

## Evaluation of residual toxicity of some insecticides against grubs and adults of *Cryptolaemus montrouzieri* Mulsant

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**Abstract:** Study on residual toxicity of ten insecticides against *Cryptolaemus montrouzieri* Mulsant was carried out at College of Agriculture, Junagadh Agricultural University, Junagadh. None of the insecticide was safe for the *C. montrouzieri*, however endosulfan 0.07 per cent was relatively safer as it caused initial mortality of 51 per cent of the grubs and the mortality was decreased on increased hours after application (44, 36, 24 and 17 per cent on 24, 48, 72 and 96 h old residues). Thiamethoxam 0.01 per cent was next safer insecticides which caused mortality of 63 per cent initially and thereafter the mortality was decreased to 31 per cent on 96 h old residues. Monocrotophos 0.036 per cent, quinalphos 0.05 per cent, malathion 0.1 per cent, imidacloprid 0.005 per cent, prophenophos 0.05 per cent and acetamiprid 0.004 per cent were found highly toxic, as they caused more than 80 per cent mortality on 1 day after application. Methyl-parathion 0.1 per cent was comparatively less toxic to predator which caused 77 per cent mortality of the *C. montrouzieri*.

**Key words:** cotton, *Cryptolaemus montrouzieri*, mealy bug.

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### I. INTRODUCTION

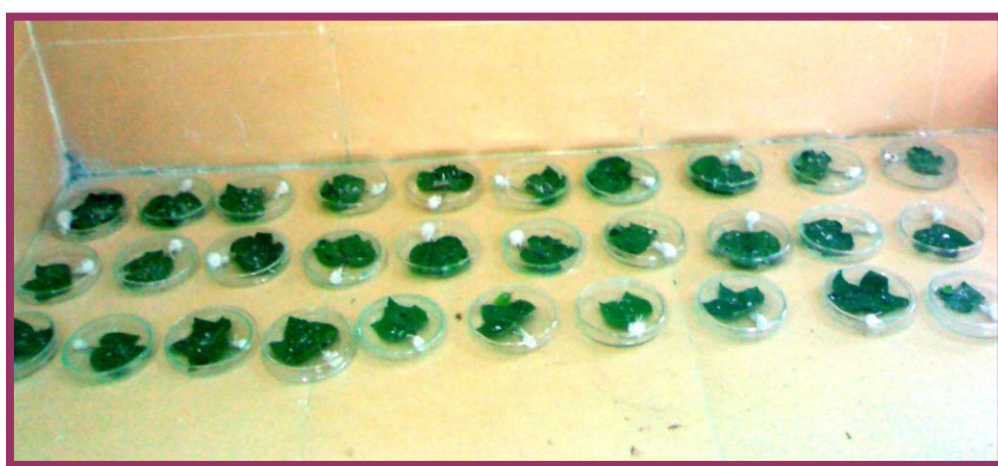
Cotton is a principle cash crop of India. Cotton crop belongs to the family Malvaceae. Among the different constraints that restrict the yield of cotton in India, the insect pests are considered to be the most serious which cause annual production loss about 40 per cent (Dhawan and Sarika, 2009). During the recent years, mealy bug, *Phenacoccus solenopsis* Tinsley (Hemiptera: Pseudococcidae) has been encountering the cotton crop in different areas of the Gujarat state and markedly flaring up year by year and became a major pest (Jhala *et al.*, 2008). The Australian ladybird beetle, *Cryptolaemus montrouzieri* Mulsant (Coleoptera: Coccinellidae) is a predator on a wide range of mealy bugs. It is native of Australia and was introduced in India in 1898 in an attempt to control the coffee green scale. The biological suppression of mealy bugs through this potent predator in India has been documented (Mani *et al.*, 1995). The insecticides commonly used for the insect pest management on cotton are harmful to this predator. Therefore, the information on toxic effects of the commonly recommended insecticides on the predator will be useful.

