TESTING OF INSECTICIDES FOR ITS TOLERANCE TO LADY BIRD BEETLE, *Coccinella septempunctata* (LINN.)

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ABSTRACT

The experiment was carried out in the laboratory of Department of Entomology, C. P. College of Agriculture, S. D. Agricultural University, Sardarkrushinagar during 2011-12. Studies on toxicity of certain insecticides to different stages of Coccinella septempunctata revealed that botanical insecticide azadirachtin 0.0075 per cent was less toxic than synthetic insecticides to eggs, larvae and adults of the predator. Among the synthetic insecticides, dichlorvos 0.05 per cent was highly toxic to eggs, larvae and adults, whereas imidacloprid 0.005 per cent was least toxic.

Key words: C. septempunctata, insecticides, tolerance

INTRODUCTION

Mustard is the second most important edible oilseed crop in India after groundnut. India is one of the largest rapeseed-mustard growing countries in the world, occupying the first position in area and second position in production after China. India was produced around 6.26 million tonnes with an area of 6.58 million ha and productivity of 952 kg/ ha (Anonymous, 2012). Aphidophagous lady bird beetle, *Coccinella septempunctata* Linnaeus is one of the most important predators of mustard aphid and keep the aphid infestation naturally checked. The *Coccinellids* are popularly called as the ladybird beetle. They are of great economic importance because a large majority of them are predaceous both in their grub as well as adult stages on the various small bodied insects including aphid.

MATERIALS AND METHODS

The experiment was carried out in the laboratory of Department of Entomology, C. P. College of Agriculture, S. D. Agricultural University, Sardarkrushinagar during 2011-12 with eight treatments including control.

To evaluate the ovicidal action of the insecticides against eggs of *C. septempunctata*, 24 to 36 hrs/old eggs were used. Ten eggs were transferred carefully on the glass slide measuring 7.5 cm x 2.5 cm with the help of fine camel hair brush. The suspension of each insecticide was sprayed on the slide with the help of baby sprayer and a control (water spray) was also maintained for each treatment. The sprayed glass slides were thoroughly

dried under ceiling fan and placed in a glass petridish. Each treatment was replicated thrice. According to hatching the observations on per cent mortality of eggs were taken at 72 hrs after spraying. The data obtained were subjected to statistical analysis.

To evaluate the larvicidal action of the insecticides against *C. septempunctata*, the third instar larvae were used. The required concentration of each insecticide was prepared in 1 litre water. Each suspension of insecticide was uniformly sprayed with baby sprayer on mustard leaves which were dried under the ceiling fan after spraying. Ten larvae (third instar) of *C. septempunctata* were released and allowed to remain in contact with sprayed leaf for 45 minutes. Thereafter, the test insects were transferred to fresh petridishes containing the mustard aphids that served as food. The food was changed daily and care was taken to avoid mortality due to starvation. Mortality due to the treatment of different insecticides under test was recorded at 12, 24, 36 and 48 hours after their release along with control. The experiment was replicated thrice. The data on per cent mortality of larva were subjected to statistical analysis.

The adults of *C. septempunctata* were collected from unsprayed mustard fields and were used in the susceptibility test to different insecticides. The insecticides were tested by using the dry film method. For preparing the insecticidal films, a petridish (10 cm diameter) was sprayed with 1 ml of each insecticide under baby sprayer. The treatments were replicated thrice and a control (water spray) was maintained for each treatment. The insecticidal films thus formed were dried under the electric ceiling fan for about 15 minutes. Ten adults of *C. septempunctata* was released and allowed to remain in contact with the film for 45 minutes. Thereafter, the test insects were transferred to fresh petridishes containing the mustard aphids that served as food for the predators. The food was changed daily and care was taken to avoid the mortality due to starvation. Mortality due to the treatment of different insecticides under test was recorded at 12, 24, 36 and 48 hours after their release. The mortality data thus obtained were transformed to percentage and were corrected by using the Abbott's formula. The corrected percentage mortality data were subjected to statistical.

RESULTS AND DISCUSSION

The data presented in Table 1 revealed that more or less all the insecticides were toxic to eggs to *C. septempunctata*. Among them, azadirachtin 0.0075 per cent recording the egg mortality (16.86%), this was at par with imidacloprid 0.005 per cent (23.67%). The highest mortality was recorded by dichlorvos 0.05 per cent (84.13%) which was significantly differed from rest of the treatments. Dimethoate 0.03 per cent (60.61%), chlorpyriphos 0.05 per cent (57.14%), profenophos 0.05 per cent (50.47%) and quinalphos 0.025 per cent (47.12%) were remained at par and found next in order. Treatment azadirachtin 0.0075 per cent (16.86%) and imidacloprid 0.005 per cent (23.67%) were found less toxic as compare to other insecticides.

