SHORT COMMUNICATION

Comparative Efficacy of Bio-Rational and Chemical Insecticides for Management of Shoot and Fruit Borer [*Earias vittella* (*Abelmoschus esculentus*)] on Okra

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Abstract

A field experiment on the efficacy of certain bio-rationals and chemical insecticides for management of shoot and fruit borer [*Earias vittella* (Fabricius)] on okra conducted at Sam Higgin bottom University of Agriculture Technology and Sciences, Prayagraj, Uttar Pradesh, India during *Kharif* season. Total seven treatments like Neemoil @ 3%, NSKE (5%), *Beauveria bassiana*, *Bacillus thuringiensis*, Chlorpyriphos 20 EC, Cypermetrin 10 EC, Dimethoate 30 EC, were evaluated against shoot and fruit borer, *Earias vittella*.. The data recorded in present studies were subjected to statical analysis by RBD. Results revealed that among the treatments minimum per cent shoot infestation, per cent fruit infestation and B:C ratio were observed in Chlorpyriphos with (5.77%, 4.82% and 1:2.67) respectively, which is followed by Cypermethrin (7.79%, 7.51% and 1:2.63), Dimethoate (9.36%, 7.99% and 1:2.49), Neem oil (10.40%, 10.42%,1:2.45), NSKE (11.63%, 10.53%, and 1:2.38), *Beauveria bassiana* (12.68%, 10.78% and 1:2.21), *Bacillus thuringiensis* (13.65%, 13.54% and 1:2.09). untreated control (water spray) (16.27%, 20.90% and 1:1.64) respectively. Insecticides Dosesw were as per CIB recommendation.

Keywords: Efficacy, Chemical insecticides, Neem oil and infestation.

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Introduction

Okra (*Abelmoschus esculentus* (L) (Moench) is one of the most important vegetable belonging to the family Malvaceae. Though it is mainly used as a fresh vegetable, it is also consumed as canned, dehydrated or frozen forms. It is having a potential exports accounting for 60 percent of fresh vegetable (Sharman and Arora, 1993). One of the major constraints in the okra production is insect pests. The crop is attacked by several insect pests since seedling to maturity. Out of 56 insect species attacking the crop, the shoot and fruit borer appeared to be the most serious inflicting 45-57.1% damage to fruits (Srinivasan and Krishnakumar, 1983). It is reported that okra is infested severely by many pests during warm and rainy season such as leaf hopper and shoot and fruit borer (Gandhale *et al.,* 1987; Clement and David 1989; Madan *et al.,* 1996).

Indiscriminate and injudicious uses of conventional insecticides for management of these insect pests have been causing different environmental hazards including resurgence, resistance and residue problem in food stuff. Therefore, the present experiment was conducted to evaluate some bio pesticides along with chemical insecticides for an effective integrated management of shoot and fruit borer in okra. Okra plants are attacked by twenty insect pests during different growth stages. The problem of pests in okra is more or less similar to that of cotton crops. The major insect pests of okra are shoot and fruit borer and sucking pests. In the later stages, the crop is severely attacked by shoot and fruit borer, *Earias vittella* (Fabricius) and *E. insulana* (Boisd). Larvae bore into growing shoot of okra plant to fruit formation resulting in withering and drying of growing shoot on availability of fruits, larvae start feeding on them and thus cause direct loss of yield in marketable fruits. The losses in okra due to fruit borer (*E. vittella*) were 49-74 per cent, reported by Krishnaiah (1980), and the losses in the yield of okra by fruit borer were 69 per cent (Rawat and Sahu, 1975).

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Okra and its pests' complex forms "okra ecosystem" which also includes natural enemies living on these pests. The predatory insects like ladybird beetle, spider and aphid lion or green lacewing feeds on aphid and other soft bodied insects, it helps to control pests which feed on okra. Pest control in okra by small-scale farmers is still heavily dependent on chemical insecticides even though their use is associated with many undesirables and sometimes lethal consequences. Improper and wide-spread use of chemical insecticides can cause under-ground and surface water pollution. Excessive use of insecticides also induces resistance development in target pests as well as killing beneficial organisms such as pollinators (especially bees) and natural enemies (insect parasitoids and predators) (Pedigo and Rice, 2006). In the present studies, the new molecules with less harmful to natural enemies and pollinators were used in view to minimize the fruit infestation caused by fruit borers on okra.

