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Effect of Selected Insecticides against *Earias vittella* (Fabricius) on Okra *Abelmoschus esculentus* L.

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Authors' contributions

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

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ABSTRACT

At the Sam Higginbottom University of Agriculture, Technology and Sciences in Prayagraj, Uttar Pradesh, India, a field experiment took place out at the Central Research Farm (CRF). Using a variant of Kasturi, the experiment was set up using a Randomized Block Design (RBD) with eight treatments that were each replicated three times. The treatments *viz.,* Lambdacyhalothrin 2.5% EC@0.5-1ml/lit, Spinosad 45%SC @0.3-0.4ml/lit Flubendiamide 480SC @0.3ml/lit, Chlorantraniliprole18.5%SC 0.5ml/lit, Imidacloprid17.8%SL@ 1ml 2.5l, Emamectin benzoate 5%SG@5 g/land Neem oil@ 20 ml/l and along with untreated control were used against fruit and shoot borer (*Earias vittella*) infesting okra. All treatments have been shown to be significantly

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superior to control when analyzing the data on the larval population of the fruit and shoot borer of okra after the first and second spray. Among all the treatments Chlorantraniliprole 18.5%SC showed lowest larval population 10.21 and 9.98 by Spinosad 45% SC(11.45,12.29%), Emamectinbenzoate 5% SG(13.86,14.11%), Imidacloprid 17.8% SL(16.94,15.87%) Lambdacyhalothrin 2.5% EC(17.83,16.03%) Flubendamide 480SC (19.25and19.40%) Neemoil 20ml/l (20.35 and18.75%) Control 5% (24.84 and 25.98%). The highest yield and cost benefit ratio was recorded in Chlorantraniliprole 18.5% SC(153q/ha,1:6.54) followed by Spinosad 45% SC(150q/ha,1;6.01) Emamectinbenzoate 5% SG(125q/1;5.54), Imidacloprid 17.8% SL(117q/ha,1:5.28) Lambdacyhalothrin 2.5% EC(105q/ha1:4.83), Flubendamide 480 SC(79q/ha, 1:3.56 and Neemoil 20ml/l (7 0 q / h a ,1:3.03).

Keywords: Okra; insecticides; Earias vittella; yield; cost benefit ratio.

1. INTRODUCTION

Okra, or Abelmoschus esculentus (L.) Moench, is an annual vegetable that belongs to the family Malvaceae. It is also referred to by a variety of names around the world, including ladies' finger, bhindi, bamia, okro, and gumbo. Okra is referred to as the "Queen of Vegetables." The soft green fruits of okra are highly prized. It can be prepared in a multitude of ways and is a component of many different recipes. Additionally, reports of its medical usefulness include the treatment of ulcers and hemorrhoids. According to Kaveri and Kumar [1].

With 6371 million tons produced globally, India is the world's largest producer. Other notable producers include Nigeria (1837 million tons) and Mali (659 million tons). Gujarat is the state that generates the most in India (1019.42 thousand tons). West Bengal comes in second with 893.96 thousand tons, followed by Bihar (794.10 thousand tons) and Uttar Pradesh (349.32 tons). Organization for Food and Agriculture, 2021).

Earias vittella, the Okra shoot and fruit borer (OSFB), is the most deadly insect that directly damages delicate shoots and fruits. Marketable manufacturing is said to have decreased by roughly 69% as a result of this insect pest's onslaught. Fruit borer damage amounts to approximately 22.5% in Uttar Pradesh, 25.93 to 40.91% in Madhya Pradesh, and 45% in Karnataka. This results in reduced nutritional content and unfitness for human consumption. As per Patil et al. [2].

1.1 Justification

Insect pests have become resistant to frequent application of systemic insecticides, affecting the agro-ecosystem by damaging non-target plants. Furthermore, there are some earlier studies on the environmentally safer and intense use of biopesticides and other botanicals in the sustainable management of insect pests on the okra ecosystem through integrated pest management (IPM) techniques. significant progress in reducing the harm done by insect pests, cutting back on the use of pesticides, and restoring the natural balance of the environment. In consideration of the aforementioned, a study titled "Effects of selected insecticides (*Earias vittella* Fab.) on okra (*Abelmoschus esculentus* L.)" has been conducted, which could potentially sustain the crop pest at a level below the economic threshold (E.T.L). Therefore, this study will be conducted to evaluate the efficacy of both.

