EFFECT OF WOVEN VENEER ON THE MECHANICAL PROPERTIES OF OIL PALM PLYWOOD

HELMI FARIZ BIN AB KADIR

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EFFECT OF WOVEN VENEER ON THE MECHANICAL PROPERTIES OF OIL PALM PLYWOOD

By

HELMI FARIZ BIN AB KADIR

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ABSTRACT

Oil palm is the one of the largest agriculture in Malaysia. So that, oil palm farm in Malaysia produce so much oil palm trunk that have potential to be used to replace wood. So that, commercializing oil palm trunk was the best way in order to avoid wasted. To prove this fact, the study to test the strength of the plywood made from oil palm trunk. The objective of this study is to provide basic information after the power trunks are made of plywood in the fabrication of the seven types and to compare the strength of seven different types of fabrication. Seven types of fabrication are 'OWOWOW', 'OWONOW', 'ONOWON', 'OWVOW', 'VOWV', 'OW'OW'OW' 'and' N'N'N ". A total of 105 samples were made according to seven fabrications that being tested. Data were analyzed using SPSS 22.0 to find the balance of power between seven fabrications. Results through bending tests prove that 'VOWV' is a very strong resistance with the value of MOE was 1029.15(±80.7084) and value of MOR was 9.279334(±0.4825) while 'N'N'N' too weak immune strength. Similarly, IB test of strength 'VOWV' still proved robust compared with six other fabrications with the value 9.47061(±1.4739).

ABSTRAK

Kelapa sawit adalah antara tanaman terbesar di Malaysia. Oleh yang demikian, ladang – ladang kelapa sawit di Malaysia telah menghasilkan banyak batang kelapa sawit yang berpotensi untuk dijadikan bahan untuk mengantikan kayu. Dengan itu, kelapa sawit haruslah dikomersilkan agar ia tidak menjadi bahan lebihan buangan. Untuk membuktikan kenyataan ini, satu kajian menguji kekuatan batang kelapa sawit telah dilakukan dengan menghasilkan papan lapis dari batang kelapa sawit. Objektif kajian ini adalah untuk menyediakan maklumat asas kekuatan batang kelapa sawit setelah dijadikan papan lapis yang di fabrikasi kepada tujuh jenis dan untuk membandingkan kekuatan di antara tujuh jenis fabrikasi yang berbeza. Tujuh jenis fabrikasi tersebut adalah seperti 'OWOWOW', 'OWONOW', 'ONOWON', 'OWVOW', 'VOWV', 'OW'OW'OW'' dan 'N'N'N''. Sebanyak 105 sampel papan lapis telah dihasilkan mengikut fabrikasi yang ingin diuji. Data yang diperolehi dianalisis menggunakan SPSS 22.0 untuk mencari perbandingan kekuatan antara tujuh fabrikasi. Keputusan melalui ujian kelenturan membuktikan bahawa 'VOWV' adalah sangat kuat ketahanan dengan nilai MOE 1029.15(±80.7084) dan MOR 9.279334(±0.4825) manakala 'N'N'N'" terlalu lemah kekuatan ketahanannya. Begitu juga dengan ujian IB kekuatan 'VOWV' masih lagi terbukti kuat berbanding dengan enam fabrikasi yang lain dengan nilai 9.47061(±1.4739).

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APPROVAL SHEET

I certify that this research project report entitled "**Effect of Woven Veneer on the Mechanical Properties of Oil Palm Veneer**" by Helmi Fariz b Ab Kadir has been examined and approved as a partial fulfillment of the requirements for the degree of Bachelor of Wood Science Technology in the Faculty of Forestry, University Putra Malaysia.

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Assoc. Prof. Dr. Norul Hisyam Hamid
Faculty of Forestry
University Putra Malaysia
(Supervisor)

.....

Prof. Dr. Mohamed Zakaria Hussin
Dean
Faculty of Forestry
University Putra Malaysia

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LIST OF ABBREVIATION

ANOVA	Analysis of Variance
IB	Internal bonding
LMWPF	Low Molecular weight phenol formaldehyde
LVL	Laminated veneer lumber
MOE	Modulus of Elasticity
MOR	Modulus of Rupture
N'N'N'	Non-woven unmodified -Non-woven unmodified- Non woven unmodified
ONOWON	Oil palm non-woven- Oil palm woven- Oil palm non-woven
OPT	Oil palm Trunk
OW'OW'OW'	Oil palm woven-unmodified- Oil palm woven-unmodified- Oil palm woven-unmodified
OWONOW	Oil palm woven- Oil palm non-woven- Oil palm woven
OWOWOW	Oil palm woven- Oil palm woven- Oil palm woven
OWVOW	Oil palm woven- veneer wood- Oil palm woven
SPSS	Statistical Package for the Social Science
VOWV	Veneer wood- Oil palm woven- Veneer wood

