



***PHYSICO-MECHANICAL PROPERTIES OF SESENDUK TREATED WITH
DIRECT CONTACT METHOD***

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DIRECT CONTACT METHOD**



**A Project Report Submitted in Partial Fulfillment of the Requirements
for the Degree of Bachelor of Wood Science Technology in the
Faculty of Forestry
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DEDICATION

This thesis is dedicated to:

My parents,

Yunus bin Mijan

Hasneh binti Rahim

My supervisor,

Assoc. Prof. Dr. Edi Suhaimi Bakar

And all of my friends.

Thank you for being there during my ups and downs.

ABSTRACT

Nowadays, wood industries focus more on high quality wood which most of them are slow-growing trees which cause high pressure to the forest area. This study is carried out to improve the quality of Sesenduk which is fast-growing trees so that it can be used widely in wood industry and reduce pressure to the forest. Heat treatment known as direct contact method is performed on Sesenduk wood samples which use variation wood thickness, time and temperature of treatment. Samples of Sesenduk wood (80 mm × 320 mm) with the thickness of 1 cm, 1.5 cm and 2 cm were heat-treated at 160°C, 180°C and 200°C with 15 min, 30 min and 45 min. For the result, water absorption, volumetric change, MOR, MOE and colour change are tested and observed. It shows that untreated samples have higher water absorption and volumetric change than treated samples which means that it is less durable and prone to fungi attack. Untreated samples also have no colour change compared to treated sample that have darker colour which indicates higher strength. MOR and MOE of treated samples are higher than untreated samples as heat treatment improves its physical and mechanical properties. Therefore, it can be concluded that direct contact method has improved Sesenduk quality.

ABSTRAK

Pada masa kini, industri perkayuan lebih memfokuskan kepada kayu berkualiti tinggi dan kebanyakan daripadanya merupakan pokok bertumbuhan perlahan yang telah menyebabkan tekanan yang tinggi terhadap kawasan hutan. Kajian ini dijalankan untuk meningkatkan kualiti Sesenduk yang merupakan kayu bertumbuhan cepat supaya ia boleh digunakan secara meluas dalam industri perkayuan seterusnya mengurangkan tekanan terhadap hutan. Rawatan haba dikenali sebagai kaedah direct contact dilakukan pada sampel kayu Sesenduk yang menggunakan variasi ketebalan kayu, masa dan suhu rawatan. Sampel kayu Sesenduk (80 mm × 320 mm) dengan ketebalan 1 cm, 1.5 cm dan 2 cm telah menjalani rawatan haba pada suhu 160°C, 180°C dan 200°C dengan tempoh 15 min, 30 min dan 45 min. Hasilnya, penyerapan air, perubahan isipadu, MOR, MOE dan perubahan warna diuji dan diperhatikan. Ia menunjukkan bahawa sampel yang tidak dirawat mempunyai penyerapan air yang lebih tinggi dan perubahan isipadu daripada sampel dirawat yang bermaksud bahawa ia adalah kurang tahan lama dan terdedah kepada serangan kulat. Sampel yang tidak dirawat juga tidak mempunyai perubahan warna berbanding sampel dirawat yang mempunyai warna gelap yang menunjukkan kekuatan yang lebih tinggi. MOR dan MOE sampel dirawat adalah lebih tinggi daripada sampel yang tidak dirawat sebagai rawatan haba meningkatkan sifat fizikal dan mekanikal. Oleh itu, dapat disimpulkan bahawa kaedah direct contact telah meningkatkan kualiti Sesenduk.

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APPROVAL SHEET

I certify that this research project report entitled “Physico-mechanical Properties of Sesenduk Treated with Direct Contact Method” by Mohd Hafiz bin Yunus 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, Universiti Putra Malaysia.

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LIST OF ABBREVIATIONS

FSP	Fibre Saturation Point
UV	Ultra-violet
MOR	Modulus of Rupture
MOE	Modulus of Elasticity
EMC	Equilibrium Moisture Content
SPSS	Statistical Package for the Social Sciences
ANOVA	Analysis of Variance



CHAPTER 1

INTRODUCTION

1.1 Sesenduk

Endospermum sp. is locally known as sesenduk. It is widely distributed in lowland secondary forest up to 1000 m altitude in Peninsular Malaysia and usually occurs in the logged over forest (Whitmore, 1973). Sesenduk is one of the timber species belong to the family of Euphorbiaceae. It has a good characteristic in term of growth performance and wood properties similar with rubber wood. It is a dioecious large tree and it was among the most important species in the inland forest (Khairil *et al.*, 2011).

Sesenduk can grow up to 40 meters and can achieve 3 meter dbh. Timber from Sesenduk shows the good wood characteristic as like rubber wood and it also had high growth rates. It can be a new species for forest plantation and can grow in the open area (Ang, 1991). It believes can be a replacement to the rubber wood since the demand for rubber wood is keep increasing while the resources of rubber wood keep decreasing (Khairul *et al.*, 2010).

The continuous logging of natural forest is also threatening the supply of the tree in the future (Rasip, 1991).

The timber is classified as light hardwood with density of about 400 kg/m³. It is a favored species for the manufacture of match splints and boxes. The timber is also suitable for pattern making, manufacture of drawing boards, trays plywood, crates, toys, wooden clog and disposable chopsticks (Shukari, 1982). This species was also selected as one of the potential species for

plantation establishment based on its fast growth rate and suitable for open planting (Darus *et al*; 1990, Ang; 1991). Corner (1988) reported only one genus *Endospermum* was found in Peninsular Malaysia. However, through observation, (Rasip, *pesr.comn*) this species can be found as two different types in wild populations based on leaf shape features, latex colour and size of fruit and flower.

1.2 Wood Modification

Wood modification technology has been widely known nowadays. It can be used to improve the properties of wood, for instance, biological durability, dimensional stability, hardness and UV-stability. This technology involves a few processes such as chemical preservative, timber treatment, thermal modification and others.

There are several types of wood modification such as thermal modification, chemical modification, hydrophobization and others. According to Younsi (2009), the thermal modification is considered as an eco-friendly. It also acts as an alternative to the chemical modification.

Actually, the difference technologies of wood modification have been known for a long time, but in the past, there was no economic or environmental urgency to develop these technologies. However, in the last decade developments in the arena of wood modification have accelerated considerably due to the increasing of environmental awareness, the increasing demand for high and constant quality and the increasing prices

and availability of tropical hardwood species. So that, these factors led to the up-scaling and the market introduction of a number of wood modification techniques (Homan, 2004).

As year passes, the thermal modification of wood increases significantly until now as an industrial process in wood properties improvement (Esteves and Pereira, 2009). Basically, the temperature used for this modification is ranged from 180°C to 240°C.

1.3 Problem Statement

In forest plantation, human harvest the trees for wood production. They focus more on high quality wood which most of them are slow-growing trees. This cause high pressure to the forest area. As the solution, this study is carried out to reduce the pressure occurs in the forest by using wood samples of Sesenduk to replace the slow-growing species. Sesenduk is one of the fast-growing species. However, fast-growing trees usually have weak and brittle wood that tends to break and create maintenance problems (Wayne, 2003). Therefore, direct contact method is performed to improve the quality of Sesenduk.

1.4 Objectives

The general objective of this study is to improve quality of Sesenduk using direct contact method at 16% of initial moisture content.

The specific objectives of this study are:

- i) To determine the effect of time and temperature of treatment on the physico-mechanical properties and colour change of Sesenduk.
- ii) To identify the effect of wood thickness on the physico-mechanical properties and colour change of Sesenduk.



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