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RELATIVE EFFICIENCY OF SOME OF THE COMMON INSECTICIDES AND THEIR JOINT FORMULATIONS WITH CARBARYL AGAINST THE TEA MOSQUITO BUG *(HELOPELTIS ANTONII* SIGNORET) INFESTING CASHEW TREES

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The tea mosquito bug *Helopeltis antonii* Signoret (Heteroptera:Miridae) is considered to be the most serious pest of the crop in Kerala state. The pest causes considerable losses by damaging the tender shoots, panicles, and developing nuts. Abraham (1958) estimated the average damage to tender shoots to be about 25% and to developing nuts to be about 15%. Damage due to inflorescence blight alone accounts for *30%* yield losses (Anon , 1966).

Damodaran and Nair (1969) evaluated the relative efficiency of some insecticides and found that, two sprayings each of DDT 0.2%, endrin 0.5% and sevin 0.1% in that order were effective in controlling the pest. Puttarudriah (1961) recommended spraying of BHC and parathion for controlling the pest. Pillai and Abraham (1 975) reported that endosulfan 0-05% applied as high volume spray or 0.1 % as low volume spray at the times of emergence of new flushes, panicles and fruit-set initiation were effective in controlling the tea mosquito bug.

In cashew, pollination is partly entomophilic and the application of highly persistent insecticides on a scheduled basis cannot be recommended. It is, therefore necessary to screen newer insecticides for their relative efficiency and safety to the ecosystem. That some of the insecticides with similar or different modes of action when applied jointly would bring about better insect control has been reported by various workers (Hewlett, 1960; Jotwani and Sarup, 1963; Jotwani 1967; Dotchkova and Georgiev, 1968), The present studies were taken up to evaluate some of the common organochlorine and organophosphate insecticides individually and **in** conjunction with carbaryl for their bio-efficiency against the tea mosquito bug infesting cashew.

Materials and Methods

The field experiment was carried out in the Cashew Research Centre, Madakkathara, Trichur, Kerala in two consecutive seasons from October, 1980 to January 1981 and from October, 1981 to January, 1982.

There were nine insecticidal treatments besides the control (Table 1). The spray formulations ware prepared from the proprietory products of the insecticides. In each year, three rounds of sprayings were given during the period from October to January. The first spraying was given in October at the time of emergence of new flushes, the second in December at the time of emergence of panicles and the third at the time of fruit set initiation. Five litres of spray fluid was sprayed per tree using

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a rocker sprayer fitted with 'hi–tree' lance attachment. The experiment was laid out in randomised block design with three replications. Six year old seedling trees were selected for the experiment and the two adjacent trees constituted one treatment.

Twenty numbers of newly formed healthy shoots were selected from each tree at random from all the four quadrants of the canopy, just prior to the first spraying and these were labelled to record post-treatment incidence of the pest. Just prior to the second spraying, twenty numbers of freshly emerged and healthy panicles were selected from each tree and labelled for recording post–treatment infestation by the pest. Observations on panicle damage were recorded two weeks after the first round of spraying from the labelled shoots. Observations on panicle damage were recorded from the labelled panicles two weeks after the second and the third sprayings.

The intensity of damage due to the bug caused to the shoots and panicles was recorded on a 0-4 scale as 0, 1, 2, 3 and 4 for no lesions/streaks, one necrotic lesion, two coalescing or non-coalescing lesions streaks three coalescing or non-coalescing lesions/streaks and lesions/streaks more than three and often confluent, respectively. The weighted mean score values were worked out for each round of observation and the data were statistically analysed.

Results and Discussion

The mean values of shoot and panicle damage scores for the two years 1980-'81 and 1981–'82 are presented in Table 1 and 2 respectively.

The mean values of shoot damage for the year 1981-'82 season ranged from 0.516 for the mixed formulation of phosphamidon and carbaryl to 1.908 for the control. All the insecticides when applied singly and in combination with carbaryl were found to be significantly superior to the control treatment in reducing the shoot damage by *H. antonii*. The order of effectiveness in reducing the shoot damage is phosphamidon + carbaryl > endosulfan > HCH + carbaryl > phosphamidon > carbaryl > monocrotophos > monocrotophos + carbaryl > endosulfan + carbaryl > HCH. HCH as well as the joint application of endosulfan + carbaryl was found to be significantly inferior to phosphamidon + carbaryl. HCH was found to be inferior to endosulfan and HCH + carbaryl. No significant difference was found between the other insecticidal treatments.

