

**SYNTHESIS OF BIOFILMS FROM *MARANTA ARUNDINACEA* FIBRE
AND PLASTICIZER FOR FOOD PACKAGING**

CHE SITI NURHUSNI BINTI CHE HUSAIN

**Final Year Project Proposal Submitted in
Partial Fulfilment of the Requirements for the
Degree of Bachelor of Science (Hons.) Applied Chemistry
In The faculty of Applied Sciences
Universiti Teknologi MARA**

JULY 2024



**SUBMISSION FOR EVALUATION
FINAL YEAR PROJECT 2 - RESEARCH PROJECT**

**SYNTHESIS OF BIOFILMS FROM *MARANTA ARUNDINACEA* FIBRE AND
PLASTICIZER FOR FOOD PACKAGING**

Name	:	CHE SITI NURHUSNI BINTI CHE HUSAIN
Student ID	:	2021886234
Program	:	AS245
Course code	:	FSG671
Mobile Phone	:	
E-mail	:	2021886234@uitm.edu.my

Approval by Main Supervisor :

I certify that the work conducted by the above student is completed and approve this report to be submitted for evaluation.

Supervisor's name : DR. NON DAINA BINTI MASDAR

Date : 24 JULY 2024

Turnitin Similarity % : 9%

Signature :

ABSTRACT

SYNTHESIS OF BIOFILMS FROM *MARANTA ARUNDINACEA* FIBRE AND PLASTICIZER FOR FOOD PACKAGING

The great potential of *Maranta Arundinacea* as fiber loading in the preparation of bioplastic was investigated. The properties of TPAS/AF composite films with the presence of glycerol were evaluated. In this study, the bioplastic was successfully synthesized from arrowroot starch solution and its fibre. The fibre was treated with 3 % sodium hydroxide solution. The starch powder was produced by means of mechanical grinder. The new mechanical properties of bioplastic were enhanced using 30% glycerol and different percentage of fibre loading (i.e, 5%, 10%, 15% and 20%). The chemical compounds of the fibre and bioplastic were characterized using the Fourier-Transform Infrared (FTIR) analysis. The spectra show the presence hydroxyl (-OH) groups at 3600-3000 cm^{-1} carbonyl group at 1600 cm^{-1} and aromatic groups of C-C stretching which are significant to the TPAS/AF composite films. Meanwhile, the morphological structures of TPAS/AF composite films were evaluated using Scanning Electron Microscopy analysis and optical microscope analysis. The images revealed the homogenous distribution of the fibre. The addition of fibre has increased the water content in TPAS/AF composite films from 9.6% to 26.2%. Besides, the solubility and water absorption of TPAS/AF composite films have decreased upon the addition of fibre in the composite films. It is beneficial for food packaging as it can extend the shelf-life of the food. The TPAS/AF composite films were further analyzed using its mechanical properties. TPAS/AF15 composite film has illustrated the highest tensile strength and Young's modulus. Meanwhile, its elongation at break has decreased, causing the composite films to have become harder. The biodegradability test was conducted using compost soil at constant temperature, moisture and pH. At 14 days, the bioplastic completely degraded. The addition of fibre loading affected the degradation rate of the bioplastic. Hence, the *Maranta Arundinacea* fibre was found to be a good candidate as green fibre for development of stronger and environmentally friendly bioplastic is suitable for food packaging.

TABLE OF CONTENTS

	Page
ABSTRACT	iii
ABSTRAK	iv
ACKNOWLEDGEMENTS	v
LIST OF TABLES	ix
LIST OF FIGURES	x
LIST OF SYMBOLS	xii
LIST OF ABBREVIATIONS	xiii
CHAPTER 1: INTRODUCTION	
1.1 Background of study	1
1.2 Problem Statement	3
1.3 Significance of study	5
1.4 Objectives of study	6
CHAPTER 2: LITERATURE REVIEW	
2.1 Starch-based bioplastic	7
2.2 Maranta Arundinacea (Arrowroot)	12
2.2.1 Starch content properties	13
2.3 Bagasse fibre	14
2.3.1 Sugarcane	18
2.3.2 Arrowroot	20
2.4 Plasticizers	22
2.4.1 Mechanisms of Plasticizer	24

CHAPTER 3: METHODOLOGY

3.1	Introduction	26
3.2	Materials	27
3.3	Sample Preparation	
3.3.1	Arrowroot starch	27
3.3.2	Arrowroot fibre	28
3.4	Preparation of TPAS/AF composite films	28
3.5	Characterization of starch, fiber and TPAS/AF composite films	
3.5.1	Physical analysis	
3.5.1.1	SEM	29
3.5.1.2	Optical microscope	30
3.5.1.3	Thickness	30
3.5.1.4	Tensile strength	31
3.5.2	Chemical analysis	
3.5.2.1	FTIR	31
3.6	Performance analysis	
3.6.1	Water content	32
3.6.2	Water absorption test	32
3.6.3	Solubility test	33
3.6.4	Biodegradability test	34
3.7	Flowchart of TPAS/AF composite films	35

CHAPTER 4: RESULTS AND DISCUSSIONS

4.1	FTIR analysis	36
4.2	Morphological structure of TPAS/AF composite films	40
4.3	Scanning Electron Microscopy	43
4.4	Thickness and Moisture Content	45
4.5	Water solubility	46
4.6	Soil biodegradability	49
4.7	Water absorption	52
4.8	Mechanical properties	54