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Ovicidal effect of insecticides on the eggs of *Dysdercus cingulatus* (Hemiptera : Pyrrhocoridae)

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Abstract : The adult females of *Dysdercus cingulatus* pass the winter season lays eggs inside the soil near food plants. The females laid eggs either in one or two loose mass in the soil. At a time, one female *Dysdercus cingulatus* laid eggs 50 to 60 in numbers. Freshly laid eggs were spherical in shape and creamy white in colour. The eggs of *Dysdercus cingulatus* were measured bout 2.50 mm to 3.50 mm in diameter. The newly emerge females when kept with mature males laid eggs as early as 15 to 18 days after fledging. Before incubation, eggs changed from creamy white to dark brown in colour. The eggs were laid one after another and were glued together on the surface by means of some adhesive secretion. Five insectidies viz, Decamethrin, Cypermethrin, endosulfan quinalphos and phosphamidon were observed as ovicides against one day old eggs of *Dysdercus cingulatus*, when applied as 0.0025%, 0.005%, 0.0075% and 0.01% in the case of Decamethrin and 0.25%, 0.05%, 0.075% and 0.1% for the remaining four insecticides. The egg mortality of the insect varies from 9.85% in case of 0.0025% Decamethrin to 100.00% in 0.1% phosphamidon. However, 0.1% quinalphos caused 82.56% egg mortality followed by 58.75% mortality in 0.1% endosulfan. Non-Pyrethroids were applied as 0.05% emulsion, phosphamidon, quinalphos, endosulfan and cypermethrin caused 71.32%, 64.50%, 51.67% and 41.76% egg mortality respectively. Evidently, synthetic Pyrethroid Decamethrin is endowed with poor ovicidal activity. The Decamethrin did not posses ovicidal action as evidenced by low egg mortality.

Keywords : Ovicide, insecticide, decamethrin, cypermethrin, endosulfan, quinalphos, and phosphamidon.

INTRODUCTION

After copulation, the female *Dysdercus cingulatus* was targeted to lay eggs inside the soil near food plants. The female laid eggs either in one or two loose mass in soil during spring season. One female insect laid eggs about 50 to 60 in numbers. Freshly laid eggs were spherical in shape and creamy white in colour. The egg of *Dysdercus cingulatus* was measured about 2.50 mm to 3.50 mm in diameter. Before incubation, egg changed into dark drowns in colour. The eggs were laid one after another and were glued together on the surface by means of some adhesive secretion. Five insecticides viz. Decamethrin, Cypermethrin, endosulfan, quinalphos and phosphamidon were observed as ovicides against one day old eggs of *Dysdercus cingulatus*. Ovicidal activity of pesticides on the body of insect in the laboratory (Chalfant et.al. 1979, Pandya *et al.* 1987 and Raju et al. 1988)[1,2,3]. The new NRDC Pyrethroids were used as agricultural insecticides (Mala *et al.* 1991, Singh and Sarup 1993)[4,5].

Evaluated the toxicity of different pesticides to Red cotton bug and reported that cypermethrin was less toxic when compared with quinalphos and endosulfan. Smith and Salkeld 1995[6], Vekaria and Vyas 1998[7], Naseema and Shivanandappa 2001[8], Kodandaram *et. al*. 2002[9], Mandel & Bhattacharya 2003[10] and Tiwari et. al. 2006[11] has used

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synthetic chemicals as a pesticides to control various pest of the plants. Finley and Dhingra (2010)[12] had investigated the different insecticides as contact poison against the adult of mustard aphid, *lipaphic erysimi kalt*. Dedos et. al. (2012)[13], Gamo et. al. (2014)[14] and Kuwana et. al. (2015)[15] had studied on the insecticides on the egg of the *Bombyx mori*, whether these five insecticides are applied on the freshly laid eggs of *Dysdercus cingulatus* need an investigation. Hence in the present study an investigation was carried out to find out the percent mortality of eggs.

