

“Comparative efficacy of selected chemicals and neem oil against okra shoot and fruit borer [*Earias vittella* (Fabricius)] on okra.”

Abstract :

The field investigation was carried out in *Kharif* season of 2022 at Central Research Farm (CRF), Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh, India. The experiment was laid in Randomized Block Design with eight treatments each replicated thrice *viz.*, Emamectin benzoate 5% SG (5 g/lit), Lambda cyhalothrin 2.5% EC (0.5-1 ml/lit), Flubendiamide 480 SC (0.3 ml/lit), Imidacloprid 17.8% SL (1 ml/2.5 lit), Chlorantraniliprole 18.5% SC (0.5 ml/lit), Neem oil @2% (20 ml/lit), Spinosad 45% SC (0.3-0.4 ml/lit), and control plot. The result revealed that among all the treatments lowest percent shoot infestation and fruit infestation of okra shoot and fruit borer was recorded in Chlorantraniliprole 18.5% SC (13.90 %), (13.11 %) at both sprayers followed by Spinosad 45% SC (15.89 %), (14.25 %), Emamectin benzoate 5% SG (16.59 %), (15.02 %), Flubendiamide 480 SC (17.27 %), (15.30 %), Imidacloprid 17.8% SL (17.44 %), (16.63 %), Lambda cyhalothrin 2.5% EC (19.09 %), (16.97 %), Neem oil @2 % (19.21 %), (17.23 %) and Control (30.87 %), (25.44 %). The highest yield and cost benefit ratio was recorded in Chlorantraniliprole 18.5% SC (158.33 q/ha), (1:6.1) followed by Spinosad 45% SC (153.33 q/ha), (1:5.4), Emamectin benzoate 5% SG (133.33 q/ha), (1:5.3), Flubendiamide 480 SC (116.66 q/ha), (1:4.7), Imidacloprid 17.8% SL (105 q/ha), (1:4.2), Lambda cyhalothrin 2.5% EC (83.33 q/ha), (1:3.3), Neem oil @2 % (70 q/ha), (1:2.8) and Control plot (33.33 q/ha), (1:1.3).

Key words: Okra, Chemicals, Cost benefit ratio, *Earias vittella*, Insecticides.

INTRODUCTION

Okra or Lady's finger, *Abelmoschus esculentus* (L.) Monech is an annual vegetable belonging to malvaceae family; it originated from Africa and grown worldwide in summer as well as rainy season. It is commercially cultivated in India, Turkey, Iran, Western Africa, Yugoslavia, Bangladesh, Afghanistan, Burma, Japan, Malaysia, Brazil, Ghana, Ethiopia and

the Southern United States. The fruits are harvested when immature and eaten as a vegetable. Okra fruit can be cooked in a variety of ways. The roots and stems of okra are used for cleaning the cane juice from which jaggery or brown sugar is prepared. (Chauhan, 1972).

Globally India ranks first in okra production 5794.0 thousand tons (72% of total world production) having an area of 564.0 thousand hectares with an annual production of 6371 thousand million tones and productivity of 12.9 million tons/ha. The crop is grown throughout India, Andhra Pradesh is the leading okra producing state which has production of around 884.2 thousand tons from an area of 78.90 thousand ha, with a productivity of 15 tons/ha. It is followed by west Bengal (862.1 thousand tonnes from 74.00 thousand with 11.70 tons/ha productivity). In Uttar Pradesh area, production and productivity of okra is 48.6 thousand ha, 176.26 thousand tones, 8 tons/ha respectively. (NHB 2020-21).

20 different insect species are known to attack okra which inflict qualitative and quantitative production losses of the crop. Among them fruit and shoot borer act as major constraint in achieving potential yield and recording up to 69% reduction in yield of crop (Rawat and Sahu, 1975).

It alone is reported to cause 57.1 per cent fruit infestation and 54.04 per cent net yield loss in okra *Earias vittella* damage to okra crop is done in two ways. First, the terminal portion of growing shoots is bored by caterpillars, which move down by making tunnels inside. As a result, the shoots drop downward or dry up. Second, the larvae enter the fruit by making holes, rendering them unfit for human consumption. According to an estimate this pest can cause 36-90% loss in fruit yield of okra (Misra 2002)

According to (Srinivasan and Gowder 1960) the OSFB causes up to 40-50% damage of okra fruit in some areas of South East Asian countries. Krishnaiah (1980) observed the attack of fruit borer to the extent of 35% in harvestable fruit of okra.

