

**EFFICACY OF INTERCROPPING, BOTANICALS AND  
INSECTICIDES AGAINST OKRA SHOOT AND FRUIT BORER  
(*Eariasvittella*F.) ON OKRA IN UTTAR PRADESH, INDIA**

**ABSTRACT**

This study assesses the effectiveness of intercrops, insecticides and botanicals against the okra shoot and fruit borer *Eariasvittella*. The okra + marigold (1:1) and okra + coriander (1:1) intercropping had the least shoot damage (4.35 percent, respectively), according to the data (4.70 per cent). Okra + maize (1:1) saw the most shoot damage (5.51%) when compared to monoculture (6.68 per cent). Spinosad 45 SC 75 g a.i./ha (2.49%) had the lowest rate of shoot damage among the insecticides, followed by Abamectin 1.8 EC 25 g a.i./ha (3.12%) and botanical NSKE 5 per cent, which found that the per cent shoot damage (3.25) compared to sole crop (okra) was higher (6.68 per cent). The data showed that the least fruit damage (9.25 percent, respectively) occurred in the intercropping of okra + marigold (1:1) and okra + coriander (1:1) (11.59 per cent) weight basis. The fruit damage in okra + maize (1:1) was highest (15.37%) compared to monoculture (18.08 per cent). Among the insecticides, Spinosad 45 SC 75 g a.i./ha (1.73%) had the lowest rate of shoot damage, followed by Abamectin 1.8 EC 25 g a.i./ha (2.02%) and botanical NSKE 5%, which discovered that the percentage of shoot damage (2.76) compared to lone crop (okra) was higher (18.08 per cent). The highest yield was observed when intercropping coriander and okra (1:1), whereas the lowest yield was recorded when intercropping maize and okra (23.28 q/ha) (1:1).

**Key words:** Okra, *Earias vittella*, shoot and fruit damage, marigold, coriander, maize, sunflower.

**INTRODUCTION**

“In India, okra (*Abelmoschus esculentus* L. Moench), often known 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. 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. India's top three okra producers are West Bengal, Gujarat, and Bihar” (Anonymous, 2017). According to

Srinivasan and Gowder (1959), “the pest in some parts of Southeast Asia, it causes 40-50 percent fruit destruction”.

“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). According to Ambekar *et al.*, (2000), “two species of in India, *Earias vittella* and *Earias insulana* attack the shoot and fruit of okra. They eat the fruits of okra and cotton, as well as other Malvaceous plants. *E. fabia*'s name has been changed to *E. vittella*”.

“The technique of simultaneously farming two or more crops on the same piece of land is referred to as intercropping or mixed cropping. Vegetables grown in fields with other crops reduce insect pest populations, reducing the need for non-environmentally friendly chemical treatments and supporting environmentally friendly production practices. Diverse environments would provide predators and parasitoids with a wider variety of habitats and prey over time, as well as alternative food sources like pollen and nectar, and maintain more stable populations of natural enemies than monocultures” (Van Emden, 1965). “Physical elements such as wind protection, shading, sheltering, dispersal prevention, colour change, and so on, or biological variables such as the presence of natural enemies, the creation of harmful chemical stimuli, and so on. Intercropping systems have the potential to influence pest population growth” (Theunissen, 1994). To aid in the development of okra; ecologically friendly insecticides are sprayed on the plants. Spinosad is one of the chemicals used to lower the occurrence and load of important insect pests. Vegetables are grown with the use of synthetic insecticides. Pests are attracted to trap crops that are intercropped. Distant from the main crop and provide outstanding service by establishing better niches for crops to thrive in more opportunities for crop growth are created. Biotic agents that control the population of pests (Ojha and Singh, Inter-planted crops attract less insect pests, according to a study published in 2003. compared to monocultures (Shelton and Perez, 2006).

