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Ovicidal Effect of Certain Insecticides on the Red Spider Mite, *Tetranychus cinnabarinus* (L.) on Bhendi

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ABSTRACT

Six emulsion concentrates and eleven granular insecticides were evaluated for their ovicidal action against the eggs of red spider mite, *Tetranychus cinnabarinus* under laboratory conditions. Granular insecticides were applied as in-furrow application at two doses of 0.5 and 1 kg a.i./ha and the emulsion concentrates were used as foliar spray and soil drench in three concentrations of 0.025, 0.05 and 0.1 per cent. Phorate and carbofuran granules were the most effective among the seventeen chemicals tested.

INTRODUCTION

Tetranychid mites are of considerable economic importance, and their control in various crops continues to be a major problem as they have developed resistance to several acaricides (Allen *et al.*, 1964). Development of resistance is more likely to occur in certain groups of pests and for some chemical groups than others. The belief seems current that resistance is less likely to arise in the egg stage than in later ones. But only negligible importance has been attached to the possibility of controlling the mite at its egg stage when it may be more susceptible. With this background, the present study was undertaken to screen certain insecticides for their ovicidal action on the eggs of *Tetranychus cinnabarinus* (L.).

MATERIALS AND METHODS

Bhendi seedlings at the four leaf stage in pots were used as the host plants. The petiole of the third leaf from the top was banded with vaseline to confine the mites on this leaf.

Eleven granular insecticides and six emulsion concentrates were tried against the eggs of red spider mites. Twenty mites were transferred from the culture maintained on bhendi plants to the banded leaf of each seedling. They were removed 24 hr of oviposition and the number of eggs on each leaf counted. Emulsion concentrates of insecticides were applied as foliar sprays and through irrigation water at 0.1, 0.5 and 0.025 per cent concentrations. Each concentration was replicated four times. Granules were applied around the seedlings in a circular band at 0.5 and 1 kg a.i./ha and the quantum of chemical to be applied was calculated on plant basis. The mortality was recorded five days after treatment in all the experiments as the egg period lasts only three days.

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RESULTS AND DISCUSSION

i. **Granular insecticides**: Data on ovicidal action of eleven granular insecticides at different dosages are presented in Table I. Among these, phorate was found to be the most effective ovicide, followed by carbofuran and fensulfothion. Phorate caused a mortality of 96.3 per cent, while carbofuran recorded 86.4 per cent (Table). Fensulfothion effected a medium ovicidal action of 70.8 per cent. All these three chemicals were on par with each other at the lower dose of 0.5 kg a.i./ha. The remaining eight granules were very

TABLE I. Effect of certain insecticides on the eggs of Red spider mite

Granular insecticides (kg a.i./ha)		Mortality (%)	Emulsion concentrates		Foliar Application Mortality (%)	Soil Application Mortality (%)
Fenitrothion	0.5 kg	0.	Phosphamidon	0.1%	47.7	52.6
-do-	1.0 kg	4.9	-do-	0.05%	37.1	47.4
Lindane	0.5 kg	0.	-do-	0.025%	16.3	32.2
-do-	1.0 kg	1.9	Dimethoate	0.1%	63.0	***
Fethion	0.5 kg	0.	-do-	0.05%	37.2	***
-do-	1.0 kg	19.2	-do-	0.025%	33.6	36.1
Chlorfenvinphos	0.5 kg	0.	Methyl demeton	0.1%	39.2	***
-do-	1.0 kg	6.8	-do-	0.05%	21.7	***
Carbofuran	0.5 kg	69.2	-do-	0.025%	13.3	39.8
-do-	1.0 kg	86.4	Dicrotophos	0.1%	9.1	30.6
Endrin	0.5 kg	12.6	-do-	0.05%	4.4	9.4
-do-	1.0 kg	18.8	-do-	0.025%	3.5	7.8
Fensulfothion	0.5 kg	67.4	Thiometon	0.1%	74.9	***
-do-	1.0 kg	70.8	-do-	0.05%	46.9	***
Quinalphos	0.5 kg	0.	-do-	0.025%	7.0	***
-do-	1.0 kg	7.7	Thiometon +Endrin	0.1%	59.6	***
Phorate	0.5 kg	67.0	-do-	0.05%	33.3	58.4
-do-	1.0 kg	96.3	-do-	0.025%	8.6	25.3
Lindane+Carbaryl	0.5 kg	6.4	Control		2.5	2.5
-do-	1.0 kg	8.1				
Disulfoton	0.5 kg	7.2				
-do-	1.0 kg	28.3				
Control		2.5				
C. D. (P = 0.05)		6.05			7.83	6.84

*** - Treated plants dried away due to phytotoxicity

weak ovicides, causing less than 30 per cent mortality of eggs. Lindane seemed to have no ovicidal action at all, as it effected less than 1.87 per cent mortality at both the doses, which was less than the natural mortality of 2.5 per cent.

