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Economic Analysis of Different Modules for the Management of Shoot and Fruit Borer (*Earias vittella* F.) of Okra

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ABSTRACT: The present investigation was studied in *Zaid* season 2022 at student's instructional farm, A.N.D. University of agriculture and Technology, Kumarganj, Ayodhya (U.P.). Intercropping of coriander with okra (1:1) was found maximum yield (41.80 q/ha), while the least (23.28 q/ha) was obtained in maize intercropped with okra (1:1). The maximum cost: benefit of 1:11.56 was obtained from Spinosad 45 SC 75 g a.i/ha treated plots. As results current study carried out the economic analysis of pest management modules.

Keywords: *Earias vittella*, okra, pest management, fruit yield, economic.

INTRODUCTION

In India, okra (*Abelmoschus esculentus*), also referred to as lady's finger, is a widely grown vegetable. It is a perennial member of the Malvaceae family. In addition to India, it is grown in many other tropical and subtropical regions of the world. Tender fruits are used in cooking as vegetables or as chopped, dry fragments. It is additionally employed to thicken gravies and soups due to its high mucilage content. The stems and roots of okra are used to clean cane juice. It is a significant vegetable crop that is widely farmed in India, primarily for its immature fruits. India leads the world in both area and production, with Nigeria coming in second. Okra production in the globe is dominated by India, which accounts for 72% of the total. Okra is grown on a total of 0.51 million hectares in India, where 6.00 million tonnes of green fruits were produced in 2016–17 at a productivity of 11.0 metric tonnes per hectare. Gujarat, Bihar, and West Bengal are the three states that produce the most okra in India (Anonymous, 2017).

There are 130 species of Earias spp. that have been recognised so far around the world. Many crops, especially those in the Malvaceae family, are attacked (Ali and Karim 1990; Gautam and Goswami 2004). According to Ambekar *et al*. (2000), two species of in India, *Earias vittella* and *Earias insulana* attack the shoot and fruit of okra. In other countries, *Earias vittella* has been reported as a major okra pest. *Earias cupreoviridis* W, *Earias fabia* S, and *Earias insulana* (B) are three *Earias* species found in Bangladesh, according to Alam (1962). They eat the fruits of okra and cotton, as well as other Malvaceous plants. *E. fabia*'s name has been changed to *E. vittella*.

According to Atwal (1976), *E. vitteila* is a serious pest of cotton and okra. It is extremely prevalent in several countries, including Pakistan, India, and North Africa. Okra was found to be the most favoured host for the growth of the pest, followed by cotton, artificial diet, and mesta (*Hibiscus* sp.), according to Satpute *et al*. (2002) investigation of numerous *E. vittella* hosts.

The production of okra is constrained by a number of biotic and abiotic factors. Fruit and shoot borer (*Earias vittella*), Jassid (*Amrasca biguttula biguttula* Ishida), Fruit borer (*Helicoverpa armigera* Hub.), whitefly (*Bemisia tabaci* Gennadius), aphid (*Aphis gossypii* Glover), semilooper (*Anomis flava* F.), red cotton bug (*Dysdercus cingulatus*), blister beetle (*Mylabris pustulata* Thumb), Fruit and shoot borer, Jassid, and whitefly are some of the most common insect pests. Usually, these insects cause a 40% loss. *Earias vittella*, a dangerous insect that seriously harms agriculture, is known as the spotted boll worm. According to reports, the marketable production was reduced by 54.04 percent as a result of the onslaught of this insect pest. Kumar *et al*. (2014).

Currently, pesticides are being utilised extensively to control okra pests. Okra is an expensive food for those with little resources to grow since pesticides are used in the crop. Pesticide misuse and residues pose serious health risks to farmers, consumers, and the environment.

MATERIALS AND METHODS

The present investigation entitles "Economic analysis of different modules for the management of shoot and fruit borer (*Earias vittella* F.) of okra" were conducted during *Zaid* season 2022 at student's instructional farm,

A.N.D. University of agriculture and Technology, Kumarganj, Ayodhya (U.P.).