## **MATERIALS AND METHODS**

The experiment was conducted during Zaid 2022 in the student instructional farm, ANDUAT kumarganj, Ayodhya (U.P.). 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 seedlings were thinned out to have a spacing of 60 cm × 30 cm, the marigold transplanting was also done. The plot size was 4 m × 3 m and the variety was Super Anamika of okra while Shweta, Bharat-709 and Caribe-1 were

the varieties of maize, sunflower and coriander, respectively. “All the cultural practices, recommended for the main crop were uniformly adopted with the seed rate being according to recommendation for particular crop. Starting from 30 days after sowing, data on the incidence of *Earias vittellawere* recorded. Shoot damage was counted randomly on 10 selected tagged plants in each replication at weekly interval and per centshoot damage was computed. Mature fruit along with damage fruits was picked at an interval of two to three days and per centdamage was computed after each picking. Healthy and infested fruits were sorted out and weighed separately to work out the damage on weight basis” [12].

The incidence of shoot and fruit borer was recorded on regular basis to know the ETL. Spray of insecticide was done when the shoot/fruit damage reached/crossed 5% in any one of treatments. Percent shoot and fruit infestation was worked out by using following formula.

$$\text{Percent shoot Infestation (\%)} = \frac{\text{Number of infested shoots}}{\text{Number of total shoots}} \times 100$$

$$\text{Percent fruit Infestation (\%)} = \frac{\text{Number of infested fruits}}{\text{Number of total fruits}} \times 100$$

## **RESULTS AND DISSCUSSION:**

The data on the shoot and fruit damage in okra under different intercrops presented in (Table 1) showedthat the shoot damage in all the crop combination started from 30 days after sowing DAS and continuedtill 60 DAS, while it attained its peak at 45 DAS. Among all the intercropsokra + marigold (1:1) intercropping showed the least damageof 2.86, 7.99 and 2.19% as against 4.57, 12.28 and 3.18 % in sole crop at 30, 45 and 60 DAS. On the contrary, intercropping of okra with maize (1:1) led to the highestdamage of 3.95, 10.01 and 2.58 % at 30, 45 and 60 DAS, respectively. Similarly, on cumulative mean basis also, the least damage (4.35%) was in okra + marigold (1:1) intercropping followed by okra + coriander (1:1) (4.70%).

The fruit damage varied remarkably among different crop combinations, the incidence started at 45 DAS and then increased continuously to it's a peak at 75 DAS, and then declined. The fruit infestation at 45, 60, 75 and 90 DAS ranged from 3.95 to 4.52, 9.66 to 16.64, 14.04 to 16.13 and 9.34 to 16.13%, respectively. However, on cumulative mean basis the least fruit damage (9.25%) was in okra + marigold (1:1) which was statistically atpar with

okra + coriander (1:1) of 11.59%, okra + sunflower (1:1) of 13.47%, okra + maize (1:1) of 15.37%.

The maximum fruit damage (15.37%) was recorded in okra + maize (1:1). Thus, okra intercropped with marigold (1:1) was the best combination, which was statistically atpar with okra + coriander (1:1), okra + sunflower (1:1) and okra + maize (1:1). These results agree with those of Abro *et al.* (2004) on *Earias* spp. in cotton that okra can be used as a trap crop. Mohansundaram *et al.* (2012) observed that intercropping of okra and cluster bean with Neembean and spinosad spray lead to the least fruit damage due to *E. vitella*. Sujayanand *et al.* (2016) observed that marigold intercropped with okra is the best followed by okra and coriander.

### **Conclusion:**

The shoot and fruit damage all treatments were non-significant before application of insecticides. During *Zaid 2022* per cent shoot damage of 2.86, 7.99 and 2.19 per cent was recorded in okra + marigold (1:1) which is significantly superior to other treatments followed by okra + coriander (1:1) 3.07, 8.70 and 2.34. The shoot and fruit damage all treatments were non-significant before application of insecticides. During *Zaid 2022* per cent shoot damage of 3.61 and 0.80 per cent was recorded in spinosad 45 SC 75 g a.i/ha per ha treated plot at 1st and 14th days after 1st spray which is significantly superior to other treatments followed by Abamection 1.8 EC 25 g a.i/ha (4.07 and 1.07).

