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LABORATORY EVALUATION OF DIELDRIN AND LORSBAN IN PROTECTING WOODEN BLOCKS FROM TERMITE (ISOPTERA) ATTACK

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Abstract: Wooden blocks of *Magnifera indica* were treated with different concentrations (0.1%, 0.2%, 0.4%, .8%) of dieldrin and Lorsban. Blocks treated with each insecticide were segregated into two groups, *i.e.* leached and unleached. Lorsban was found more effective than dieldrin in protecting wooden blocks from attack of *Microcerotermes championi* Snyder, during short term laboratory experiments.

INTRODUCTION

Scientists all over the world are trying to find out insecticides, other than chlorinated compounds for protecting wooden structures from termite attack (Beal and Smith, 1972; Beal and Miller, 1980; Howick and Creffield, 1981; Rose *et al.*, 1984; Kard *et al.*, 1989; Akhtar and Sarwar, 1991.

In the present paper efficacy of Lorsban and dieldrin in protecting wooden blocks from attack of *Microcerotermes championi* is discussed.

MATERIALS AND METHODS

Laboratory evaluation of two insecticides applied to wooden blocks

For laboratory evaluation of insecticides by leaching and unleaching method, the procedure used by Tsundo and Nishimoto (1985) was adopted. Two insecticides involved were Lorsban and Dieldrin. The concentrations of the insecticides used were 0.1%, 0.2%, 0.4% and 0.8%.

Termite test

Termite test was done according to Japan Wood Preservation Association standard, Anon 11(1) 1981.

Wood specimen

Wood specimens, measuring $10(R) \pm 0.5 \times 10(T) \pm 0.5 \times 20(L) \pm 0.5$ mm, were prepared from the sound sapwood of *Magnifera indica*.

Treatment and conditioning of test wooden blocks

Treatment was done by brushing @ 110 ± 10 g/m^2 of treating solution. After treatment, the wooden blocks were dried in the ambient temperatures for at least 20

days before leaching or termite test. Twenty four blocks treated with different concentrations of Dieldrin solution were then assigned to two groups, leached and unleached groups. So that 12 of treated-leached and treated-unleached blocks were prepared. In the same way, blocks treated with different concentrations of Lorsban were also assigned to two groups. Untreated-unleached wooden blocks were also subjected to termite test as control.

Leaching procedure

Leaching procedure consisted of ten times repeated wet and dry cycles. wooden blocks were dipped in non-running water for 30 seconds and then kept in a desiccator with water at the bottom for 4 hours at 26±2 °C. After the wet cycle, the blocks were transferred into an oven and kept at 40±2 °C for 20 hours. All the wooden blocks were dried at 60±2 °C before termite test for determining the oven-dried weights of them. Then oven dried weights (W_1) were measured by analytical balance to the nearest 0.001g.

Petri dishes (90mm x 15mm) were used as test container. One each of treated or untreated wooden block was placed at the center of petri dish. One hundred and fifty (150) termites were introduced into each petri dish. All the petri dishes were then stored at 28±2 °C in the dark for 15 days. After the test period, all the blocks were cleaned and dried at 60±2 °C for two days and then reweighed (w_2). Weight loss of wood blocks were then calculated from the following equation:

$$\text{Weight loss (\%)} = \frac{W1 - W2}{W1} \times 100$$

Number of dead termites were recorded at the end of the test so that mortality of termites could be determined as follows:

$$\text{Termite mortality (\%)} = \frac{\text{No. of dead termites}}{150} \times 100$$

Besides, regular observations were made to count dead termites.

RESULTS

Laboratory evaluation of two insecticides applied to wooden blocks

Table No. 1 shows the percentage weight loss of treated blocks caused by termite attack. As a candidate chemical can be considered as "effective" when it succeeds in limiting termite attack to below 3% weight loss of treated blocks even after leaching according to the qualitative standards (Japan Wood Preserving Association Standard), Lorsban tested was satisfactorily effective. Percentage weight loss of the blocks treated at 0.2, 0.4 and 0.8% was less than 3%, though moderate termite attack was found at 0.1% in leached Lorsban-treated wood blocks.