### II. MATERIAL AND METHODS

The study was carried out in Bio-control laboratory, Department of Entomology, College of Agriculture, Junagadh Agricultural University, Junagadh during *Kharif* 2010 to evaluate toxicity of commonly recommended insecticides to *C. montrouzieri*. The experiment was laid out in completely randomized design (CRD) with three replications and ten treatments including control *viz.*, monocrotophos 36 SL (0.036%), quinalphos 25 EC (0.05%), malathion 50 EC (0.1%), endosulfan 35 EC (0.07%), methyl parathion 25 EC (0.1%), imidachloprid 17.8 SL (0.005%), prophenofos 50 EC (0.05%), thiamethoxam 25 WG (0.01%) and acetamiprid 20 SP (0.004%). The Second instar grubs and adults were selected for the studies. Potted cotton plants were sprayed with aqueous solution of insecticides at field concentrations. Water spray served as check. A few batches of petridishes equal to the number of treatments, replicated thrice were set. Leaves from the cotton plants treated with respective insecticides were plucked at 1, 24, 48, 72 and 96 h after spray and kept in the petridishes. Ten adults as well as ten second instar grubs were released in each petriplate with the help of moist camel hair brush and provided with non-contaminated prey from the culture. During the entire experiment, the grubs and adults were provided daily with sufficient quantity of prey, particularly egg sacks of mealy bugs. After release of the predator (grubs and adults) on the treated leaves, the mortality caused by the insecticidal residues was recorded. Leaves from the water spray treatment were used in the check. Observations on mortality of adults as well as grubs were recorded at 1, 24, 48, 72 and 96 h after treatment. The average percentage mortality of grubs and adults was worked out for each treatment and the data were subjected to statistical analysis as per Panse and Sukhatme (1985).



**Plate 1. Rearing of predator, *Cryptolaemus montrouzieri* Mulsant**



**Plate 2. Toxicity of insecticides to the predator, *Cryptolaemus montrouzieri* Mulsant**

### III. RESULTS AND DISCUSSION

#### **Test against grubs of *C.montrouzieri*:**

The results on toxicity of different insecticides to grubs of *C.montrouzieri* at 1 h after the application revealed that monocrotophos 0.036 per cent recorded the significantly highest mortality of 95.17 per cent of the grub and proved to be most toxic. However, it was at par with the treatments of quinalphos 0.05 per cent and malathion 0.1 per cent with the grub mortality of 92.85 and 88.73 per cent, respectively (Table 1). Endosulfan 0.07 per cent and thiamethoxam 0.01 per cent were relatively safer insecticides against the grubs of *C.montrouzieri* with the significantly lower mortality of 51.33 and 63.10 per cent, respectively.

The mortality of grubs at 24 h after application revealed that monocrotophos 0.036 per cent recorded the significantly highest mortality (87.58 per cent) and was most toxic (Table 1). The trend of other insecticides was similar as recorded 1 h after application. Here also, significantly lowest grub mortality of 43.90 per cent was recorded in endosulfan 0.07 per cent followed by thiamethoxam 0.01 per cent (56.04 per cent mortality) and proved to be relatively less toxic insecticides against the grubs.

The mortality of grubs at 48, 72 and 96 h after application show similar trend of mortality found in 1 h and 24 h after application. Monocrotophos 0.036 per cent recorded the significantly highest mortality of grubs and proved to be most toxic 48, 72 and 96 h after application, respectively. Endosulfan 0.07 per cent was relatively less toxic insecticide against the grubs of *C.montrouzieri* on 48, 72 and 96 h after application with the mortality of 35.77, 24.37 and 16.98 per cent, respectively.

#### **Test against adults of *C.montrouzieri***

The results on safety of different insecticides against adults of *C.montrouzieri* at 1 h after the application (Table 2) revealed that monocrotophos 0.036 per cent recorded the significantly highest mortality of (91.70 per cent) of the adults and proved to be most toxic. However, it was at par with quinalphos 0.05 per cent and malathion 0.1 per cent, respectively. Endosulfan 0.07 per cent was the less toxic insecticide against the adults of *C.montrouzieri* with significantly lower mortality of 48.28 followed by thiamethoxam 0.01 per cent (59.75 per cent).

Monocrotophos 0.036 per cent recorded the significantly highest adult mortality (86.71 per cent) on 24 h after the application (Table 2) and was most toxic. The same trend of toxicity as 1 h after the application was also found in 24 h after the application. The lowest adult mortality of 41.78 per cent was recorded in endosulfan 0.07 per cent followed by thiamethoxam 0.01 per cent (53.69 per cent) and proved to be less toxic insecticides against the adults.

