PATTERNS OF *Coptotermes* sp. TERMITE ATTACK ON *Shorea leprosula* Miq IN KHDTK SEBULU, EAST KALIMANTAN

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ABSTRACT

Red meranti (*Shorea leprosula* Miq) as a major commercial timber has been widely planted in Dipterocarp forests. *Coptotermes* sp. termite often attacks S. *leprosula* Miq to its death, but the attack patterns are unknown. This research aims to get data on the frequency, intensity, and patterns of *Coptotermes* sp. attack in KHDTK Sebulu, East Kalimantan. Methods used were observation, recording, and mapping on S. *leprosula* Miq trees attacked by termites in KHDTK Sebulu. The results showed that the frequency of termite attacks on S. *leprosula* Miq in KHDTK Sebulu was 6.4-30.5% and termite attacks intensity was 4.7-22.1%. Termite attack patterns tended to spread and were followed by the formation of the nest to produce colonies.

Key words : S. *Leprosula* Miq plant, *Coptotermes* sp.,attack frequency, attack intensity, attack pattern.

INTRODUCTION

Termites are the most problematic pests in the plant kingdom. Termites are excellent decomposers of dead wood and other sources of cellulose from plants (Verma *et al*., 2009). In the field, *Coptotermes* termites attack plantation forest. *Shorea leprosula* Miq as a valuable species in plantation forest (Subiakto & Parthama, 2007) are also attacked by termites. Termite attack symptoms in *S. leprosula* Miq is the crust of soil covering tree trunks up to several meters from the ground. This termite attack occurrs on trees that are both alive and dead, but the attack patterns are unknown. This research aims to get data on the frequency, intensity, and patterns of *Coptotermes* sp. termite attack in the forest research (KHDTK) Sebulu, East Kalimantan.

MATERIALS AND METHODS

The study was conducted by making 4 plots in the Forest Area for Special Purpose (KHDTK) Sebulu, Kutai Kertanegara Distric, East Kalimantan. Each 0.3 ha plot extent, inter-plot bounded by 2 m wide path. Observation of termite attacks on *S. Leprosula* was conducted by observing each tree in the plot based on the score as presented in Table 1. The patterns of termite attacks on *S. leprosula* were then mapped*.*

Table 1. Determination score of termite attack on trees

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 was fallen and no signs of life	4

Sources : Mardji (2000) with modification

The attack frequency (F) was calculated using the formula (Mardji, 2003) as follows:

$$F = \frac{X}{y} \times 100\%$$

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

The attack intensity of (I) was calculated using the formula according to Mardji (2000) that was modified as follows:

$$I = \frac{X_1y_1 + X_2y_2 + X_3y_3 + X_4y_4}{Xy_4} \times 100\%$$

Remarks :
X = number of observed plants
X_1 = number of light damaged plants (skor 1)
X_2 = number of moderately damaged plants (skor 2)
X_3 = number of heavy damaged plants (skor 3)
X_4 = number of death plants (skor 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 Mardji (2003) can be seen in Table 2.

Table 2. Determining condition of the plants based on termites attack

Attack intensity (%)	Plants condition
0 – 1	Healthy
>1 – 25	Lightly damaged
> 25 – 50	Moderately damaged
> 50 – 75	Heavily damaged
> 75 – 100	Very heavily damaged

RESULT AND DISCUSSION

Coptotermes sp. termites attack on *S. leprosula* marked on the ground in the presence of soil crust on the trunk of the tree, if the tree trunk is covered by a crust of soil, then the plant will eventually die. *Coptotermes* sp. attacked living and dead trees. According to Natawiria (1989), the characteristics of *Coptotermes* sp. attack was crust bark ground cover up to several meters from the ground. Termites eat cellulose in trunk, so trees are easily broken or uprooted when exposed to the wind. The number and frequency of *Coptotermes* termites attack in *S. leprosula* in KHDTK Sebulu is presented in Table 3.

Tabel 3. Number and frequency of *Coptotermes* termites attack in *S. leprosula* in KHDTK Sebulu.

Plot	Spacing (m)	Number of plants	Number of plants which attacked by termites	Attacked frequency (%)	The number of plants that die from termite attack	Death frequency (%)
1	1 x 1	1.080	0	0	0	0
2	1,4 x 1,4	477	31	6,4	15	3,1
3	2 x 2	275	0	0	0	0,0
4	3 x 3	121	37	30,5	17	14,0

Table 3 shows that the frequency of termite attack on plot 2 was 6.4% and 4 plot was 30.5%. 69.3% of the tropical rain forest trees infested by termites *Coptotermes* Amazon with a mortality frequency of 14.4% (Apolinario and Martius, 2004). Termites that attacked *S. leprosula* ate cellulose in the trunk until the tree died. Based on the resistance of wood against termites attack, *S. leprosula* belongs to resilience grade wood is very susceptible to termite attack *C. curvignathus* and other species such as *Pinus* and *Acacia mangium* (Rudi *et al.*, 1999).