Percent weight loss was higher than 3% at 0.1, 0.2 and 0.4% in treated leached wood blocks with dieldrin. At 0.8% dieldrin was effective in limiting termite attack below 3%, as is shown in Table 1. Termite mortality change with time has been shown in Fig. 1 and Fig. 2.

Table 1: Percent Weight Loss of Wooden Blocks and Termite Mortality

Chemical (Solvent)	Treating conc. %	Leaching	Weight loss (%) Min. - Max.	Mean	Mortality (%) Min. - Max.	Mean
Dieldrin	0.1	Yes	6.4 - 7.9	7.03	3 -7	5
		No	1.1 - 1.4	1.23	30 - 42	35
	0.2	Yes	5.2 - 6.1	5.6	6 - 11	9
		No	0.4 - 0.9	0.66	53 - 85	70
	0.4	Yes	3.9 - 4.7	4.3	11 - 15	13
		No	0.1 - 0.3	0.16	69 - 91	82
	0.8	Yes	0.4 - 1.1	0.7	24 - 38	34
		No	0.0 - 0.1	0.03	100 - 100	100
Lorsban	0.1	Yes	2.7 - 3.3	3.03	40 - 53	45
		No	0.3 - 1.0	0.6	51 - 79	64
	0.2	Yes	1.5 - 2.4	1.93	57 - 98	74
		No	1.0 - 3.0	0.2	87 - 100	95
	0.4	Yes	0.1 - 0.7	0.4	98 - 100	99
		No	0.0 - 0.1	0.06	100 - 100	100
	0.8	Yes	0.0 - 0.2	0.1	100 - 100	100
		No	0.0 - 0.0	0.0	100 - 100	100
	Untreated control		12.4 - 22.6	17.3	0.0	0

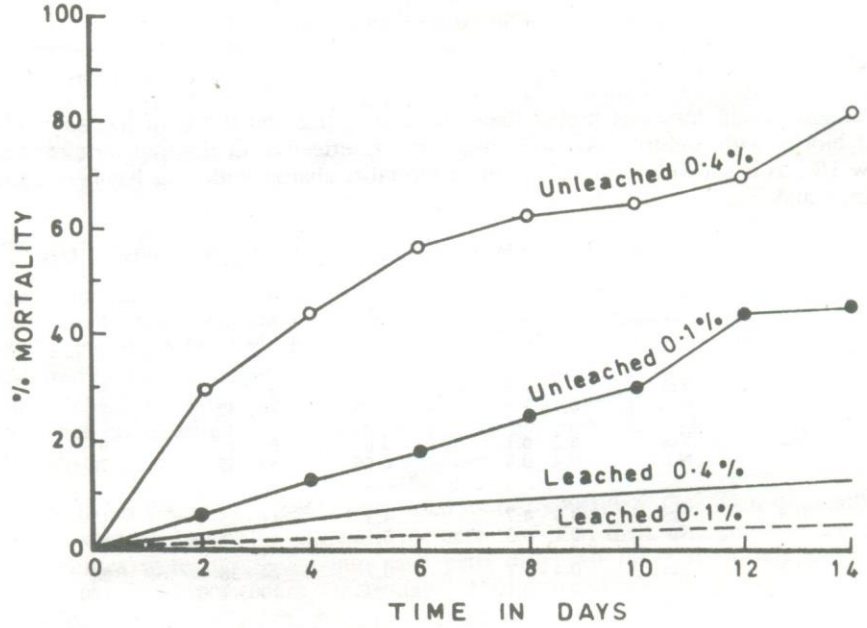

Fig. 1. Percent mortality of *Microcerotermes championi* exposed to wooden blocks treated with Aldrin