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CHAPTER 1

INTRODUCTION

1.0 Background

Oil palm tree that called *Elaeis guineensis* is native to the tropical forest in West Africa. Oil palm is under family Palmaceae. It was introduced first in Bogor Botanical Garden of Indonesia in 1818 before it was first planted in Malaysia as an ornamental plant in 1871 (Basiron *et al*. 2000). It then has been increasing rapidly on a yearly basis, especially between 1975 to 2010, as one of the most important commercial cash crops in Malaysia. It also showed that the Malaysian oil palm industry is growing each year and can be seen by the increasing planting area substantially from 3.37×10^6 ha in 2000 to 4.05×10^6 ha in 2005 and in 2010; the total oil palm planted area was 4.85 million hectares (Sulaiman *et al*. 2012).

To creating the other product, oil palm residues can be modified to be used in many applications such as composite and also panel material. For the most part, it has been utilized as plywood core and laminated veneer lumber. Since the raw materials are having a troublesome time these days, industries need to search for different sources as a raw material that is not commercial yet but have a future and can be commercialize. Since Malaysian oil palm industry is expanded, the choice to utilize oil palm as alternative raw material is simply right. To get the same item with a similar usage and qualities like rattan and bamboo, there are still have another non-wood material to be processed, however the source is going to be a major problem. Plywood has filled the demand for a development material that is light, flat and solid. The standard panel size,

4 x 8 feet, speeds on site and factory construction resulting in lower construction costs (Richard, 1981). According to Richard, the art of making softwood plywood began in the early 1900s; however, the invention and development of the manufacturing technology began much earlier. Since the plantation of oil palm tree has been increased rapidly in Malaysia, the usage of the oil palm tree as raw material has been introduced in the plywood industry.

In the wood industry in Malaysia, working people struggle to gain sufficient raw materials at a competitive price. Oil palm trunk (OPT) is abundantly available, and it is a less expensive lignocellulose raw material compared to wood (Othman, 2011). Plywood consists of 3 parts which is face, core and back. The conventional plywood is aligning horizontally between face and back part. The strength is depending on the thicknesses of the face, core and back a part of the glue type used and also the species of wood used. Any modification that has been made from any of the factor will change the final result. For this situation, the progressions that was made are the veneer which was using woven mat.

Woven mat can produce by interlacing thing to frame into a mat shape. In this study, the interlacing thing was formed from an oil palm veneer that has been cut into size from an inner part of OPT. There were 7 different arrangements to try. Each size and arrangements was replicated to get an accurate reading of results. To modify this woven mat using low molecular weight phenol formaldehyde as a substance material, the mat was impregnated which is very effective in upgrading wood properties.

The objective of woven oil palm core is to improve the core structure by woven the oil palm strip into mat which will produce more strengthen and durable core and in the same time, it will maintain the dimensional stability.

1.1 Problem Statement

Oil palm trunk has a different density throughout from inner segment to the outer segment of the trunk. The inner segment of oil palm trunk is not suitable for sawn timber because of its low in density and soft.

Current oil palm plywood industries just using outer segment of OPT as a peeled veneer. This is due to the composition of the wood itself that make the oil palm trunk not suitable for the other product. Other than that, current industries only utilize the oil palm veneer as a core layer integrated with tropical wood veneer as a face and back layer.

The modified of oil palm veneer with low molecular weight phenol formaldehyde (LmwPF) from inner section of oil palm trunk was not improved enough compared to the outer section (Loh *et al*. 2010).

In this manner, it is important to improve the strength of oil palm mat from inner section by using woven and impregnation with low molecular weight of phenol formaldehyde. So it can be utilized as another material as a part of building construction and also in paneling products.

1.2 Objectives

The general objectives of this study are to enhance the strength of oil palm veneer using the woven technique for plywood core. The specific objectives of this study are:

1. To evaluate the mechanical properties of woven veneer of oil palm plywood.
2. To investigate the potential of woven oil palm veneer from the inner section of oil palm trunk impregnate with low molecular weight phenol formaldehyde.

1.3 Significance of Research

The oil palm tree is the potential option as raw material resources which can lower the depending on wood resource. The research and development of oil palm tree is well established. However, the uses of oil palm tree especially inner OPT are limited mainly for biomass, since the inner part have a lack in strength. Despite abundance of OPT after its 25 years' rotation cycle, the properties of OPT is not suitable for sawn timber caused by its high moisture content and very fibrous. The main application of OPT is for the core of plywood (Bakar *et al.* 2008). This research can improve the recovery grate and fully utilized the usage of oil palm veneer in industries. Hence, this research will provide a good prospect for OPT as substitute material for furniture and panel industries. This study also was give more advantage for Malaysia financial development by maximizing the utilization of lignocellulose material as well as a recognition of OPT as a new source of raw material apart just thrown with no utilization.

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