During *Zaid 2022* the per cent fruit damage was recorded in intercropping, per cent shoot damage of 3.95, 9.66, 14.04 and 9.36 per cent was recorded in okra + marigold (1:1) which is significantly superior to other treatments followed by okra + coriander (1:1) 4.01, 12.16, 18.16 and 13.33. The shoot and fruit damage all treatments were non-significant before application of insecticides. During *Zaid 2022* per cent fruit damage of 3.01 and 0.73 per cent was recorded in spinosad 45 SC 75 g a.i/ha per ha treated plot at 1st and 14th days after 1st spray which is significantly superior to other treatments followed by Abamectin 1.8 EC 25 g a.i/ha (3.21, 1.08, 3.02 and 0.76) > NSKE 5% (4.01, 1.80, 3.80 and 1.42). 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).

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Table 1. : Effect of Intercropping and Insecticides and Botanicals on shoot and fruit damage by *Earias vittella* in okra during Zaid season 2022

Treatments	Mean percent damage caused by okra fruit borer**								
	Shoot damage (%)				Fruit damage (%) weight basis				
	30 DAS	45 DAS	60 DAS	Cumulative Mean	45 DAS	60 DAS	75 DAS	90 DAS	Cumulative mean
T <sub>1</sub> – Okra + Marigold (1:1)	2.86 (9.74)	7.99 (16.42)	2.19 (8.50)	4.35 (12.03)	3.95 (11.46)	9.66 (18.11)	14.04 (22.01)	9.36 (17.81)	9.25 (17.71)
T <sub>2</sub> – Okra + Sunflower (1:1)	3.46 (10.71)	9.27 (17.72)	2.45 (9.01)	5.06 (13.00)	4.13 (11.73)	14.00 (22.01)	21.67 (27.74)	14.02 (21.99)	13.46 (21.52)
T <sub>3</sub> – Okra + Coriander (1:1)	3.07 (10.09)	8.70 (17.15)	2.34 (8.81)	4.70 (12.53)	4.01 (11.57)	12.16 (20.41)	18.16 (25.22)	13.33 (21.45)	11.59 (19.90)
T <sub>4</sub> – Okra + Maize (1:1)	3.95 (11.46)	10.01 (18.45)	2.58 (9.24)	5.51 (13.58)	4.35 (12.04)	16.64 (24.08)	24.20 (29.47)	16.13 (23.68)	15.37 (23.08)
T <sub>5</sub> – Abamectin 15 g a.i/ha	4.07 (11.63)	1.07 (5.93)	4.22 (11.85)	3.12 (10.17)	3.21 (10.32)	1.08 (5.89)	3.02 (10.01)	0.76 (4.96)	2.02 (8.16)
T <sub>6</sub> – NSKE 5%	3.82 (11.27)	2.52 (9.14)	3.41 (10.64)	3.25 (10.39)	4.01 (11.55)	1.80 (7.71)	3.80 (11.24)	1.42 (6.84)	2.76 (9.56)
T <sub>7</sub> – Spinosad 75 g a.i/ha	3.61 (10.95)	0.80 (5.14)	3.06 (10.07)	2.49 (9.08)	3.01 (12.04)	0.73 (4.90)	2.81 (9.65)	0.36 (3.44)	1.73 (7.55)
T <sub>8</sub> – Okra (Sole crop)	4.57 (12.34)	12.28 (20.52)	6.00 (14.18)	6.68 (14.98)	5.67 (13.77)	20.00 (26.57)	28.54 (32.29)	18.11 (25.19)	18.08 (25.16)
<b>SEm±</b>	<b>(0.24)</b>	<b>(0.14)</b>	<b>(0.14)</b>	<b>(2.19)</b>	<b>(0.17)</b>	<b>(0.29)</b>	<b>(0.11)</b>	<b>(0.28)</b>	<b>(2.05)</b>
<b>CD@ 5%</b>	<b>(0.72)</b>	<b>(0.41)</b>	<b>(0.42)</b>	<b>(6.64)</b>	<b>(0.51)</b>	<b>(0.87)</b>	<b>(0.33)</b>	<b>(0.83)</b>	<b>(6.04)</b>