Similarly, same pattern of mortality of adults was at 48, 72 and 96 h after application as recorded earlier. Monocrotophos 0.036 per cent recorded the significantly highest mortality of 81.85, 79.18 and 73.80 per cent of the adults and proved to be most toxic. Endosulfan 0.07 per cent was the less toxic insecticide against the adults of *C.montrouzieri* on 48, 72 and 96 h after application with the mortality of 37.72, 44.93 and 26.15 per cent, respectively.

Earlier, higher toxicity of monocrotophos, quinalphos and malathion against grubs of the predator has been reported by Satyanarayana *et al.*, (1991). Satyanarayana *et al.*, (1991), Kishore *et al.* (1997), Babu and Ramanmurthy (1999) and Mali *et al.* (2008) found that monocrotophos, malathion and quinalphos were toxic to the adults. Shirke and Salunkhe (1996) found that endosulfan was found to be moderately toxic to the *C. montrouzieri*. While, Mali *et al.*, (2008) found that thiamethoxam (0.01%) was less toxic to all the stages of *C. montrouzieri*.

#### IV. FIGURES AND TABLES

**Table 1: Evaluation of toxicity of different insecticides against grubs of *C. montrouzieri***

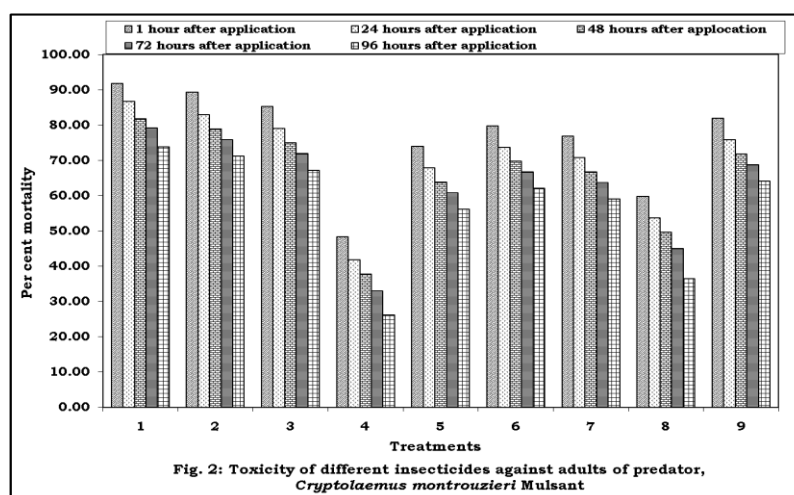
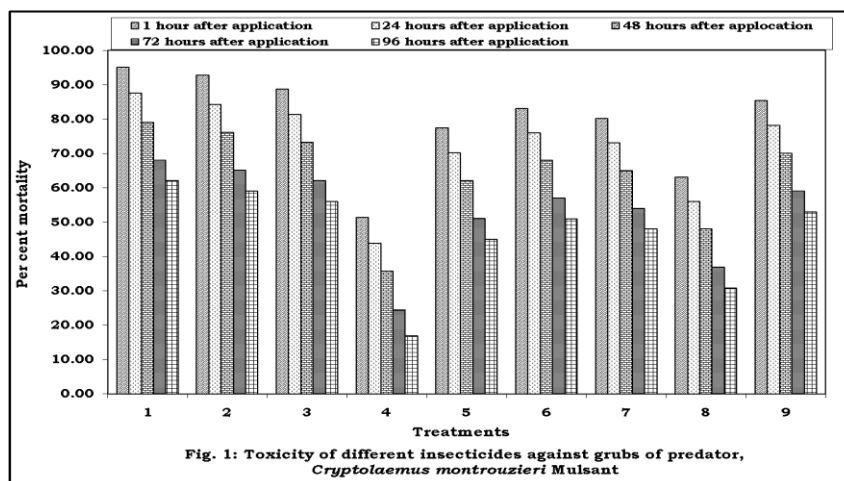
Sr. No.	Treatments	Per cent mortality (hours after treatment)				
		1 h	24 h	48 h	72 h	96 h
1	Monocrotophos 0.036%	(77.30*) 95.17	(69.36) 87.58	(62.79 ) 79.09	(55.58) 68.04	(51.96) 62.03
2	Quinalphos 0.05%	(74.49) 92.85	(66.62) 84.26	(60.76) 76.14	(53.77) 65.07	(50.21) 59.04
3	Malathion 0.1%	(70.38) 88.73	(64.44) 81.39	(58.84) 73.22	(52.00) 62.09	(48.47) 56.04
4	Endosulfan 0.07%	(45.76) 51.33	(41.50) 43.90	(36.73 ) 35.77	(29.58) 24.37	(24.33) 16.98
5	Methyl-Parathion 0.1%	(61.61) 77.39	(56.94) 70.24	(52.02) 62.13	(45.58) 51.02	(42.11) 44.96
6	Imidachloprid 0.005%	(65.69) 83.05	(60.69) 76.03	(55.56) 68.02	(49.03) 57.01	(45.57) 51.00
7	Prophenofos 0.05%	(63.53) 80.13	(58.74) 73.08	(53.76 ) 65.04	(47.30) 54.01	(43.85) 47.99
8	Thiamethoxam 0.01%	(52.60) 63.10	(48.47) 56.04	(43.84) 47.98	(37.40) 36.89	(33.72) 30.82
9	Acetamiprid 0.004%	(67.49) 85.35	(62.17) 78.20	(56.86 ) 70.12	(50.21) 59.05	(46.73) 53.01
S. Em. ±		2.89	2.41	2.23	2.30	2.24
C.D. at 5%		8.52	7.11	6.57	6.78	6.62
C.V. %		7.78	7.10	7.22	8.52	9.03

