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The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; 12(3): 2807-2810

www.thepharmajournal.com
Received: 18-01-2023
Accepted: 21-02-2023

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Effect of newer insecticides on coccinellids population in okra

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Abstract
Newer molecules may be a better alternative than conventional synthetic insecticides for pest management but should be safe to the natural enemies. In this context, a study was conducted at Hisar (Haryana) during *kharif* 2019 and 2020 to assess the effect of newer molecules on coccinellids while using against okra shoot and fruit borers. Experiment was conducted in randomized block design in plot size of 5 × 4 m with three replications for each treatment. Insecticides *viz*. chlorantaniliprole 18.5 SC, emamectin benzoate 5 SG, pyridalyl 10 EC, lambda-cyhalothrin 5 EC, cypermethrin 25 EC and quinalphos 25 EC were applied thrice at the rate of 25, 6.75, 15, 50, 37 and 200 g a.i. per ha, respectively. It was observed that chlorantaniliprole and emamectin benzoate causing no significant adverse effect on population were safe to the coccinellids. Pyridalyl 10 EC was next relatively safer molecule while cypermethrin, lambda-cyhalothrin and quinalphos caused significant reduction in coccinellids population. Hence, chlorantraniliprole, emamectin benzoate and pyridalyl can alternatively be used for pest management in okra.

Keywords: Coccinellids, effect, newer insecticides, okra, *Earias* spp

Introduction

Okra, *Abelmoschus esculentus* L. (Moench) is an economically important crop grown in tropical and subtropical parts of the world. India is the second largest producer of total vegetables in the world and first in okra production, contributing about 62 per cent to the total global production of okra. In India, okra is grown throughout the year over an area of 5.31 lakh ha with annual production of 64.66 lakh metric tons and productivity of 12.2 metric tons per ha. In Haryana, it occupied an area of 0.12 lakh ha with a production of 1.19 lakh metric tons and productivity of 10.26 metric tons per ha. (Anonymous, 2022) [1]. About 72 species of insect-pests have been reported to attack on okra crop during the growing period (Rao and Rajendran, 2002). Among the major insect pests of okra, shoot and fruit borers, *Earias insulana* (Boisduval) and *E. vittella* (Fabricious) are most destructive (Mani *et al*., 2005) [10].

In the present scenario, farmers rely mainly upon insecticidal application for the management of these pests. But the indiscriminate use of the insecticides has resulted in numerous environmental and health problems (Ignacimuthu, 2007) [7]. Most importantly, the non-selective use of pesticides causes destruction of natural enemy fauna which may invite serious consequences for the pest population dynamics like resurgence and eruption of secondary pests (Gallo *et al*., 2002) [4]. A number of new molecules are on the scene, which always have a higher stability and superiority over conventional pesticides in controlling insect pests in a classical manner at field level. But it is necessary to adopt the molecules having high toxicity even at lower doses and also safer to the natural enemies present in the agro eco-system (Chaudhary and Dadeech, 1989) [3]. Coccinellids popularly known as lady bird beetles are the most important group of natural enemies. About 90 per cent of the approximately 4200 coccinellid species are considered beneficial because of their predatory activity, mainly against Homopterous insects and mites. Although, many studies have been conducted on this aspect (Nair *et al*., 2008; Rajavel *et al*., 2011; Sharma *et al*., 2017; Narayan *et al*., 2019) [12, 14, 17, 13] but there is a need to review the efficacy of different insecticides continuously for their comparative effectiveness, specificity and safety to the non-target organism. Hence, the present study was undertaken to assess the effect of newer insecticides on population of coccinellids in okra while using against *Earias* spp.

Material and methods

The present study was conducted at Research Farm of CCS Haryana Agricultural University, Hisar during *kharif* 2019 and 2020. The experiment was conducted in randomized block design in plot size of 5 × 4 m. Okra variety "*Hisar Naveen*" was sown during both the seasons at spacing of 60 × 30 cm. All agronomic practices were followed as per the package of practices, CCS Haryana Agricultural University, Hisar (Anonymous, 2020) [2], except insecticidal application. For the management of okra shoot and fruit borers, *Earias* spp., three foliar applications of various insecticides were done in okra crop at 15 days interval. To assess the effect of these insecticides on natural enemies, population of coccinellids was recorded a day before and at 1, 3, 7 and 14 days after each spray from five randomly selected and tagged plants in each plot during both the seasons. For this, each of the five plants was thoroughly examined to detect the presence of coccinellids. The statistical software OPSTAT (http://14.139.232.166/opstat/index.asp), developed by CCS, Haryana Agricultural University, Hisar (Haryana), India was used for statistical analysis of data (Sheoran, 2010) [18].

