LABORATORY EVALUATION OF CRUDE WOOD VINEGAR AS A POTENTIAL ANTI-MOULD CHEMICAL FOR SESENDOK AND JELUTONG

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By

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DEDICATION

Special thanks to my beloved parents and family

Who always support me in whatever I do in my life and also always guide me in

where I am today

ABSTRACT

Sesendok and Jelutong have good potential to replace rubberwood as their fast growth rate are similar to rubberwood. But the durability of the Sesendok and Jelutong are very low. The durability of Sesendok and Jelutong have been ensured and classified as non-durable wood species under exposed condition. Sesendok and Jelutong are easily attacked by sapstain and mould fungi especially under exposed condition. *Endospermum* spp. (Sesendok) and *Dyera costulata* (Jelutong) were used in this study. The mould fungi coverage and wettability were tested in different concentration of wood vinegar in non-volatile and volatile state. Based on the result obtained, there was a significant difference in the concentration of wood vinegar towards the mould fungi coverage on Sesendok and Jelutong ($p<0.05$). In fact, there was no significant difference between volatile and non-volatile wood vinegar treatment on Sesendok and Jelutong. Generally, the most optimum concentration of wood vinegar to function as antistain chemical for Sesendok and Jelutong is 1:1 and undilute. Both Sesendok and Jelutong treated with 1:1 concentration and undilute concentration wood vinegar had successfully inhibited from mould fungi attack. Generally, there is no significant relation between discoloration and wettability ($p<0.05$).

ABSTRAK

Sesendok dan Jelutong berpotensi untuk menggantikan kayu getah disebabkan mereka boleh bertumbuh cepat. Tetapi, ketahanan Sesendok dan Jelutong yang rendah telah menyebabkan mereka tidak dapat berbanding dengan kayu getah. Sesendok dan Jelutong telah diklasifikasikan sebagai kayu yang kurang tahan apabila diletakkan di kawasan terbuka. Dua jenis kayu ini adalah senang diserang oleh kulat. Dalam kajian ini kayu yang digunakan ialah *Endospermum* spp. (Sesendok) dan *Dyera costulata* (Jelutong). Kawasan yang ditutup oleh kulat dan pembasahan kayu telah dikaji sebagai keputusan daripada kegunaan cuka kayu yang mempunyai kepekatan yang berbeza (meruap dan tidak meruap). Daripada keputusan yang dicatatkan, terdapat perbezaan dalam kepekatan cuka kayu yang berbeza terhadap penumbuhan kulat di atas kayu Jelutong dan Sesendok ($p<0.05$). selain itu, tiada perbezaan daripada meruap dan tidak meruap cuka kayu terhadap kayu Sesendok dan Jelutong. Keseluruhannya, kepekatan cuka kayu yang paling optimum untuk berfunsi sebagai kemikal anti kulat ialah 1:1 dan tulen. Hal ini demikian kerana, tiada penumbuhan kulat di atas kayu Jelutong dan kayu Sesendok yang telah dirawat dengan cuka kayu yang kepekatan 1:1 dan tulen. Keseluruhannya, tiada berkaitan antara pemucatan warna dan pembasahan.

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APPROVAL SHEET

I certify that this research project entitled "Laboratory Evaluation of Crude Wood Vinegar as a Potential Anti-Mould Chemical for Sesendok and Jelutong" by Lee Yan Yi has been examined and approved as a fulfilment of the requirements for the degree of Bachelor of Wood Science and Technology in the Faculty of Forestry, Universiti Putra Malaysia.

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LIST OF ABBREVIATIONS

NVWV	Non-volatised wood vinegar
VWV	Volatilised wood vinegar
ASTM	America Society for Testing and Materials

CHAPTER 1

INTRODUCTION

1.1 General background

For many years Sesendok had act as a very useful tree which can be used to produce a lot of product such as match splints, boxes, drawing boards, toys and clogs. From here, it was classified as a pioneer species. In fact, Sesendok not only famous with its variety products, but it is also considered as a fast growing plant which makes it has the potential for future afforestation program in Peninsular Malaysia. *Endospermum* spp. or locally known as Sesendok is one of the timber species that belong to the family of Euphorbiaceae. It is a deciduous large tree and it was among the most important species in the inland forest (Khairil, 2011).

