International Journal of Environment and Climate Change

Volume 14, Issue 10, Page 394-399, 2024; Article no.IJECC.107173
ISSN: 2581-8627
(Past name: British Journal of Environment & Climate Change, Past ISSN: 2231–4784)

Efficacy of Intercropping, Botanicals and Insecticides Against Okra Shoot and Fruit Borer (*Earias vittella* F.) on Okra in Uttar Pradesh, India

Heenashree Mansion [a*], Umesh Chandra [a], Sreelakshmi B. R. [a], Amit Kumar [b] and Sunil Kumar Dhabhai [c]

[a] Department of Entomology, Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya (Uttar Pradesh), India.
[b] Department of Entomology, Maharana Pratap University of Agriculture and Technology, Udaipur 313001, India.
[c] Department of Entomology, College of Agriculture, Jodhpur, Agriculture University, Jodhpur, Rajasthan, India.

Authors' contributions

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

Article Information

DOI: https://doi.org/10.9734/ijecc/2024/v14i104494

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/107173

Original Research Article

Received: 28/07/2024
Accepted: 30/09/2024
Published: 01/10/2024

ABSTRACT

This study assesses the effectiveness of intercrops, insecticides and botanicals against the okra shoot and fruit borer *Earias vittella*. 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

**Corresponding author: E-mail: heenashreem@gmail.com;*

Cite as: *Mansion, Heenashree, Umesh Chandra, Sreelakshmi B. R., Amit Kumar, and Sunil Kumar Dhabhai. 2024. "Efficacy of Intercropping, Botanicals and Insecticides Against Okra Shoot and Fruit Borer (Earias Vittella F.) on Okra in Uttar Pradesh, India". International Journal of Environment and Climate Change 14 (10):394-99. https://doi.org/10.9734/ijecc/2024/v14i104494.*

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).

Keywords: Okra, Earias vittella; shoot and fruit damage; marigold; coriander; maize; sunflower.

1. 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" [1]. According to Srinivasan and Gowder [2] "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" [3]. According to Ambekar et al., [4] "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 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" [5]. "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" [6]. 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 [7].

2. 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 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 vittella* were recorded. Shoot damage was counted randomly on 10 selected tagged plants in each replication at weekly interval and per cent shoot damage was computed. Mature fruit along with damage fruits was picked at an interval of two to three days and per cent damage was computed after each picking. Healthy and infested fruits were sorted out and weighed separately to work out the damage on weight basis" [8].

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.

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

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

3. RESULTS AND DISSCUSSION

The data on the shoot and fruit damage in okra under different intercrops presented in (Table 1) showed that the shoot damage in all the crop combination started from 30 days after sowing DAS and continued till 60 DAS, while it attained its peak at 45 DAS. Among all the intercrops okra + marigold (1:1) intercropping showed the least damage 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 the highest 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 at 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 at par with okra + coriander (1:1), okra + sunflower (1:1) and okra + maize (1:1). These results agree with those of Abro et al. [9] on *Earias* spp. in cotton that okra can used as a trap crop. Mohansundaram et al. [10] 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. [11], [12] observed that marigold intercropped with okra is the best followed by okra and coriander.

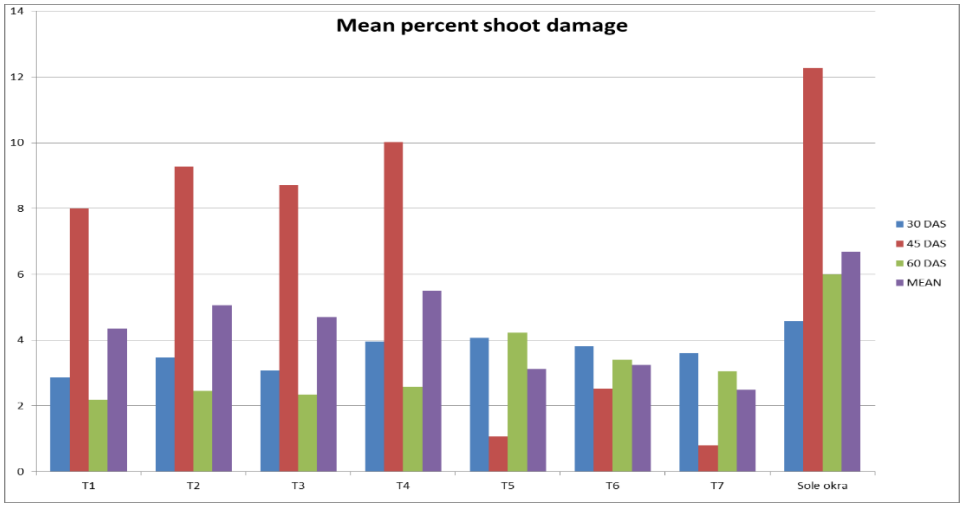

Fig. 1. Effect of Intercropping, Insecticides & botanicals against shoot damage by okra shoot and fruit borer during Zaid season, 2022

