Uttar Pradesh Journal of Zoology

Volume 45, Issue 17, Page 701-706, 2024; Article no.UPJOZ.4022
ISSN: 0256-971X (P)

Management of Okra Shoot and Fruit Borer *Earias vitella* (Fab.) by Different Insecticides on Okra

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: https://doi.org/10.56557/upjoz/2024/v45i174415

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://prh.mbimph.com/review-history/4022

Original Research Article

Received: 27/06/2024
Accepted: 29/08/2024
Published: 02/09/2024

ABSTRACT

The okra shoot and fruit borer (*Earias vittella*) is a significant pest affecting okra crops. It bores into the shoots and fruits, causing stunted growth and reduced yield. To combat this pest the present study was conducted during Kharif, 2023 at Rainfed Agriculture Research Farm, Department of

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Cite as: *Yadav, Anil Kumar, A.K. Choudhary, B.Gangwar, Pradeep Kumar, Ajay Kumar Yadav, Mahendra Yadav, Jitendra Harsoliya, and Kamal Yadav. 2024. "Management of Okra Shoot and Fruit Borer Earias Vitella (Fab.) by Different Insecticides on Okra". UTTAR PRADESH JOURNAL OF ZOOLOGY 45 (17):701-6. https://doi.org/10.56557/upjoz/2024/v45i174415.*

Entomology, Bundelkhand University Jhansi. The investigation was carried out to evaluate the efficacy of different insecticides against okra shoot and fruit borer *Earias vitella* (Fab.), Nine insecticides including control (untreated) were sprayed three times on the okra crop resulted all treatments were significantly effective over control. Among all treatments emamectin benzoate 5% SG was found best effective to control the shoot and fruit infestation caused by *E. vitella* in all three sprays followed by fluebendiaminde 480% EC and spinosad 45% SC. Among all treatments maximum C:B ratio was obtained from the emamectin benzoate 5% SG (147.56 qt/hac and 1:1.57) followed by spinosad 45% SC (1:1.46), indoxacarb 14.5% SC (1:1.37).

Keywords: Earias vitella (Fab.); emamectin benzoate; idoxacarb; fluebendiaminde; spinosad.

1. INTRODUCTION

Okra (*Abelmoschus esculentus* (L.) Moench) is known in many English-speaking countries as lady's fingers, bhindi in India.This warm-weather vegetable is particularly slimy in texture, but for others, this finger-shaped pod is versatile and delicious *Abelmoschus esculentus* is cultivated throughout the tropical and warm temperate regions of the world for its fibrous fruits or pods containing round, white seeds [1]. Okra is good for health and the mucilage of okra has great medicinal properties antioxidant, ant-diabetic, antitumor, antimicrobial, and antiulcer capacities, and it also has the properties to control the cholesterol in the human body and is good for the liver [2]. Okra fruit is a good source of minerals, protein, fiber, folate, calcium, phosphorous, and magnesium along with vitamins A, B, C and K_1 [3]. This crop is severely damaged by more than 30 pests at different stages of plant growth [4]. The incidence of insect pests is one of the prime factors in the production of okra. The crop is attacked by several insect pests among which shoot and fruit borer, *Earias vittella* (Fabricius) and *Earias Insulana* are the most serious as they take the upper hand by causing direct damage to tender fruits. 88 to 100 percent damage to fruits by fruit borer [5]. Shoot and fruit borer, *Earias vitella* (Fab.), (Noctuidae: Lepidoptera) is the most noxious and destructive pest. Initially caterpillar gain entry into the growing shoot tip then bud, flower and developing fruits and feed there. Consequently, there is dropping and drying of growing tips. The infested shoot die, the buds, flowers, and fruits drop prematurely and affected fruits become unfit for human consumption, fetching less price in the market [6].

2. METHODS AND MATERIALS

The present investigation to find a suitable management strategy for the okra fruit and shoot borer by chemical insecticides was carried out during the *Kharif*2023 at Rainfed Agriculture Research Farm, Department of Entomology, Bundelkhand University, Jhansi. The experiment was conducted with nine treatments *viz*. Spinosad 45%SC, Azadiractine1500PPM, Fluebendiaminde 480%EC, Lamda cyhalothrin5%EC, Emamectin benzoate 5%SG, Idoxacarb 14.5%SC, Profenophos 50%EC, Acephate75%SP and control (untreated) in three replication under randomized block design. The okra verity Sonali-90 was sowed in the month of July with a spacing of 60×45 cm. The treatments were sprayed when the infestation of borer reached at ETL level, a total of three sprays of treatments were applied in the cropping period [7-10].

