Agri. Res. J. Kerala, 1978, 16 (2) 188—192

TOXICITY OF NEWER INSECTICIDES TO THE COCONUT CATERPILLAR *NEPHANTIS SERINOPA* MEYR AND ITS PARASITE *BRACON BREVICORNIS* WESMEAL

KUNJAMMA P. MATHEW. M. R. G. K. NAIR and C. C. ABRAHAM

College of Agriculture, Vellayani, Kerala

Eventhough the coconut caterpillar *Nephantis serinopa* Meyr (Lepidoptera: Cryptophasidae) is generally kept under control by inundative releases of its parasites, sometimes, especially in certain endemic pockets, it becomes difficult to check the increasing population of the pest by parasite releases and use of insecticides will become necessary for the population control. DDT was recommended for the control of the caterpillar (Nirula *er. al.* 1951). Residues of DDT were observed to remain on the coconut leaves toxic to the parasites of the pest for more than 8 weeks while those of BHC became ineffective in 5 to 6 days (Nirula *et. al.* 1958). Basic lead arsenate spray at 1.5 per cent concentration gave 90 per cent mortality in the larvae in laboratory experiments (Sathi Amma *et. al.* 1967). Malathion 0.05 per cent spray was as effective as DDT 0.2 per cent in controlling the caterpillar (Sathi Amma and Kurian, 1970). Dichlorvos was the most highly toxic insecticide to the larvae followed in the descendig order by trichlorphon, arprocarb, methyl demeton and carbaryl (Sathi Amma and Kurian, 1972).

The present paper reports results of laboratory studies made on the relative toxicity of eleven insecticides in common use including the newer ones. Toxicity of the residues of these insecticides to the first instar larvae of the pest and to adults of the larval parasite *Bracon brevicornis* when applied at their field doses on coconut leaves has also been determined.

Materials and Methods

The toxicity of the insecticides to the 4th instar larvae of *N. serinopa* was assessed in terms of the LD_{50} of each. For this, coconut leaflets cut to 10 cm. long bits were sprayed on both sides with the graded concentrations of the insecticides under a Potter's spraying tower, using 1 ml of the spray fluid for each spraying. The graded emulsion concentrations of all the insecticides excepting phosalone were prepared from their technical grades with benzene as solvent (chloroform was used for carbaryl) and triton X 100 as emulsifier; the proprietory E.C. was used in the case of phosalone. The insecticides used were those given in the tables. The sprayed leaflets were dried under a fan and put in to glass chimneys (15 cm. x 7.5 cm) at the rate of 3 leaflets per chimney. The caterpillars were then put on these sprayed leaflets and the chimneys closed with muslin cloth. There were

Table 1

Toxicity of different insecticides to 4th instar larvae of *N. serinopa*

Insecticide	Hetrogenity	Regression equation	LD 50	Fiducial limit
Phosalone	$X_3^2 = 2.048$	y — 1.847171 X + 4.282918	0.02428	0.01750 0.03370
Endosulfan	$X_3^2 = 1.893$	y = 3.8851 14 X + 0.695934	0.02925	0.02463 0.03472
Malathion	$X_3^2 = 1.316$	y = 2.242844 X 4 4.386719	0.05288	0.03896 0.07180
Quinalphos	$X_3^2 = 1.978117$	y = 1.501996 X + 3.874509	0.05614	0.04042 0.07798
Fenthion	$X_3^2 = 0.203$	y = 409149 X + 1742759 X	0.08416	0.0715 0.1010
Phosphamidon	$X_3^2 = 0.331$	y = 1.923189 X + 3.121704	0.09477	0.06972 0.1288
Monocrotophos	$X_3^2 = 1.897$	y = 2. 149144 X + 2.866538	0.09833	0.07435 0.1292
Fenitrothion	$X^2 = 0.493$	y = 1.107128 X + 3.886701	0.1013	0.06416 0.2276
DDVP	$X_3^2 = 1.326$	y — 2.9 14457 X + 1.674926	0.1639	0.1105 0.2429
BHC		y = 2.466952 X + 1.645555	0.2290	0.2029 0.2562
• Carbaryl	$X^2 = 5.483$	y = 1.913X + 1.759	0.4949	0.3530 0.6937

three replications of 10 caterpillars each for each insecticide dose. Caterpillars exposed to leaflets sprayed with emulsion water (water containing 0.625 per cent triton X 100, used for emulsifying the insecticides) formed the control. Mortality counts were taken 48 hours after exposure of the caterpillars to the sprayed leaflets.