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)

**Figures in parenthesis are Arcsine transformed values,*

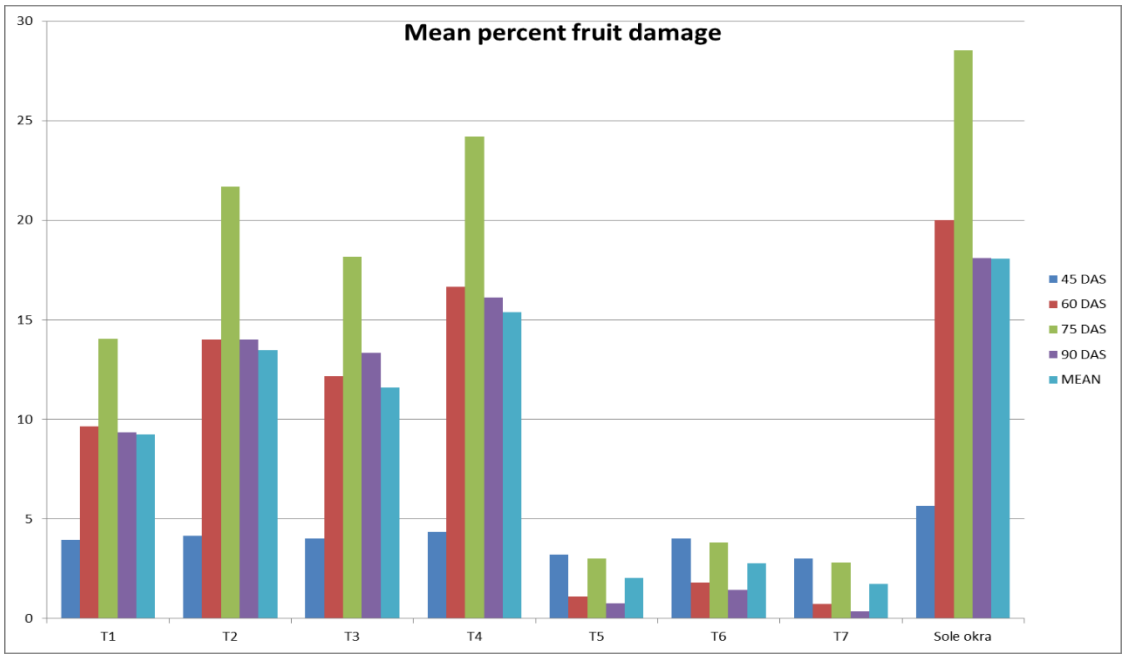

Fig 2. Effect of Intercropping, Insecticides & botanicals against fruit damage by okra shoot and fruit borer during Zaid season, 2022

4. 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).

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 this manuscript.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Anonymous. Indian Horticulture database. National Horticulture Board, Gurgaon, Haryana. 2017;(1):4.
2. Srinivasan PM, Gowder RB. A preliminary note on the control of the bhendi shoot and fruit borer, Earias vittella F and E. insulana, J. Agric. Sci. 1959;30(1):55- 57.
3. Ali MI, Karim MA. Host preference of spotted bollworm (Sbw), *Earias vittella* (F.) its potential use in Integrated Pest Management of the Sbw in cotton. Univ. J. Zool. Rajshahi. Univ. 1990;9:81-83.

4. Ambekar JS, Pawar AS, Sakhare MV. Bio- efficacy of neem certain products against okra fruit borer. J Maharashtra Agril. Univ. Pune, India. 2000;25(1): 42-43.
5. Van Emden HF. The effect of uncultivated land on the distribution of cabbage aphid on an adjacent crop. J. App. Ecol. 1965;2:171-196.
6. Theunissen J. Intercropping in field vegetable crops: Pest management by agrosystem. Diversification overview. Pesticide Science. 1994;42:65-68.
7. Shelton AM, Badenes-Perez FR. Concepts and applications of trap cropping in pest management. Annual Review of Entomology. 2006;51:285-308.
8. Kumar R, Singh PP, Kumbhar CR. Intercropping as sustainable approach against okra shoot and fruit borer *Earias spp*. Indian Journal of Entomology. 2022;67:4-6.
9. Abro GH, Memon AJ, Syed TS, Shaikh AA. Infestation of *Earias spp*. on cotton and okra grown as mono and mix crops. Pak. J. Biol.Sci. 2004;7(6):937-942.
10. Mohanasundaram A, Sharma,RK, Sharma K. Ecofriendly management of major insect pests of okra with intercropping and newer molecules. Indian Journal of Plant Protection. 2012;40(1):32-37.
11. Sujayanand GK, Sharma RK, Shankarganesh K. Impact of intercrops and border crops on pest incidence in okra. Indian J. Horti. 2016;73(2):219-223.
12. Ojha PK, Singh P. Effect of intercropping on the incidence of insect pests of cauliflower and its economics under agroclimatic zone-1 Bihar. Pestology. 2003;27:22-25.

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/107173