2. MATERIALS AND METHODS

Randomized Block Design with eight treatments replicated three times using variety Kasturi seeds in a plot size of 2m × 1m at a spacing of 45cm × 30cm with a recommended package of practices excluding plant protection, the present investigation took place out at the experimental research plot of the Department of Entomology, Central Research Farm, Sam Higginbottom University of Agriculture Technoogy and Sciences, Prayagraj, during the kharif season of 2023. The experimental site's soil was medium high and well-drained. The treatments Chlorantraniliprole 18.5%SC@0.5 ml/l, Imidacloprid 17.8%SL@ 1ml 2.5lit, Emamectin benzoate 5%SG@ 5 g/lit and Neem oil@ 20 ml/lit along with untreated control were used against fruit and shoot borer (*Earias vittella*) infesting okra.

In each plot, the total amount of insects on select plants was counted, and the number of insects per five plants was recorded. Then, for each treatment, the mean of three replications was determined; the untreated plot underwent the same technique. Five randomly selected plants from each plot were used to record the shoot fruit damage caused by the borer, and each treatment's total number of shoots and fruits as well as the affected ones were noted. The percentage of shoot/fruit damage was determined based on these observations, which were made one day before, three, seven, and fourteen days after each spray. Following each plucking, the contaminated and healthy fruits were separately weighed and tallied. A statistical analysis was carried out on the combined infestation data. The average amount of fruit harvested per plot

$$B:C\ Ratio = \frac{Gross\ return(t/ha)}{Total\ cost\ of\ cultivation}$$

3. RESULTS AND DISCUSSION

The results (Table 1) after 1st and 2nd spray revealed that all the treatments were significantly superior over the control.

Data on okra shoot infestation on days 3, 7, and 14 after the first spray showed that all of the pesticides performed control with an enormous amount.

Among all the treatments lowest percent infestation of shoot borer was recorded in Chlorantraniliprole 18.5%SC (10.21) followed by Spinosad 45% SC (11.45), Emamectin benzoate 5%SG (13.86), Imidaclopride17.8%SL (16.94) and Lambda cyhalothrin 2.5% EC(17.83) The treatments Flubendamide 480 SC(19.25) and Neem oils (20.35) were least successful of all the treatments, but far better than the untreated plot T0 (24.84).

Data on okra fruit infestation on the third, seventh, and fourteenth day after spraying showed that all pesticides exceeded control by a substantial amount. Among the treatments lowest percent infestation of fruit borer was recorded in Chlorantraniliprole 18.5%SC (9.98) followed by Spinosad 45%SC (12.29), Emamectin benzoate 5%SG (14.11), Imidaclopride17.8%SL (15.87) and Lambda cyhalothrin2.5%EC (16.03). In this regarded Flubendamide480 SC (17.04) and Neem oils (18.75), were found to be least effective than all the treatments and is significantly superior over the untreated plot T0 (25.98).

The highest yield and cost benefit ratio were recorded in Chlorantraniliprole 18.5%SC 153q/ha and (1:6.54) followed by Spinosad 45%SC(150q/ha)and (1:6.01), Emamectin benzoate 5%SG (125q/ha) and (1:5.54), Imidacloprid 17.8%SL (117q/ha) and (1:5.28), Lambda cyhalothrin 2.5%EC (105q/ha) and (1:4.83) Flubendamide480SC (79q/ha) and 1:3.56, Neemoil20ml/lit (70q/ha) and 1:3.03. Control 5% recorded (30q/ha0and 1:1.41.

The most effective treatment for the okra shoot and fruit borer infestation was found to be chlorantraniliprole 18.5%SC. The first and second sprays produced results of 10.21 and 9.98%, respectively. These results were similar to Chandran et al [3] and Reddy et al., (2019). Spinosad 45% SC (11.45), (12.29) were also found to be very effective in minimizing the infestation of shoot and fruit borer. These results are similar to Kaveri and Kumar (2022) and Rajput and Tayde [4]. The efficacy of Emamectin benzoate 5% SG on shoot and fruit borer in first and second spray were 13.86 %and 14.11%, respectively. These results are as per the findings of Manikanta and Kumar [5] and Dash et al. [6].