The data presented in Table 2 on the mean per cent larval mortality of *C. septempunctata* recorded at 12 hours after application of different insecticides revealed that azadirachtin 0.0075 per cent (0.50%) and imidacloprid 0.005 per cent (16.86%) were found significantly least toxic then rest of the treatments, whereas

dichlorvos 0.05 per cent (67.56%) found significantly more toxic followed by dimethoate 0.03 per cent (47.12%), chlorpyriphos 0.05 per cent (43.63%), profenophos 0.05 per cent (37.08%) and quinalphos 0.025 per cent (30.16%), which were at par with each others. After 24 hours of application of insecticides, the dichlorvos 0.05 per cent (84.13%) was found more toxic and recorded significantly more larval mortality (84.13%). Dimethoate 0.03 per cent (63.87%), chlorpyriphos 0.05 per cent (60.62%), profenophos 0.05 per cent (50.47%) and quinalphos 0.025 per cent (50.47%) were also found toxic and statistically at par with each others. The data further revealed that azadirachtin 0.0075 per cent (16.86%) and imidacloprid 0.005 per cent (30.16%) were recorded significantly less larval mortality and safer compared to other insecticides. More or less similar trend was also observed on larval mortality of *C. septempunctata* after 36 hours of application of different insecticides, that dichlorvos 0.05 per cent (95.24%) was found significantly more toxic, followed by dimethoate 0.03 per cent (77.29%), chlorpyriphos 0.05 per cent (67.71%), profenophos 0.05 per cent (60.62%) quinalphos 0.025 per cent (53.82%). Azadirachtin 0.0075 per cent (20.48%) recorded significantly less larval mortality followed by imidacloprid 0.005 per cent (40.34%) and found safer insecticide as compared to other insecticides. The data on larval mortality of *C. septempunctata* after 48 hours of insecticidal application found similar trend as shown after 36 hours of application of insecticides.

The data presented in Table 3 on the mean per cent mortality of adults of *C. septempunctata* recorded at 12 hours after application of different insecticides revealed that dichlorvos 0.05 per cent (67.56%) was found significantly more toxic then rest of the treatments followed by dimethoate 0.03 per cent (57.15%), chlorpyriphos 0.05 per cent (53.98%), quinalphos 0.025 per cent (40.32%), profenophos 0.05 per cent (37.08%) and imidacloprid 0.005 per cent (23.67%). The data further revealed that the treatment azadirachtin 0.0075 per cent (5.82%) was found significantly less toxic as compared to other insecticides. After 24 hours of application of insecticides, data indicated that dichlorvos 0.05 per cent (98.42%) was found significantly more toxic to adult of *C. septempunctata* followed by chlorpyriphos 0.05 per cent (73.95%), dimethoate 0.03 per cent (70.80%), quinalphos 0.025 per cent (57.30%), profenophos 0.05 per cent (53.84%) and imidacloprid 0.005 per cent (43.79%). Azadirachtin 0.0075 per cent (16.86%) recorded significantly less adult mortality and found safer insecticide as compared to other insecticides. The data on mean per cent adults mortality of *C. septempunctata* recorded at 36 hours after application of different insecticides revealed that dichlorvos 0.05 per cent (99.90%) was found significantly more toxic then rest of the treatments followed by dimethoate 0.03 per cent (84.13%), chlorpyriphos 0.05 per cent (80.47%), profenophos 0.05 per cent (67.56%), quinalphos 0.025 per cent (63.87%) and imidacloprid 0.005 per cent (53.84%). The data further revealed that the treatment azadirachtin 0.0075 per cent (27.01%) was found significantly less toxic as compared to other insecticides. The data on adult mortality of *C. septempunctata* after 48 hours of insecticidal application found similar trend as shown after 36 hours of application of insecticides.

Among the insecticides tested for the susceptibility of eggs, larvae and adults of *C. septempunctata* concluded that the botanical insecticide, azadirachtin 0.0075 per cent was safer to eggs, grubs and adults of *C. septempunctata*. Among synthetic insecticides, dichlorvos 0.05 per cent and dimethoate 0.03 per cent were highly toxic to eggs, larvae and adults of this predator. Earlier dichlorvos and dimethoate were also reported comparatively highly toxic by Babu and Sharma (2003), while imidacloprid 0.005 per cent was also reported comparatively safer by Babu and Sharma (2003) and Solangi *et al.* (2007). Insecticides like profenophos 0.05 per cent, quinalphos 0.03 per cent and chlorpyriphos 0.05 per cent were moderately toxic to eggs, grubs and adults of *C. septempunctata* was reported by various workers (Gour and Pareek 2005 and Ahmad and Ahmad 2009).

