https://doi.org/10.29321/MAJ.10.A02612

Madras agric. J. 70. (4): 256—260 April 1983

TOXICITY, PERSISTENCE AND EFFECTIVENESS OF CERTAIN GRANULAR INSECTICIDES AGAINST THE BROWN PLANTHOPPER, *Nilaparvata lugens* Stal*

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Thirteen granular insecticides at four concentrations were evaluated for their efficacy and persistence in pot culture and in micro field plots against adults and nymphs of brown planthopper. On the basis of 'PT' valves carbofuran and Mipcin at 0.5 to 0.75 Kg ai/ha were found to be the most effective against both adults and nymphs.

Though a lot of data on insecticidal evaluation against BPH have accumulated in Philippines, Japan etc., such critical studies either in green house or in field against BPH are rather limited from India. Considering the importance of BPH, critical studies on toxicity, persistence and effectiveness of some granular insecticides applied in standing water against BPH adults and nymphs were carried out at Central Rice Research Station, Cuttack during 1975 to 1977, the resulrs of which are discussed in this paper.

MATERIAL AND METHODS

Three experiments were carried out during the years 1975 to 1977. For expt. I and II, one month old rice plants. var. *Jaya* were used as test plants. Thirteen commercial granular insecticides at four doses viz, 0.5, 1.0, 1.5 and 2.0 Kg a.i/ha (Table I and II) were applied in earthenware pots, taking the diameter of the pot into consideration for calculation of granular insecticide. The calculated amount of granular insecticide was applied in standing water and water was kept impounded in pots thoughout investigation period. In expt. III, seven granular insecticides at 0.75 and 1.50 Kg a.i/ha were applied to rice grown at 20 x 20 cm spacing in microfield plots of 2 x 2 m. A thin film of water was kept impounded in the microfield plots throughout the investigation period. In expt. I and II, ten BPH adults or ten 3rd instar nymphs as the case may be were caged separately on the treated plants at 1, 5, 10, 15, 20, 25, 30 and 35 cays after treatment (DAT). For experiment III, a new bioassay technique was adopted. Excluding border plants, any three plants were randomly removed from each treatment at each time. The plants were washed thoroughly to free the plants from field soil. The root portion was

*Part of Ph. D thesis of the senior author, submitted to the Orissa University of Agriculture and Technology, Bhubaneswar during 1978.

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wrapped in wet cotton over which a piece of polyethylene sheet was tied with a rubber band. This method, allowed retention of the freshness of the plant parts for at least 60 hours without any further addition of water. The plants thus tied were kept in chimenys tied at both ends with muslin cloth. Adult BPH were released on these plants kept at regulated temperature of 26 to 28°C and 60 to 65% of RH in laboratory on the 1st, 5th, 10th, 15th and 20th day after treatment. In all the experiments, the treatments were replicated thrice including control. Mortality counts recorded 24 hours after exposure was corrected (Abbot, 1925).

'PT' values which are the product of average percentage residual toxicity (T) and the period (P) for which some toxicity is observed were calculated by following the method of Saini (1959)

RESULTS AND DISCUSSION

Adults: Carbofuran and Mipcin at all four doses recorded 50 0 to 100.0% mortality upto 20 days after treatment and lost their persistent toxicity between 25 to 30 DAT. Carbaryl + lindane, diazinon and dimethoate recorded more than 50 per cent mortality at all four doses on one day old residues. Carbaryl + lindane and phorate recorded more than 50 per cent mortality at 1.0 kg a.i and above even at 10 to 15 DAT, so as diazinon. On one day old residues less than 50.0 percent mortality was recorded with phorate at 0.5 Kg ai. quinalphos at 0.5 a.i, fensulfothion at 0.5 and 1.0 kg a.i mephosfolfan at 0.5 and 1.0 kg a i, chlorfenvinphos and endosulfan at all four doses. Endosulfan and chlorfenvinphos lost toxicity by 5 DAT.

Nymphs: On one day old residues, 50.0 to 100.0 per cent mortality was recorded in all four doses of carbofuran, Mipcin, carbaryl + lindane, phorate, diazinon, dimethoate. Carbofuran and Mipcin at 1.5 and 2.0 kg ai recorded more than 50.0 per cent mortality even 20 days after treatment. The persistent toxicity of both these insecticides lost in between 25 to 30 DAT. Carbaryl + lindane, phorate and diazinon at 1.5 and 2.0 kg a.i recorded more than 50.0 per cent mortality at 10 DAT. Less than 50.0 per cent mortality was recorded in carbaryl + lindane and fensulfothion at 0.5 to 1.5kg a.i, in quinalphos and mephosfolan at 0.5 to 1.0 kg a.j and all four doses of chlorfenvinphos and endosulfan. The other insecticides under report lost their persistent toxicity between 10 to 15 DAT.