Systemic ovicidal action of phorate has earlier been established on the eggs of six-spotted leafhopper, *Macrosteles fascifrons* (Stal.) by Saini and Cutkomp (1967). In order to kill eggs with an ovicide, direct contact of the eggs with the chemical is necessary, since secondary contact through movements of the insect stage over treated surfaces or parts is ruled out. A primary contact can be achieved by a direct hit with foliar application or by the action of the vapourized material. In the case of in-furrow application of granular insecticides, the eggs may be affected in either of the two ways: a contact effect with the translocated chemical through the leaf tissue or the action of compound as vapours leaving the plant via the stomata in the transpiration stream or leaving from the soil. Since there is little contact between the leaf surface and eggs when they are deposited on the webbing, it is possible that phorate might act in the vapour phase. This may be further explained from the fact that of the three granules found effective in the present study, phorate has high vapour action (Saini and Cutkomp, 1967). Fensulfothion which is used as a soil fumigant in the control of plant parasitic nematodes, is also effective against the mite eggs in view of the high vapour pressure. The vapour penetartes into the egg relatively easily, since gas exchange is a function of its metabolism.

The ovicidal action of carbofuran may be greater on eggs in contact with the leaf surface underneath the webbing, due to the contact action of the translocated material. So ovicidal action of these three effective granules to the pest might be due to the combined manifestation of vapour and contact action.

ii. Emulsion concentrates: The emulsion concentrates had varying toxicities in foliar and soil application (Table). Foliar application of thiometon at 0.1 per cent concentration produced high ovicidal, action of 74.9 per cent closely followed by dimethoate with medium ovicidal action of 63.0 per cent at the same concentration. Thiometon + endrin showed a medium ovicidal action of 59.6 per cent at 0.1 per cent concentration which was statistically on par with that of dimethoate which in turn was on par with thiometon. Of the six emulsion concentrates tested by foliar application, dicrotophos was least effective ovicidally.

In the soil application of emulsion concentrates, out of the six chemicals, only five could be compared, for thiometon was highly phytotoxic in all concentrations tested (Table). Dimethoate and methyl demeton could be evaluated at their lowest concentration of 0.025 per cent and thiometon+endrin at 0.05 and 0.025 per cent concentrations. Of these, phosphamidon and thiometon+endrin had medium ovicidal action

Phosphamidon 0.1 per cent and thiometon+endrin 0.05 per cent inflicted 52.6 and 58.4 per cent mortality of eggs and both were statistically on par with each other in their ovicidal action. Of all the emulsion concentrates, dicrotophos was least effective.

The ovicidal action of thiometon, dimethoate and thiometon+endrin in the foliar application may be mainly due to direct contact with eggs and through the host plant. Most of the rapidly absorbed systemic insecticides are lipoid soluble and are directly absorbed through cuticle. Similar results were obtained by Mailloux and Morrison (1962) who observed that thiometon along with other systemic insecticides offered favourable results against the immature stages of the red spider mite. Though phosphamidon was a very weak ovicide in the foliar application, it caused 52.6 per cent mortality of eggs in the soil application. This behaviour of phosphamidon is in conformity with the results obtained by Mailloux and Morrison (1962) where phosphamidon gave moderate percentage kill of the eggs of *T. telarius* (L.) on bean plants. Dimethoate, though having medium ovicidal action in foliar application (6.30 per cent), was only a very weak ovicide in the soil application.

Hence, specific acaricide with a highly active vapour phase, the ability of penetrating leaves, of translocation in the plant system and a mode of action different from that of organaphosphorus compounds must be evolved as a potential candiate chemical for the control of mites which are normally difficult to control by pesticide treatments.

Soil application of emulsion concentrates would be not of much value in the control of eggs of red spider mite as some chemicals caused phytotoxicity at higher concentrations.

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