

Conference Paper

Potential of Weaver Ant (*Oecophylla smaragdina* Fabricius, 1775) as Biocontrol Agent for Pest of Teak Stand in Wanagama Forest, Gunungkidul, Yogyakarta, Indonesia

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Abstract

Weaver ant (*Oecophylla smaragdina* Fabricius, 1775) is an aggressive predator that can be used in controlling the pest of teak stand. The research was done to determine the potential of weaver ant to control termite and defoliator of teak stand. Predatory of weaver ant on termite was observed in Laboratory of Forest Health and Protection. The effects of weaver ant on the termite attack on teak trees and the level of teak defoliation were observed. The results showed that in the laboratory study, mortality of termite was 100 % after 12 h of weaver ant presence. In the teak stand, the presence of weaver ant decreased the termite attacks and also the defoliation. The research indicates that weaver ant is potentially used as biocontrol of teak pest.

Keywords: Weaver ant, Biocontrol agent, Teak stand, Wanagama Forest, Teak pest.

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1. Introduction

Teak (*Tectona grandis* Lf.) is one of the most important commercial trees in Indonesia. The teak wood has a smooth texture and beautiful colors. The wood is used for various purposes such as for building materials, shipbuilding industry, household furniture etc. The demand for teak wood has been increasing [1].

Teak defoliator attacks the leaf of teak stands in early of wet season. The attack of the pest may disturb the photosynthesis process and decrease the growth increment of the tree. Therefore, an effective control needs to be done against this pest so that the losses can be reduced.

Use of weaver ants as predators of teak pest is potential to be developed. Weaver ants are members of the family Formicidae (*Order Hymenoptera*), which make a nest and live in a tree so that it can effectively control pests [2]. Utilization of weaver ants as predators of pests has been developed in China, Vietnam, and Thailand [3]. Weaver

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ants, *Oecophylla smaragdina* (Fabricius, 1775) can control over 50 species of pests on many tropical tree crops and forest trees [4, 5]. Weaver ant can control bagworm *Pteroma pendula* (de Joannis, 1929) in oil palm plantations in Malaysia [6]. Weaver ants have been known to prey on many insects nectary exudates from plants and sugary secretion of homopteran insects [7, 8].

Weaver ants have not been widely used for pest control in Indonesia. The research on using weaver ants as biocontrol agent has not been done in Indonesia. The teak stands in Wanagama Forest have been attacked by teak defoliator and termite. Therefore, it is necessary to do research on the potential of weaver ant to control the termite and defoliation of teak stand.

2. Materials and Methods

The research was done in Wanagama Forest belongs to The Faculty of Forestry Universitas Gadjah Mada. It is located in Banaran, Playen, Gunungkidul, Daerah Istimewa Yogyakarta, Indonesia. This area is located at an altitude of 150 m to 400 m above sea level, covering an area of 600 ha. Teak stands are located on plot 13 and it was planted in 1990 in an area of 5 ha.

3. Laboratory Study

Ten individuals of termites were placed in a plastic box with a diameter of 0.1 m. Five individuals of weaver ants were added to each plastic box. The plastic box without weaver ant was used as control. Ten replications were used in the study. Termite mortality was observed after 1 h, 6 h, and 12 h.

4. The Effects of the Weaver Ants on Termite

Ten plots of teak stand measuring 20 m × 20 m consisted of five plots with colony of weaver ant and five plots without colony of weaver. Observation on the termite attack on teak tree was done. The presence of termites in a tree can be seen from the gallery attached to the tree.

5. The Effect of Weaver Colonies on the Leaf Damage

The study was conducted on teak stand on the plot 13. Eighteen teak trees with the nest of weaver ant and 18 teak trees without weaver ants nest were selected for the study. Observation on damage level of the leaves was observed on each tree. Leaf damage is classified into four categories:

1. mild damage (1 % to 25 % leaf damage)
2. moderate (26 % to 50 % leaf damage)
3. rather heavy (51 % to 75 % leaf damage)
4. heavy (76 % to 100 % leaf damage)

6. Results and Discussion

The mortality of termites by weaver ants can be seen in Fig. 1. Weaver ant aggressively attacked the termites. One hour after presence of weaver ant more than 50 % of termite died. Mortality of termite was 100 % in 12 h.