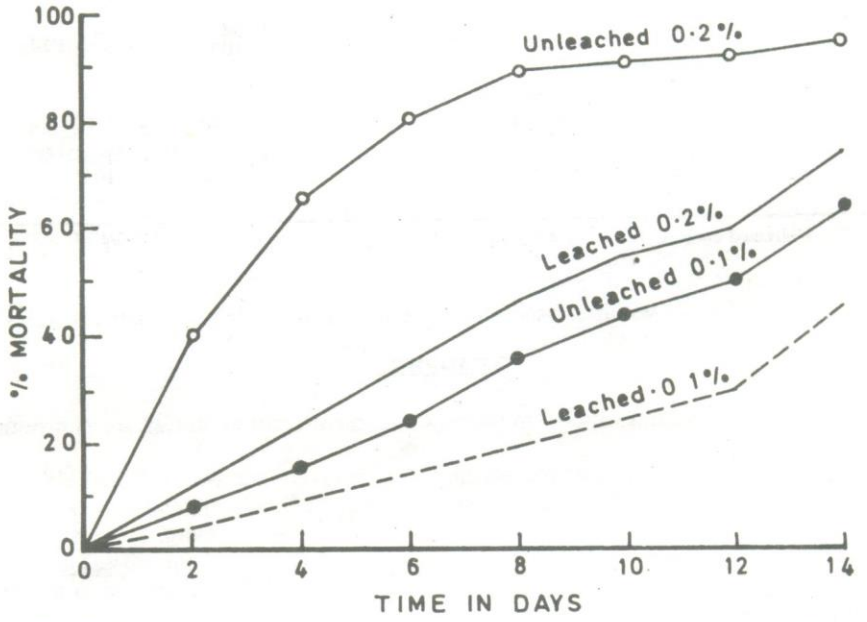

Fig. 2. Percent mortality of *Microcerotermes championi* exposed to wooden blocks treated with Lorsban.

DISCUSSION

Toxic properties of an insecticide may vary in different climatic zones, depending upon the pH and percent base saturation of soil (Beal, 1980).

Hydrocarbons provided decades of termite control at United states test sites, and organophosphates and pyrethroids did not last as long, though they were effective for 5 or more years at same rates (Kard *et al.* 1989). But as regards chloropyrifos (an organophosphate), Su *et al.* 1987 have reported that this insecticide exhibited its effect more rapidly than chlordane. Tamashiro *et al.*, 1989 have also shown Dursban TC insecticide as a preventive treatment for Formosan termite in Hawaii. According to them chlorpyrifos, the active ingredient in Dursban TC insecticide, forms an effective barrier in sand and clay to prevent infestation of Formosan subterranean termite in most locations in Hawaii for 5 years or more. Jones (1989) have carried out studies with *Reticulitermes flavipes* and *Coptotermes formosanus* regarding toxicity and repellency of chlordane, chlorpyrifos and permeth.'n. He has reported that during contact toxicity tests workers of both the species were knocked down within a few hours. But permethrin was more repellent than other two insecticides tested. Besides, borate preservatives have been reported to offer effective protection for building timber and other above ground uses of wood products with less hazard to users and the environment (Curtis, 1990).

In Pakistan soil toxicity and repellency of some insecticides have been studied against *Microtermes championi* Snyder and *Bifiditermes beesoni* (Gardner). Akhtar and Irshad (1990) compared toxicity of dieldrin, Lorsban, Bestox and heptachlor at different concentrations 6.25, 12.5, 25, 50, 100, and 200 ppm. They have reported that heptachlor showed greater toxicity against *M. championi* than other insecticides. Next to heptachlor was Bestox. Akhtar and Sarwar (1991) have also compared toxicity and repellency of dieldrin, Lorsban, Bestox and Decis-D against *Bifiditermes beesoni*. Bestox showed greater toxicity against *Bifiditermes beesoni* than dieldrin at 200, 100, and 50 ppm. Next to Bestox in toxicity was Decis-D.

Tsunoda and Nishimoto (1985) have also studied efficacy of organophosphates in giving protection to wooden blocks. They have reported that of five organophosphates applied to wooden blocks, chlorpyrifos and phoxim were the most effective against *Coptotermes formosanus* even after leaching (weathering). Present studies with *Microcerotermes championi* have also shown that lorsban was more effective than dieldrin in protecting wooden blocks after leaching (weathering), during short term laboratory experiments.