To assess the persistent toxicity of the insecticides to the first instar larvae of *N. serinopa* and adults of *B. brevicornis* coconut leaves of an young palm were sprayed with the different insecticides each at its field dose. (Tables 2 & 3).

Table 2

Residual toxicity of different insecticides on coconut leaves to first instar larvae of N. *serinopa.*

Insecticides	Per cent mortality of larvae at different intervals after insecticide application (days)				
	0	2	4	8	16
DDVP 0.5%	100	83.33	46.67	13.33	0
Fenitrothion 0.05%	100	96.67	53.33	6.67	0
Malathion 0.05%	100	96.67	83.33	23.33	0
Monocrotophos 0.02%	100	96.67	96.67	90.00	43.33
Quinalpho's 0.05%	100	96.97	66.67	46.67	0
Fenthion 0.5%	100	96.67	26.67	6.67	20.00
Phosalone 0.05%	100	96.67	96.67	63.33	0
Carbaryl 0.02%	100	96.67	96.67	96.67	76.67
BHC 0.2%	100	96.67	96.67	50.00	13.33
Endosulfan 0.035%	100	96.67	50.00	6.67	0
Phosphamidon 0.05 %	100	96.67	50.00	13.33	0

The spraying was done with a hand sprayer to the dripping point. Samples of the sprayed leaflets were collected at fixed intervals, cut in to 10 cm long pieces and first instar larvae not more than 24 hours old exposed on them in glass chimneys. For the exposures of adults of *R. brevicornis* to the sprayed surface cages were made out of the 10 cm long pieces of the leaflets by securing the two flaps of the leaflets along their length and one end with cellophane tape. The parasites were then put in the leaflet cages and closed with a clip. This ensured continuous contact for the parasite with the internal sprayed surface of the leaflets. Larvae and parasites exposed to untreated leafletes/leaflet cages served as control. There were 3 replications of 10 insects each in both the cases. Mortality counts were taken 24 hours after exposure of the insects to the treated surfaces.

Results and Discussion

In Table 1 is given the data on the relative toxicity of different insecticides to 4th instar I arvae *N. serinopa.* Phosalone is the most highly toxic insecticide with an LD 50 of 0.02428, immedietely followed by endosulfan, malathion and quinalpos with the LO 50 values of 0.02428, 0.05288 and 0.05614 respectively. The other insecticides are much less toxic and are hence of no use controlling the caterpillar pest.

Table 3

Residual toxicity of different insecticides on coconut leaves to adults of 8. *brevicornis*

	Per cent mortality of larvae at different intervals after insecticide applicction. (days)				
	0	2	4	8	16
DDVP 0.05%	100	96.67	26.67	6.67	0
Fenitrothion 0.05%	100	96.67	76.67	23.33	0
Malathion 0.05%	100	96.67	96.67	76.67	0
Monocrotophos 0.02 %	100	96.67	96.67	96.67	36.67
Quinalphos 0.05%	100	96.67	76.67	43.33	0
Fenthion 0.05%	100	96.67	66.67	23.33	0
Phosalone 0.05%	100	96.67	96.67	96.67	0
Carbaryl 0.2%	100	96.67	93.33	86.67	73.33
BHC 0.2%	100	96.67	93.33	76.67	0
Endosulfan 0.035%	100	96.67	50.00	13.33	0
Phosphamidon 0.05%	100	70.00	76.67	33.33	0

In Table *2* is presented the data on the residual toxicity of the different insecticides to the first instar larvae of *N. serinopa* when applied on coconut leaves at their field dose. All the insecticides excepting monocrotophos, quinalphos, phosalone, carbaryl and BHC show negligible residual toxicity by the 8th day of inscticidal application; on the 16th day none of the toxicants except carbaryl and monocrotophos have any residual toxicity to the larvae and the residues of these two insecticides have still substantial toxicity.

