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Relative Resistance of *Eucalyptus* Seedlings against Japanese Subterranean Termites

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Keywords : *Eucalyptus* seedlings, termite resistance, *Coptotermes formosanus*, *Reticulitermes speratus*

Introduction

Eucalyptus species are well recognized as fast-growing trees and have been often planted in Asian and African regions these years¹⁾. Literature survey of early works indicates that some trees and plants newly introduced to the places far away from their origins are vulnerable to indigenous subterranean termites²⁻⁴⁾. Although chemical applications definitely reduce mortality of seedlings, environmental pollution seems to become more serious around the applied regions.

Eucalyptus is not domestic in Japan, and it is quite natural to imagine that the seedlings of the group will be readily attacked by Japanese subterranean termites.

The present investigations were designed to produce the predicted termite attacks on the *Eucalyptus* seedlings in the laboratory, and to compare relative termite resistance among the tested species. Field evaluations were also planned to support the results of laboratory tests.

Materials and Methods

Field test

Test seedlings : Seedlings of 7 species were used. Details of the seedlings are given in Table 1. *Eucalyptus* seedlings were supplied by Oji Paper Co., Ltd and others by Nakanishi Shiseido.

Test site : A test plot was set up in the termite field test site of Wood Research Institute of Kyoto University, a part of domestic pine (*Pinus thunbergii* Parl.) forest at Fukiage-cho, Kagoshima Pref. Two major Japanese subterranean termites, *Coptotermes formosanus* Shiraki and *Reticulitermes speratus* (Kolbe) are distributed in the test site.

Test period : June 18, 1997–January 7, 1998

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Table 1. Seedlings for testing

Species	Age	Diameter (cm)	Height (cm)
<i>Pinus densiflora</i> Sied. et Zucc	2	0.8–2	20–30
<i>Cryptomeria japonica</i> D. Don	3	1–3	30–50
<i>Chamaecyparis obtusa</i> Endl.	2	1–3	30–50
<i>Eucalyptus camaldulensis</i> Dehnh.	1	0.5–0.8	20–30
<i>Eucalyptus globulus</i> Labill.	1	0.5–0.8	10–20
<i>Eucalyptus grandis</i> Hill ex Maid	1	0.5–0.8	10–20
<i>Eucalyptus nitens</i> (Deane & Maid.) Maid.	1	0.5–0.8	10–20

Test design: A pine stake (3×3×35 cm) was driven into the soil and surrounded concentrically by planting each of 7 kinds of seedlings, and the set was repeated 19 times.

The test seedlings were inspected to recover dead specimens on October 22, 1997. The remaining seedlings were taken out and served for the examination of termite attacks, on January 7, 1998.

Evaluation method: The recovered seedlings were washed off soil and debris with running tap water before visual examination of the termite attacks on roots and stems of the test seedlings.

Relative intensity of attacks was not evaluated, but only presence or absence of termite attacks was carefully observed.

Choice test—Exposure to laboratory colony

Test seedlings were exposed to the laboratory colony of *C. formosanus* at $28 \pm 2^\circ\text{C}$, $>80\%$ RH for 4 weeks. During the test duration, the seedlings were lighted half day. Five replicates of 5 test seedling species (*P. densiflora*, *E. camaldulensis*, *E. globulus*, *E. grandis* and *E. nitens*) were randomly planted, 5 cm apart from each other in the concrete trough where the termite colony had been maintained. Relative intensity of attacks was not evaluated, but only presence or absence of termite attacks was carefully observed.

Choice test in an artificially weather-controlled room

Five seedlings consisting of one each of the test seedlings (*P. densiflora*, *E. camaldulensis*, *E. globulus*, *E. grandis* and *E. nitens*) were planted in a plastic container (30 cm in diameter and 15 cm in height), and 1,350 workers and 150 soldiers of *Coptotermes formosanus* were introduced into the container. This set was repeated 4 times. A *P. densiflora* seedling planted in a pot (10.5 cm in diameter and 8.5 cm in height) was prepared for comparison. The assembled containers were kept at $25 \pm 2^\circ\text{C}$, 70–80% RH and lighted half day for 4 months.

Results and Discussion

Field test

Fig. 1 shows the proportion of the seedlings attacked in the field for 7 months. Though termites were very active in the test area, they did not cause serious damage to the seedlings. One possibility is that this area is very rich with organic substances. So termites may not need to use living trees as food.

P. densiflora was most vulnerable and 15% of the seedling samples were attacked by termites, and followed by *E. nitens* (10%) and *E. globulus* (5%). Other species were not attacked. Two domestic species (*C. japonica* and *C. obtusa*) seemed more resistant than *Eucalyptus*. Differences of termite attacks between domestic species and *Eucalyptus* might be dependent on the differences of age and size in these sample trees. Some seedlings of *E. globulus*, *E. grandis* and *E. nitens* could not be recovered. It was not clear whether they were missed due to severe termite attacks.