The mean values of panicle damage after the second round of spraying ranged from 0,800 for phosphamidon + carbaryl to 2.233 for the control treatment. All the insecticidal treatments were found to be significantly more effective than the control in reducing the panicle damage. There were no differences between phosphamidon + carbaryl, HCH + carbaryl, endosulfan, phosphamidon and carbaryl, but all these treatments were found to be superior both to HCH as well as to endosulfan + carbaryl.

The mean values of panicle damage after the third round of spraying also showed simitar trends. Here also the insecticidal treatments were found significantly superior to the control treatment. The treatment with endosulfan + carbaryl was found to be on par with monocrotophos and HCH, but significantly inferior to all other insecticidal treatments. So also, HCH was found to be significantly inferior to all other insecticidal treatments.

The data for the year 1981–'82 are furnished in Table 2, The general trend was found to be more or less similar to the previous year in respect of shoot and panicle damage. All the insecticides when applied singly and in combination with

Table 1

Relative efficiency of insecticides and their joint formulation with carbaryl in controlling the tea mosquito bug *Helopeltis antonii* during 1980-81

Sl. No.	Insecticides	Shoot damage (mean score values)	Panicle damage (mean score values)	
			Freshly emerged panicles	Beyond fruit set initiation
1	Endosuifan (0.05%) (Thiodan 35 EC)	0.583	0.983	1.133
2	Phosphamidon (0.03%) (Dimecron 100 EC)	0833	1.075	1.225
3	Monocrotophos (0.05%) (Nuvacron 40 EC)	0.875	1.183	1.292
4	Carbaryl 0.15% (Sevin 50% WP)	0.867	1.050	1.258
5	HCH 0.15% (BHC 50% W P)	1.216	1.500	1 800
6	Endosuifan (0.025%) + Carbaryl (0.075%)	1.017	1.500	1.733
7	Phosphamidon (0,015%) + Carbaryl (0.075%)	0.516	0.800	0.950
8	Monocrotophos (0.025%) + Carbaryl (0.075%)	0.883	1.133	1.216
9	HCH (0.075%) + Carbaryl (0.075%)	0.608	0.883	1.016
10	Control	1,908	2.233	2.467
	CD (0.05)	0,495	0.420	0.480

Commercial formulations are given in parentheses

Table 2

Relative efficiency of insecticides and their joint formulations with carbaryl in controlling the tea mosquito bug *H. antonii* during 1981-82

Sl. No.	Insecticides	Shoot damage (mean score values)	Panicle damage (mean score values)	
			Freshly emerged panicies	Beyond fruit set initiation
1	Endosulfan (0.05%) (Thiodan 35 EC)	0.550	0.650	0.833
2	Phosphamidon (0.03%) (Dimecron 100 EC)	0.683	0.883	1.066
3	Monocrotophos (0.05%) (Nuvacron 40 EC)	0,733	0.908	1.142
4	Carbaryl (0.15%) (Sevin 50% WP)	0.683	0.850	1.125
5	HCH (0.15%) ' (BHC 50% WP)	1.068	1.26G	1.691
6	Endosulfan (0.025%) + Carbaryl (0.075%)	1.050	1.258	1.758
7	Phosphamidon (0.015%) + Carbaryl (0.075%)	0.408	0.616	0.975
8	Monocrotophos (0.025%) + Carbaryl (0.075%)	0.992	1.200	1.483
9	HCH (0,075%) + Carbary! (0.075%)	0.600	0.766	1.042
10	Control	1.733	2075	2.666
	CD (0.05)	0.570	0.506	0.511

Commercial formulations are given in parentheses

carbaryl were found significantly superior to control in reducing the shoot and panicle infestation during the second year. The treatment phosphamidon + carbaryl was found to be consistently superior to endosulfan + carbaryl and HCH in reducing the shoot damage and panicle damage at two stages, namely, a fortnight after panicle emergence and at the time of fruit set initiation.

