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CHARACTERIZATION OF RIPE EMPTY FRUIT BUNCH (EFB) OIL AND WASTE FRYING OIL ON THE PROPERTIES OF STARCH BIO-BASED PLASTICS

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ABSTRACT

Much attention has been paid in recent years on research to replace petroleum-based commodity plastics with renewable materials in a cost-effective manner. The current study has therefore focused on the production of bio-plastic, primarily starch, from renewable materials. This paper presents the results of studies of the characteristics of the produced bio-plastic by using ripe empty fruit bunch (EFB) oil and waste frying oil (WFO). The potato starch-glycerol based with different amount of ripe EFB oil and waste oil (2.5, 5.0, 7.5 and 10.0 g) were prepared and drying at 40°C for 48 h. Mechanical properties, water solubility, water vapor permeability (WVP), biodegradation test and fourier transform infrared spectroscopy (FTIR) were performed in this study. As a result, the higher the amount of ripe (EFB) oil/WFO in starch bio-based plastic, increase the elasticity which the higher value is 16.5 MPa and 36.33% in elongation at break but decrease in tensile strength, solubility and water vapor permeability. FTIR exhibit that the intermolecular interaction in starch bio-based plastic occurred through C-O-H, O-H, C-H aliphatic and C=O groups. For biodegradation test, all starch bio-based plastic was no longer in soil after a week they were buried which means they have been degrade successfully.

TABLE OF CONTENTS

LIST OF ABBREVIATIONS

Abbreviations	
EFB	Empty Fruit Bunches
WFO	Waste Frying Oil
PET	Polyethylene Terephthalate
PE	Polyethylene
BPA	Bisphenol A
WVP	Water Vapor Permeability
SREOB	Starch Ripe EFB Oil Bio-Plastic
SWFOB	Starch Waste Frying Oil Bio-Plastic
CNC	Cellulose Nanocrystals
NFC	Nano-Fiber Cellulose
FTIR	Fourier Transform Infrared Spectroscopy
E	Young's Modulus
TS	Tensile Strength
%EAB	Percentage of Elongation at Break
TPS-R	Thermoplastic Starch-Ripe
TPS-W	Thermoplastic Starch-Waste

CHAPTER ONE

INTRODUCTION

1.1 Research Background

Currently, people become conscious of the damaging effects on the environment materials of petrochemical plastic derived. Some of the researchers conducted some researches into plastic waste management on this world by searching an environmentally friendly ways to plastics. The environmentally friendly ways is bioplastic, which it can be easily degraded by microorganisms' enzymatic actions and disposed in the environment.

Approximately, percentage of the world's oil production is 4%. This 4% has been converted to plastics usually for used as external car panels and shopping bags while the other further few percent are used in industries of processing. The utilization of fossil fuels caused more costly and as oil runs out, the need for raw material replacement sources for the production of plastics are becoming more and more important [1].

A bio-plastic is made from renewable resources that come from sources of biology like gelatin, potato starch, maize, soy, rice, sugarcane, wheat and vegetable oil, in part or in whole. Bio-plastics consist of all range of different applications and properties [2].

Despite the efforts of the associations, however, the term bioplastics still tends to be misunderstood. The problem is essentially that petrochemical plastics like polyethylene terephthalate (PET) and polyethylene (PE) could be manufactured from raw materials which from renewable sources. People can know and understand easily that it is quite strange to define a product made from traditional plastics such as PE as bioplastics. In this case, innovation lies not in the product, but in the production process. However, the word of bio-plastics appears much more appropriate to characterize the innovative biodegradable and bio-based materials [2].