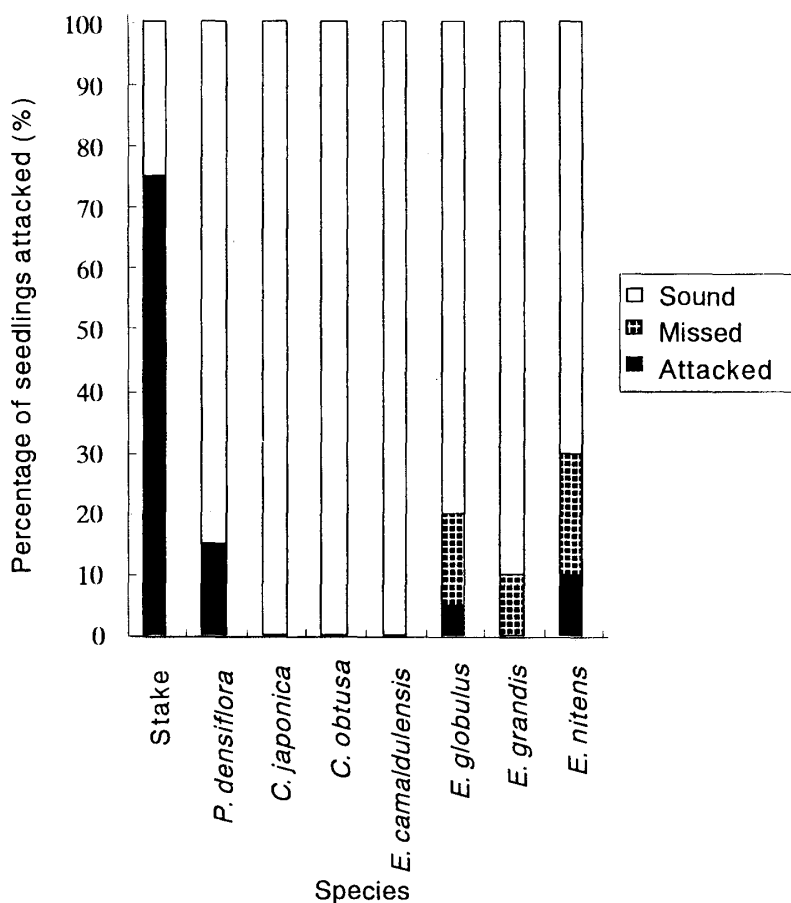


Fig. 1. Percentage of seedlings attacked by termites in field test.

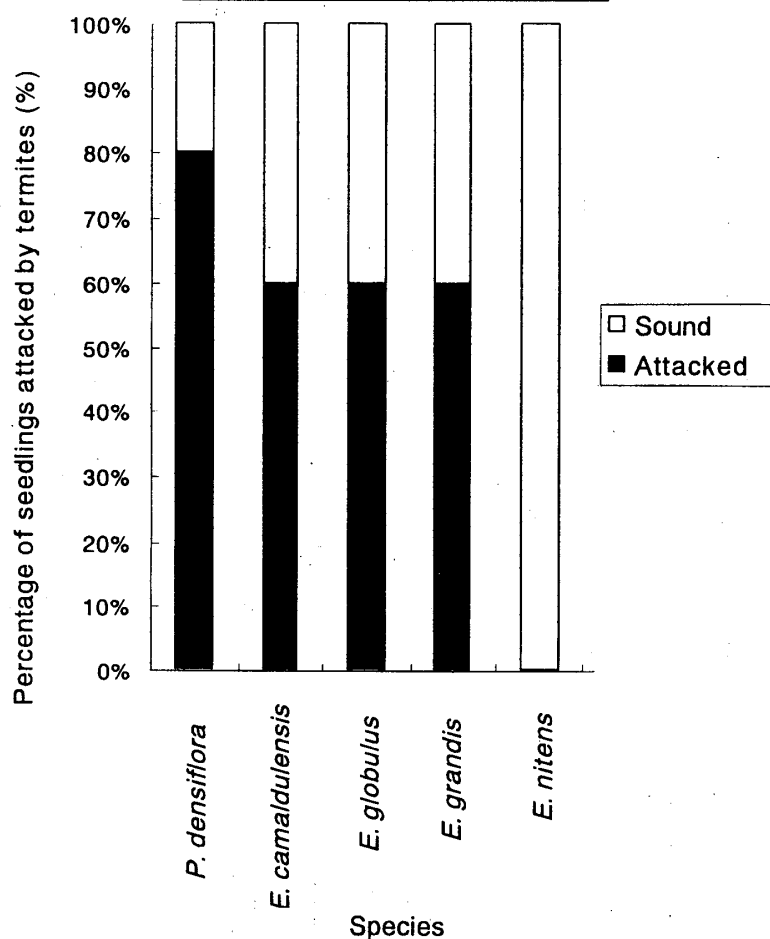


Fig. 2. Percentage of seedlings attacked by termites when exposed to the laboratory colony of *Coptotermes formosanus*.

Choice test—Exposure to laboratory colony

Fig. 2 shows percentage of seedlings attacked by termites. *P. densiflora* was most susceptible among the test species. This was the same as in field test. But *E. nitens* was not attacked. As there was no wood materials but planted seedlings as food for termites in the concrete trough, highly populated group of termites caused severe damage to the seedlings in this test. Subsequently, *E. nitens* was considered as more resistant to termites than others.

Choice test in an artificially weather-controlled room

All of *P. densiflora* seedlings were attacked by termites but none of *Eucalyptus* seedlings were attacked. Seedlings were planted in humus. Termites fed humus other than *P. densiflora*. Termites were favorite of *P. densiflora* seedlings more than humus. But they liked *Eucalyptus* less than humus. In all tests described here, *P. densiflora* was most vulnerable among the species. It was clear that termites had food preference. Their food preference suggests that some pine seedlings should be attacked by termites shortly after planting even in Japan. In this experiment soil for gardening which was rich in organic substances was used as medium in the test container. Therefore, the soil other than

seedlings could be nutritious to the termites. These situations appeared to support the results which were not so severe as those in laboratory colony test.

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