TERMITICIDE TRIALS ON YOUNG INFESTED *GMELINA ARBOREA* TREES IN SEGALIUD-LOKAN, SABAH

V.K. Chey

Forest Research Centre, Sabah Forest Department, P.O.Box 1407, 90008 Sandakan, Sabah, Malaysia

Received February 1995

CHEY, V.K. 1996. Termiticide trials on young infested *Gmelina arborea* trees in Segaliud-Lokan, Sabah. Five treatments (four chemicals: BHC, Chlordane, Dieldrin, Chlorpyrifos, and a control) were applied to 25 termite-infested *Gmelina arborea* trees (age: 2.5 years) grown in Segaliud-Lokan, near Sandakan, Sabah. Over a period of four years, both Chlorpyrifos and Chlordane registered no recurrence of termite attack, Dieldrin and BHC had low sporadic recurrence, while the untreated trees gave significantly higher infestation. The main primary pest termite was *Coptotermes curvignathus*. Tree growth was found to be not directly related to the type of termiticide used.

Keywords: *Gmelina arborea* - termite - BHC - Chlordane - Dieldrin - Chlorpyrifos - growth

CHEY, V.K. 1996. Percubaan racun anai-anai ke atas pokok muda *Gmelina arborea* yang diinfestasi di Segaliud-Lokan, Sabah. Lima rawatan (empat bahan kimia: BHC, Chlordane, Dieldrin, Chlorpyrifos dan satu kawalan) telah dijalankan ke atas 25 pokok *Gmelina arborea*, berumur 2.5 tahun yang diserang anai-anai di Segaliud-Lokan, berhampiran Sandakan, Sabah. Pokok-pokok yang dirawat dengan Chlopyrifos dan Chlordane adalah bebas daripada serangan anai-anai untuk selama empat tahun manakala pokok-pokok yang dirawat dengan Dieldrin dan BHC menunjukkan serangan semula yang rendah dan pokok-pokok yang tidak dirawat menunjukkan infestasi tinggi yang ketara. Anai-anai perosak primer yang utama adalah *Coptotermes curvignathus*. Tumbesaran pokok didapati tidak bergantung kepada jenis racun anai-anai yang digunakan.

Introduction

Out of the three main plantation tree species grown in Sabah, viz. *Acacia mangium*, *Gmelina arborea* and *Paraserianthes falcataria*, the second has the highest incidence of termite attack (Chey 1989). Termite infestation on *Gmelina arborea* has also been recorded in Peninsular Malaysia (Browne 1968) as well as Sarawak (Sarkawi 1986).

The primary termite pest was found to be *Coptotermes curvignathus*, notorious as a severe rubber pest throughout Southeast Asia. Dhanarajan (1969) reported that contrary to popular belief, the termite would also attack healthy vigorous trees especially exotics. Tho and Kirton (1990) also emphasised on its importance as a primary pest of agricultural and forestry tree crops.

Coptotermes curvignathus nests subterraneanly, and from the main termitarium runways ramify to subsidiary nests. Its typical mode of attack is to enter the tree through the roots, and it often constructs external soil runways on the bark as well

as encasing the basal part of the trunk with a crust of earth. The species is easily recognisable by its soldier which secrets a milky fluid from its fontanelle when harassed.

Due to its subterranean nesting habit, control is made doubly difficult, especially in plantations which have been established. There is a dearth of information on the effective treatment of infested trees in the first few years after planting out. Many workers assume that remedial treatment is too late and too expensive (Sands 1973, Wardell 1987). Tho (1974) suggested that chlorinated hydrocarbons be applied to localised areas of termite infestation in the later years after establishment, if the trees have been protected by root zone insecticide in the initial years. In fact preventive measures in the form of treating potting soil with suitable termiticide, usually persistent chlorinated hydrocarbons, are considered to be the best. Experiments with controlled release granules of non-persistent insecticides for seedlings have also been conducted in several tropical countries (Mitchell 1989, Canty 1991), while remedial measures remain neglected. The following trials were conducted on young termite-infested *Gmelina arborea* trees to investigate the efficacy of the available termiticides in termite control as well as in curbing further attack.