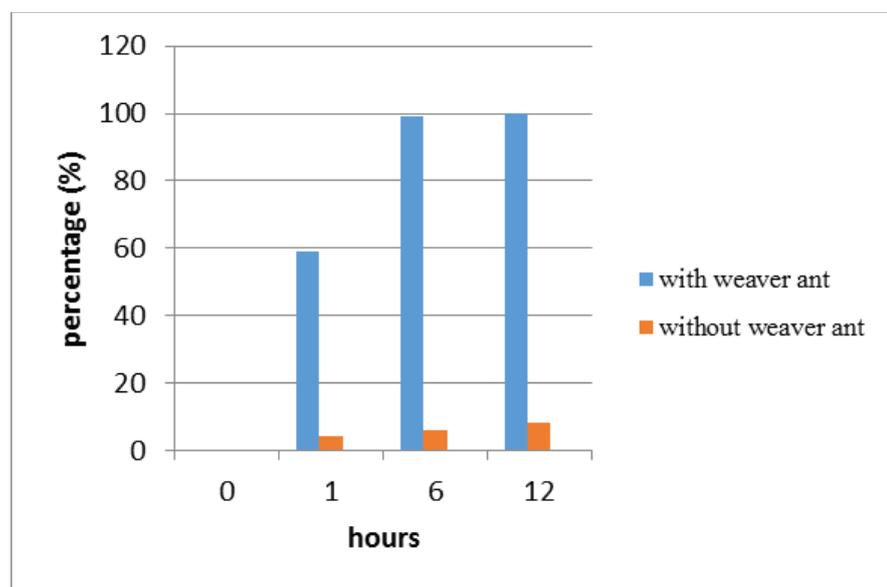


Figure 1: Mortality of termite attacked by weaver ant in laboratory.

The percentage of teak tree attacked by termite was shown in Fig. 2. The percentage of tree attacked by termite was lower in the plot with weaver ant colony than that of without weaver ant colony.

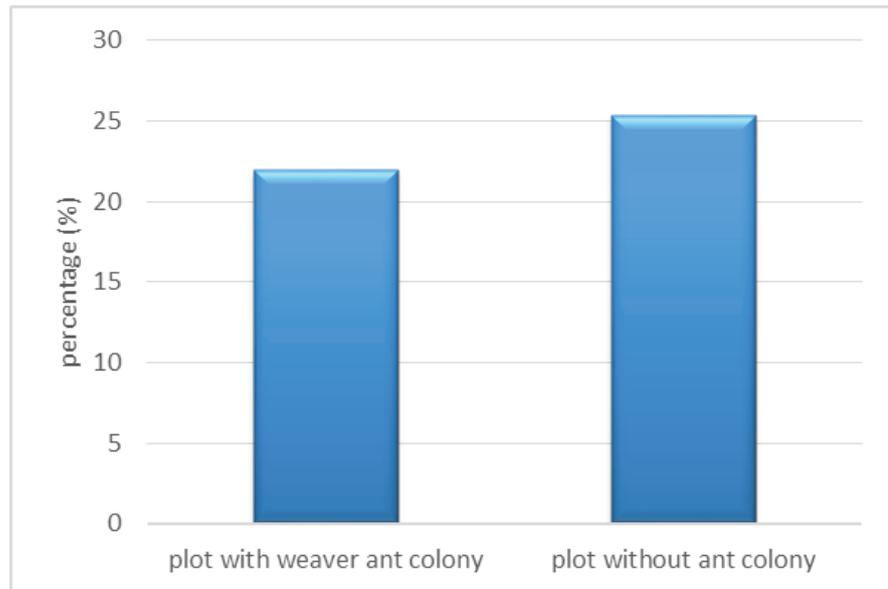


Figure 2: Percentage of trees attacked by termite in teak stand.

The effect of the presence of weaver ant on teak leaf damage can be seen in Fig. 3. Damage on the leaves on trees without weaver ant was slightly higher than that of tree with weaver ant.