The fast growth rates of the Sesendok has showed a similar characteristic as rubber wood which we believe it can be a replacement to the rubber wood as the demand for rubber wood is increasing gradually while the resources of rubber wood has showed a critical drop rate (Khairul et al., 2010). In order to catch up with the demand, Sesendok actually has a number of characteristics fitted for mass-planting. For example, the tree is fast growing, able to survive in open conditions and does not require large tracts of planting spaces. The planting material that use in planting Sesendok also can be mass-produced (Anon, 2009).

Jelutong or *Dyera costulata* is a tall hardwood tree that grows in Malaysia, Bornuo and Sumatra. It is a low durability hardwood which will easily attacked by sapstain and mould fungi (Lee & Ashaari, 2015). Jelutong is famous with its low density straight grain and fine texture as it made the wood easier to work and hence popular with model makers and within the patternmaking trade. The timber is known to be very susceptible to both powder-post beetles and termite attacks. It is also very liable to blue stain in the green state.

With all the characteristic that really helpful in wood marketing, Sesendok and Jelutong are still not commonly used in wood product compare to rubberwood. One of the main reason is the durability of the Sesendok and Jelutong itself. The durability of the Sesendok and Jelutong have been ensured and classified as non-durable or class V (service life less than 2 years) under exposed conditions (Lee & Ashaari, 2015). This indicates that Sesendok and Jelutong are easily deteriorated by termites and fungi. However, Sesendok and Jelutong can be treated using chemical to increase the performance especially durability. A research had been carried out to increase the fungi resistant of Sesendok and Jelutong by impregnatation of Sesendok and Jelutong in phenolic resin. The research had came out with a satisfaction result where fungi resistance of phenolic treated Sesendok and Jelutong was increased compared to untreated Sesendok wood (Lee & Ashaari, 2015).

It is important to protect wood from sapstain and mould. This is because staining and mould is the pioneer attack prior to wood deterioration. There are many artificial chemical that can be used such as Antiblu® 375. But sometimes the artificial chemical may harm the wood itself too. There are also some of the natural chemical that can be used to treat sapstain, one of the chemical is wood vinegar. Wood vinegar or so called as pyroligneous acid was used in agriculture field since centuries ago. It is the by-product when producing wood charcoal in the factory. Wood vinegar was popular in agriculture due to its role as a fertiliser to the plant which enhance the plant growth. It assists the enzymes and microbes which facilitates plant cell growth and other useful reaction as wood vinegar contain acetic acid in its component. Despite its use in agriculture, they are some study which already been carried out to further explore the use of wood vinegar in other field. For example, crude wood vinegar has been confirmed as a potential anti-stain agent against sapstain and mold fungi for Japanese red pine (Salim et al., 2013).

1.2 Problem statement

Sesendok and Jelutong are non-durable wood and species and very susceptible to fungal attack. After felling, the log of these species will undergo common process that is transporting to the factory or sawmills. Before cutting the logs, these logs are placed in the logyard for an average 3 to 4 weeks, sometimes up to 8 weeks, during that time, these logs are most susceptible to mould and sapstain attack. Sawmills use antistain to prevent logs being attacked by stain and mould fungi. However, these chemicals are costly, not sustainable to be practiced in sawmills, moreover, it is toxic to the environment. The use of natural or organic antistain such as wood vinegar could overcome problems faced by sawmills because it could lessen the anti stain and mould treatment cost, as well as wood vinegar abundantly available and it is more environmental friendly compared to the conventional anti-stain chemical used in most sawmills.

1.3 Objective

The objectives of this study are:

1. To determine the effect of crude wood vinegar treatment on Sesendok and Jelutong against mould fungi.
2. To determine the most optimum concentration of crude wood vinegar (volatilised and non-volatilised) to inhibit mould on Sesendok and Jelutong.
3. To determine wettability of treated Sesendok and Jelutong due to mould attack.

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