

**MECHANICAL AND PHYSICAL PROPERTIES OF
LIGNOCELLULOSIC PLASTIC COMPOSITE FROM HYBRID
SUGARCANE BAGGASE AND MIXED TROPICAL HARDWOOD**

NURFATIHA BINTI ZAINAL ABIDIN

**Final Year Project Report Submitted in
Partial Fulfilment of the Requirements for the
Degree of Bachelor of Science (Hons.) Furniture Technology
in the Faculty of Applied Sciences
Universiti Teknologi MARA**

JANUARY 2020

CANDIDATE'S DECLARATION

I declared that work in this dissertation was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and it is the result of my own work, unless otherwise indicated or acknowledged as reference work. This topic has not been submitted to any other academic institution or non academic institution for any degree or qualification.

In the event that my dissertation be found to violate the conditioned mentioned above, I voluntarily waive the right of confirming my degree and agree to be subjected to the disciplinary rules and regulations of Universiti Teknologi MARA.

Name of candidate : Nurfatiha binti Zainal Abidin
Candidate I.D. No. : 2016598313
Program : B. Sc. (Hons) Furniture Technology
Faculty : Applied Science

Title : Mechanical & Physical Properties of
Lignocellulosic Plastic Composite
from Hybrid Sugarcane Bagasse and
Mixed Tropical Hardwood


Signature of Candidate : 
Date : 28 January 2020

TABLE OF CONTENTS

	Page
APPROVAL SHEET	ii
CANDIDATE'S DECLARATION	iii
ACKNOWLEDGEMENTS	iv
TABLE OF CONTENTS	v
LIST OF TABLES	vii
LIST OF FIGURES	viii
LIST OF PLATES	ix
LIST OF SYMBOLS	x
LIST OF ABBREVIATIONS	xi
ABSTRACT	xii
ABSTRAK	xiii
CHAPTER 1 INTRODUCTION	
1.1 Background of the study	1
1.2 Problem statement	3
1.3 Significance of Study	4
1.4 Objectives of the study	5
CHAPTER 2 LITERATURE REVIEW	
2.1 Sugarcane Bagasse	6
2.2 Malaysian Tropical Hardwood	7
2.4 Thermoplastic	9
2.4.1 Polypropylene	10
2.5 Hybrid Composite	11
2.6 Lignocellulosic Fiber	13
2.6.1 Lignin	14
2.6.2 Cellulose	14
2.6.3 Hemicellulose	15
2.2 Effect of Filler Loading	16
CHAPTER 3 METHODOLOGY	
3.1 Materials preparation	18
3.1.1 Preparation of Sugarcane Bagasse Filler	19
3.2 Preparation of Boards	20
3.2.1 Process of Preparing Board	20
3.2.2 Blending in Dispersion Mixer	22
3.2.3 Hot Press	23
3.2.4 Cold Press	24
3.3 Sample Cutting and Conditioning	24

3.4	Mechanical & Physical Testing	26
3.4.1	Bending Testing	26
3.4.2	Tensile Testing	26
3.4.3	Determination of Water Absorption (WA)	29
3.4.4	Determination of Thickness Swelling (TS)	29
3.5	Experimental Design	31
3.6	Statistical Analysis	32

CHAPTER 4 RESULTS AND DISCUSSION

4.1	ANOVA Analysis	33
4.1.1	Summary of ANOVA on Filler Loading & Types of Filler	33
4.2	DMRT Analysis	35
4.3.1	DMRT Analysis on Percentage of Filler Loading	35
4.3.2	DMRT Analysis on Types of Filler	35
4.3	Mechanical properties	36
4.3.1	Effect of Filler Loading on Tensile Properties	36
4.3.2	Effect of Types of Filler on Tensile Properties	38
4.3.3	Effect of Filler Loading on Bending Properties	40
4.3.4	Effect of Types of Filler on Bending Properties	42
4.5	Physical Properties	44
4.4.1	Effect of Filler Loading on Water Absorption & Thickness Swelling	44
4.4.2	Effect of Types of Filler on Water Absorption & Thickness Swelling	46

CHAPTER 5 CONCLUSION AND RECOMMENDATION	48
REFERENCES	50
APPENDICES	55
PUBLICATION OF THE PROJECT REPORT UNDERTAKING	56
PERMISSION FOR REFERENCES AND PHOTOCOPYING	57
EVALUATION OF FINAL YEAR PROJECT REPORT	58
CURRICULUM VITAE	59

ABSTRACT

MECHANICAL & PHYSICAL PROPERTIES OF LIGNOCELLULOSIC PLASTIC COMPOSITE FROM HYBRID SUGARCANE BAGASSE AND MIXED TROPICAL HARDWOOD

Production of Lignocellulosic Plastic Composite (LPC) using wood wastes and agricultural waste is the best way to use waste for beneficial use. Hence, the use of waste and fibers from agricultural waste as an alternative to natural wood for the manufacture of Lignocellulosic Plastic Composite. The aim of the study was to determine the effect of filler loading and types of filler on the mechanical & physical properties of lignocellulosic plastic composite. Four types of filler used are Neat Polypropylene (PP), Sugarcane Bagasse, Mixed Tropical Hardwood and Hybrid Composite (combination of Sugarcane Bagasse and Mixed Tropical Hardwood). In this study, three filler loading were used 10% filler loading, 15% filler loading and 20% filler loading with different types of filler loading. Types of filler and filler loading were main factors that affect the mechanical & physical properties of lignocellulosic plastic composite in this study. There are two types of testing that have been conducted such as mechanical testing and physical testing. The mechanical testing which included tensile testing and bending testing while physical testing including water absorption testing (WA) and thickness swelling testing (TS). The result had shown that filler loading had significant effect on tensile MOE and thickness swelling. For the types of filler, only bending MOE have significant effect. The interaction between filler loading and types of filler shows only tensile MOE have significant effect. At higher filler loading, mechanical properties such as tensile MOE and tensile MOR had showed highest value as compared to lower of filler loading. However, bending MOR was showed opposite effect. Physical properties such as water absorption and thickness swelling was increased at higher filler loading.