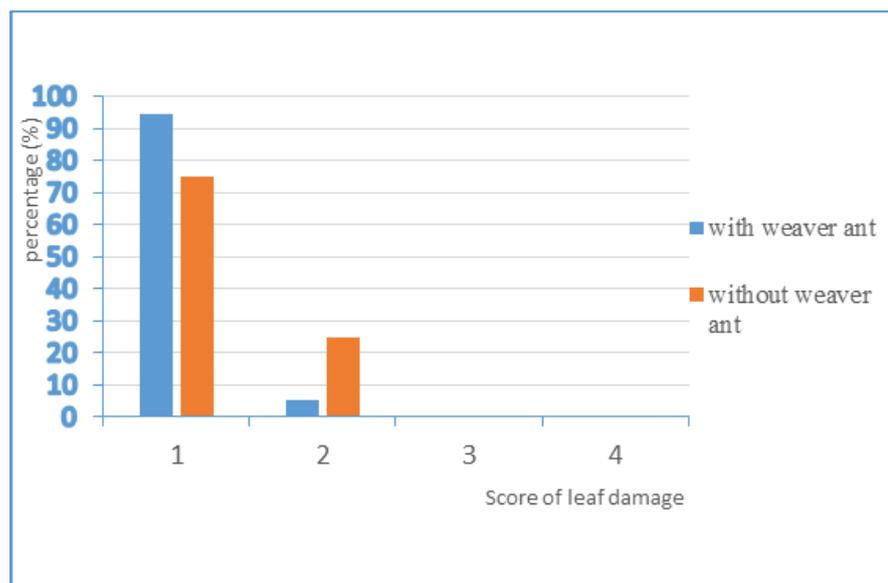


Figure 3: The damage of teak leaf on teak tree with weaver ant without weaver ant in April 2016.

Weaver ant is an aggressive predator that can kill many kinds of pests [3]. Weaver ant does not eat mealy bugs because it is symbiont of weaver ants. Mealybugs produce honey dew required by weaver [9]. Weaver ant was an effective of biocontrol agent of red-banded thrips [10]. Weaver ants need sugar and protein for its diet [11].

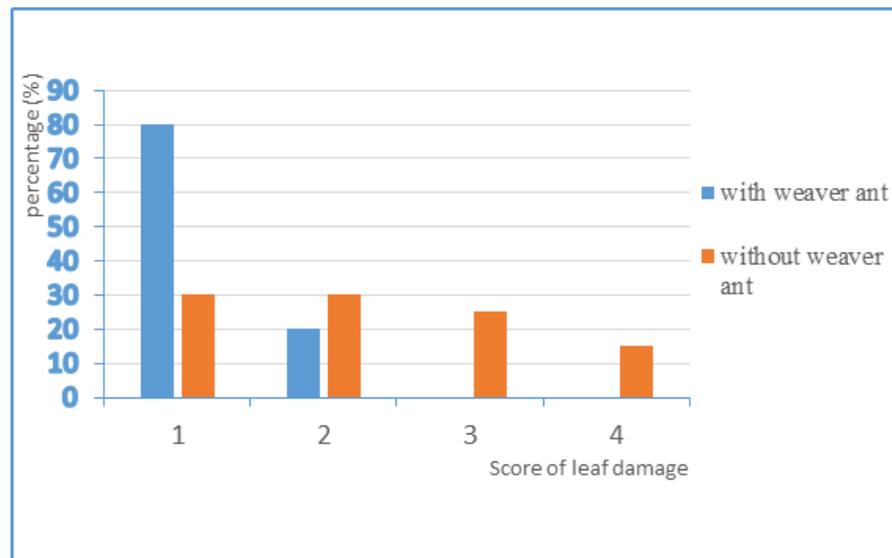


Figure 4: The damage of teak leaf on teak tree with weaver ant without weaver ant in June 2016.

7. Conclusion

The presence of weaver ant decreased the termite attacks and defoliation of teak stand. The weaver ant is potentially used as biocontrol of teak pest.

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