Materials and methods

The site chosen was a 2.5-y-old *Gmelina arborea* plantation (area 1.83 ha, spacing 3 × 3 m) located in Segaliud-Lokan, near Sandakan.

A total of 25 termite-infested trees were selected, which were divided randomly among five treatments: three chlorinated hydrocarbons, viz. Gamma BHC 20% w/w (tradename: Lindane 20EC), Chlordane 30% w/w (tradename: Chlordane 30), Dieldrin 15.9% w/w (tradename: Dieldrex 15), one organophosphate, viz. Chlorpyrifos 21.2% w/w (tradename: Dursban 75), and a control. The four termiticides were chosen mainly because of their availability, and Chlorpyrifos as an organophosphate, which though not as widely used, would provide comparison with the other three chlorinated hydrocarbons. The doses were applied at the recommended rates: BHC at 45 ml in 4.5 litre water, Chlordane at 150 ml in 4.5 litre water, Dieldrin at 10 ml in 4.5 litre water, Chlorpyrifos at 70 ml in 18 litre water.

In carrying out the treatment, the mudwork on the infested tree base (up to 30 cm) was scraped off, and a drain (10 cm deep) was dug in the soil encircling the base. Each tree was numbered, its dbh (diameter at breast height) was noted, and a termite sample was collected before 2 litre of the termiticide was poured into the drain to drench down the root system. In the case of the control, 2 litre of plain water was used instead.

Each treatment was randomly assigned to five infested trees and applied once in early 1991. Over the next four years inspection trips were made to check for any recurrence of termite attack on the selected trees. This was done by examining the tree trunk as well as the tree base with its immediate surrounding soil.

Results and discussion

Table 1 shows the results of the trials over the four years. There was not a single recurrence of termite attack on trees treated with Chlordane or Chlorpyrifos. Those with Dieldrin and BHC had a few sporadic recurrences, the latter more frequent than the former. As expected, the control produced significantly higher infestation (ANOVA, $p<0.01$), with a tree being dead ten months into the trials.

Table 1. Proportion (%) of trees with termites after treatment

Treatment	Months after treatment								
	1	2	5	8	10	12	14	24	48
BHC	0	0	40	40	0	20	20	0	0
Chlordane	0	0	0	0	0	0	0	0	0
Dieldrin	0	0	20	0	0	0	0	40	20
Chlorpyrifos	0	0	0	0	0	0	0	0	0
Control	60	60	80	60	80	40	40	40	20

Coptotermes curvignathus was, as usual, the major primary pest termite, and the other species collected such as *Schedorhinotermes* spp., *Odontotermes grandiceps*, *Glyptotermes paracaudomunitus* were probably of minor importance as they have been recorded feeding mostly on rotting wood (Thapa 1981).

The reason for the sporadic recurrences of termite attack on both BHC and Dieldrin treated trees is unclear. It is possible that both of these chlorinated hydrocarbons at the recommended rates were not as persistent in the plantation as Chlordane or Chlorpyrifos. One control tree also exhibited similar sporadic recurrences, which suggests that termite reinfestation could be subject to certain site conditions such as soil moisture. Sands (1973) reported that the peak foraging time for most termites happens after the rainfall peak and before the soils dry out, which is also the most active season of plant growth.

The increase in dbh after four years for the selected trees varied widely within each treatment. For example, trees treated with Chlordane registered a growth factor (the ratio dbh four years after treatment/dbh at treatment) ranging from 1.19 to 2.85 (Table 2). There was also no significant difference in the effect of the termiticides on tree growth (ANOVA, $p<0.05$). It would appear that growth was possibly subject to tree vigour and severity of the termite attack, and not directly related to the type of termiticide used.