MATERIALS & METHODS

One day old egg masses of *Dysdercus cingulatus* were obtained from the culture for assessing the ovicidal effect of insecticides Decamethrin (0.0025, 0.005, 0.0075, 0.01% EC) cypermethrin, endosulfan, quinalphos and phosphomidon (0.025, 0.05, 0.075 and 0.1% EC) were investigated for ovicidal activity against the eggs of *Dysdercus cingulatus*. One day old egg masses with soil were placed in the clean dry petridish (10 cm x 10 cm) and sprayed directly under Potter's tower at 24 cm mercury pressure with one (1) ml emulsion of each concentration of insecticides. The sprayed egg masses contained in the petridishes were dried for 20 to 25 minutes at ambient temperature and transferred to test tubes (10.00 cm x 3.0 cm) which were plugged with soaked cotton and kept at 28±1^{0}C in the Entomology laboratory. There were three replications for each concentration as well as untreated control. Observation on egg mortality were recorded 2 days after treatment and continued till no further hatching occurred. The data on percent egg mortality were subjected to analysis of variance (Finney, 1971)[16]. The control line experiment was also established parallel to the experiment.

RESULTS & DISCUSSION

In the present study, effect of five insecticides i.e. Decamethrin, cypermethrin, endosulfan, quinalphos and phosphamidon were observed as ovicides against one day old eggs of *Dysdercus cingulatus*. The egg mortality data in respect of Decamethrin, Cypermethrin, endosulfan quinalphos and phosphamidon applied at four variable concentrations against one day old eggs are presented in Table-1. Egg mortality of the insect varies from 9.85% in case of 0.0025% Decamethrin to hundred percent in 0.1% phosphamidon. All the aforesaid insecticides irrespective of concentration applied, proved to be significantly superior to untreated control. Amongst the five insecticides, higher concentration gave significantly higher mortality of *Dysdercus cingulatus* eggs vis-a-vis their respective lower concentrations. Phosphamidon exhibited higher ovicidal activity which was significantly superior to the remaining four insecticides. Decamethrin proved to be inferior as evidenced by lower percent egg mortality. Amongst the five insecticides applied at 0.1% EC, Phosphamidon caused 100% egg mortality followed by quinalphos 82.56% and endosulfan 58.75% (Graph-1). When applied as 0.05% EC on Red cotton egg masses, Phosphamidon caused 71.23%, quinalphos 64.50%, endosulfan 47.67% and cypermethrin 41.76% egg mortality. These insecticides when applied as 0.075% EC, the eggs mortality were 50.35% of cypermethrin, 52.36% of Endosulfan, 72.42% of Quinalphos and 78.47% of phosphamidon. The insecticides when applied as 0.025% EC, the eggs mortality were 12.25% of cypermethrin, 22.53% of Endosulfan 33.27% of Quinalphos and 50.17% of phosphamidon. It may be indicated that the embryonic development in the treated eggs continued because all the treated eggs reached the 'blackhead stage' and death occurred only just before hatching. There was no egg mortality in the untreated control.

Evidently, the Decamethrin did not posses ovicidal effect on the egg of *Dysdercus cingulatus,* as evidenced by low 19.54% egg mortality. Poor ovicidal effect (15.6%) of Decamethrin against the eggs of yellow stem borer, *S. incertulas* when applied as 0.04% reported by Pandya et. al. (1987)[2] and Raju et. al. (1988)[3]. However, cypermethrin displayed good ovicidal action against the eggs of spotted bollworms, the mortality being 95% at 0.009% E.C. (Singh et. al. 1982 & Vekaria and Vyas, 1998)[17,7]. Higher ovididal effect of cypermethrin (0.01% EC) against the egg of *H. armigera* (Mala et. al. 1991)[4] and against pumpkin caterpillar, *Dysdercus cingulatus* (Mandel and Bhattacharya, 2003)[10]. According to Singh and Sarup (1993)[5] fen propathrin, permethrin and fenvalerate when

applied as 0.01% and 0.0075%EC did not show much ovicidal action against the eggs of *C. partellus*, the mortality being less than 35%. Tiwari et. al. (2006)[11] and Finley and Dhingra (2010)[12] had applied Chlor pyriphos as 0.01%EC did not show higher ovicidal effect against the egg of *D. Koenigii.* The mortality was less than 32% on the eggs of the insect.