The overall trend for two years showed that the joint application of phosphamidon and carbaryl was superior to endosulfan + carbaryl and HCH. However, the joint application of phosphamidon and carbaryl was not superior either to phosphamidon or to carbaryl applied individually. Phosphamidon + carbaryl mixture was however on par with HCH + carbaryl mixture. The joint application of HCH + carbaryl was found to be superior to HCH but not to carbary! in controlling shoot and panicle infestation by the pest during the first year of the experiment.

The manifestation of synergism or antagonism in mixtures involving two insecticides has already been recorded by Jotwani (1967) and Keaster (1969). Reduction in the intensity of shoot and panicle damage by *H. antonii*, consequent on the joint application of phosphamidon and carbaryl is explicable partly on the basis of the systemic toxicity of the former and ths contact toxicity of the latter and also on the basis of lack of any antagonism between the two compounds. These two insecticides are already recommended in Kerala to be used in scheduled sprayings against the bugs and a mixed formulation of the two appears to be useful. The superior performances of HCH + carbaryl could perhaps be due to the extended persistence of the former and the better control due to joint action of the two insecticides.

Summary

The relative efficiency of endosulfan (0.05%), phosphamidon (0.03%), monocrotophos (0.05%), carbaryl (0.15%) and HCH (0.15%) and their joint formulations with carbaryl against the tea mosquito bug *Helopeltis antonii* Signoret was evaluated in a field experiment conducted in the Cashew Research Centre, Madakkathara, Trichur during two consecutive years 1980-81 and 1981-82. Three rounds of sprayings were given in each year using a rocker sprayer Fitted with 'hi-tree' lance attachment at the times of new vegetative flush formation, panicle emergence and at fruit set initiation. The intensity of pest damage was recorded from twenty numbers of randomly selected shoots and panicles on a 0-4 scale.

All the insecticides and their joint formulations were effective in reducing the intensity of damage by the mosquito bugs. The joint application of phosphamidon (0,015%) + carbaryl (0.075%) was consistently superior to endosulfan (0.025%) + carbaryl (0.075%) and HCH (0.15%) in reducing shoot and panicle damage.

HCH (0.075%) + carbaryl (0.075%) was on par with phosphamidon (0.015%) + carbaryl (0.075%) in reducing the infestation. However, the conjunctive use of insecticides did not show superior performance as compared to their individual applications, except in the case of HCH + carbaryl in which case, the combined application was found to be superior to HCH. But this mixture was not superior to carbaryl applied alone.

സംഗ്രഹം

കശുമാവിന്റെ പൂങ്കുല കരിച്ചിലും, കൊമ്പുണക്കവും വരുത്തുന്ന തേയില കൊതുകുകളെ നിയന്ത്രിക്കുന്നതിന് എൻഡോസൽഫാൻ, ഫോസ്ഫാമിഡോൺ, മോണോ ക്രോട്ടോഫോസ്, എച്ച്. സി. എച്ച്. എന്നീ കീടനാശിനികളുടേയും ഇവയുടെ കാർബറിൽ ചേർന്ന സമ്മിശ്ര രൂപകങ്ങളുടേയും ആപേക്ഷികമായ ശേഷിയെ സംബന്ധിച്ചുള്ള പരീക്ഷണങ്ങൾ, മാടക്കത്തറ കശുമാവ് ഗവേഷണ കേന്ദ്രത്തിൽ 1930-81, 1981-82 എന്നീ വർഷങ്ങളിൽ നടത്തുകയുണ്ടായി. കീടനിയന്ത്രണത്തിന് ഫോസ്ഫാമിഡോൺ + കാർബറിൽ, എച്ച്. സി. എച്ച്. + കാർബറിൽ എന്നീ കീടനാശിനി മിശ്രിതങ്ങളും, എൻഡോസൽഫാൻ, ഫോസ്ഫാമിഡോൺ, കാർബറിൽ, മോണോക്രോട്ടോഫോസ് എന്നീ കീടനാശിനികളും ഫലപ്രദമാണെന്ന് കാണുകയുണ്ടായി.

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