAGING BIOPLASTIC FILM FROM SUGAR CANE BAGASSE FIBRE REINFORCED WITH MAIZE STRAW

BY

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ABSTRACT

Given the world's growing plastic demand and its damaging effects on the environment, it is vital to find an appropriate environmentally-friendly substitute like bioplastics. This study focused on the development and characterization of packaging material from sugarcane bagasse fibers reinforced with maize straw. The research investigated the differences in thermal stability, physical and chemical properties of the developed bioplastic films owing to their different compositions (based on the cellulose and fibre content). The ratios of cellulose to fibre content investigated in the current study regarding bioplastic production included 100:0,75:25, 50:50,25:75,0;100. The results from this study showed that the ratio of 75:25 (cellulose, maize straw: fibre, sugarcane bagasse) produced the best bioplastic film with the lowest water absorption (33%), slightly moist. Overall, this study highlights the potential of utilizing agricultural residues to create biodegradable and sustainable packaging material thus contributing to the advancement of green packaging materials.

DECLARATION

We hereby declare that this report is the result of our own work, all information, data, and content presented in this report are accurate to the best of our knowledge and has not been submitted to any institution of higher learning for the award of any academic qualifications.

NAME....NYERERE GERALD

SIGNATURE.....

DATE....23rd/05/2024...

NAME...KYOKUSIIMA SUSAN.....

SIGNATURE.....

DATE....19/06/2024.....

APPROVAL

This is to certify that this final project report has been written under the guidance of our supervisor and it is to be handed over to the Department of Agricultural Mechanization and Irrigation Engineering, Busitema University.

SUPERVISOR:

Name: **DR: RESTY NABATEREGA**

Signature: 

Date: 19/06/2024

DEDICATION

We dedicate this report to God, our dear parents, supervisor, our lecturers, and fellow students.

ACKNOWLEDGEMENT

We would like to sincerely thank God the Almighty for giving us life and enabling us to accomplish this report successfully.

Special thanks go to our supervisor Dr. Resty Nabaterega for her continuous guidance and mentorship in the development of this idea.

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May the Almighty Lord bless you abundantly.

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SDG	Sustainable Development Goal
SCB	Sugarcane Bagasse
NaOH	Sodium hydroxide
WVP	Water Vapour Permeability
FTIR	Fourier Transform Infrared Spectrometry
SEM	Scanning Electron Microscopy
UTM	Universal Tensile machine
TGA	Thermal Gravimetric Analysis

CHAPTER ONE: INTRODUCTION

1.1 Background

Plastics are the most frequently used packaging materials globally and it is estimated that 10% of household waste is made up of plastic (Barnes & Milner, 2005). Plastics are nonbiodegradable and made from petroleum-based polymers (non-renewable fossil fuels). In most developing countries Uganda inclusive, the plastic waste materials are poorly managed and in most cases are burnt, littered in lakes and other surface water sources, landfilled or end up blocking water drains(Barnes & Milner, 2005). These poor plastic waste management practices negatively affect both the ecology and human health. For example, burning plastic wastes can damage the neurological system, raise the risk of heart disease, and cause rashes, nausea, and headaches (Azmin et al., 2020). Furthermore, poor disposing off plastic wastes can clog sewers, providing breeding grounds for insects like mosquitoes which in turn proliferate the risk of diseases such as malaria. Therefore, there is an urgent need to investigate other biodegradable packaging materials to replace plastic packaging. (Cusumano, 2005).

Bioplastic packaging materials made from agricultural waste materials are a potential sustainable alternative to plastic packaging materials (Cusumano, 2005). Fortunately, lots of agricultural wastes such as maize straws and bagasse are produced in large quantities and are underutilized. For example, sugarcane growing is one of the most common economic activities taking place around the world where approximately 1,907 million tons are produced annually (Dilbilmez, 2023). In East Africa, about 36 million tons are grown annually which produces approximately 4.86 million tons of bagasse (Ainomugisha et al., 2021). For every ton of sugarcane processed, about 280 kg of sugarcane bagasse are produced (Cardona et al., 2010). Most of the bagasse produced is burnt in the boilers to produce electricity via cogeneration (To et al., 2018). However, not all the bagasse is used for electrical generation. Other bagasse wastes are deposited in the fields and burnt from there and this causes pollution (Micheal & Moussa, 2021).

On the other hand, maize straw, a byproduct of maize also known as corn stover is one of the most common agricultural wastes produced in farming (Feedipedia, 2017). The increase in maize growing for the past few years has resulted in an increase in the production of maize straw (Chen & Shi, 2015). For example, for every 1 kg of maize grains harvested there is a total of 1.01kg of maize straw produced (Mazurkiewicz et al., 2019). However, the optimum

Cellulose Bagasse

0	100
50	50
75 25	100 0
25	75

Appendix 12: Results of desired points exported from design expert 13

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