

## The Resistance of Some Indonesian Lesser Used Species against Termites

by

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### Abstract

Thirty five Indonesian lesser used wood species were collected from community plantation areas in West Java for durability test. Ten wood samples from each species measuring 5.0 cm length by 2.5 cm width by 2.0 cm thick were exposed to dry-wood termites (*Cryptotermes cynocephalus* Light), other ten samples measuring 2.5 cm length by 2.5 cm width by 0.5 cm thick were tested against subterranean termites (*Coptotermes curvignathus* Holmgreen). Indonesian National Standard (SNI) No. 01-7207-2006 was reference due to testing procedures. Results revealed that only 2 species out of the 35 investigated wood species were classified as highly durable wood (i.e. classes I and II) to sunterranean termite *Coptotermes curvignathus* Holmgreen and the rest 33 species or 94% were classified as the lower durability performance (classes III, IV and V). The results also showed that 12 species or 34% out of 35 wood species were categorized resistant against dry wood termite *Cryptotermes cynocephalus* Light, and the remain 23 wood species or 66% were categorized in severe durability classes (III, IV, and V).

**Key words:** Durability class, lesser used Indonesian wood species, dry-wood and subterranean termites laboratory test.

### Introduction

Values of particular wood species are determined by its specific characteristics, among others wood resistance against wood-destroying organisms. Related with such, various wood species afford different resistances against kinds of organisms that attack. Even, in the same wood species, its resistance is not similar against different organisms, i.e. dry-wood and subterranean termites. Besides, resistance of particular wood species is affected by age of tree when it is felled; growth rate of tree; the origin of tree whether it is from natural forest or from plantation forest; and physical-chemical properties of the wood. All these factors can significantly affect wood resistance and hence its durability (Martawijaya, 1996).

Durability of wood is the natural resistance of wood against wood destroying organism such as fungi, insect and marine borer. Depend on its utilization, there are different durability of wood under exposure from interior usage, terrestrial from water and utilization in lowland from highland (Sumarni and Roliadi, 2002).

In the past, plantation forests in Indonesia were intended to meet the needs of raw material for wood industries. However, with appropriate management and handling, production of plantation wood besides being allocated for pulp and paper industries, can also comply with the raw material needs for

merchant-wood industries (Muslich and Sumarni, 2006). The durability of wood was important because although the high strength class, but its benefit will often decrease when the age was short. The characteristics of the durability of a wood species could be used for the point to be considered in taking the decision whether this wood must be preserved or not if being used for the certain need (Seng, 1964).

This paper present result of research on durability of 35 lesser used species of Indonesian wood against dry-wood termite (*Cryptotermes cynocephalus* Light) and subterranean termite (*Coptotermes curvignathus* Holmgreen).

### **Materials and methods**

Thirty five of lesser used wood species were collected from community plantation in West Java, Indonesia. It was cut to test specimens with the sizes of 5 cm in length x 2.5 cm in width x 2 cm in thickness (for resistance test against dry-wood termites), and 2.5 cm in length x 2.5 cm in width x 0.5 cm in thickness (for resistance against subterranean termites). Ten specimens of such wood which had been prepared in their intended sizes (as specified above) were used in the test for the resistance against those two organisms (dry-wood termites and subterranean termites). The testing procedures were referring to those of modified ASTM (2006) and Indonesian National Standard (SNI) No. 01-7207-2006 (Anonim, 2006).

#### ***Wood resistance against dry-wood termites in laboratory test***

Ten wood specimens for each of wood species were prepared with sizes specified for the test against dry-wood termites (5 cm x 2.5 cm x 2 cm) and then placed in contact with a glass tube (3 cm in height and 1.8 cm in diameter), one specimen for one glass tube. Wood specimen was placed horizontally under the glass tube vertically installed on it such that the larger surface of specimen was in contact with the lower mouth (hole) of glass tube. In other to make the contact between lower glass-tube and upper specimen-surface airtight for the possible small air-spaces, those spaces was sealed using wax. Afterwards, inside the glass tube were inserted as many as 50 dry-wood termites of the worker type. In this way, therefore, the termites could not move out of the glass tube during the test. Instead, the termites would eat wood specimens thereby leaving a kind of tunnels on the specimen surface. This test arrangement (wood specimen, dry-wood termites, sealing wax, and cotton) was allowed to proceed for 12 weeks. In this test, those ten-wood specimens as described previously were regarded as replicates.

After 12 weeks, the examination or assessment was carried out on the wood specimens covering percentage of wood-weight losses, percentage of survival termites, and degree of attack by termites (extent of degradation or destruction on wood specimens). The data (resulting examination or assessment) were used to determine the resistance class of wood tested using the classification of wood resistance as described in Table 1 (Anonim, 2006). In addition, to assess the degree of attack by termites, the related criteria by the AWPAs were also consulted (Anonim, 1972).