Results and Discussion

Effect of insecticides on population of coccinellids *Kharif* 2019

Population of coccinellids during *kharif* 2019 was very low. The pre-treatment count of coccinellids was in the range of 1.67 to 2.33 coccinellids per five plants and did not differ significantly among the treatments including untreated check (Table 1). After first spray, the mean number of coccinellids per five plants in treatments involving pyridalyl (2.17), emamectin benzoate (2.00) and chlorantraniliprole (1.92) was on a par with that in untreated check (2.67). Contrarily, in cypermethrin, quinalphos and lambda-cyhalothrin treated plots, it was (0.92, 1.17 and 1.25, respectively) significantly lower than that in untreated check and on a par with each other. Similar trend was observed after second spray and application of pyridalyl, chlorantraniliprole and emamectin benzoate caused no significant reduction in population as resulted in 4.33, 4.25 and 4.17 coccinellids per five plants, respectively, on a par with that in untreated check (4.58). On the other hand, treatments involving cypermethrin, quinalphos and lambda-cyhalothrin resulting in mean population (1.67, 2.33 and 2.50 coccinellids/5 plants, respectively) significantly lower than untreated check appeared to be harmful to coccinellids and were on a par with each other. After third spray also, mean number of coccinellids per five plants in treatments involving emamectin benzoate (2.58), chlorantraniliprole (2.33) and pyridalyl (2.33) was on a par with that in untreated check (2.92). However, in treatments involving cypermethrin (0.92), lambda-cyhalothrin (1.33) and quinalphos (1.33), it was significantly lower when compared to untreated check. Overall mean population of coccinellids in treatments involving pyridalyl, emamectin benzoate and chlorantraniliprole (2.94, 2.92 and 2.83 coccinellids/5 plants, respectively) was also on a par with that in untreated check (3.39 coccinellids) indicating their safety to the coccinellids. In contrast to this, cypermethrin, quinalphos and lambda-cyhalothrin treated plots resulting in mean population (1.17, 1.61 and 1.69 coccinellids/5 plants, respectively) significantly lower than that in untreated check appeared to be harmful and were on a par with each other.

Kharif 2020

During *kharif* 2020 also, population of coccinellids was low, however, higher than that recorded during previous season. The population recorded before initiation of spray did not differ significantly among the treatments and varied from 3.33 to 4.33 coccinellids per five plants (Table 1). After first spray, mean number of coccinellids per five plants in chlorantraniliprole and emamectin benzoate treated plots was (3.50 and 3.33, respectively) on a par with that in untreated check (4.25). However, in pyridalyl treated plots, it was (3.00) although significantly lower than untreated check but higher than that in cypermethrin (1.25), lambda-cyhalothrin (1.75) and quinalphos (1.75). Mean of the data recorded after second spray showed that treatments involving emamectin benzoate, chlorantraniliprole and pyridalyl registered coccinellids population (3.75, 3.67 and 3.08 coccinellids/5 plants, respectively) on a par with that in untreated check (4.25). Conversely, mean population in cypermethrin, lambda-cyhalothrin and quinalphos treated plots (1.58, 2.00 and 2.08 coccinellids/5 plants, respectively) significantly lower than that in untreated check and on a par with each other. After third spray also, mean number of coccinellids (per five plants) in treatments involving chlorantraniliprole (3.33), emamectin benzoate (3.33) and pyridalyl (3.25) was on a par with that in untreated check (3.42). On the other hand, in cypermethrin, quinalphos and lambda-cyhalothrin treated plots, it was (1.08, 1.42 and 1.50, respectively) significantly lower than that in untreated check and on a par with each other.

During *kharif* 2020 also, similar trend was observed and treatments involving chlorantraniliprole, emamectin benzoate and pyridalyl did not cause any significant adverse effect on coccinellids as registered overall mean population (3.50, 3.47 and 3.11 coccinellids/5 plants, respectively) on a par with that in untreated check (3.97). However, treatment involving cypermethrin resulting in 1.31 coccinellids per five plants, and lambda-cyhalothrin and quinalphos 1.75 coccinellids per five plants each suppressed the population significantly when compared to untreated check.

