# Six Papua New Guinea Woods Resistance to Subterranean Termite Attack

YS Hadi[1)], MY Massijaya[1)], N Hadjib[2)], M Niangu[3)]
[1)]Bogor Agricultural University, Bogor 16680, Indonesia
[2)]Forest Products Research Institute, Bogor 16680, Indonesia
[3)]Forest Research Institute, Lae, Papua New Guinea

## Abstract

Three woods from plantation namely Wau beech (*Elmerrillia papuana*), Bintangur (*Calophyllum* sp) and Balsa (*Ochroma lagopus*), and three woods from natural forest namely Taun (*Pometia pinnata*), Garcinia (*Garcinia* sp) and Canarium (*Canarium* sp) were tested to subterranean termite regarding to Indonesian standard SNI 01.7207-2006, at the end of test wood weight loss was determined and then the wood was classified in to resistant class I or very resistant to class V or very poor resistant depending on the value of wood weight loss. The result showed that wood weight loss and resistant class of Wau beech were 7.27% and II, Bintangur were 4.77% and II, Balsa were 37.2% and V, Taun were 6.40% and II, Garcinia were 6.09% and II, and Canarium were 7.99% and III respectively, and these results were similar with PNG Publication.

**Keywords:** PNG wood, subterranean termite, weight loss, resistant class.

## Introduction

Papua New Guinea (PNG) is one of the largest island nations in the Asia-Pacific region which producec a range of forest products, including furniture, plywood and prefabricated buildings for both domestic and export markets, and in 2009 exported about 1.8 million m3 logs with average price US$ 82 per m3 (Massijaya et al. 2011). Furthermore it was explained that most of PNG's logs export go to Asian countries mainly 89% to China, followed by Japan, Korea, India, the Philippines, Taiwan, and Vietnam. In total, forestry contributes about 7% to PNG's gross domestic product plus millions of kina in taxes, landowner royalties, infrastructure development and work for more than 10,000 people.

Most of the trees harvested are converted into sawn timber for domestic consumption. There is a number of portable sawmills operating in the region, however records of their production and operational areas are often sketchy. Over the past two decades, the number of companies operating in forest and wood-based industries has declined from an early count of more than 40 to about 25. This decline has largely been a result of diminishing timber resources that are available to sustain these operations.

Plantation forest is one choice to accomplish wood supply from natural forest in the future, and PNG Forest Authority has scheme to enlarge the forest with planting mangium and other species. The wood resistance to termite attack from plantation forest and natural forest seems to be different because of tree age and presence of extractive. In this study, we compared termite resistance of three woods from plantation and three woods from natural forests from PNG.

## Materials and Methods

### Materials

Three small diameter trees from plantation were cut to wood samples for subterranean termite test, the woods were Wau beech (*Elmerrillia papuana*), Bintangur (*Calophyllum* sp), and Balsa (*Ochroma lagopus*). The three woods species extracted from natural forest were also prepapred for the test, namely Taun (*Pometia pinnata*), Garcinia (*Garcinia* sp), and Canarium (*Canarium* sp). 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 Lae area in Papua New Guinea.

## 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 $cm^2$, 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).

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 |

On the other hand Eddowes (1977) published commercial timber of PNG with classified into class 1 to class 4 as described in Table 2 for comparison.

Table 2. Resistance class of PNG wood (Eddowes 1977)

| Class | Description |
|---|---|
| 1. Very Durable | Suitable for long term use in structures exposed to the weather, and in contact with the ground |
| 2. Durable | Suitable for use in the ground and for unprotected exterior use under normal conditions |
| 3. Moderately Durable | Suitable for protected exterior work and for interior use. Not suitable for use in contact with the ground |
| 4. Non-Durable | Not suitable for exterior use unless treated with preservative |

## 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 3, and regarding to Hadjib *et al*. (2011) its specific gravity is also shown.

Table 3. Weight loss and resistant class of each wood species.

| No | Wood | WL (%) | SNI Class | SG*) | PNG Class**) |
|---|---|---|---|---|---|
| 1 | Wau beech | 7.27 | II | 0.35 | 2 |
| 2 | Bintangur | 4.77 | II | 0.51 | 3 |
| 3 | Balsa | 37.2 | V | 0.12 | 4 |
| 4 | Taun | 6.40 | II | 0.49 | 3 |
| 5 | Garcinia | 6.09 | II | 0.60 | 3 |
| 6 | Canarium | 7.99 | III | 0.38 | 4 |

*) Hadjib *et al*. (2011); **) Eddowes (1977).

From Table 3 can be explained that wood weight loss percentage and its resistant class of each wood species as followed Wau beech were 7.27% and II, Bintangur were 4.77% and II, Balsa were 37.2% and V, Taun were 6.40% and II, Garcinia were 6.09% and II, and Canarium were 7.99% and III respectively. Balsa wood with very low density has very poor resistant or resistant class V to

subterranean termite attack, as Arango *et al*. (2006) mentioned 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* termites. Seng (1990) mentioned also that Balsa wood (*Ochroma bicolor* Rowlee) from Indonesia had very poor resistant to biodeterioration or had resistant class V.

If we compare the results of resistant class by Indonesian standard, the woods are classified into class II to V, or durable to very poor durable. On the other hand, refering to PNG Publication (Eddowes 1977) these woods are classified to durability class 2 or durable to class 4 or non-durable. Both results seem similar, which is indicated wood with class II from Indonesian standard became class 2-3 by PNG Publication, and the other woods with class III-V from Indonesian standard became class 4 by PNG Publication.

Canarium wood with specific gravity of 0.38 had moderate resistant or resistant class III to subgterranean termite attack, and this result was similar with Seng (1990) which did research with Indonesian canarium wood. Both wood species namely Balsa and Canarium are supposed be treated with preservation prior to be used for any purpose. The other four wood species namely Wau beech, Bintangur, Taun, and Garcinia had resistant to subterranean termite attack or resistant class II, these species can be used without treated prior to use for any purpose except if it is placed in the very severe attack of termites.

## Conclusions

The result showed that wood weight loss and resistant class of Wau beech was 7.27% and II, Bintangur was 4.77% and II, Balsa was 37.2% and V, Taun was 6.40% and II, Garcinia was 6.09% and II, and Canarium was 7.99% and III respectively, and these results were similar with PNG Publication. Balsa and Canarium are supposed be treated with preservation prior to use for any purpose, but the other four wood species can be used without any treatment if they are used in the ordinary area.

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