#### ***Wood resistance against subterranean termites in laboratory test***

Ten wood specimens for each wood species were also prepared with sizes specified for the test against subterranean termites (2.5 cm x 2.5 cm x 0.5 cm) and then placed into the glass bottles, one specimen for one bottle. Inside the bottle, the wood specimen was placed lengthwise rather vertically such that one of the widest specimen-surfaces leaned against the inner wall of the bottle. Further, into the

bottle was put 200 grams of wet (damp) sand with moisture content of 7% (below its water-holding capacity). Subsequently, into the bottle were put as many as 200 healthy, active subterranean termites (*Coptotermes curvignathus* Holmgreen). Afterwards, the arrangement test (i.e. wood specimen, wet sand, subterranean termites, and bottle) was stored in dark room and then let for 4 weeks. In this test similar to dry-wood termites, those ten-wood specimens were also regarded as replicates.

Table 1. Classification of wood resistance against the attack by dry-wood termites (*Cryptotermes cynocephalus* Light) and subterranean termites (*Coptotermes curvignathus* Holmgreen)

Class	Resistance criteria	Weight loss (%)	
		Dry-wood termites	Subterranean termites
I	Very resistant	< 2.0	< 3.52
II	Resistant	2.0-4.4	3.52-7.50
III	Moderate	4.4-8.2	7.50-10.96
IV	Poor	8.2-28.1	10.96-18.94
V	Very poor	> 28.1	>18.94

Source: Anonim (2006)

After 4 weeks, the examination or assessment was carried out on the wood specimens covering also percentage of wood-weight losses, percentage of living or survival termites, and degree of attack by termites (extent of degradation or destruction on wood specimens). The data (resulting examination or assessment) were used to determine the resistance class of tested woods using the classification of wood resistance as described in Table 1

## Results and discussion

In detailed scrutiny, resistance of test wood specimens against dry-wood termites appeared to be different from that against subterranean termites, as described in the following.

### ***Resistance against dry-wood termites in laboratory test***

In laboratory test, resistance of test wood specimens against dry-wood termites was assessed according to each species of those specimens. Results of the resistance test (i.e. survivals –termites, weight loss, and degree of attack) that lasted for 12 weeks are presented in Table 2.

The test results of dry wood termites (*Cryptotermes cynocephallus* Light.) and subterranean termites (*Coptotermes curvignathus* Holmgreen.) are presented in Table 2. In Table 2 can be seen that 35 wood species tested have different durability classes. Durability class of wood species against dry wood termites is not necessarily the same as subterranean termites. Of the 35 species tested belong to durability class I (against subterranean termites), only 1 species, and 1 species belong to class II, the rest belong to durability class III, IV and V (94.3%). While on dry wood termites there are 7 species belong to durability class I, 5 wood species class II, and the rest belong to class III-V (65.7%). Wood with undurable class (belonging to class III-V) should be preserved to prolong its service life.

