ENTOMON 43(1): 67-70 (2018)
Short Communication No. ent. 43111

Relative toxicity of commonly used pesticides to different stages of predator *Cheilomenes sexmaculata* (Fabricius) in cotton

Nirali J. Sanghani, G. R. Bhanderi* and H. R. Desai

Cotton Entomology, Main Cotton Research Station, Navsari Agricultural University, Surat 395007, Gujarat, India. E-mail: grbhanderi@yahoo.co.in

ABSTRCT: Experiment was conducted to evaluate toxicity of thirteen insecticides *viz*., thiamethoxam 25 WG, buprofezin 25 SC, clothianidin 50 WDG, diafenthiuron 50 WP, fipronil 5 SC, imidacloprid 70 WG, flonicamid 50 WDG, lamda-cyhalothrin 5 EC, methyl parathion 50 EC, thiacloprid 21.7 SC, cypermethrin 10 EC, indoxacarb 15.8 EC and chlorantranilliprole 18.5 SC against different stages of predatory coccinellid, *Cheilomenes sexmaculata*. Indoxacarb 15.8 E@ 0.008% was highly toxic at 72 hours after treatment against eggs (55.19% mortality). While, indoxacarb 15.8 E@ 0.008% and methyl parathion 50 EC@ 0.05% ware highly toxic at 72 hours after treatment against grubs and adults, with 92.96 and 83.33 per cent mortality of grubs and adults, respectively. Buprofezin 25 SC@ 0.05% caused the lowest mortality at 24, 48 and 72 hour after treatment, of all stages tested, hence can be considered as safer insecticide.

KEY WORDS: *Cheilomenes sexmaculata*, pesticides toxicity, cotton

To develop a sound pest management programme, the knowledge on the safety and adverse effect of pesticides to important natural and promising bio-control agent is essential. Therefore, attempt was made to study the effect of commonly used/new pesticides to eggs, grubs and adults of *Cheilomenes sexmaculata* a predator in cotton ecosystem.

Laboratory experiments were conducted under ambient and protected conditions at Bio-control Laboratory, Department of Agricultural Entomology, N. M. College of Agriculture, Navsari Agricultural University, Navsari during 2016-2017. Eggs, grubs and adults of predatory Coccinellids *Cheilomenes sexmaculata* were collected from research farm of Main Cotton Research Station, N.A.U., Surat. Collected insects were pre conditioned in the laboratory for about 3-4 hours before treatment.

Efficacy of thirteen commercial formulations of insecticides at recommended field dose using distilled water was evaluated under laboratory condition. Insecticides tested were insecticides viz., thiamethoxam 25 WG, buprofezin 25 SC, clothianidin 50 WDG, diafenthiuron 50 WP, fipronil 5 SC, imidacloprid 70 WG, flonicamid 50 WDG, lamda-cyhalothrin 5 EC, methyl parathion 50 EC, thiacloprid 21.7 SC, cypermethrin 10 EC, indoxacarb 15.8 EC and chlorantranilliprole 18.5 SC.

For study bioassay of eggs, the spray fluid of each insecticide prepared at desired strength was sprayed

* Author for correspondence

on the respective glass slide (7.5 x 2.5 cm) with the help of Potter's Tower spraying at a constant air pressure of 2.5 kg/m^2. A set of control treatment without any insecticidal application was maintained. The glass slides thus treated were thoroughly dried under ceiling fan and placed in a glass petridish (9.0 x 2.0 cm). Each treatment was replicated three times. Observations on the mortality of eggs were recorded at 72 h after spraying. For study of bioassay on grub and adult, third instar grub and adult of *C. sexmaculata* were used. Each of the insecticidal spray fluid was uniformly sprayed with hand sprayer on cotton leaves. The leaves were kept in plastic bowl (15.0 x 8.0 cm) and kept under ceiling fan for drying. After drying, 10 grub (3rd instar) and newly emerged adults of *C. sexmaculata* were released on treated leaves and the plastic bowl covered with lid having aeration facility and allowed to remain in contact with sprayed leaves for 45 minutes. The grub and adult were transferred to petri dish containing *A. gossypii* that served as food for the predator and the food changed daily. A control treatment without any insecticidal spray also maintained to compare the mortality. Mortality was recorded at 24, 48 and 72 hours after treatment. The mortality data was corrected with the help of Abbott's (1925) formula.