CONCLUSION

From the results of different insecticides tested for the susceptibility of eggs, larvae and adults of *C. septempunctata*, it can be concluded that the botanical insecticide, azadirachtin 0.0075 per cent was safer to eggs, grubs and adults of *C. septempunctata*. Among synthetic insecticides, dichlorvos 0.05 per cent and dimethoate 0.03 per cent were highly toxic to eggs, larvae and adults of this predator.

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Table 1: Ovicidal action of insecticides on eggs of *C. septempunctata*

Sr. No.	Treatments	Egg Mortality (%)
1.	Imidacloprid (0.005%)	29.11 (23.67)
2.	Chlorpyriphos (0.05%)	49.11 (57.14)
3.	Profenophos (0.05%)	45.27 (50.47)
4.	Dichlorvos (0.05%)	66.52 (84.13)
5.	Quinalphos (0.025%)	43.35 (47.12)
6.	Dimethoate (0.03%)	51.13 (60.61)
7.	Azadirachtin (0.0075%)	24.24 (16.86)
8.	Control (Water spray)	13.96 (5.82)
S. Em. ±		3.04
C. D. at 5%		9.13
C. V. %		13.07

Note: Figures outside the parentheses are arc sin transformed values and those inside are retransformed values.

Table 2: Toxicity of insecticides on larvae of *C. septempunctata*

Sr. No.	Treatments	Larval Mortality (%) After Hours of Treatment			
		12	24	36	48
1.	Imidacloprid (0.005%)	24.24 (16.86)	33.31 (30.16)	39.43 (40.34)	41.35 (43.65)
2.	Chlorpyriphos (0.05%)	41.34 (43.63)	51.13 (60.62)	55.37 (67.71)	59.53 (74.29)
3.	Profenophos (0.05%)	37.51 (37.08)	45.27 (50.47)	51.13 (60.62)	53.05 (63.87)
4.	Dichlorvos (0.05%)	55.28 (67.56)	66.52 (84.13)	77.40 (95.24)	77.40 (95.24)
5.	Quinalphos (0.025%)	33.31 (30.16)	45.27 (50.47)	47.19 (53.82)	49.12 (57.17)
6.	Dimethoate (0.03%)	43.35 (47.12)	53.05 (63.87)	61.54 (77.29)	63.77 (80.47)
7.	Azadirachtin (0.0075%)	4.05 (0.50)	24.24 (16.86)	26.91 (20.48)	29.11 (23.67)
8.	Control (Water spray)	4.05 (0.50)	13.95 (5.81)	13.95 (5.81)	13.95 (5.81)
	S. Em. ±	2.78	3.15	3.78	3.52
	C. D. at 5%	8.13	9.43	11.34	10.57
	C. V. %	16.50	13.10	14.06	12.77

Note: Figures outside the parentheses are arc sin transformed values and those inside are retransformed values.

Table 3: Toxicity of insecticides on adults of *C. septempunctata*

Sr. No.	Treatments	Adults Mortality (%) After Hours of Treatment			
		12	24	36	48
1.	Imidacloprid (0.005%)	29.11 (23.67)	41.43 (43.79)	47.20 (53.84)	53.05 (63.87)
2.	Chlorpyriphos (0.05%)	47.28 (53.98)	59.31 (73.95)	63.77 (80.47)	64.29 (81.18)
3.	Profenophos (0.05%)	37.51 (37.08)	47.20 (53.84)	55.28 (67.56)	57.30 (70.81)
4.	Dichlorvos (0.05%)	61.54 (72.29)	82.77 (98.42)	88.15 (99.90)	88.15 (99.90)
5.	Quinalphos (0.025%)	39.42 (40.32)	49.20 (57.30)	53.05 (63.87)	55.28 (67.56)
6.	Dimethoate (0.03%)	49.11 (57.15)	57.30 (70.80)	66.52 (84.13)	69.27 (87.47)
7.	Azadirachtin (0.0075%)	13.96 (5.82)	24.24 (16.86)	31.31 (27.01)	35.51 (37.74)
8.	Control (Water spray)	4.05 (0.50)	9.00 (2.45)	18.90 (10.49)	18.90 (10.49)
	S. Em. ±	3.17	3.76	2.48	2.87
	C. D. at 5%	9.47	11.27	7.44	8.60
	C. V. %	15.57	14.06	8.10	9.00

Note: Figures outside the parentheses are arc sin transformed values and those inside are retransformed values.

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