In the present investigations, insecticides phosphamidon and quinalphos at 0.1%% EC caused hundred percent (100%) and 82.56% egg mortality respectively. At 0.075% EC the egg mortality was 78.47% and 72.42% and when 0.050% EC the egg mortality was 71.32% and 64.50% respectively. However, in the case of cypermethrin and endosulfan more than 50% egg mortality was observed only at 0.1%EC and 0.075%EC (High concentration). At lower concentration of 0.025% and 0.05%, the egg mortality was low (12.25% to 41.76%). Thus, organophosphate proved to be ovicidal activity as compared to cypermethrin and Decamethrin. The present observations are in close agreement with the observations obtained by Singh *et. al* (1982)[17] who reported reasonably good ovicidal activity of phosphamidon 0.03% as evidenced by 90.00% egg mortality against Earias spp. Higher ovicidal effect of posphamidon 0.04% and quinalphos 0.05% against the eggs of *C. medinalis* was recorded by Raju *et al.*(1988)[3] and Dedos *et. al.* (2012)[13] also supports the present results.

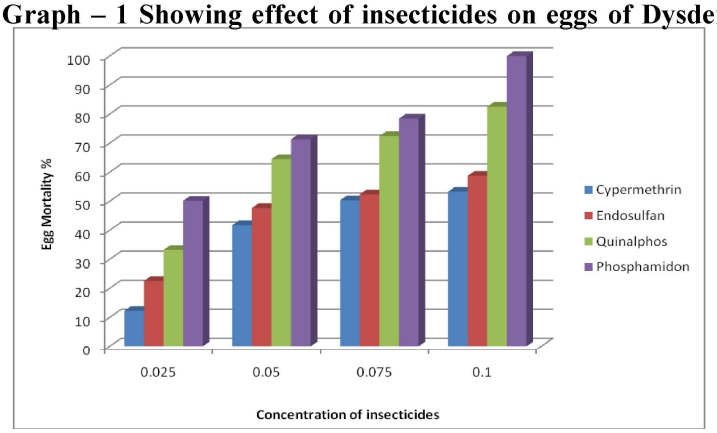
However, larvae of insects frequently died during hatching when eggs treated with pyrethroid often reach the 'blackhead stage'. This characteristic response to pyrethroids was noted in cabbage looper by Chalfant e*t. al.* (1979)[1], in the Colorado potato beetle by Ruscoe (1977)[18] and Kuwana *et. al.* (2015)[15]. Gamo *et. al*. (2014)[14] suggested that embryos under chemicals stress often reach maturity and die before eclosion. In addition, some toxins are absorbed by the embryonic membranes and released to exert their toxic effect upon the embryo when the membrane is broken down prior to eclosion. A toxic dose was probably acquired either by contact or ingestion during or immediately preceeding eclosion. Obviously, the egg mortality *Dysdercus cingulatus* to Decamethrin insecticides did not effect or had little effect at the lower concentration (0.0025% EC) when phosphamidon had higher effect at the higher concentration.

Table-1 Ovicidal effect of insecticides on one day old eggs of *Dysdercus cingulatus*

Sl. No.	Name of insecticides	Concentration(%)	Percent mortality	
			Original	Transformed
1.	Decamethrin	0.0025	9.85	18.52
		0.0050	12.58	23.50
		0.0075	15.46	28.72
		0.01	19.54	35.28
2.	Cypermethrin	0.025	12.25	22.62
		0.050	41.76	58.24
		0.075	50.35	62.52
		0.1	53.28	68.38
3.	Endosulfan	0.025	22.53	40.25
		0.050	47.67	52.42
		0.075	52.36	58.35
		0.1	58.75	60.72
4.	Quinalphos	0.025	33.27	35.38
		0.050	64.50	58.25
		0.075	72.42	64.78
		0.1	82.56	72.52
5.	Phosphamidon	0.025	50.17	48.75
		0.050	71.32	68.46
		0.075	78.47	74.35
		0.1	100.00	92.50

S.E. ± 1.25

Graph – 1 Showing effect of insecticides on eggs of Dysdercus cingulatus.



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