The mortality data was corrected with the help of Abbott's (1925) formula.

$$\text{Corrected mortality (\%)} = \frac{\text{\% Mortality (T)} - \text{\% Mortality(C)} \times 100}{100 - \text{\% mortality (control)}}$$

The data obtained were analyzed with appropriate methods of transformation using Completely Randomized Block Design with three repetitions.

Data on the toxicity of insecticides against to eggs exhibited 44.81 % and 55.19 % mortality in methyl parathion 50

EC @ 0.05% and indoxacarb 15.8 EC @ 0.008% and lowest mortality of eggs observed in buprofezin 25 SC @ 0.05% (17.04%) Neetan and Aggarwal (2012) reported that buprofezin 25 SC @ 0.05% and imidacloprid 70 WG @ 0.014% recorded lower per cent mortality of eggs of *C. sexmaculata* at 72 hours after exposure and categorized them harmless. They also reported that buprofezin 25 SC recorded significantly higher (76.66%) hatching of eggs of *C. sexmaculata* followed by imidacloprid (70.00%). As per the report of Awasthi *et al.* (2013) found that indoxacarb 15.8 EC was toxic to different predatory stage of Coccinellids. At 72 hours after exposure, the insecticide lamda-cyhalothrin 5 EC @ 0.0025%, cypermethrin 10 EC @ 0.01%, methyl parathion 50 EC@ 0.05% and indoxacarb 15.8 EC @ 0.008% recorded 67.78 to 92.96 per cent mortality in grubs. The lowest mortality was recorded in buprofezin 25 SC @ 0.05% (21.11%) which was on par with clothianidin 50 WDG @ 0.025% (28.15%) and flonicamid 50 WDG @ 0.015% (28.15%) (Table 1). Pandi *et al.* (2013) reported buprofezin at recommended dose @ 0.013% considered as safer for grub of *C. sexmaculata*, because it produced 22% mortality at 72 hrs after treatment and it categorized under harmless category. Whereas, in present study cypermethrin 10 EC @ 0.01% (71.11% mortality) and slightly harmful. Tank *et al.* (2007) reported cypermethrin 0.015 per cent recorded 74.33 per cent larval mortality of *C. sexmaculata.*

At 72 h after treatment, methyl parathion 50 EC @ 0.05% was recorded 83.33 per cent mortality and found more toxic as compared to rest of insecticides. The lower mortality were recorded in chlorantranilliprole 18.5 SC @ 0.006% (20.00%) which was on par with buprofezin 25 SC @ 0.05% (23.33%), flonicamid 50 WDG @ 0.015% (26.67%) and fipronil 5 SC @ 0.01% (30.00%) (Table 2). Megha *et al*. (2014) reported methyl parathion was highly toxic and recorded 100 percent mortality to adult of *C. sexmaculata* after 72 hr. Gour and Pareek (2005) revealed that cypermethrin 10 EC was found to be most toxic to the adults of the *C. septempunctata* and rated as highly toxic insecticides. Galvan *et al*. (2005) and Galvan *et al*. (2006) reported adverse effects of indoxacarb on *Harmonia axyridis*. Similar results were reported by Jalali *et al*. (2009). Emamectin benzoate was moderately toxic to predatory Coccinellids. Sharma and Kaushik (2010) found emamectin benzoate toxic to natural enemies including lady bird beetle on brinjal.