\*Figures in parentheses are arcsine transformed value

**Table 2: Evaluation of toxicity of different insecticides against adults of *C. montrouzieri***

Sr. No.	Treatments	Per cent mortality (hours after treatment)				
		1 h	24 h	48 h	72 h	96 h
1	Monocrotophos 0.036%	(73.25*) 91.70	(68.62) 86.71	(64.78) 81.85	(62.85) 79.18	(59.21) 73.80
2	Quinalphos 0.05%	(70.87) 89.26	(65.65) 83.00	(62.66) 78.91	(60.58) 75.87	(57.54) 71.19
3	Malathion 0.1%	(67.42) 85.26	(62.75) 79.04	(59.96) 74.95	(57.98) 71.89	(55.06) 67.21
4	Endosulfan 0.07%	(44.02) 48.28	(40.27) 41.78	(37.89) 37.72	(35.01) 32.91	(30.76) 26.15
5	Methyl-Parathion 0.1%	(59.34) 74.00	(55.48) 67.89	(53.03) 63.83	(51.23) 60.79	(48.49) 56.08
6	Imidachloprid 0.005%	(63.24) 79.73	(59.15) 73.71	(56.60) 69.70	(54.75) 66.69	(51.96) 62.03
7	Prophenofos 0.05%	(61.20) 76.79	(57.26) 70.75	(54.77) 66.73	(52.96) 63.72	(50.21) 59.04
8	Thiamethoxam 0.01%	(50.62) 59.75	(47.12) 53.69	(44.80) 49.66	(42.09) 44.93	(37.12) 36.42
9	Acetamiprid 0.004%	(64.88) 81.97	(60.58) 75.87	(57.94) 71.82	(56.04) 68.79	(53.20) 64.11
S. Em. ±		2.83	2.73	2.54	2.57	2.76
C.D. at 5%		8.34	8.06	7.50	7.57	8.15
C.V. %		7.94	8.24	8.04	8.45	9.71

\*Figures in parentheses are arcsine transformed value



## V. CONCLUSION

Thus, monocrotophos 0.036 per cent, quinalphos 0.05 per cent, malathion 0.1 per cent, acetamiprid 0.004 per cent and imidachloprid 0.005 per cent were found highly toxic treatments against adults of the predator, *C.montrouzieri*. While, prophenofos 0.05 per cent and methyl-parathion 0.1 per cent were toxic treatments against the predator stages. Only endosulfan 0.07 per cent and thiamethoxam 0.01 per cent were found relatively less toxic insecticides against adult stage of the predator.

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