EFFICACY OF INTERCROPPING, BOTANICALS AND INSECTICIDES AGAINST OKRA SHOOT AND FRUIT BORER (*EARIASVITTELLA*) ON OKRA IN UTTAR PRADESH

ABSTRACT

This study assesses the effectiveness of using natural and synthetic insecticides against the okra shoot and fruit borer *Eariasvittella* as well as maize, marigold, sunflower, and coriander as an intercrop with okra (at a 1:1 ratio of main and intercrop).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*, intercrop, incidence, shoot and fruit damage, marigold, coriander, maize, sunflower, mono cropping, yield, botanical.

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).In almost every country where okra is grown, the okra shoot and fruit borer (OSFB) is a major insect pest of the crop that reduces its economic yield.

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 environmentally friendly chemical treatments and supporting environmentally friendly production practises. 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 factors like wind protection, shading, sheltering, preventing dispersal, colour change, etc., or biological factors like the existence of natural enemies, the production of hazardous chemical stimuli, etc. Systems of intercropping may have an impact on the expansion of insect populations (Andow, 1991; 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.

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 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. 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, the incidence of *Earias vittella* was observed. Shoot damage was counted randomly on 10 selected tagged plants in each replication at weekly interval and % shoot damage was computed. Mature fruit along with

damage fruits was picked at an interval of two to three days and % damage was computed after each picking. Healthy and infested fruits were sorted out and weighed separately to work out the damage on weight basis.

RESULTS AND DISSCUSSION:

Shoot borer and fruit borer:

The data on the shoot and fruit damage in okra under different intercrops presented in (Table 1) reveal that the shoot damage in all the crop combination started from 30 days after sowing DAS and combined till 60 DAS while it attained its peak at 45 DAS. Among all the intercropping okra + marigold (1:1) intercropping was observed with the least values of 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 maximum damage 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 on par 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 on par 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 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. In contrast, Mansour (2017) and Zakka *et al.* (2018) concluded that okra, intercropped with maize harboured maximum infestation of various pests.

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 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 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 1 st spray which 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_1 – 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_2 – 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_3 – 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_4 – 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_5 – 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_6 – 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_7 – 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_8 – 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)
SEm±	**(0.24)**	**(0.14)**	**(0.14)**	**(2.19)**	**(0.17)**	**(0.29)**	**(0.11)**	**(0.28)**	**(2.05)**
CD@ 5%	**(0.72)**	**(0.41)**	**(0.42)**	**(6.64)**	**(0.51)**	**(0.87)**	**(0.33)**	**(0.83)**	**(6.04)**

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

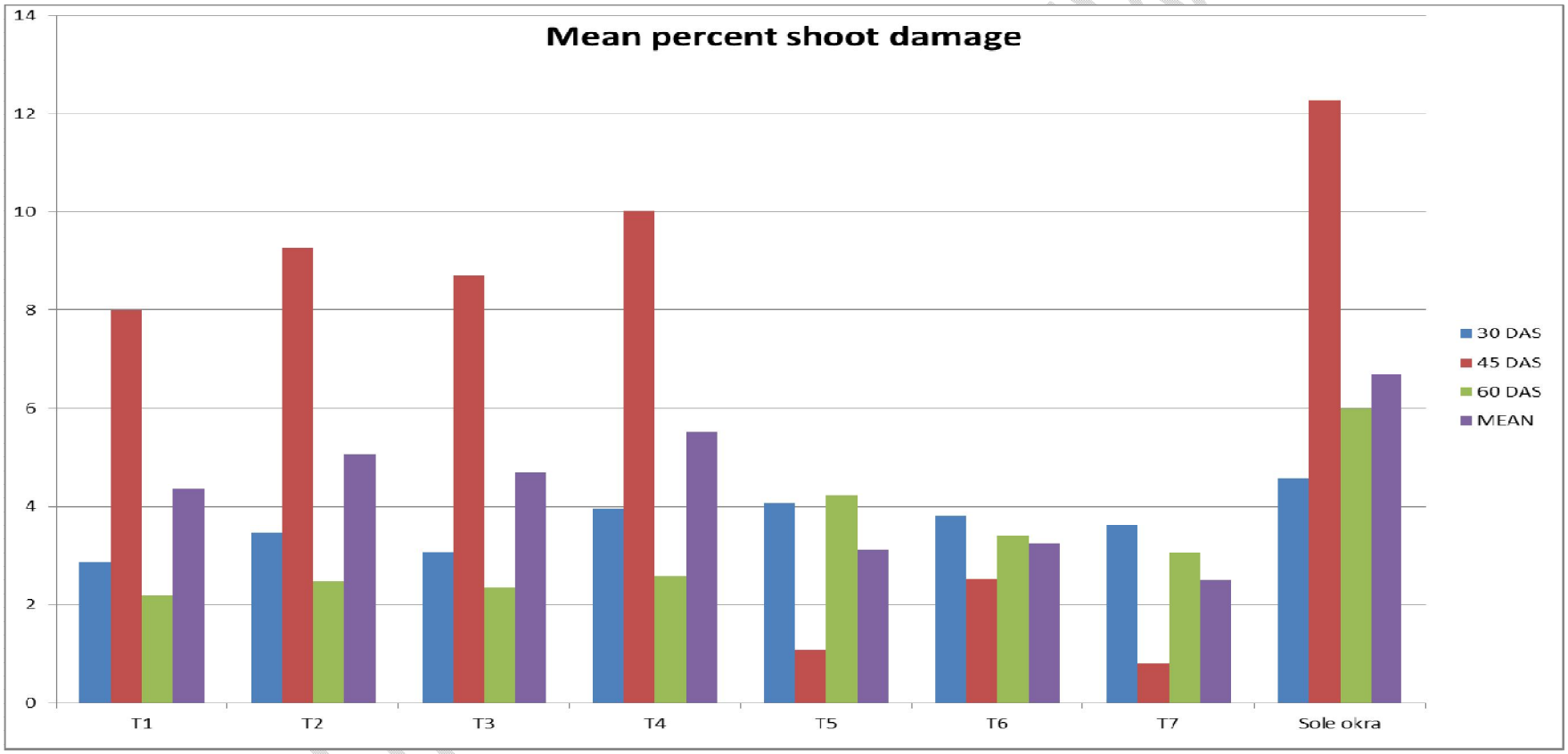

Fig 2. Effect of Intercropping, Insecticides & botanicals against fruit damage by okra shoot and fruit borer during *Zaid* season, 2022