

Resistance of Three Small Diameter Logs to Subterranean Termite Attack

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Abstract

Three woods species from plantation namely cempaka hutan (*Elmerillia ovalis* (Miq.) Dandy), rubberwood (*Hevea brasiliensis* Muell. Arg) and manglid (*Manglietia glauca* Blume.) were tested to subterranean termite regarding to Indonesian standard SNI 01.7207-2006, at the end of the test wood weight loss and feeding rate were determined and then the woods were classified in to resistant class I or very resistant until class V or very poor resistant depending on the value of wood weight loss. The result showed that wood weight loss, resistant class and feeding rate of cempaka hutan were 19.4%, V and 126 μ /day/termite, rubberwood were 19.5%, V and 129 μ /day/termite, and manglid were 2.1%, I and 14 μ /day/termite respectively. Cempaka hutan and rubberwood need preservation treatment prior to be used, and the three wood species has good prospectous utilization.

Keywords: Small diameter logs, subterranean termite, weight loss, feeding rate, resistant class.

Introduction

Logs supply in 2008 reach 32 million m³ and 77% was from plantation or man made forest (Ministry of Forestry 2009). Most of them had small diameter and young wood which had a lot of juvenile wood and the wood had inferior in physical-mechanical properties and lower durability as well. The plantation forests are spread out in the whole country to support wood industries of plywood, sawmill, particleboard, medium density fiberboard, and other wood processing.

The plantation forests are managed by government in the production forest and called industrial plantation forest, some of them are managed by government enterprise and called Perhutani or Inhutani, but in small areas people also are planting forest as community forest or private forest. Most of them are planting fast growing species, e.g. cempaka hutan (*Elmerillia ovalis* (Miq.) Dandy), rubberwood (*Hevea brasileinsis* Muell. Arg), manglid (*Manglietia glauca* Blume.) sengon (*Paraserianthes falcataria*), mangium (*Acacia mangium*) and other species. Suprpti and Krisdianto (2006) mentioned that wood from community forest is mostly small diameter log which is resulting juvenile wood, a lot of knots, low specific gravity, and low durability.

The durability of plantation wood is affected by wood species, tree site, age, silviculture system, part of the tree, and other factors. The purpose of study was to determine resistance of three woods namely campaka hutan, rubberwood, and manglid, and these woods were from small diameter logs or less than 30 cm diameter.

Materials and Methods

Materials

Three small diameter logs were cut to wood samples for subterranean termite test, the woods were cempaka hutan, rubberwood, and manglid. The wood specimens as wood samples sized for the test was 2.5 cm by 2.5 cm by 0.5 cm in length by width by thickness, respectively. The replication of wood samples for the test was three pieces, and all wood samples were from around Bogor Indonesia.

Subterranean termite test

Wood specimens were placed in a 450- to 500-ml wide-mouth round glass jar with a bottom area of 25 to 30 cm², and 200 g of moist sand (7% moisture content under water holding capacity) and 200 healthy and active worker subterranean termites (*Coptotermes curvignathus* Holmgren) were placed in each jar. The glass jars were placed in a dark room for 4 weeks. Each week the bottles were weighed, and if the moisture content of the sand was reduced by 2 percent or more, water was added to reach the moisture content standard. At the end of the test wood weight loss percentage was determined, and then the resistance class of the wood was determined according to Indonesian Standard as shown in Table 1 (SNI 2006). Whereas Feeding rate was determined by mass loss per day per termite.

Table 1.—Resistance class against subterranean termite (SNI 01.7207-2006).

Sample condition	Weight loss (%)	Resistant class
Very resistant	<3.52	I
Resistant	3.52–7.50	II
Moderate	7.50–10.96	III
Poor	10.96–18.94	IV
Very poor	>18.94	V

Results and Discussions

After four weeks period of subterranean termite test in laboratory, weight loss percentage average and resistant class of each wood species are shown in Table 2.

Table 2. Weight loss and resistant class of each wood species.

No	Wood	WL (%)	SNI Class	Feeding Rate (μ/d/termite)
1	Cempaka hutan	19.4	V	126
2	Rubberwood	19.5	V	129
3	Manglid	2.1	I	14



Figure 1. Rubberwood attacked by subterranean termite

From Table 2 can be explained that wood weight loss percentage of cempaka and rubberwood were similar and both of them belonged to resistant class V or very poor resistant, but manglid wood had weight loss much lower than the other species, i.e. 2.1% compared to 19%, and the wood belonged to class I or very resistant. Furthermore, feeding rate of cempaka and rubberwood were similar 126 and 129 μ/day/termite, and these value were much higher compared to manglid wood which had feeding rate of 14 μ/day/termite. Both weight loss percentage and feeding rate had similarity values, namely high weight loss percentage had high feeding rate.

Specific gravity, alcohol benzene solubility and strength class of those species are shown at Table 3. Alcohol-benzen solubility indicated extractive content in the wood which is consisting of carbohydrat, tannin, gum and pigment, and if the content is high especially carbohydrates will be resulting more food for bio-deterioration agents including termite and fungi (Anonymous 2001). Alcohol benzen solubility in cempaka hutan wood was higher than the other, and also the wood had lower specific gravity compared the other, as Arango *et al.* (2006) stated based on their analysis of six hardwood species, which indicated a significant inverse association between percentage of mass lost and specific gravity; in other words, wood with a higher specific gravity has more resistance to *Reticulitermes flavipes* Kollar termites. On the other aspect, cempaka hutan wood has specific texture and can be made for fancy veneer.

Tabel 3. Specific gravity, alcohol benzene solubility and strength class of each wood species.

No	Wood species	Specific gravity	Alc-benzen solubility, %	Strength class (I-V)
1	Cempaka hutan	0.34	11.86*	IV
2	Rubberwood	0.58	4.58**	II-III
3	Manglid	0.44	4.21***	IV

Note : * :Anonymous (2004); ** : Anonymous (2001); *** : Anonymous (2010)

Rubberwood had high density but the containing of attractively extractive for termite, blue stain and also *Schyzophyllum spp* fungi, even the wood has good strength but susceptible attacked by bio-deterioration agents. Rubberwood and cempaka hutan wood need recommended preservation treatment prior to be used, e.g. propylactic treatment to prevent blue stain attack. Manglid wood has medium specific gravity and high durability, and also it is easy to be manufactured, has special smell, redish color, and it is suitable for building materials, furniture, mebeuler, cabinet, wood panel, door-window frame, fancy veneer and other purposes (Anonymous 2010). The three wood species has very prospectous to be utilized for building materials, furniture, and also for plywood manufacturing especially for fancy veneer.

Conclusions

The result showed that wood weight loss, resistant class and feeding rate of cempaka were 19.4%, V and 126 μ /day/termite, rubberwood were 19.5%, V and 129 μ /day/termite, and manglid were 2.1%, I and 14 μ /day/termite respectively. Cempaka hutan and rubberwood need preservation treatment prior to be used, and the three wood species has good prospectous utilization.

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