Layout sketch of the *S. leprosula* spacing of 1.4 m x 1.4 m (plot 2) and 3 m x 3 m (plot 4) that were attacked by *Coptotermes* sp. termite in KHDTK Sebulu can be seen in the Appendix 1 and 2. The amount and intensity of termite attack on *S. leprosula* in KHDTK Sebulu can be seen in Table 4.

Table 4. The amount and intensity of termite attack on *S. leprosula* in KHDTK Sebulu

Plot	Spacing (m)	Number of plants	Amount of termite attack	Intensity of termite attack (%)
1	1 x 1	1.084	0	0,0
2	1,4 x 1,4	477	31	4,7
3	2 x 2	275	0	0,0
4	3 x 3	121	37	22,1

Table 4 shows that the intensity of the termite attack on plot 2 and 4 were 4.7% and 22.1%, respectively. Both intensity are considered light damage. In general, the loss because of termite attack was high, ranging from 19 to 80% of the saplings (Nair & Varma, 1985). In addition, termite attack is slow but sure, *Coptotermes* sp termite often attacks *S. leprosula* to its death. Then the termites will continue to attack from one tree to another in the surrounding area when no control is performed.

The presence of termite attack on plants with primary nest termite mound of soil in the form attached to the tree trunk. The primary termite nest was the queen produce termite colony. Hasan (1986), species of subterranean termites, in addition to the primary nest in the ground, the wood is a secondary nest to hatch and hide themselves from predatory insects, so that the diameter of the tree which provides an opportunity for active termites in taking food from the tree. Patterns of termite attacks tend to spread from the primary nest to the nearby trees (Black & Okwakol, 1997).

Environmental conditions in the understory of *S. leprosula* in KHDTK Sebulu were good enough for termites to breed. It was based on the observations of temperature and humidity environments, which ranged from 20.2 to 28.0ºC and 80.0 to 90.1%. According to Nandika et al. (2003), subterranean termites like *Coptotermes*, *Macrotermes*, *Odontotermes,* and other species require humidity between 79% and 90% and an optimum temperature of 15-38ºC for their growth and activity. Temperature and humidity were factors that jointly affected termite activity. Environmental changes caused changes in the development and behavior of termite activity.

CONCLUSION

Termites (*Coptotermes* sp.) in meranti (*S. leprosula*) in KHDTK Sebulu could result in death. Termite attack was characterized by the presence of soil crust that covered most or all of the tree trunk. Termite nest was a place to produce termite colony. The more termite attack found, there was a tendency of attacks is increasing.

REFERENCES

Apolinario, F.E., and C. Martius. 2004. Ecological Role of Termites (Insecta, Isoptera) in Tree Trunks in Central Amazonian Rain Forests. *Forest Ecology and Management Journal.* Vol. 194 : 23-28.

Black, H.I.J., and M.J.N. Okwakol. 1997. Agricultural Intensification, Soil Biodiversity and Agroecosystem Function in The Tropics : The Role of Termites. A*pplied Soil Ecology Journal.* Vol. 6 : 37-53.

Hasan, T. 1986. *Beberapa teknik pengendalian rayap di Indonesia*. Ghalia Indonesia, Jakarta.

Mardji, D. 2000. *Penuntun pratikum penyakit hutan*. Fakultas Kehutanan Universitas Mulawarman, Samarinda.

Mardji, D. 2003. *Identifikasi dan penanggulangan penyakit pada tanaman Kehutanan*. Pelatihan Bidang Perlindungan Hutan di PT ITCI Kartika Utama, Samarinda. H 62 – 87.

Nair, K.S.S., and R.V. Varma. 1985. Some Ecological Aspects of the Termite Problem in Young Eucalypt Plantations in Kerala, India. *Forest Ecology and Management Journal*. Vol. 12 : 287-303.

Nandika, D.R. Yudi, and F. Diba. 2003. *Rayap, biologi dan pengendaliannya*. Muhammadiyah Surakarta Press, Surakarta.

Natawiria, D. 1989. Teknik pengenalan hama hutan tanaman industri. *Informasi Teknik No. 4*. Pusat Penelitian dan Pengembangan Hutan, Bogor.

Rudi, D., R.C. Nandika, Tarumingkeng dan D. Darusman 1999. Preferensi makan rayap tanah *Coptotermes curvignathus* Holungren (Isoptera, Rhinotermitidae) terhadap delapan jenis kayu bangunan. *Prosiding Mapeki* (Masyarakat Peneliti Kayu Indonesia), Yogyakarta.

Verma, M., S. Sharma, and R. Prasad. 2009. Biological Alternatives for Termite Control : A Review. I*nternational Biodeterioration and Degradation Journal*. Vol. 63 : 959-972.

Appendix 1. Layout sketch of the S. *Leprosula* spacing of 1.4 m x 1.4 m which attacked by termites in KHDTK Sebulu