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Short Communication

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EFFECT OF ROOT - KNOT NEMATODE, *MELOIDOGYNE JAVANICA* ON NODULATION AND ROOT GROWTH OF CHICKPEA

Chickpea (*Cicer arietinum* L.) is an important grain legume crop in Pakistan. It occupies about 1.05 million ha, producing 456,000 tons of grain, contributing about 81% to the total production of pulses in the country (*Agric. Stat. of Pakistan, Ministry of Food Agric. and Co-operat. Islamabad,* pp. 289, 1989). Its yield per unit area is very low. Many factors contribute to low yield of chickpea in Pakistan. The most important of these factors is the occurance of different diseases. The root-knot disease caused by *Meloidogyne* spp. has been studied on chickpea (Srivastava *et. al, Indian J. Nematol.*, **4**:248-251, 1974). It causes considerable damage to chickpea crop. in Pakistan (Maqbool *et. al, U.S.-Pakistan Internat. Workshop, Plant Nematol., Univ. Karachi, Karachi*, pp. 229-240, 1988). Root-knot nematodes are widely distributed in our soils and cause considerable damage to various crops including pulses. The annual yield losses due to *Meloidogyne* spp. are 16.9% and in pulses these are 39% (Handa and Mishra, *Indian J. Pulses Res.* **2**:152-155, 1989). These parasites not only infect the root system and cause direct damage but also interfere with the formation and functioning of rhizobial nodules. The present investigation was, therefore, made to study the effect of *M. javanica* on nodulation and root growth of chickpea.

Materials and Methods

Surface sterilized seeds of five cultivars of gram were sown in plastic pots of (12cm diameter) containing sterilized sandy loam soil. The seeds were treated with *Rhizobium* spp. Pots were completely randomized under field conditions. Each variety had six replications and two treatments *i.e.* treated with nematodes and non-treated, uninoculated plants were kept as check. Culture of *M. javanica* was continuously maintained on tomato cv. money maker. Extraction and estimation of second stage larvae from heavily infested roots of tomato were done by modified Whitehead and Hemming trays method (Whitehead and Hemming, *Ann. Appl. Biol.* **55**: 25-38, 1965). Clean hand pump water was used to irrigate young seedlings throughout the period of studies.

Ten days old healthy seedlings of chickpea were inoculated with 4,000 larvae of *M. javanica* per pot. The uninoculated chickpea plants with soil were gently removed from pots and their roots were carefully washed in running water. Data were recorded on the basis of number of noduies, root length, fresh and dry weight of root. The data were analyzed statistically by using factorial design.

Results and Discussion

The results of present investigation (Table. 1) revealed that there was significant reduction in number of nodules of chickpea by the application of *Meloidogyne javanica* in all the cultivars. The number of nodules was more in non-treated as compared to treated with nematodes. The reduction in nodulation has been explained to be more due

to nutritional interferences, particularly carbohydrates or physiological changes brought about by nematode infection rather than due to competition for infection sites. Similar observations have been reported by (Taha and Raski, *Indian J. Nematol.*, **1**:201-211, 1969; Raut and Sethi, *Indian J. Nematol.*, **10**:166-176, 1980).

The root length was also more in non-treated as compared to treated with nematodes. Due to the development of galls on the root system the root weight was not adversely affected. In fact, It was increased which could be due to severe galling on root system as was also observed by (Sethi, *Thesis D.I.C Imperial College, Univ. of London, London*, 1966).

Table 1. **Effect of *Meloidogyne javanica* treatment on nodulation and root growth of chick pea (Each value is mean of six replicates).**

Varieties	Nodules Numbers		Root Length (cm)		Fresh Root Weight (g)		Dry Root Weight (g)	
	Non Treated	Treated	Non Treated	Treated	Non Treated	Treated	Non Treated	Treated
CM72	35.33	24.16b	34.33a	25.66b	4.60a	5.53b	0.43a	0.73b
918	42.5a	22.50b	38.16a	23.66b	2.80a	5.48b	0.43a	0.78b
1435	32.83a	23.00b	31.00a	21.83b	2.41a	3.90b	0.35a	0.71b
C727	43.33a	31.83b	57.50a	29.83b	4.05a	6.81b	0.60a	0.75b
1430	38.66a	33.83b	35.16a	26.83b	4.15a	5.58b	0.60a	0.73b
S.E.	0.52		0.47		0.15		0.04	

- Any two means in rows in each column sharing different letters differ significantly.
- Ducan's Multiple range test at 0.05 probability.

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