The crop yield was highest in Chlorantraniliprole 18.5%SC (153q/ha) and Spinosad 45%SC (150q/ha) followed by Emamectin benzoate 5%SG (125q/ha), Imidacloprid 17.8%SL (117q/ha) Lambda cyhalothrin 2.5%EC (105q/ha), Flubendamide 480SC (79q/ha), Neemoil 20ml/lit (70q/ha). control5%recorded (30q/ha).

Maximum cost benefit ratio (1:6.54) was obtained in Chlorantraniliprole, which was supported by Chandran et al [3] who reported that the Chlorantraniliprole 18.5%SC recorded the high yield. The cost benefit ratio of Spinosad was 1;6.01and these results were to the similar findings of Janu and Kumar [7]. Emamectin benzoate, also, had a profitable yield of 125q/ha and cost benefit ratio was 1;5.54 accordingly to Dash et al., [6]. Next superior treatment were observed that Imidaclopride with the cost benefit ratio (1:5.28) which was similar to Manikanta and Kumar [5]. The cost benefit ratio obtained in the treatment Lambdacyhalothrin(1:4.83) was supported by Pachole et al., (2017). At last, the cost benefit ratio of Flubendamide (1:3.56) and Neem oil (1:1.41), which were supported by Patil *et al*., (2021) [8-12].

Table 1. Effects of insecticides against fruit and shoot borer *Earias vittella* (Fabricius) of okra

Treatments		Percentage of fruit and shoot damage									Yield q/ha	C: B Ratio
		1^{ST} Spray (fruit infestation)					2^{ND} Spray (shoot damage)					
		1 DBS	**3 DAS**	**7 DAS**	**14 DAS**	**Mean**	**3 DAS**	**7 DAS**	**14 DAS**	**Mean**		
T0	Untreated	20.54	23.00^{a}	25.38^{a}	26.15 ^{a}	24.84^{a}	24.76^{a}	25.35^{a}	27.66^{a}	25.98^{a}	30.00	1:1.41
T1	Lambda cyhalothrin2.5%EC	20.56	18.13^{d}	17.62^{bc}	17.76 ^{cd}	17.83^{cd}	17.27^{c}	14.95^{cd}	15.89^{c}	16.03^{c}	105.0	1:4.83
T2	Spinosad 45%SC	16.31	12.16^{f}	10.47^{de}	11.73 ^{ef}	11.45^{f}	12.93^{e}	11.44^{ef}	12.50^{e}	12.29^{e}	150.0	1:6.01
T3	Emamactin benzoate 5%SG	17.19	15.39^{e}	12.92^{d}	13.27 ^{e}	13.86^{e}	14.83^{d}	13.49^{de}	14.10^{d}	14.11^{d}	125.0	1:5.54
T4	Chlorantraniliprole18.5%SC	16.02	11.0^{f}	9.32^{e}	10.31 ^{f}	10.21^{f}	10.93^{f}	9.01^{ef}	10.00^{f}	9.98^{f}	153.0	1:6.54
T5	Imidacloprid17.80%SL	19.48	17.50^{d}	16.44^{c}	16.88^{d}	16.94^{d}	16.67^{c}	14.26^{cd}	16.70^{c}	15.87^{c}	117.0	1:5.28
T6	Flubendamide480SC	20.24	19.74^{c}	18.63^{bc}	19.40^{bc}	19.25^{bc}	18.42^{bc}	16.47^{bc}	16.23^{c}	17.04^{c}	79.0	1:3.56
T7	Neem oil 20ml L^{-1}	18.21	21.21^{b}	19.32^{b}	20.54^{b}	20.35^{b}	19.43^{b}	17.97^{b}	18.87^{b}	18.75^{b}	70.0	1:3.03
F – test		**NS**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**-**	**-**
C.D. (0.05%)		-----	1.36	2.79	1.92	1.53	1.82	2.78	1.26	1.41	**-**	**-**
S.Ed (±)		06.05	01.36	02.79	01.92	01.53	01.82	02.78	01.26	01.41	**-**	**-**

DBS -Day Before Spraying, DAS-Day After Spraying, NS=Non Significant, S= Significant

4. CONCLUSION

Insect pests have become resistant to frequent application of systemic insecticides, affecting the agro-ecosystem by damaging non-target plants. Furthermore, there are some earlier studies on the environmentally safer and intense use of biopesticides and other botanicals in the sustainable management of insect pests on the okra ecosystem through integrated pest management (IPM) techniques.

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.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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