Pooled

On the basis of pooled mean of the data, it could be seen that application of emamectin benzoate and chlorantraniliprole was relatively safe as resulted in mean population (3.19 and 3.17 coccinellids/5 plants, respectively) on a par with that in untreated check (3.68). Treatment involving pyridalyl although registered mean population (3.03 coccinellids/5 plants) significantly lower than untreated check but on a par with the former treatments and higher than rest of the treatments. On the other hand, application of cypermethrin, quinalphos and lambda-cyhalothrin resulting in mean population (1.24, 1.68 and 1.72 coccinellids/5 plants, respectively) significantly lower than untreated check appeared to be harmful to coccinellids and were on a par with each other. Data on per cent reduction in coccinellids population over untreated check also indicated that application of emamectin benzoate, chlorantraniliprole and pyridalyl caused minor reduction of 13.32, 13.86 and 17.66 per cent, respectively. Contrarily, application of cypermethrin suppressed the population of coccinellids highly *i.e.*, by 66.30 per cent followed by quinalphos (54.35%) and lambda-cyhalothrin (53.26%).

The results are supported by the earlier findings (Mandal *et al.*, 2011; Rajavel *et al.*, 2011) [9, 14] that chlorantraniliprole did not cause any significant reduction in the predatory fauna in brinjal. Similarly, Govindan *et al*. (2013) [6] also reported that emamectin benzoate did not cause any significant reduction in coccinellids population in cotton. The results are also in line with Isayama *et al*. (2005) [8] and Nair *et al.* (2008) [12] who reported that pyridalyl was very safe to natural enemies. Moreover, Sharma *et al.* (2017) [17] reported that pyridalyl was least toxic to coccinellids as compared to chlorantraniliprole and emamectin benzoate which is in contradiction to the findings of the present study. The present findings are further supported by Sabry and Sayed (2011) [16] who reported that lambda-cyhalothrin and cypermethrin were toxic to green lacewing (*Chrysoperla carnea*). Similarly, Narayan *et al*. (2019) [13] reported that lambda-cyhalothrin 5 SC was slightly toxic and Gogoi *et al.* (2013) [15] suggested that quinalphos 25 EC was more toxic to the parasitoids.

Table 1: Effect of insecticides on population of coccinellids in okra

Treatment	Dose (g a.i. per ha)	Mean population of coccinellids/5 plants											Reduction over control (%)
		Kharif 2019					*Kharif* 2020					Pooled mean	
		BS	1st spray	2nd spray	3rd spray	Mean	BS	1st spray	2nd spray	3rd spray	Mean		
Chlorantraniliprole 18.5 SC	25	2.00 (1.72)*	1.92 (1.70)	4.25 (2.29)	2.33 (1.82)	2.83 (1.96)	4.00 (2.24)	3.50 (2.12)	3.67 (2.15)	3.33 (2.08)	3.50 (2.12)	3.17 (2.04)	13.86
Emamectin benzoate 5 SG	6.75	2.33 (1.81)	2.00 (1.73)	4.17 (2.27)	2.58 (1.89)	2.92 (1.98)	3.33 (2.07)	3.33 (2.08)	3.75 (2.17)	3.33 (2.07)	3.47 (2.11)	3.19 (2.05)	13.32
Lambda cyhalothrin 5 EC	15	2.00 (1.72)	1.25 (1.50)	2.50 (1.86)	1.33 (1.52)	1.69 (1.64)	3.33 (2.08)	1.75 (1.65)	2.00 (1.73)	1.50 (1.58)	1.75 (1.66)	1.72 (1.65)	53.26
Pyridalyl 10 EC	50	1.67 (1.61)	2.17 (1.77)	4.33 (2.31)	2.33 (1.82)	2.94 (1.98)	4.33 (2.31)	3.00 (2.00)	3.08 (2.02)	3.25 (2.06)	3.11 (2.03)	3.03 (2.01)	17.66
Cypermethrin 25 EC	37	2.33 (1.79)	0.92 (1.38)	1.67 (1.63)	0.92 (1.38)	1.17 (1.47)	3.33 (2.08)	1.25 (1.50)	1.58 (1.61)	1.08 (1.43)	1.31 (1.51)	1.24 (1.50)	66.30
Quinalphos 25 EC	200	2.00 (1.72)	1.17 (1.47)	2.33 (1.82)	1.33 (1.52)	1.61 (1.61)	3.33 (2.07)	1.75 (1.65)	2.08 (1.76)	1.42 (1.55)	1.75 (1.66)	1.68 (1.64)	54.35
Untreated check		2.00 (1.73)	2.67 (1.91)	4.58 (2.36)	2.92 (1.98)	3.39 (2.10)	4.00 (2.23)	4.25 (2.29)	4.25 (2.29)	3.42 (2.10)	3.97 (2.23)	3.68 (2.16)	
SE(m)±		0.16	0.08	0.07	0.09	0.05	0.12	0.08	0.10	0.12	0.08	0.05	
C.D. (p=0.05%)		NS	0.24	0.22	0.28	0.16	NS	0.26	0.30	0.37	0.24	0.14	

BS= Before spray; *Figures in parentheses are square root transformed values

Conclusion

It can be inferred that chlorantaniliprole 18.5 SC and emamectin benzoate 5 SG applied at the rate of 25 and 6.75 g a.i. ha^{-1}, respectively were relatively safe to coccinellids. Following to this, pyridalyl 10 EC applied at the rate of 50 g a.i. ha^{-1} was found next safer molecule over lambda cyhalothrin 5 EC, cypermethrin 25 EC, and quinalphos 25 EC which caused significant reduction in population of coccinellids when applied at the rate of 15, 37 and 200 g a.i. ha^{-1}, respectively.

