Conference Paper

Coptotermes sp. Termite Attacks in Some Locations of Red Meranti (*Shorea leprosula* Miq.) Plantation

Ngatiman and Andrian Fernandes

Dipterocarps Research Center, Research, Development and Innovation Agency, Ministry of Environment and Forestry, Jl. A W Syahranie no. 68, Sempaja Selatan, Samarinda, East Kalimantan 75119, Indonesia

Abstract

Red Meranti (*Shorea leprosula* Miq.) have been widely planted in secondary forests and logged over forest. Problems were found in the field is due to the presence of *Coptotermes* sp. termite attack in *S. leprosula* plants resulting to its death. The aims of this study were to determine the percentage and intensity of *Coptotermes* sp. termite attack. The method used is to perform observations of termite attack in several locations planting, i.e. in KHDTK Samboja (East Kalimantan), KHDTK Sebulu (East Kalimantan), PT INHUTANI II, Pulau Laut (South Kalimantan) and PT Suka Jaya Makmur (West Kalimantan). The results showed that the percentage and intensity of *Coptotermes* sp. termite attacks in KHDTK Samboja, respectively 7.3% and 4.7%, in KHDTK Sebulu 11.3% and 8.2%, in Inhutani II 5.8% and 5.3% and in PT Suka Jaya Makmur 5.4% and 4.8%. The source of termite attacks in plants in KHDTK Samboja and KHDTK Sebulu was the termite nest contained in secondary forest bordering *S. leprosula* plantations while the source of the termite attack in plants in Inhutani II and PT Suka Jaya Makmur was the termite nests located between *S. leprosula* plantations. Finally, *Coptotermes sp* termite attack disturbed *S. leprosula* plantation.

Keywords: *Coptotermes* sp. termite attack; intensity termite attack; percentage termite attack; *Shorea leprosula* Miq.

Corresponding Author:
Ngatiman
ngatiman_diptero@yahoo.com

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1. Introduction

Coptotermes is a subterranean genus of termites and distributed across Asia, Africa and other tropical regions. *Coptotermes* was likely to be tree-nesting [1]. Termite became economic pests when they started destroying wood, wooden product, building materials and forests [2].

Meranti/*Shorea* as one of *Dipterocarps* family had been planted in secondary forests and logged over forest. *Shorea leprosula* as valuable species in plantation forests because it could grow well in almost all test sites plantings including Sumatra, Kalimantan, Maluku and Papua [3]. *S. leprosula* plantation aged 5 yr and over in Kalimantan, attacked by *Coptotermes* sp. termite resulting to its death. This research aims to get

No.	Number of plots	Size of plots (ha)	Spacing (m)	Tree age (year)	Observation time (year)	Plantation location
1	1	0.6	5 ×5	16	2012	KHDTK Samboja (East Kalimantan)
2	1	0.3	1.4 × 1.4	16	2012	KHDTK Sebulu (East Kalimantan)
	2	0.3	3 × 3	16		
3	1	0.5	10 × 3	6	2012	PT Inhutani II Pulau Laut (South Kalimantan)
	2	0.5	10 × 3	6		
4	1	1.0	20 × 2.5	7	2014	PT Suka Jaya Makmur (West Kalimantan)

Table 1: Observation location.

Tree Condition	Criteria	Score
Not affected	No termite attack	0
Light affected	Attacked the relatively narrow tree marked with the soil crust on tree trunks or soil crust form the grooves found on rooting and stem	1
Medium affected	The affected part of the tree is relatively medium area, with the soil crust characterized by ground on tree trunks or soil crust that forms around a tree trunk and closed the half of the diameter of the trunk	2
Heavy affected	The affected part of the tree is relatively wide area, with the soil crust characterized by ground on tree trunks or soil crust has formed close trunk	3
Death	Soil crust on the trunk or soil crust formed already covered the entire tree trunks, tree leaves were fallen and no signs of life	4
Sources: [4] with modification.		

Table 2: Determination score of termite attack on tree.

data on the frequency and intensity of *Coptotermes* sp. termite attack on *S. leprosula* plantation in Kalimantan (East Kalimantan, South Kalimantan, and West Kalimantan).

2. Materials and Methods

Research materials were *S. leprosula* plantation with various ages, which were planted in secondary forest and logged over forest. The equipment used hagameter and polemeter to measure tree height, phiband to measure tree diameter and camera for research documentations. This research observed *Coptotermes* sp. termite attack on *S. leprosula* plantation in Kalimantan (East Kalimantan, South Kalimantan, and West Kalimantan) can be seen in Table 1.

Observation of termite attacks on *S. leprosula* by observing each tree in the plot based on the score as presented in Table 2.

Attack intensity (%)	Plants condition
0–1	Healthy
> 1 to 25	Light damaged
> 25 to 50	Moderately damaged
> 50 to 75	Heavy damaged
> 75	Very heavy damaged

Table 3: Determining condition of the plants based on termites attack.