Observation: The observations were taken before and after the spray, the first data was collected before and after spray for shoot infestation and the second and third data were collected for fruit infestation. The data were collected at 3 days, 7days and14 days after the application of treatments and compared with the data collected before spray to evaluate how much reduction of infestation was found in individual treatment. The data of yield was collected in individual plots to know how much yield enhancement and reduction were found in different treated plots of the experimental field by compared with the control (untreated) plot [11,12].

3. RESULTS AND DISCUSSION

Efficacy of treatments: The data collected before the first application of the insecticide observed there have 13-15 percent of the shoot were infested by the okra shoot and fruit borer and after the application of the treatments the minimum shoot infestation was observed under the emamectin benzoate 5%SG treated plot which was at par with fluebendiaminde 480%EC and spinosad 45%SC, these were performed more efficiently than other insecticides. Moreover, all insecticide

treatments were found significantly effective over control to manage shoot infestation in okra crops. The data collected before the second spray where the mean fruit infestation ranged from 15-17 percent per plant and after the application of spray the minimum fruit infestation was recorded under emamectin benzoate 5%SG followed by fluebendiaminde 480% EC spinosad 45% SC. Among all insecticides these were most effective followed next idoxacarb 14.5%SC, lamda cyhalothrin 5%EC, acephate 75%SP and profenophos 50% EC, where the azadiractine 1500PPM was the least effective treatments found along all [13-15].

After the third spray of treatments, the most effective insecticide that control the fruit infestation caused by the okra fruit and shoot borer was emamectin benzoate 5%SG as per fluebendiaminde 480% EC and spinosad 45%SC, remain all treatments were significantly effective over control but azadiractine 1500PPM was least effective to control the infestation caused by okra shoot and fruit borer in okra crop [16].

Fruit yield and cost-benefit ratio- The data of the yield reveled maximum fruit yield and C:B ratio was obtained from the emamectin benzoate 5%SG (147.56 qt/hac and 1:1.57) followed by spinosad 45%SC (1:1.46), indoxacarb 14.5% SC (1:1.37), lamda cyhalothrin 5%EC (1:1.34), and fluebendiaminde 480% EC (1:1.29) where all remain was obtained higher C:B ratio compared with control(Untreated) that recorded only 1:0.77 [17].

Table 1. Effect of treatment on the infestation of okra fruit and shoot borer on okra crop after first spray

T.no	Treatments	Doses	Mean shoot infestation (percentage)				Mean
			Before	3DAS	7DAS	14DAS	
T_1	Spinosad 45% SC	220 ml/hac	14.52	12.37	10.69	8.20	10.42
T_2	Azadiractine1500 PPM	500 ml/hac	14.21	13.86	12.15	9.37	11.79
T_3	Fluebendiaminde480% EC	125 ml/hac	13.21	11.96	10.68	8.03	10.22
T_4	Lamda cyhalothrin5%EC	625 ml/hac	13.04	11.73	11.59	9.29	10.87
T_5	Emamectin benzoate 5% SG	200 gram/hac	14.25	11.78	9.99	7.92	9.90
T_6	Idoxacarb 14.5% SC	500 ml/hac	13.58	12.67	11.02	8.31	10.67
T_7	Profenophos 50% EC	625 ml/hac	15.11	12.82	12.67	9.83	11.77
T_8	Acephate 75% SP	750 gram/hac	15.42	12.84	11.57	9.04	11.15
T_9	control	------	13.57	14.15	15.35	16.61	15.37
C.D.			1.641	1.038	0.817	0.604	1.945
SE(m)			0.543	0.343	0.270	0.200	0.643

Table 2. Effect of treatment on infestationof okra fruit and shoot borer on okra cropafter second spray