**Table 2. Weight loss, survival and degree of attack on wood species due to subterranean and dry-wood termites**

No	Wood species	Density	Subterranean termite				Dry-wood termite			
			Weight loss, %	Survival %	Degree of attack, %	Durability class*	Weight loss, %	Survival %	Degree of attack, %	Durability class
1	Asem jawa ( <i>Tamarindus indica</i> L.)	0.92	9.67	68.9	74	V	0.89	25.6	90	III
2	Balobo ( <i>Diplodiscus</i> sp.)	0.73	5.58	36.5	86	III	1.6	56.0	70	V
3	Beleketebe ( <i>Sloanea sigun</i> Szysz.)	0.82	27.07	82.0	40	V	0.31	10.4	90	I
4	Cangkring ( <i>Erythrina fusca</i> Lour.)	0.35	18.77	84.2	40	V	1.48	58.4	70	V
5	Cerei ( <i>Garcinia celebica</i> )	0.65	22.90	91.0	40	V	0.67	37.2	90	III
6	Hanja ( <i>Anthocephalus chinensis</i> Lamk.)	0.52	20.42	88.7	40	V	1.42	58.2	70	V
7	Hantap heulang ( <i>Sterculia cordata</i> Blume.)	0.32	31.10	88.4	40	V	1.59	63.6	70	V
8	Huru gading ( <i>Litsea odorifera</i> Val.)	0.50	7.86	79.3	70	V	0.76	5.8	90	I
9	Huru kacang ( <i>Neolitsea triplinervia</i> Merr.)	0.49	29.20	83.7	40	V	0.57	23.4	90	II
10	Huru koja ( <i>Litsea angulata</i> Bl.)	0.58	15.03	81.1	70	V	0.87	30.0	76	V
11	Huru pedes ( <i>Cinnamomum iners</i> Reinw. Ex Blume.)	0.56	14.48	80.2	70	V	0.83	32.0	80	V
12	Huru mentek ( <i>Lindera polyantha</i> Boerl.)	0.85	6.15	41.4	90	III	0.21	9.8	90	I
13	Kapinango ( <i>Nauclera orientalis</i> )	0.64	15.06	82.8	70	V	0.59	36.2	90	III
14	Kayu putih ( <i>Melaleuca cajuputi</i> Powell.)	0.81	3.60	15.6	90	II	0.56	32.8	90	III
15	Kelapa ciung ( <i>Horsfieldia glabra</i> Warb.)	0.60	11.76	78.5	70	V	0.84	28.0	79	V
16	Ki kendal ( <i>Ehretia acuminata</i> R.Br.)	0.57	1.89	76.7	70	V	0.93	22.4	92	II
17	Ki bancet ( <i>Turpinia sphaerocarpa</i> Hassk.)	0.55	5.35	54.8	82	IV	1.82	58.2	70	V
18	Ki bulu ( <i>Gironniera subasqualis</i> Planch.)	0.51	3.40	38.2	90	III	1.98	58.8	70	V
19	Ki endog ( <i>Acer niveum</i> Bl.)	0.52	35.80	85.8	40	V	0.59	14.4	90	II
20	Ki hantap ( <i>Stercularia oblongata</i> R.Br.)	0.36	12.50	90.5	40	V	2.45	64.4	70	V
21	Ki hiur ( <i>Castanopsis acuminatissima</i> A.DC.)	0.83	17.28	83.3	58	V	0.86	30.0	78	V
22	Ki hiyang ( <i>Albizia procera</i> )	0.71	48.76	96.8	0	V	1.67	61.6	70	V
23	Ki kanteh ( <i>Ficus nervosa</i> Heyne.)	0.55	25.89	90.7	40	V	3.05	64.0	49	V
24	Ki kuya ( <i>Ficus vasculosa</i> Wall ex Miq.)	0.45	13.09	92.4	40	V	2.76	64.2	70	V
25	Ki lubang ( <i>Callophyllum grandiflorum</i> JJS.)	0.58	11.21	89.1	46	V	1.69	58.0	70	V
26	Ki tanah ( <i>Zanthoxylum rhetsa</i> DC.)	0.55	6.88	36.6	90	III	1.39	53.2	70	V
27	Ki sampang ( <i>Meliocope lumu-ankenda</i> (Gaertn.) T.G. H.)	0.50	10.15	75.7	70	V	0.45	9.2	90	I
28	Kundang ( <i>Ficus variegata</i> BL.)	0.27	17.92	81.4	47	V	2.96	58.2	70	V
29	Marasi ( <i>Hymenea carboril</i> L.)	0.87	1.39	16.5	90	I	1.05	37.4	76	IV
30	Mimba ( <i>Azadirachta indica</i> Juss.)	0.73	8.94	48.8	90	III	0.35	14.2	90	II
31	Nyatoh ( <i>Pouteria duclitan</i> Bachni.)	0.69	6.68	72.4	70	V	0.47	23.6	90	II
32	Sampora ( <i>Colona javanica</i> B.L.)	0.49	4.26	59.2	82	V	1.00	9.0	78	I
33	Tangkalak ( <i>Litsea roxburghii</i> Hassak)	0.34	20.68	85.3	40	V	1.73	64.2	70	V
34	Tarisi ( <i>Albizia lebbeck</i> Benth)	0.63	10.97	80.0	70	V	0.08	0.0	100	I
35	Tunggeureuk ( <i>Castanopsis tungurrut</i> A.DC.)	0.47	11.46	70.8	74	V	0.3	18.6	90	II

Note \* : Anonim (2006)

From the results obtained in this study, showed that most of the wood species tested have different durability classes. This is because each wood species has extractive content of different substances. On mimba or neem wood (*Azadirachta indica* Juss.) generally have the best durability class compared to other wood species tested, this may have caused the toxic wood extractive substances. Ruskin (1993) stated that neem has extractive substance of azadirachtin, salanin, mehantriol, nimbin and nimbidin. Azadirachtin acts as ecdyson blocker or substances that can inhibit hormone ecdyson Metamorphose on termites in the process that resulted in death (Chiu, 1988).

### Conclusion

Tests for resistance of the 35 lesser used wood species against dry wood termites (*Cryptotermes cynocephalus* Light.) and subterranean termites (*Coptotermes curvignathus* Holmgreen.) can be summarized as follows:

1. Wood which has a high durability class of dry wood termites do not necessarily have the same durability class of subterranean termites. Similarly, wood that has high durability class of subterranean termites do not necessarily have the same durability class of dry wood termites.
2. 94% of 35 wood species tested were not resistant to subterranean termites and 66% of 35 wood species tested were not resistant to dry-wood termites. Mimba (*Azadirachta indica* Juss.) and marasi (*Hymenea courbaril* L.) in general have the best durability class compared to other wood species tested

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