A. Experimental location

Geographical location of experiment site fall subtropical climatic zone of Indo-Gangetic plains and situated at 26.47°N latitude and 82.12°E longitude at an altitude of 113 meters from mean sea level. The region receiving mean rainfall about 1200mm, about 80 per cent of total rainfall is received from mid June to end of September and periods is known as monsoon months. The winter months are very cold, whereas summer months are hot and dry. Westerly hot winds start from end of April and continue till the onset of monsoon.

The location is situated almost in the center of Indo-Gangetic belt, having 5091sq. km area which forms distinct subdivision of India. The nearest sea is the way of Bengal, which is at a more than 800km distinct from the site. The soil type of area is sandy to loam textured, alkaline type, typical to Gangetic plain.

B. Experimental layout

It was laid out in randomized block design (RBD). okra was raised and with intercrops viz. marigold, coriander, sunflower and maize, at the ratio of 1:1 (main and intercrop) each. After germination, the seedling were thinned out to have a spacing of 60 cm × 30 cm, the marigold transplanting was also done. The plot size 4 m × 3 m. the variety was super anamika of okra while Shweta, Bharat-709 and Caribe-1 were the varieties of maize, sunflower and coriander.

C. Procurement of seed for experiment

Seeds of okra variety Super Anamika were selected against okra shoot and fruit borer is collected from local market. Okra sole crop was raised and with intercrop viz. maize, coriander, marigold, sunflower, at the ratio of 1:1 (main and intercrop) each. The variety of Super Anamika for okra while Shweta, Bharat-709, Caribe-1 were the varieties of maize, sunflower and coriander.

D. Fruit yield

The fruit yield was taken on individual plot basis in kg/plot, which was converted into q/ha for making comparison between treatments to see the effectiveness of treatments against shoot and fruit borer.

E. Cost: Benefit ratio

The cost: benefit ratio of the experiment was worked out by using the following formula:

$$C:B\ ratio = \frac{Value\ of\ saved\ yield\ over\ control\ (Rs/ha)}{Total\ cost\ of\ protection\ (Rs/ha)}$$

RESULTS AND DISCUSSION

A. Effect of intercropping, insecticides & botanicals on the yield of okra

The effectiveness of treatments determined on the basis of fruit yield of okra in different treatments during *Zaid* 2022 is presented in (Table 1). The data of fruit yield of okra obtained at the harvesting time showed that all the treatments were found significantly superior over the control. The intercropping with okra as main component differed in productively as per seasons (Table 1). Consistently, intercropping of coriander with okra (1:1) was found maximum yield (41.80 q/ha), while the least (23.28 q/ha) was obtained in maize intercropped with okra (1:1).

Table 1: Yield of okra under different treatments during *Zaid*, 2022.

Sr. No.	Treatments	Dosage		Healthy yield q/ha				
			R_1	R_2	R_3	Total	Inter crop	Mean
1.	Okra+ Marigold	-	31.95	25.39	32.24	89.58	108.00	29.86
2.	Okra+Sunflower	-	24.96	21.54	25.16	71.66	37.98	23.88
3.	Okra+Coriander	-	32.85	45.24	47.32	125.41	2.76	41.80
4.	Okra+Maize	-	27.01	19.85	23.00	69.86	41.6	23.28
5.	Abamectin 1.8 EC	15ga.i./ha	55.29	61.45	58.36	175.10		58.36
6.	NSKE	5 %	54.8	56.56	58.34	169.70		56.56
7.	Spinosad45 SC	75 ga.i./ha	81.73	75.41	73.96	231.10		77.03
8.	Control (waterspray)		10.01	7.41	9.68	27.10		9.03
	SEm±	-	-	-	-	-		2.37
	CD	-	-	-	-	-		7.18

