

**EFFECT OF OVEN AND MICROWAVE TREATMENT
ON PHYSICO- MECHANICAL PROPERTIES OF
KELEMPAYAN (*Neolamarckia cadamba*)**

MARYAM BINTI MOHD RADZI

**BACHELOR OF SCIENCE (Hons.) FURNITURE TECHNOLOGY
FACULTY OF APPLIED SCIENCES
UNIVERSITI TEKNOLOGI MARA**

FEBRUARY 2023

ABSTRACT

EFFECT OF OVEN AND MICROWAVE TREATMENT ON PHYSICO-MECHANICAL PROPERTIES OF KELEMPAYAN (*Neolamarckia cadamba*)

A treatment of wood performs as to enhance the strength of the wood which would improve the wood properties in terms of dimensional stability, strength and durability when it was differentiate with methods of drying treatment. In this study, a kelempayan wood (*Neolamarckia cadamba*) is chosen because it is one of the potential species as an alternative raw material for furniture components. The aim of this study is to determine the effect of physico-mechanical properties of kelempayan wood through oven and microwave treatment at different portions (bottom, middle, and top). The kelempayan trees were harvested from UiTM Educational Forest Reserve of UiTM Pahang Branch and then has been converted into sawn timber using the facilities at Wood Industry Workshop of UiTM Pahang Branch. The logs were cut into the billets and then they have been cut into the wood samples size for physical testing (25 mm x 25 mm) and mechanical testing for bending (20 mm x 20 mm x 300 mm), compression parallel to grain (20 mm x 20 mm x 60 mm), compression perpendicular to grain (50 mm x 50 mm x 50 mm) and shear (20 mm x 20 mm x 20 mm). The samples were oven dried at temperature of 105 °C for 24 hours and microwave dried at 90 watts with maximum rated power output of 1000 watt by using domestic microwave oven for 3 minutes. The treated samples were analysed the physico-mechanical properties based on volumetric changes. The physical test methods were performed accordance to ASTM D4442-20 standard. Meanwhile, the mechanical properties have been tested accordance to BS 373 standard. The results were revealed that the physical and mechanical properties at different tree portions and methods of drying treatments have significant difference. Therefore, the oven and microwave treatment influenced the physico-mechanical properties of kelempayan wood which made its possible to be used as the furniture component parts.

ACKNOWLEDGEMENTS

First and foremost, I would deliver my gratitude to Allah S.W.T for whom with His willing gives me the most precious opportunity to complete this thesis and also for giving me the tranquillity of mind to handle all the obstacles and difficulties in finishing this task properly. A special thanks to my dedicated supervisor, Dr Siti Zalifah Mahmud and co-supervisor, Madam Nur Hannani Abdul Latif for the helps, guidance and enthusiasm throughout the whole process of completing this thesis. Additionally, I would like to thank the workshop staff, Mr. Abdul Rahman Ahmad and Mr. Mohd Sharil Izanie Abdullah and Mr. Ahmad Sardey Idris who I puzzled over many of the same problems. Finally, and most importantly, I would like to thank my family especially my parents through the support, encouragement, patience and unwavering love were undeniably the bedrock upon which the past two years of my life have been built. Their tolerance of my occasional vulgar moods is a testament in itself of their unyielding devotion and love. I thank my parents, for their faith in me and allowing me to be as ambitious as I wanted. Your prayer for me was what sustained me thus far.

Maryam Binti Mohd Radzi
(2021112575)

TABLE OF CONTENTS

	Page
ABSTRACT	iii
ABSTRAK	iv
ACKNOWLEDGEMENTS	iii
TABLE OF CONTENTS	iv
LIST OF TABLES	vi
LIST OF FIGURES	vii
LIST OF ABBREVIATIONS	ix
CHAPTER 1 INTRODUCTION	1
1.1 Background of the Study	1
1.2 Problem Statement	2
1.3 Significant of Study	3
1.4 Objectives	4
CHAPTER 2 LITERATURE REVIEW	5
2.1 Kelempayan	5
2.1.1 Species	5
2.1.2 Density and Moisture Content	6
2.1.3 Colour	7
2.1.4 Anatomy	7
2.2 Wood Properties	8
2.2.1 Anisotropic	8
2.2.2 Volumetric Changes (Physical Properties)	9
2.3 Importance of Wood Drying	11
2.4 Method of Drying	14
2.4.1 Oven Drying	15
2.4.2 Microwave Drying	15
CHAPTER 3 METHODOLOGY	17
3.1 Sample Preparations	17
3.2 Drying Treatment Process	18
3.2.1 Oven Drying Treatment	18
3.2.2 Microwave Drying Treatment	20
3.3 Sample Testing	21
3.3.1 Volumetric Change (Physical)	21
3.3.2 Mechanical Testing	23

CHAPTER 4 RESULTS AND DISCUSSION	27
4.1 Statistical Analysis of Physico-Mechanical Properties	27
4.2 Analysis of Physical Properties	30
4.2.1 Moisture Content	30
4.2.2 Density	31
4.2.3 Shrinkage	33
4.2.4 Swelling	35
4.3 Analysis of Mechanical Properties	37
4.3.1 Modulus of Elasticity (MOE)	37
4.3.2 Modulus of Rupture (MOR)	39
4.3.3 Compression Perpendicular to the Grain	41
4.3.4 Compression Parallel to the Grain	43
4.3.5 Shear	45
CHAPTER 5 CONCLUSION AND RECOMMENDATIONS	48
5.1 Conclusion	48
5.2 Recommendation for Future Research	49
CITED REFERENCES	50
APPENDICES	56
CURRICULUM VITAE	57