\*Figures in parenthesis are Arcsine transformed values,

Fig. 1. Effect of Intercropping, Insecticides & botanicals against shoot damage by okra shoot and fruit borer during *Zaid* season, 2022

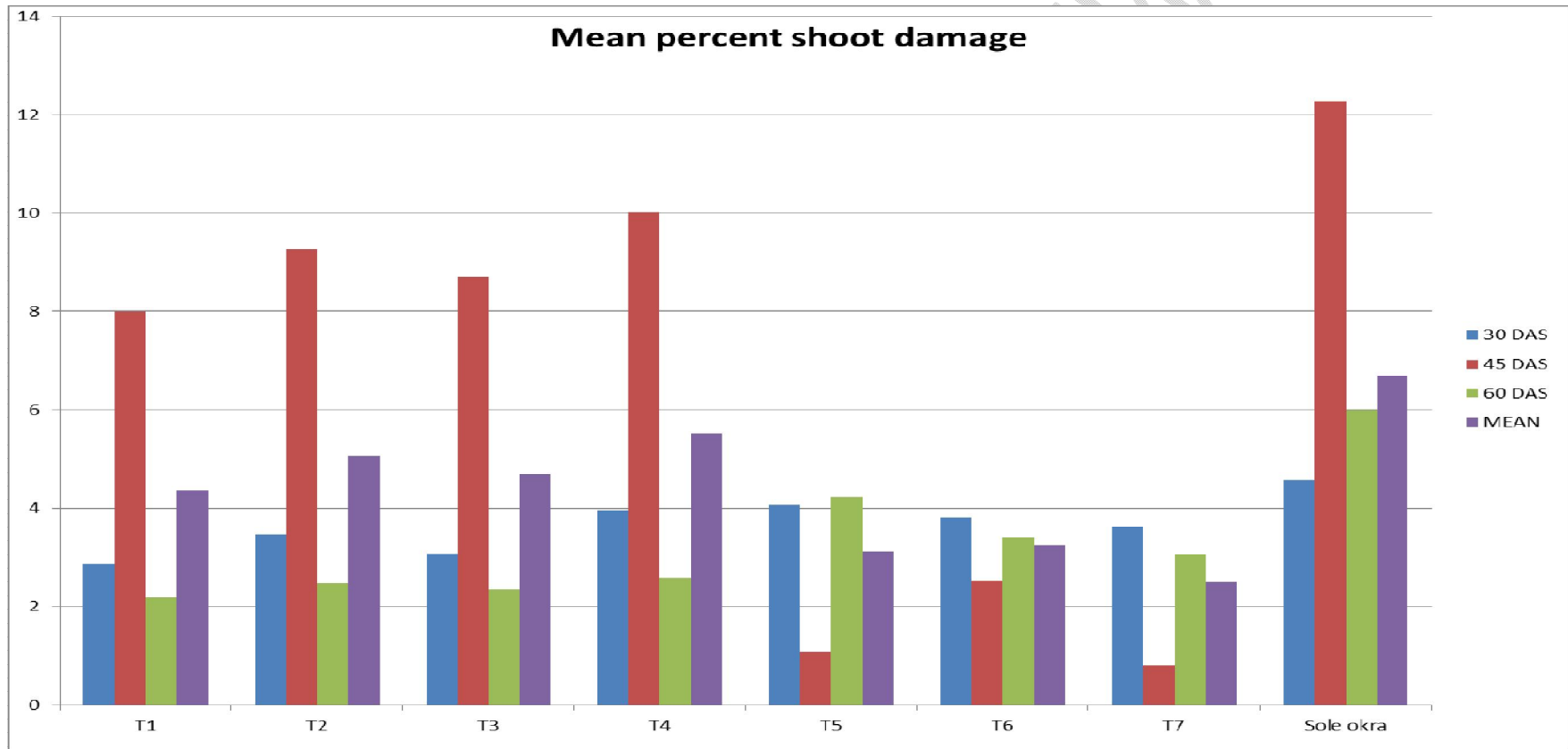


Fig 2. Effect of Intercropping, Insecticides & botanicals against fruit damage by okra shoot and fruit borer during *Zaid* season, 2022