Materials and Methods

The experiment was conducted during *Kharif* season 2016 at the Central Field of "Sam Higgin bottom University of Agriculture, Technology and Sciences" Prayagraj, Uttar Pradesh, India, in a randomized block design with eight treatments, using variety AHB-118 in a plot size of (2m x 1m) at a spacing of (45x30cm) with recommended package of practices excluding plant protection. Three insecticidal sprays were administrated at 20 days interval starting from 35 days after sowing. The insecticide treatments include Neemoil@3%, NSKE (5%), *Beauveria bassiana, Bacillus thuringiensis*, Chlorpyriphos20EC, Cypermethrin10EC @2 mL/L, Dimethoate 30 EC @ 2 mL/L along with untreated control. The spraying was done after the population reaching its ETL (2.67-4.94%). The incidence of the borer on the shoot and the fruit were recorded from the five randomly selected plants. Observations were recorded one day before spray, 7th, 14th days after spraying. The assessment of the shoot damage was done by calculating the number of damaged shoots and total number of the healthy shoots observed from five randomly selected plants per plot and expressed in percentage. Okra fruits were harvested at weekly intervals. The total yield of the marketable fruits obtained from different treatments was calculated and converted by considering the additional cost (cost of insecticides and operational charges) and benefit (compared to untreated control) in the respective treatments.

Results and Discussion

The result on efficacy of insecticides on shoot and fruit borer infestation of okra as well as healthy marketable fruit yield with cost benefit ratio has been presented. The result revealed that (Table 1 to 4) all the treatments proved significantly effective in controlling the shoot and fruit borer infestation over untreated plot as evidence from data collected on its

Table 1: Efficacy of synthetic insecticides and biopesticides on shoot and fruit borer (*E. vitella*) in okra (*A. esculentus* Moench) (First Spray)

Treatments		*Before*	*7 DAS*	*14 DAS*	*Mean*
T_0	Control	13.20	14.38	18.16	16.27
T_1	Neem oil	15.12	10.18	11.24	10.40
T_2	NSKE	15.14	11.15	12.11	11.63
T_3	*BeauveriaBassiana*	16.21	12.20	13.15	12.68
T_4	*Bacillus Thurilgensis*	15.15	13.16	14.13	13.65
T_5	Chlorpyriphos	17.15	5.09	6.44	5.77
T_6	Cypermethrin	16.16	7.13	8.44	7.79
T_7	Dimethoate	16.22	9.57	9.15	9.36
Overall Mean		15.54	10.36	11.60	10.94
F- test		NS	S	S	S
S. Ed. (±)		1.395	0.682	1.432	0.928
C. D. (P = 0.05)		2.957	1.445	3.037	1.968

Table 2: Efficacy of synthetic insecticides and biopesticides on shoot and fruit borer (*E. vitella*) in okra (*A. esculentus* Moench) (Second Spray)

Treatments		*Before*	*7 DAS*	*14 DAS*	*Mean*
T_0	Control	17.25	18.18	19.32	18.75
T_1	Neem oil	14.12	12.16	13.15	12.69
T_2	NSKE	17.16	12.18	13.60	12.89
T_3	*B. bassiana*	15.33	12.22	14.52	13.35
T_4	*B. Thurilgensis*	18.18	13.13	15.63	14.38
T_5	Chlorpyriphos	14.20	5.33	6.20	5.77
T_6	Cypermethrin	18.11	8.17	10.15	9.24
T_7	Dimethoate	18.22	10.19	10.3	10.17
Overall Mean		16.57	11.45	12.86	12.15
F- test		NS	S	S	S
S. Ed. (±)		4.007	0.601	1.055	0.614
C. D. (p = 0.05)		8.494	1.274	2.236	1.301

Table 3: Efficacy of synthetic insecticides and biopesticides on shoot and fruit borer (*E. vitella*) in okra (*A. esculentus* Moench) (Third Spray)

Treatments		*Before*	*7 DAS*	*14 DAS*	*Mean*
T_0	Control	22	22	24.1	23.05
T_1	Neem oil	13	7.1	8.23	7.66
T_2	NSKE	15.2	7.2	9.18	8.19
T_3	*B. bassiana*	14.3	8.21	9.19	8.7
T_4	*B. Thurilgensis*	16.1	12.16	13.24	12.7
T_5	Chlorpyriphos	11.25	3.56	4.19	3.88
T_6	Cypermethrin	14.13	5.35	6.18	5.76
T_7	Dimethoate	15.16	5.45	6.23	5.84
Overall Mean		15.14	8.88	10.07	9.47
F- test		NS	S	S	S
S. Ed. (±)		3.285	0.601	1.471	0.552
C. D. (p = 0.05)		6.963	1.274	3.118	1.170