Table 1. Relative susceptibility of *C. sexmaculata* egg and grub to pesticides used in cotton

Tr. No.	Treatments	Conc. (%)	Formulation (ai/10 lit. water)	Per cent cumulative mortality of *C. sexmaculata* hour after exposure							
				Egg		Grub					
				72hours		24 hours		48 hours		72 hours	
T_1	Thiamethoxam 25 WG	0.01%	4 g	24.07	(29.29)	16.67	(23.84)	23.33	(28.77)	42.59	(40.67)
T_2	Buprofezin 25 SC	0.05%	20 ml	20.37	(26.40)	6.67	(12.58)	13.33	(21.13)	21.11	(26.92)
T_3	Clothianidin 50 WDG	0.025%	5 g	31.11	(33.88)	13.33	(21.14)	13.33	(21.14)	28.15	(31.81)
T_4	Diafenthiuron 50 WP	0.05%	10 g	24.07	(29.29)	20.00	(26.55)	26.67	(30.98)	49.63	(44.77)
T_5	Fipronil 5 SC	0.01%	20 ml	24.07	(29.29)	13.33	(21.14)	13.33	(21.14)	38.89	(38.30)
T_6	Imidacloprid 70 WG	0.014%	2 g	41.48	(38.06)	36.67	(37.21)	56.67	(48.83)	57.04	(49.03)
T_7	Flonicamid 50 WDG	0.015%	3 g	24.07	(29.29)	13.33	(21.14)	16.67	(23.85)	28.15	(31.81)
T_8	Lamda-cyhalothrin 5 EC	0.0025%	5 ml	38.15	(41.99)	43.33	(41.13)	66.67	(54.76)	67.78	(55.40)
T_9	Methyl Parathion 50 EC	0.05%	10 ml	51.85	(46.04)	56.67	(48.82)	60.00	(50.75)	82.22	(65.25)
T_{10}	Thiacloprid 21.7 SC	0.005%	2 ml	34.44	(35.89)	13.33	(21.13)	23.33	(28.76)	53.33	(46.90)
T_{11}	Cypermethrin 10 EC	0.01%	10 ml	37.78	(37.89)	46.67	(43.06)	53.33	(46.90)	71.11	(57.81)
T_{12}	Indoxacarb 15.8 EC	0.008%	5 ml	55.19	(46.90)	53.33	(46.90)	56.67	(48.83)	92.96	(77.34)
T_{13}	Chlorantranilliprole 18.5 SC	0.006%	3 ml	24.07	(29.29)	10.00	(18.43)	20.00	(26.55)	38.89	(38.49)
S Em+				2.12		2.63		2.13		3.65	
C.D. at 0.5%				6.18		7.63		6.20		10.60	
C.V. %				10.55		15.43		10.62		13.59	

Figures in the parentheses are the arc-sine transformed values

Table 2. Relative susceptibility of *C. sexmaculata* adult to pesticides used in cotton

Tr. No.	Insecticidal treatments	Conc. (%)	Formulation (ai/10 lit. water)	Per cent cumulative mortality of *C. sexmaculatus* adult hour after exposure					
				24 hour		48 hour		72 hour	
T_1	Thiamethoxam 25 WG	0.01%	4 g	13.33	(21.13)	20.00	(26.06	33.33	(35.20)
T_2	Buprofezin 25 SC	0.05%	20 ml	6.67	(12.28)	13.33	(21.13)	23.33	(28.76)
T_3	Clothianidin 50 WDG	0.025%	5 g	26.67	(30.98)	30.00	(32.98)	36.67	(37.21)
T_4	Diafenthiuron 50 WP	0.05%	10 g	13.33	(21.13)	23.33	(28.76)	33.33	(35.20)
T_5	Fipronil 5 SC	0.01%	20 ml	10.00	(18.42)	23.33	(28.76)	30.00	(32.98)
T_6	Imidacloprid 70 WG	0.014%	2 g	43.33	(41.13)	53.33	(46.90)	56.67	(48.82)
T_7	Flonicamid 50 WDG	0.015%	3 g	13.33	(21.13)	20.00	(26.55)	26.67	(30.98)
T_8	Lamda-cyhalothrin 5 EC	0.0025%	5 ml	33.33	(35.20)	53.33	(46.90)	56.67	(48.82)
T_9	Methyl Parathion 50 EC	0.05%	10 ml	33.33	(35.20)	76.67	(61.19)	83.33	(66.12)
T_{10}	Thiacloprid 21.7 SC	0.005%	2 ml	20.00	(26.55)	33.33	(35.20)	36.67	(37.21)
T_{11}	Cypermethrin 10 EC	0.01%	10 ml	43.33	(41.13)	46.67	(43.06)	63.33	(52.75)
T_{12}	Indoxacarb 15.8 EC	0.008%	5 ml	43.33	(41.13)	53.33	(46.90)	53.33	(46.90)
T_{13}	Chlorantranilliprole 18.5 SC	0.006%	3 ml	10.00	(18.42)	16.67	(23.84)	20.00	(26.06)
S Em+				2.48		2.47		2.69	
C.D. at 0.5%				7.22		7.20		7.80	
C.V. %				15.35		11.91		11.48	