Attack frequency (F) was calculated using the formula [5] as follows:

$$F = \frac{X}{Y} \times 100\% \quad (1)$$

Remarks: F = attack frequency (%), X = numbers of attacked plants, y = numbers of observed plants.

Attack intensity of (I) was calculated using the formula according to [4] that modified as follows:

$$I = \frac{X_1 y_1 + X_2 y_2 + X_3 y_3 + X_4 y_4}{X y_4} \times 100\% \quad (2)$$

Remarks: X = number of observed plants, X_1 = number of light damaged plants (score 1), X_2 = number of moderately damaged plants (score 2), X_3 = number of heavy damaged plants (score 3), X_4 = number of death plants (score 4), y_1–y_4 = grades 1 to 4 of each of the plants showing symptoms of a mild attack to death (no sign of life).

To describe the overall condition of plants in research area due to termite attack can be discovered based on criteria according to [5] can be seen in Table 3.

3. Result and Discussion

Field identification showed that every plot attacked by termites with different frequency and intensity. Number of plants which attacked by termites, attacked frequency and intensity of termite attack in some *S. leprosula* plantation presented in Table 4.

The result showed that every plot had been attacked by termite. Termite nest widely distributed in all studied plots [6]. Termite attack frequency ranged 5.4% to 11.3%. *Coptotermes* sp. attack tended to slowly but sure. Termite would attack trees that are an live or dead tree and tends to spread to the surrounding trees [7].

Field observations indicated that termite attack spread from tree to another tree through fallen tree and liana which attacked by termite. Termite could be found from leaves on the ground, fallen branches, and vertical soil sheetings covering the bark of trees [8]. Termite could digest cellulose, hemicellulose, and lignocellulose efficiently from wood [9]. The activity of litter-feeding termite is a strong factor controlling the nutrient distribution in termite colonized soil [10].

No.	Number of plots	Size of plots (ha)	Number of plants	Number of plants which attacked by termites	Attacked frequency (%)	Intensity of termite attack (%)	Planting site
1	1	0.6	162	16	9.8	6.7	KHDTK Samboja (East Kalimantan)
2	2	0.3	598	68	11.3	8.2	KHDTK Sebulu (East Kalimantan)
3	2	0.5	135	8	5.9	5.3	PT Inhutani II Pulau Laut (South Kalimantan)
4	2	1.0	276	15	5.4	4.8	PT Suka Jaya Makmur (West Kalimantan)

Table 4: Number of plants which attacked by termites, attacked frequency and intensity of termite attack in some *S. leprosula* plantation.

Meranti (*S. leprosula*) trees were attacked by termite had a trunk covered by termite nest made from soil. Termite species confirmed the fact that soil engineers can have a greater impact on soil [8]. Termite may have collected a greater part of their building materials from the local thin soil cover [6].

Some Meranti (*S. leprosula*) trees side by side could be attacked by termite and connected into one nest. Landscape structure played an important role in territory development [11]. Termite territory occupied by physical obstacles such as rocks or artificial structures in which termite cannot tunnel for foraging.

In KHDTK Sebulu and KHDTK Samboja found termite nest with a height up to 2 m to 3 m. Meranti (*S. leprosula*) trees in KHDTK Sebulu and KHDTK Samboja had bigger stem diameter than in PT Inhutani II and PT Suka Jaya Makmur. Termite attack was correlated with the size-dependent growth of *Eucalyptus tetrodonta* and with the probability of survival of either *E. tetrodonta* or *E. miniata* [12].

Termite attack in KHDTK Samboja and KHDTK Sebulu derived from secondary termite nest that is in the secondary forest around the *S. leprosula* plantations. While termite attack in PT. Inhutani II Pulau Laut and PT Suka Jaya Makmur derived from secondary termite nest in the secondary forest between plantation rows. Patterns of termite attack were tend to spread from the termite nest to a tree near the nest [13].

When termite nest in the Meranti (*S. leprosula*) trees was opened, it was found some neotenic. Termite nest consists of eggs, larva, pseudergate, soldier, neotenic and nymph. The nymphs may become Pseudergate or Alate. Both Alate and neotenic reproduce sexually [14].

Termite attack in Meranti (*S. leprosula*) trees made the leaves drought, some of the leaves were fallen, and branches or stem were easy broken. Termite attack in the long term about one year could lead *S. leprosula* to death. Termite attack on living *Shorea polyandra* tree in Kalimantan causing the tree suffer and often until the tree

dies [15]. Live trees in Amazonian rain forests commonly have rotten cores that contain Coptotermes termites [16].

4. Conclusions

Coptotermes sp. termite attacked some location of Red Meranti (*Shorea leprosula*) plantation in Kalimantan. *Coptotermes* sp. termite attacked *S. leprosula* plantation since the age of 6 yr. Red Meranti (*S. leprosula*) trees were attacked by termite had a trunk covered by termite nest made from soil. Termite attack in the long term about one year could lead *S. leprosula* to death. *Coptotermes sp* termite attack disturbed *S. leprosula* plantation.

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