Tables 1 to 3 gives the data on the residual toxicity of the insecticides to adults of *Bracon brevicornis* when applied on coconut leaves in their field doses. On the 8th day after the application of the insecticides all except malathion, monocrotophos, quinalphos, phosalone, carbaryl and BHC show little persistent residual toxicity to the parasite; on the 16th day residues of carbaryl and monocrotophos manifest substantial toxicity while all the others have lost the toxic residues completely.

The reaults presented above thus show that the insecticides phosalone, endosulphan, malathion and quinalphos are suitable for the control of *N. serinopa.* Follow up liberation of the parasites may have to be done to re-estahlish the host-parasite balance.

Summary

The LD 50 levels of toxicity of phosalone, endosulfan, malathion, quinalphos, fenthion, phosphamidon. monocrotophos, fenitrothion, dichlorvos, BHC and carbaryl to 4th instar larvae of the coconut caterpillar *Nephantis serinopa* were 0.02428, 0,02925, 0.05288, 0.05614, 0.08416, 0.09477, 0.09833, 0 1013, 0.1639, 0.2920and 0.4990 respectrvely. Toxicity of residues of dichlorvos 0.05%, fenitrothion, 0.05%, malathion 0.05% on coconut leaves to 1st instar larvae of *N. serinopa* had become negligible on the 8th day of their application and that of residues of quinaiphos 0.05%, phoslone 0.05% and BHC 0.2% on the 16th day of application; residues of carbaryl 0.2%, and monocrotophos 0.02% showed toxicity beyond 16 days. Toxicity of residues of the same concentrations of dichlorvos, fenitrothion, fenthion, endosulfan and phosphamidon on coconut leaves to adults of *Bracon brevicornis* had become negligible in 8 days of application and that of residues of malathion, quinaiphos, phosalone and BHC in 16 days of application; residues of monocrotophos and crabaryl remained toxic to parasites beyond 16 days.

സംഗ്രഹം

തെങ്ങോലപ്പുഴുവിനും അതിനെ നിയന്ത്രിക്കുന്ന ബ്രാക്കോൺ ബ്രെവികോണിസ് എന്ന ഏതിർ പ്രാണിക്കും എതിരെ 11 വിവിധ ra>roo കീട നാശിനികളം പ്രയോഗിച്ച നോക്കിയതിൽ നിന്നും 'ഫോസലോൺ' 'എൻഡോസൾഫാൻ,' 'മാലത്തയോൺ' 'ക്വിനൽഫോസ്' എന്നീ കീടനാശിനികളം തളിച്ചാൽ ഈ കീടത്തെ നിയന്ത്രിക്കാൻ സാധിക്കുമെന്നും എതിർ പ്രാണികളെ വിട്ട പ്രസ്തുത കീടത്തെ തുടർന്നു നിയന്ത്രിക്കാൻ സഹായകരമായിരിക്കുമെന്നും തെളിഞ്ഞു.

REFERENCES

Nirula, K. K., Antony, J. and Menon, K. P. V. 1951. Investigations on the pests of coconut palm - Part II. *Indian Cocon. J. 4,* 225—234.

Nirula, K. K., Antony, J., Sahasranamam, K. N. and Menon, K. P. V. 1958. Retentive toxicity of the field weathered insecticides to the Eulophid parasite (*Trichospilus pupivora*) associated with *Nephantis serinopa* Meyr. *Indian Cocon. J.* **11, 124—132.**

Sathi Amma, B., Kurian Chandy and Mathew Jacob 1967. Lethel dose and fiducial limits of basic lead arsenate for controlling the coconut caterpillar *(Nephantis serinopa* Meyrick) *Indian 3. Agric. Sri.* **37,** 221—225.

Sathi Amma, B. and Kurian Chandy 1970. Malathion effectively controls the coconut leaf eating caterpillar. *Coconut Bull.* , 12 — 13.

Sathi Ammma, B. and Kurian Chandy 1972. Note on laboratory evaluation of insecticides against the coconut leaf eating caterpillar *(Nephantis serinopa* Meyrick). *Indian J. Agric. Sci. 42,* 640—41.

(M. S. Received 6-6-1978)