Figures in the parentheses are the arc-sine transformed values

It may be concluded that **t**he insecticides methyl Parathion 50 EC, indoxacarb 15.8 EC, Cypermethrin 10 EC and lamda-cyhalothrin 5 EC showed higher mortality of coccinellid predators. Buprofezin 25 SC was the least toxic insecticide and hence, considered as safe.

REFERENCES

Abbott W. S. (1925) A method of computing the effectiveness of an insecticide. Journal of Economic Entomology 18: 265 - 267.

Awasthi N. S., Barkhade U. P., Patil S. R. and Lande G.K. (2013) Comparative toxicity of some commonly used insecticides to cotton aphid and their safety to predatory Coccinellids. The Bioscan 8(3): 1007-1010.

Galvan T. L., Koch R. L. and Hutchinson W. D. (2005) Effects of spinosad and indoxacarb on survival, development and reproduction of the multicolored Asian lady beetle. Biological Control 34: 108-114.

Galvan T. L., Koch R. L. and Hutchinson W. D. (2006) Toxicity of indoxacarb and spinosad to the multicolored Asian lady beetle, *Harmonia axyridis*, via three routes of exposure. Pest Management Science 62: 797-804.

Gour I. S. and Pareek B. L. (2005) Relative toxicity of some insecticides to coccinellid, *Coccinella septempunctata* and Indian honey bee, *Apis cerana indica*. Indian Journal of Agriculture Research 39: 299-302.

Jalali M. A., Leeuwen T. V., Tirry L. and De Clercq P. (2009) Toxicity of selected insecticides to the two-spot ladybird A*dalia bipunctata.* Phytoparasitica 37: 323–326.

Megha R. R., Basavangoud K. and Kulkarni M. S. (2014) Safety evaluation of some insecticide against coccinellids, *Cheilomenes sexmaculata* (Fab.) and *Hippodamia varigata* (Goeze). Journal of Experimental Zoology of India18 (20): 315-318.

Neetan and Aggarwar N. (2012) Toxicity of Some Insect growth regulator and neonicotinoid insecticides to cotton mealybug predator, *Cheilomenes sexmaculata*. Madras Agriculture Journal 99 (1-3): 116-120.

Pandi G., Guru Pirasanna, Paul B., Shah V. and Shankarganesh K. (2013) Relative toxicity of insecticides against Coccinellid beetle, *Cheilomenes sexmaculata* (F.). Annals of Plant protection Science 21 (1): 17-20.

Sharma S.S. and Kaushik H.D. (2010) Effect of Spinosad and other insecticides against pest complex and natural enemies on egg plant. Journal of Entomological Research 34: 39-44.

Tank B. D., Korat D. M. and Board P. K. (2007) Relative toxicity of some insecticides against *Cheilomenes sexmaculata* (Fab.) in laboratory. Karnataka Journal of Agriculture Science 20 (3): 639-641.

(Received 19 December 2017; revised ms accepted 16 February 2018; published 12 March 2018)