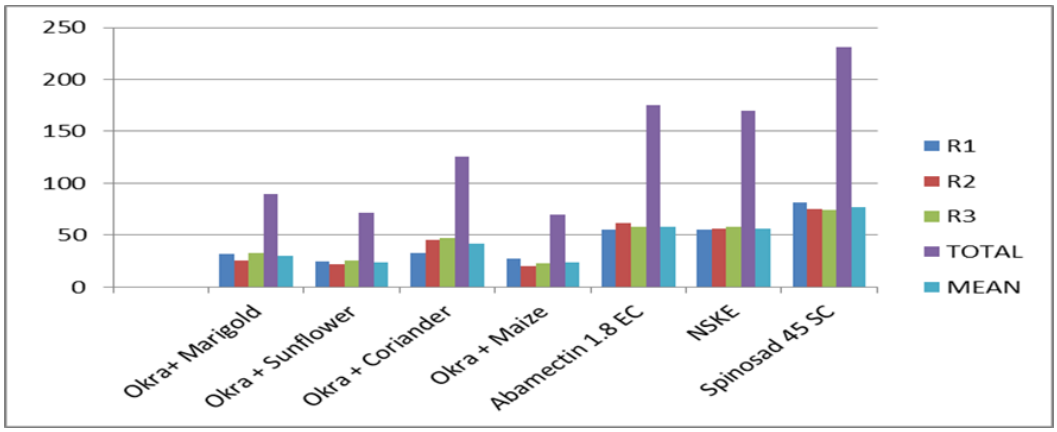

Fig. 1. Yield of okra under different treatments during *Zaid* season, 2022.

Among the insecticides Spinosad 45 SC@ 75g a.i/ha treated plots gave maximum fruit yield (77.03 q/ha) followed by Abamectin 1.8 EC @ 15g a.i/ha with (58.36 q/ha) yield. The fruit yield in okra in NSKE 5% obtained were (56.56 q/ha). Present study corroborates with the findings of Kumar and Singh (2021); Saha *et al*. (2016); Singh *et al*. (2005).

B. Economics and Cost: Benefit ratio of treatments

The economics of treatments were determined to find out the cost effective the term of cost-benefit ratio in table 3.2. The maximum Cost : Benefit was obtained in plot treated with Spinosad 45 SC 75g a.i/ha (1:11.56) followed by Abamectin 1.8 EC 15g a.i/ha (1:3.99). The cost: benefit and net income of other treatment NSKE 5% (1:3.99). The cost: benefit of treatments were varying due to the different cost of treatments, application charges and monitary gain on plot wise yield.

All the treatments were found economical and cost effective on the basis of cost: benefit. Among these Spinosad 75g a.i/ha was found most effective followed by Abamectin 15g a.i/ha NSKE 5% and in controlling the shoot borer and fruit borer population and giving the maximum fruit yield and on the basis of cost effectiveness also.

Table 2: Economics and Cost: Benefit – ratio of treatments.

Sr. No.	Treatments	Concentration on (%) / Dose a.i/ha (g/lit/kg)	Quantity required (lit/kg/ha)	Total quantity of insecticides required (lit/kg/ha)	Cost of insecticides (Rs./lit/kg)	Total cost of insecticidal application (Rs./ha)	Yield (q/ha)	Saved yield over control (q/ha)	Value of saved yield (Rs./ha)	Net return (Rs./ha)	Cost-benefit ratios
T_5	Abamectin 1.8 EC	15 g a.i. /ha	0.833	1.667	3222.87	3922.87	58.10	31.00	31000	27077.13	6.90
T_6	NSKE	5 %	10	20	5000	5700	56.53	28.43	28430	22730.00	3.99
T_7	Spinosad 45 SC	75 g a.i./ha	0.167	3.34	3188.03	3888.03	75.95	48.85	48850	44961.97	11.56
T_8	Untreated check	-	-	-			27.10	27.10	27100	27100.00	

Rent of sprayer @ Rs. 100/day = Rs. 200/- ; Labour charge @ Rs. 300/day/labour = 600/- Cost of produce Rs. 1000/q

SUMMARY AND CONCLUSIONS

Spinosad 45 SC 75 g a.i/ha gave maximum fruit yield (77.03 q/ha) followed by Abamectin 1.8 EC 25 g a.i/ha with (58.36 q/ha). The maximum cost: benefit was obtained in plot treated Spinosad 45 SC 75 g a.i/ha with (1:11.56) followed by Abamectin 1.8 EC 25 g a.i/ha (1:6.90). By the experiment conducted, in order to derive effective control against okra shoot and fruit borer, we can recommend cultural practices like intercropping with marigold at 1:1 ratio and among chemical practices, spraying with Spinosad 45 SC@75g a.i/ha can be carried out as it is cost effective and also can effectively control the pest, with good yield ultimately.

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