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Crude wood vinegar as a potential anti-mould chemical for sesendok and jelutong

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Introduction

Known widely as fast-growing tropical hardwood species, both Sesenduk (*Endospermum* spp.) and Jelutong (*Dyera co stulata*) have good potential to replace rubberwood (*Hevea brasiliensis*) for timber production. These woods are classified as non-durable species and could last up to 2 years depending on the exposed condition. Being non-durable, they are easily attacked by sapstain and mould fungi especially during air drying or storage prior to sawmilling. Attack by sapstain and mould can be prevented by kiln drying. However, wood manufacturers normally reduce the kiln dry period to cut costs. Therefore, in this study, the potential of crude vinegar from oil palm for mould inhibition was investigated. The effecti veness of the treatment to inhibit sesenduk and jelutong from mould fungi were ascertained. The most optimum concentration and effect of volatile and non-volatile wood vin egar on mould resistance were also determined.

Objectives

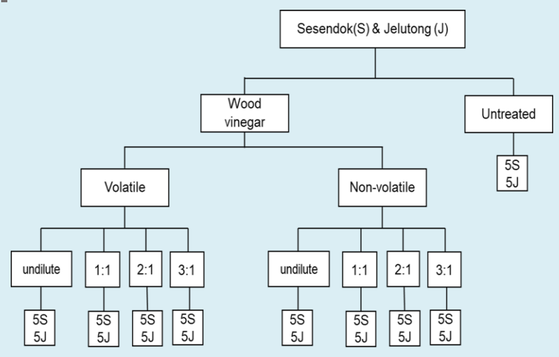
The aim of this research is to determine the effectiveness of crude wood vinegar (volatile and non-volatile) to inhibit mould fungi on sesenduk and jelutong wood.

Methodology

Wood treatment

- A 7 x 20 x 70 mm sesenduk and jelutong samples at 30% MC were dipped into crude wood vinegar for 3 mins
- Volatile wood vinegar was prepared by exposed 3L of wood vinegar to room temperature until remain 1.5L (Salim et al., 2013)
- Volatile and non-volatile wood vinegar was diluted into 3:1, 2:1, and 1:1 (deionized water: wood vinegar, on v/v)

Experimental design



Laboratory evaluation test

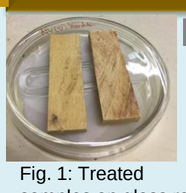


Fig. 1: Treated samples on glass rod

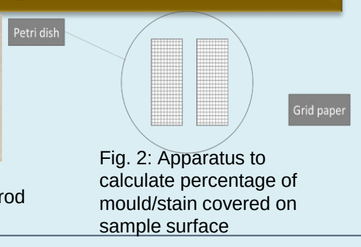


Fig. 2: Apparatus to calculate percentage of mould/stain covered on sample surface

- After treatment, the samples were placed on glass rods over moistened filter papers in glass petri dishes
- Then, samples were sprayed with fungal mould cocktail prepared by combining 8 mould fungi (ASTM D4445-91).

- Incubate at room temperature (25 + 2°C) for 8 weeks.
- At the end of test, samples were visually rated for degree of discoloration.

Results and discussion

◆Effect of wood species

- Jelutong treated with wood vinegar at 3:1 and 2:1 concentration (volatile and non-volatile) were 100% coverage after 2 weeks
- Sesenduk treated with non-volatile wood vinegar at 2:1 concentration showed 100% mould coverage after 4 weeks, while volatile wood vinegar at the same concentration showed 100% mould coverage
- when treated with undiluted or 1:1 (non-volatile and volatile) wood vinegar, both wood species were well preserved for 8 weeks without being attacked by mould

Table 1. Mould coverage on Sesenduk and jelutong wood surface after 2, 4 and 8 weeks of exposure

Wood	Wood vinegar	Concentration	Week			
			2	4	6	8
Jelutong	untreated		100%	100%	100%	100%
	non- volatile (NVWV)	undilute	0%	0%	0%	0%
		1:1	0%	0%	0%	0%
		2:1	100%	100%	100%	100%
		3:1	100%	100%	100%	100%
	volatile (VWV)	undilute	0%	0%	0%	0%
		1:1	0%	0%	0%	0%
		2:1	100%	100%	100%	100%
		3:1	100%	100%	100%	100%
Sesenduk	untreated		100%	100%	100%	100%
	non- volatile (NVWV)	undilute	0%	0%	0%	0%
		1:1	0%	0%	0%	0%
		2:1	48%	100%	100%	100%
		3:1	100%	100%	100%	100%
	volatile (VWV)	undilute	0%	0%	0%	0%
		1:1	0%	0%	0%	0%
		2:1	100%	100%	100%	100%
		3:1	70%	100%	100%	100%

◆Effect of wood vinegar concentration

- Higher concentration of wood vinegar (1:1) gave a better effectiveness as antimould treatment for sesenduk and jelutong
- The undilute and 1:1 wood vinegar showed inhibition for 8 weeks of exposure
- For concentration 2:1 and more, sesenduk and jelutong were covered by mould after 2-3 weeks

Fig. 4: Sesenduk treated with NVW V 3:1 (a), 2:1 (b), 1:1 (c), undilute (d)

Fig. 3: Jelutong treated with NVWV 3:1 (a), 2:1 (b), 1:1 (c), undilute (d)

- higher concentration of wood vinegar contains higher phenolic compound that acts as fungicide (Baimark and Niamsaa 2009)
- wood vinegar contains antifungal compounds like guaiacol, cresol, 4-ethyl-2methoxylphenol, and 2, 6-dimenthyoxyphenol (Ikergami et al., 1992)

◆Effect of volatile or non-volatile wood vinegar

- There was no significant difference in the effectiveness of non-volatile and volatile wood vinegar treatment against mould attack
- the VWV treated samples showed darker colour than NVWV treated samples
- The volatile and non-volatile wood vinegar provided similar efficiency inhibiting mould growth

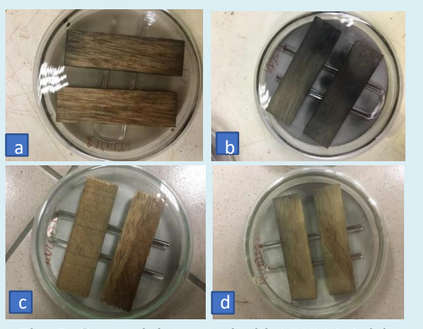


Fig. 5: Sesenduk treated with VWV 1:1 (a), VWV undilute (b), NVWV 1:1 (c) and NVWV undilute (d)

Fig. 6: Jelutong treated with VWV 1:1 (a), VWV undilute (b), NVWV 1:1 (c) and NVWV undilute (d)

- This might due to most of the tar content was not volatile and thus control mould growth (Chen et al., 2020).
- Result also indicates that the effectiveness of wood vinegar not only depend on phenolic compound but also tar content.

Conclusion

- Crude wood vinegar is a potential anti-mould for sesenduk and jelutong
- Undilute and 1:1 concentration wood vinegar had successfully inhibited mould growth on sesenduk and jelutong for 8 weeks
- The most optimum wood vinegar concentration is 1:1
- Volatile and non-volatile wood vinegar did not show significant effect on mould inhibition

References

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