A perusal of 'PT' values revealed (Table 1) carbofuran, Mipcin, carbaryl + lindane are significantly superior to diazinon (standard), while phorate was on par in expt. I and expt. II. The other insecticides were less effective than diazinon. Inrease in dose resulted in highly significant increases in persistent toxicity.

In expt. III, in respect of Mipcin, carbofuran, terbufos and BPMC, at both doses the insect mortality ranged from 30.0 to 80.0 per cent on the first day. Highest insect mortalties were obtainad with Mipcin, terbufos and BPMC on the first day itself. How-

ever, in respect of carbofuran, highest insect mortality was obtained on 5th day, after which decline in toxicity was noticed. Endosulfan + BPMC, SAN 1551 and SAN 197 recorded low mortality ranging from 10.0 to 33.3 per cent at both doses on all days of test. All insecticides lost their toxicity between 15th to 20th day in both the doses.

The results indicated that Mipcin is more persistent than carbofuran, while terbufos and BPMC are on par with each other (Table 2). Increase in dose resulted in highly significant increase in persistent toxicity. Considering the PT values, the most effective one is Mipcin=carbofuran > Carbaryl + lindane > diazinon The insecticides *viz.* mephosfolan, quinalphos, dimethoate, carbaryl, lindane and fensul fothion were less effective than diazinon.

The results reported by Chelliah *et al.*, (1972-73) regarding the efficacy of phorate and diazinon are in conformity with the results reported in this paper. The effectiveness of carbofuran by Venkataraman *et al.*, 1973 a, Narayanasamy *et al.*, 1975, Heinrichs, 1977 and Pathak 1971, are in broad confirmity with the results reported in this paper. The observations of Venkataraman *et al.*, 1973 b, Bae and Pathak, 1969; Enyo and Kobayashi, 1967; Nagata and Fukuda, 1968; Okamoto, 1970, on the effectiveness of diazinon are agreeing with the results of this paper. The effectiveness of carbofuran, phorate and mephosfolan (Narayanasamy, 1975); Mipcin, Carbofuran and phorate (Rao *et al.*, 1976); quinalphos and carbofuran (Balasubramanian *et al.* 1976); Mipcin, Anon, 1968, Nagata *et al*, 1973); and diazinon and carbofuran (Naovarangsy, and savongdy 1975) reported earlier are in confirmity with the results reported here.

The author's are thankful to the Director, CRRI, for providing facilities for carrying out the work and to ICAR for the award of Senior Fellowship to the Senior author.

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Table 1: Relative effectiveness and persistence of different insecticides applied into standing water against BPH adults (1.3.76-10.4.76)*

(PT Values)

Insecticide	Dose in kg a.i/ha	Adults Expt I	Nymphs Expt I
Carbofuran	0.5	2194	1220
	1.0	2156	1550
	1.5	2399	2075
	2.0	2650	2433
Mipcin	0.5	1366	1316
	1.0	1779	1450
	1.5	2166	2216
	2.0	2552	
Carbaryl + lindane	0.5	719	538
	1.0	1165	856
	1.5	1487	1157
	2.0	1610	1450
Phorate	0.5	443	273
	1.0	581	503
	1.5	1192	922
	2.0	1266	1185
Diazinon	0.5	368	257
	1.0	975	691
	1.5	1200	973
	2.0	1200	1133
Carbaryl	0.5	116	146
	1.0	331	230
	1.5	624	505
	2.0	624	608
Lindane	0.5	153	168
	1.0	484	330
	1.5	758	599
	2.0	941	726
Dimathoate	0.5	280	199
	1.0	313	360
	1.5	425	397
	2.0	641	613
Quinalphos	0.5	163	25
	1.0	335	268
	1.5	426	329
	2.0	660	615
Fensulfothion	0.5	261	166
	1.0	443	360
	1.5	647	590
	2.0	974	845
Mephosfolan	0.5	34	43
	1.0	86	109
	1.5	291	240
	2.0	435	352
Chlorfenvinphos	0.5	16	0
	1.0	48	0
	1.5	71	31
	2.0	71	55
Endosulfan	0.5	33	0
	1.0	75	50
	1.5	108	67
	2.0	116	133
% range mortality in control			0.10%

Mean R H 72%

Mean Max Temp. 34.4°C

Mean Min. Temp. 23.3°C