Materials and Methods:

The experiment was conducted during *kharif* season 2022 at Central Research Farm (CRF), SHUATS, Prayagraj, Uttar Pradesh, India, in a Randomized Block Design with eight treatments replicated three times using variety *kasturi* in a plot size of (2m×1m) at a

spacing of (45×30cm) with a recommended package of practices excluding plant protection. The soil of the experimental site is well drained and medium high. Research field is situated at an Altitude of 98 meters above sea level at 25.27° North Latitude and 80.50° E Longitudes. The treatments used in experiment are *viz.*, Emamectin benzoate 5% SG (5 g/lit), Lambda cyhalothrin 2.5% EC (0.5-1 ml/lit), Flubendiamide 480 SC (0.3 ml/lit), Imidacloprid 17.8% SL (1 ml/2.5 lit), Chlorantraniliprole 18.5% SC (0.5 ml/lit), Neem oil @2% (20 ml/lit), Spinosad 45% SC (0.3-0.4 ml/lit) and Control.

Five plants were randomly selected from each plot and tagged. The total number of infested shoots and total number of shoots were recorded one day before application and 3rd, 7th and 14th days after application in each treatment. The results thus obtained were converted into per cent shoot infestation with the following formula. Similar observation was taken for fruit infestation with the following formula (**Manikanta and Kumar, 2022**)

$$\% \text{ Shoot infestation} = \frac{\text{Number of infested shoots}}{\text{Number of total shoots}} \times 100$$

$$\% \text{ Fruit infestation} = \frac{\text{Number of infested fruits}}{\text{Number of total fruits}} \times 100$$

Ultimately, the cost benefit ratio was calculated on the basis of prevailing market price of okra, insecticides and spraying cost.

$$\text{B: C Ratio} = \frac{\text{Gross return}}{\text{Total cost of cultivation}}$$

Result and Discussion:

The results (Table: 1) after 1st and 2nd spray revealed that all the treatments were significantly superior over the control in managing the pest infestation of *Earias vittella* in okra. The data on the percent infestation of *E. vittella* in okra after first spray revealed that the overall mean of 3rd, 7th and 14th lowest per cent shoot infestation was recorded in Chlorantraniliprole 18.5% SC (13.90 %) followed by Spinosad 45% SC (15.89 %), Emamectin benzoate 5% SG (16.59 %), Flubendiamide 480 SC (17.27 %), Imidacloprid 17.8% SL (17.44 %), Lambda cyhalothrin 2.5% EC (19.09 %) and Neem oil @2% (19.21 %). The treatment Chlorantraniliprole 18.5% SC (13.90 %) was most effective among all the treatments and is significantly superior over the control plot (30.87 %) infestation.

Among all the treatments the overall mean of 3rd, 7th and 14th lowest per cent fruit infestation after second spray was recorded in Chlorantraniliprole 18.5% SC (13.11 %) followed by Spinosad 45% SC (14.25 %), Emamectin benzoate 5% SG (15.02 %), Flubendiamide 480 SC (15.30 %), Imidacloprid 17.8% SL (16.63 %), Lambda cyhalothrin 2.5% EC (16.97 %) and Neem oil @2% (17.23 %). The treatment Chlorantraniliprole 18.5% SC (13.11 %) was most effective among all the treatments and significantly superior over the control plot (25.44 %) infestation.

The crop yield and cost benefit ratio ranged between (33.33 q/ha to 158.33 q/ha), (1:6.1 to 1:1.3) the highest being in Chlorantraniliprole 18.5% SC (158.33 q/ha), (1:6.1) followed by Spinosad 45% SC (153.33 q/ha), (1:5.4), Emamectin benzoate 5% SG (133.33 q/ha), (1:5.3), Flubendiamide 480 SC (116.66 q/ha), (1:4.7), Imidacloprid 17.8% SL (105 q/ha), (1:4.2), Lambda cyhalothrin 2.5% EC (83.33 q/ha), (1:3.3), Neem oil @2% (70 q/ha), (1:2.8) and Control plot (33.33 q/ha), (1:1.3).

The observations obtained in the first and second spray in Chlorantraniliprole were (13.90 %) and (13.11 %). These results are supported by **Chandran *et al.*, (2020)**, **Naidu and Kumar (2019)** and **Reddy *et al.*, (2019)**. Spinosad 45% SC was also found to be very effective in reducing the infestation of shoot and fruit borer(15.89 %), (14.25 %). The same results were observed by **Chandar *et al.*, (2020)** and **Kaveri and Kumar (2020)**. Emamectin benzoate 5% SG on shoot and fruit borer in first and second spray were (16.59 %) and (15.02 %) respectively. These results are as per the findings of **Manikanta and Kumar (2022)** and **Javed *et al.*, (2018)**. Yield data was recorded on the basis of healthy fruits at each picking. The cost benefit ratio was calculated on the basis of prevailing market price of okra, insecticides and spraying cost.