T.no	Treatments	Doses	Mean fruit infestation (percentage)				Mean
			Before	3DAS	7DAS	14DAS	
T_1	Spinosad 45% SC	220 ml/hac	15.25	14.57	13.44	10.98	13.00
T_2	Azadiractine 1500 PPM	500 ml/hac	16.40	15.60	14.62	12.16	14.13
T_3	Fluebendiaminde 480% EC	125 ml/hac	16.40	14.99	12.84	10.59	12.81
T_4	Lamda cyhalothrin 5%EC	625 ml/hac	16.89	15.41	13.86	11.16	13.48
T_5	Emamectin benzoate 5% SG	200 gram/hac	16.70	14.17	12.60	10.12	12.30
T_6	Idoxacarb 14.5% SC	500 ml/hac	17.32	15.02	13.20	10.93	13.05
T_7	Profenophos 50% EC	625 ml/hac	17.23	15.52	14.44	12.07	14.01
T_8	Acephate 75% SP	750 gram/hac	15.95	15.11	14.30	11.49	13.63
T_9	control	------	15.81	16.45	16.96	17.34	16.92
C.D.			N/A	N/A	0.938	0.857	1.454
SE(m)			0.729	0.483	0.310	0.283	0.481

Table 3. Effect of treatment on the infestationof okra fruit and shoot borer on okra cropafter third spray

T.no	Treatments	Doses	Mean fruit infestation (percentage)				Mean
			Before	3DAS	7DAS	14DAS	
T_1	Spinosad 45% SC	220 ml/hac	10.93	8.90	6.23	5.02	6.72
T_2	Azadiractine 1500 PPM	500 ml/hac	12.49	10.65	9.95	8.11	9.57
T_3	Fluebendiaminde 480% EC	125 ml/hac	10.59	8.45	6.08	4.65	6.39
T_4	Lamda cyhalothrin 5%EC	625 ml/hac	11.16	9.04	7.15	6.25	7.48
T_5	Emamectin benzoate 5% SG	200 gram/hac	10.12	8.11	5.81	4.05	5.99
T_6	Idoxacarb 14.5% SC	500 ml/hac	10.98	8.77	6.29	5.27	6.78
T_7	Profenophos 50% EC	625 ml/hac	12.07	10.07	8.48	7.03	8.53
T_8	Acephate 75% SP	750 gram/hac	11.68	10.01	7.66	6.61	8.09
T_9	control	------	17.34	18.00	18.60	20.02	18.88
C.D.			0.987	0.738	0.693	0.464	1.683
SE(m)			0.326	0.244	0.229	0.153	0.557

Table 4. Economics of cultivation and yields

T. no.	Treatments	Yield Qt/h	Cost of yield (Rs)	Common cost(Rs)	Rate of treatment	Treatment cost(Rs)	Total cost (Rs)	Net Income (Rs)	C:B ratio
T_1	Spinosad 45% SC	140.39	224624	88800	1250/liter	2625	91425	133199	1:1.46
T_2	Azadiractine 1500 PPM	118.75	190000	88800	500/liter	3800	92600	97400	1:1.05
T_3	Fluebendiaminde 480% EC	144.74	231584	88800	28000/liter	12300	101100	130484	1:1.29
T_4	Lamda cyhalothrin 5%EC	133.89	214224	88800	600/liter	2925	91725	122499	1:1.34
T_5	Emamectin benzoate 5% SG	147.56	236096	88800	2400/kg	3240	92040	144056	1:1.57
T_6	Idoxacarb 14.5% SC	137.47	219952	88800	1570/liter	4155	92955	126997	1:1.37
T_7	Profenophos 50% EC	122.68	196288	88800	700/liter	3112.5	91912.5	104376	1:1.14
T_8	Acephate 75% SP	125.24	200384	88800	500/kg	1912.5	90712.5	109672	1:1.21
T_9	control	98.47	157552	88800	1250/liter	0	88800	68752	1:0.77

Crop value -1600/quintal (in rupees)
Labour charge- 300/labour (in rupees)

4. CONCLUSION

The present investigation find that among all chemical treatments, Emamectin benzoate 5% SG was found best effective to control infestation caused by okra shoot and fruit borer on shoot as well as on fruit infestation and it also gives a higher C:B ratio than other mean it was an economically suitable treatment for the farmer where Spinosad 45% SC and Fluebendiaminde 480% EC also found effective to control infestation caused by borer on okracrop.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

ACKNOWLEDGEMENT

The author would like to thank our advisor and co-advisor for his support in the experiment and kind patronage whenever required and grateful to university for providing a laboratory and field to conduct that field experiment.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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SVS. Bioefficacy of newer and bio-rational insecticides against shoot and fruit borer, *Earias* spp. on Okra. International Journal of Current Microbiology and Applied Sciences. 2017; 6(7):1035-1044.

Peer-review history:
The peer review history for this paper can be accessed here:
https://prh.mbimph.com/review-history/4022