References

1. Anonymous. Okra: area under cultivation. Ministry of Agriculture and Farmers Welfare, Government of India; c2022. https://www.indiastat.com.
2. Anonymous. Package of practices for flower, fruit and vegetable crop production and preservation. Second Edition. Directorate of Extension Education, CCS Haryana Agricultural University, Hisar, India; c2020.
3. Chaudhary HR, Dadeech LN. Incidence of insect attacking okra and losses caused by them. Annals of Arid Zone. 1989;2(3/4):305-07.
4. Gallo D, Nakano O, Silveira-Neto S, Carvalho RPL, Baptista GC, Berti-Filho E, *et al*. Manual de Entomologia Agrrcola. Piracicaba, Fealq; c2002. p. 649.
5. Gogoi P, Bora DK, Bhattacharjee B, Borah RK. Effect of plant extract and insecticides on immature stages of *Trichogramma chilonis.* Annals of Plant Protection Science. 2013;21(1):27-29.
6. Govindan K, Gunasekaran K, Kuttalam S. Emamectin Benzoate 5 SG: A safer insecticide to coccinellids predators in cotton ecosystem. African Journal of Agricultural Research. 2013;8(21):2455-60.
7. Ignacimuthu S. Insect Pest Management Meeting Report. Current Science. 2007;92:1336-37.
8. Isayama S, Saito S, Kuroda K, Umeda K, Kasamatsu K. Pyridalyla novel insecticide: potency and insecticidal selectivity. Archives of Insect Biochemistry and Physiology. 2005;58(4):226-33.
9. Mandal SK, Karam N, Das A. Bio-efficacy of rynaxypyr 20% SC (chlorantraniliprole) a new molecule against eggplant shoot and fruit borer. Acta Horticulturae. 2011;917(7):63-68.
10. Mani MA, Krishnamoorthy, Gopalakrishnan C. Biological control of lepidopterous pests of Horticultural crops in India. Annual Review of Agricultural Research**.** 2005;26(1):39-49.
11. Misra HP, Dash DD, Mahapatra D. Efficacy of some insecticides against okra fruit borer *Earias* spp. and leafroller *Sylepta derogata* (Fab). Annals of Plant Protection Sciences. 2002;10(1):51-54.
12. Nair N, Sekh K, Somchoudhury AK, Dhar PP. Bioefficacy of pyridalyl 10 EC against the bollworms of cotton and its effect on natural enemies in West Bengal condition. Journal of Entomological Research. 2008;32(4):313-15.
13. Narayan HA, Zanwar PR, Shubhash AS. Bioefficacy of newer insecticides against natural enemies of insect-pest on brinjal (*Solanum melongena* L). Journal of Pharmacognosy and Phytochemistry. 2019;8(5):1144-47.
14. Rajavel DS, Mohanraj A, Bharathi K. Efficacy of chlorantraniliprole (Coragen 20 SC) against brinjal shoot and fruit borer *Leucinodes orbonalis* (Guen). Pest Management in Horticultural Ecosystem. 2011;17(1):28-

31.
15. Rao NS, Rajendran R. Joint action potential of neem with other plant extracts against the leaf hopper *Amrasca devastan* (Distant) on okra. Pest Management and Economic Zoology. 2002;10:131-136.
16. Sabry KH, Sayed AA. Biosafety of a biopesticide and some pesticides used on cotton crop against green lacewing *Chrysoperla carnea* (Stehens) (Neuroptera: Chrysopidae). Journal of Biopesticides. 2011;4(2):214-18.
17. Sharma P, Kumawat KC, Khinchi SK, Kumar V, Prasad B. Toxic effect of different insecticides on coccinellid beetle *Coccinella septempunctata* in cabbage ecosystem. International Journal of Chemical Studies. 2017;5(3):894-96.
18. Sheoran OP. Online statistical analysis (OPSTAT) software (http://wwwhauernetin/opstathtml) developed by Chaudhary Charan Singh Haryana Agricultural University Hisar India; c2010.