The cost benefit ratio ranged between (1:6.1) and (1:1.3). Maximum cost benefit ratio and yield (1:6.1), (158.33 q/ha) was obtained in chlorantraniliprole which is supported by **Chandran *et al.*, (2020)** and **Reddy *et al.*, (2019)**. The cost benefit ratio and yield of Spinosad was (1:5.4), (153.33q/ha) and the results were similar to the findings of **Chandar *et al.*, (2020)** and **Kaveri and Kumar (2020)**. Emamectin benzoate also had a profitable yield of (133.33 q/ha) and cost benefit ratio (1:5.3) according to **Javed *et al.*, (2018)** and **Manikanta and Kumar (2022)**.

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Table: 1 Efficacy of selected chemicals and neem oil against okra shoot and fruit borer [*Earias vittella* (Fabricius)] on okra.

S.No	Treatments	Doses	Percent shoot and fruit infestation of <i>Earias vittella</i>										Yield	C:B ratio
			First spray (Shoot infestation)					Second spray (Fruit infestation)						
			1DBS	3 DAS	7 DAS	14 DAS	Mean	1DBS	3 DAS	7 DAS	14 DAS	Mean		
T ₀	Control	—	27.40	29.31 ^c	30.71 ^{cd}	32.60 ^{bc}	30.87 ^c	22.52 ^{bc}	23.61 ^{de}	25.50 ^c	27.22 ^{cd}	25.44 ^{ef}	33.33	1:1.3
T ₁	Emamectin benzoate 5% SG	5 g/lit	23.08	17.49 ^a	15.14 ^a	17.14 ^a	16.59 ^a	18.31 ^a	16.13 ^a	13.63 ^a	15.32 ^a	15.02 ^a	133.33	1:5.3
T ₂	Lambda cyhalothrin 2.5% EC	0.5-1 ml/lit	25.52	20.63 ^{bc}	17.86 ^{bcd}	18.79 ^{bc}	19.09 ^c	20.64 ^{bc}	18.40 ^{cde}	15.44 ^{bc}	17.07 ^{bcd}	16.97 ^{de}	83.33	1:3.3
T ₃	Flubendiamide 480 SC	0.3 ml/lit	24.47	18.17 ^b	15.88 ^b	17.77 ^b	17.27 ^b	18.58 ^{abc}	16.50 ^{bc}	14.02 ^b	15.38 ^{bc}	15.30 ^{bc}	116.66	1:4.7
T ₄	Imidacloprid 17.8% SL	1 ml/2.5 lit	25.38	18.37 ^{bc}	16.13 ^{bcd}	17.83 ^b	17.44 ^c	20.52 ^{bc}	18.29 ^{bcd}	15.18 ^{bc}	16.43 ^{bcd}	16.63 ^{cd} _e	105	1:4.2
T ₅	Chlorantraniliprole 18.5% SC	0.5 ml/lit	19.40	14.84 ^{bc}	13.03 ^{bc}	13.83 ^b	13.90 ^c	17.78 ^{abc}	14.14 ^{bc}	11.86 ^b	13.34 ^{bc}	13.11 ^{bc} _d	158.33	1:6.1
T ₆	Neem oil @2%	20 ml/lit	27.00	20.76 ^c	17.96 ^d	18.91 ^c	19.21 ^d	20.78 ^c	18.51 ^e	15.46 ^c	17.74 ^d	17.23 ^f	70.00	1:2.8
T ₇	Spinosad 45% SC	0.3-0.4 ml/lit	21.04	16.94 ^b	14.73 ^b	16.02 ^b	15.89 ^b	18.00 ^{ab}	15.01 ^b	12.95 ^b	14.81 ^b	14.25 ^b	153.33	1:5.4
	F- test		NS	S	S	S	S	S	S	S	S	S		
	CD.at 0.05%		—	3.63	3.10	3.83	2.93	2.29	2.29	2.15	2.62	2.11		
	S. Ed. (±)		—	1.69	1.44	1.78	1.62	1.37	1.06	1.006	1.22	1.17		

DBS- Day Before Spraying, DAS- Day After Spraying.

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