Mitchell (1989) warned that Chlorpyrifos, being supposedly semi-persistent, could induce severe phytotoxicity to *Eucalyptus* seedlings (pricked out into potting soil admixed with insecticide) at doses required to control termites. The results obtained here for *Gmelina arborea* trees showed otherwise, as no recurrence of termite attack was evident for the Chlorpyrifos-treated trees, and their growth did not seem to be severely impeded. However, indiscriminate application of high doses of both chlorinated hydrocarbons as well as organophosphates should be

avoided. Wardell (1987) reported on the inhibition of root initiation when Dieldrin was wrongly administered, and Sands (1973) also pointed out the risks of phytotoxicity of the higher dosage rates of organophosphates including Chlorpyrifos and Propoxur.

Table 2. Growth factor of the treated trees represented by the ratio dbh four years after treatment/dbh at treatment

Replicate	Treatment				
	BHC	Chlordane	Dieldrin	Chlorpyrifos	Control
1	1.86	1.80	1.18	1.35	1.57
2	1.33	1.23	1.53	1.46	1.64
3	1.15	1.19	1.79	1.25	0
4	1.78	1.33	2.33	1.80	1.73
5	1.39	2.85	1.40	1.31	1.78

The results here suggest that Chlorpyrifos could be a suitable termiticide for *Gmelina arborea* trees, considering the often publicised environmental hazards posed by the persistent organochlorine insecticides.

Acknowledgements

The author would like to acknowledge the help given by Madu Lajaun of Segaliud-Lokan Plantation and staff of the Entomology Section of the Sabah Forest Department, especially Abd. Razak Habib Ahmad, Saikeh Lantoh, Momin Binti and Willibrord Jimin in carrying out the project. Two anonymous reviewers gave useful comments on the manuscript.

References

BROWNE, F.G. 1968. *Pests and Diseases of Forest Plantation Trees.* Clarendon Press, Oxford. 1330 pp.

CANTY, C. 1991. Controlled release granules protect *Eucalyptus* trees from termite attack. In Schonau, A.P.G. (Ed.) *Proceedings of Symposium on Intensive Forestry: The Role of Eucalypts*, Volume 2. Durban, South Africa. September 2-6, 1991. IUFRO.

CHEY, V.K. 1989. *A Survey of Termites in Sabah Forests.* FRC Publications 1/89. Sabah Forest Department, Sandakan. 144 pp.

DHANARAJAN, G. 1969. The termite fauna of Malaya and its economic significance. *Malayan Forester* XXXII No. 3 : 274 - 278.

MITCHELL, M.R. 1989. Comparison of non-persistent insecticides in controlled release granules with a persistent organochlorine insecticide for the control of termites in young *Eucalyptus* plantations in Zimbabwe. *Commonwealth Forestry Review* 68(4) : 281 - 294.

SANDS, W.A. 1973. Termites as tree and crop pests. *Overdruk uit* 38 : 817 - 830. Mededelingen Fakulteit Landbouwwetenschappen, Gent.

SARKAWI HJ. MOHD. UMAR. 1986. Common insect pests in forest nurseries and forest plantations in Sarawak. Paper presented at the 9th Malaysian Forestry Conference. Sarawak Forest Department, Kuching.

THAPA, R.S. 1981. *Termites of Sabah.* Sabah Forest Records 12. Sabah Forest Department, Sandakan. 374 pp.

THO, Y.P. 1974. The termite problem in plantation forestry in Peninsular Malaysia. *Malaysian Forester* 37 : 278 - 283.

THO, Y.P. & KIRTON, L.G. 1990. The economic significance of *Coptotermes* termites in Malaysian forestry. Pp. 193-199 in *Proceedings of the Third International Conference on Plant Protection in the Tropics.* Volume IV. Genting Highlands, Malaysia, 1990.

WARDELL, D.A. 1987. Control of termites in nurseries and young plantations in Africa: established practices and alternative courses of action. *Commonwealth Forestry Review* 66(1): 77 - 89.