Table 4: Efficacy of synthetic insecticides and biopesticides on shoot and fruit borer (*E. vitella*) in okra (*A. esculentus* Moench) (II &III Spray pooled mean)

Treatments		*II^{nd} spray*	*III^{rd} spray*	*Overall mean*
T_0	Control	18.75	23.05	20.90
T_1	Neem oil	12.69	8.15	10.42
T_2	NSKE	12.88	8.19	10.53
T_3	*B. bassiana*	13.35	8.22	10.78
T_4	*B. Thurilgensis*	14.38	12.70	13.54
T_5	Chlorpyriphos	5.77	3.88	4.82
T_6	Cypermethrin	9.24	5.79	7.51
T_7	Dimethoate	10.17	5.82	7.99
Overall Mean		12.15	9.48	10.81
F- test		S	S	S
S. Ed. (±)		0.61	0.55	2.61
C. D. (p = 0.05)		1.30	1.17	5.53

Table 5: Economics of cultivation

Treatments		*Yield q/ha*	*Cost of yield Rs/q*	*Total cost of yield in Rs*	*Common cost in Rs*	*Treatment cost in Rs*	*Total cost in Rs*	*C:B ratio*
T_1	Neem oil	80.55	1500	120825	47878	1430	49308	1:2.45
T_2	NSKE	78.45	1500	117675	47878	1425	49303	1:2.38
T_3	*B. Bassiana*	73.30	1500	109950	47878	1785	49663	1:2.21
T_4	*B. Thurilgensis*	69.50	1500	104250	47878	1830	49708	1:2.09
T_5	Chlorpyriphos	88.10	1500	132150	47878	1470	49348	1:2.67
T_6	Cypermethrin	86.30	1500	129450	47878	1330	49208	1:2.63
T_7	Dimethoate	83.65	1500	125475	47878	2475	50353	1:2.49
T_0	Control	52.44	1500	78660	47878	------	47878	1:1.64

incidence both on shoot and fruits. Among the treatments, lowest percent infestation of shoot and fruit borer was recorded in Chlorpyriphos (4.82 %) followed by Cypermethrin (7.51%), which are at par with each other followed by the treatments Dimethoate (7.99%) which are also at par with each other, followed by next effective treatment Neem oil (10.42%). Treatments NSKE (10.53%), *B. bassiana* (10.78%), *B. thuringiensis* (13.54%) are least effective among all the treatments and are at par with each other. Chlorpyriphos was found very effective in reducing per cent shoot infestation, per cent fruit infestation. Same trend was observed by, Vishveshwar Dhadkar and Kumar, A. (2015) who reported that application of Chlorpyriphos reduced shoot and fruit borer damage. Cypermethrin the next best treatment is also reported to reduce the percent shoot and fruit infestation remarkably as that of the cypermethrin which is supported by (Sarkar *et al.,* 2015) and (Jat and Ameta 2013). The result (Table 5) pertaining to yield data and subsequent economic analysis revealed that the maximum marketable yield (88.10 q/ha) of healthy okra fruits and maximum profit (1:2.67) was obtained from plot treated with Chlorpyriphos. Similar results were found by Vishveshwar Dhadkar and Kumar, A. (2015) finding application of Chlorpyriphos for the management of okra shoot and fruit borer, *E. vittella* recorded higher yield than other chemicals, followed by Cypermethrin which also reported a profitable yield of 86.30 q/ha these findings are supported by (Singh *et al.,* 2006).

Conclusion

It was concluded that among the treatments, lowest percent infestation of shoot and fruit borer was recorded in Chlorpyriphos (4.82 %) followed by Cypermethrin (7.51%), which are at par with each other followed by the treatments Dimethoate (7.99%) which are also at par with each other, followed by next effective treatment Neem oil (10.42%). Treatments NSKE (10.53%), *B. bassiana* (10.78%), *B. thuringiensis* (13.54%) are least effective among all the treatments and are at par with each other. The recommendations of insecticides are as per CIB report. They reported that Chlorpyriphos was found most effective in reducing the population of *E. vitella* as well as in increasing yield.

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