Seasonal incidence of shoot and fruit borer,*Eariasvittella*(Fab.) on okra *Abelmoschusesculentus* (L.) in relation to abiotic factors

Abstract: -

The present investigation was carried out during *kharif* season 2023at Agricultural Research Farm of RBS College Bichpuri, Agra (Uttar Pradesh). During the investigation, it has been revealed that the infestation of the shoot and fruit borer, *Eariasvittella* (Fab.) on okra during the *kharif* season commenced from shoots 31th SMW (3.20%) and fruit borer 35th SMW (3.20%). The infestation ranged from shoot (3.20 - 29.70%) and fruit borer (3.20 - 36.42%), with the peak occurring in the 36th(29.70) and 39th (36.42) SMW and continuing until harvesting. The percentage of shoot and fruit borer infestation has a positive significant correlation with maximum temperature, minimum temperature, evening relative humidityand wind velocity. However, morning relative humidity, rainfall and sunshine hour has a negative significant correlationduring *kharif* season 2023.

Key words: -Okra, shoot and fruit borer, abiotic factor,correlation, infestation.

Introduction

Lady finger, also known as okra, *Abelmoschus esculentus* (L.) is a popular vegetable in tropical regions like India, Nigeria, Pakistan, Cameroon, Iraq and Ghana. Despite being primarily farmed outside Europe and North America, it is known for its high folic acid, vitamin A, carbohydrates, phosphorus, and magnesium content. Okra is referred to by various regional names globally, including lady's finger in England, gumbo in the United States, guino-gumbo in Spain, guibero in Portugal, and bhindi in India. It is also grown in countries like India, Turkey, Iran, Western Africa, Yugoslavia, Bangladesh, Afghanistan, Burma, Japan, Malaysia, Brazil, Ghana, Ethiopia, and the Southern United States.

Okra plays an important role in the human diet and is a good source of protein, carbohydrates, vitamins, calcium, potassium, enzymes, and total minerals which are often lacking in the diet of developing countries**(Saifullah *et. al.*, 2009 & Gopalan *et. al.*, 2007)**[11]. "The composition

of okra pods per 100 gm edible portion is water 88.6 g, energy 144.00 kJ (36 kcal), protein 2.10 g. carbohydrate 8.20 g, fat 0.20 g, fiber 1.70 g, Ca 84.00 mg, P 90.00 mg, Fe 1.20 mg,β-carotene 185.00 µg, riboflavin 0.08mg, thiamin 0.04 mg, niacin 0.60 mg. ascorbic acid 47.00 mg. The fruits of okra have reawakened beneficial interest in bringing this crop into commercial production. Its medicinal value has also been reported in curing ulcers and relief from haemorrhoids. It has also been found to be medically beneficial as a plasma replacement or blood volume expander and also useful in genitourinary disorders, spermatorrhea and chronic dysentery" **(Gemedee*t. al*., 2015 & Basnet*et. al*., 2023)**[3]**.“Among all pests, shoot and fruit borer (*Eariasinsulana* and *E. vittella*) the most destructive pests of okra, as young larva bores into tender shoots in early vegetative growth of plants and grown-up larvae damage fruits resulting in serious loss in yield. *E. vittella* is an oligophagous pest and its main hosts are okra and cotton”**(Rajendran *et. al*., 2018)**. It is also found feeding on a large number of cultivated and wild malvaceous plants species. The pest is active almost the year-round and prefers high humidity and high temperature for its growth and development. The affected fruits are rendered unfit for human consumption, as well as for procurement of seed. The borer has been reported to cause 24.6 to 26.0 per cent damage to okra shoots **(Pareek *et. al*.& Zala *et. al*., 1999)**[7] and 40 to 100 per cent loss to fruits **(Pareek *et. al*., 2003, Shinde *et. al*., 2007 & Rai *et. al*., 2014)**[8]**. "The pest is active almost year-round and prefers high humidity and high temperatures for its growth and development. In India, an estimated loss of 69.00 per cent in marketable yield was due to the attack of this insect on okra alone" **(Ray *et. al*., 2019)**[10]**.

The incidence of *E. vittella* shows violent fluctuations due to changes in climatic conditions. Information on the impact of abiotic factors on the incidence of *E. vittella* is very useful for the management of this pest in western semiarid zone of Uttar Pradesh. The seasonal incidence study will help to determine the relation between the weather factors and the population of this pest, this research study also helps okra to understanding pest dynamics, developing effective management strategies, and reducing crop losses. The study helps identify peak infestation periods, informing targeted pest management interventions and contributing to sustainable agriculture practices. Keeping in view the importance of okra and the incidence of present work was carried out to know the seasonal incidence of pest.

Materials and Methods

The field experiment was carried out during the *kharif* season 2023-24 at Agricultural Research Farm of Raja Balwant Singh College Bichpuri, Agra (U.P). The Research Farm is situated about 11 km to the west of Agra on Agra Bharatpur Road at latitude of 27°2' N and longitude of 77°9' E with an elevation of 163.4 m above the mean sea level.Ankur-41 cultivar a commonly grown and recommended in this area was sown on the first week of July2023 with a plots size 4.5×1.5 m^2 and keeping row to row and plant to plant distance of 45×30 cm, two seeds sown in one place at 2-3 cm depth on first week of July 2023 respectively. The crop was left for the natural infestation.The data of shoot and fruit borer, *Eariasspp*. were recorded on the five randomly selected and tagged plant throughout the crop period at weekly intervals by a visual count of the plant in which the top portion was damaged, starting after two weeks of sowing to last picking of the fruits.

The per cent shoot infestation was calculated by counting the total number of shoots and the number of damaged shoots. The per cent infestation of fruits on a number basis was calculated by counting the infested and healthy fruits separately from selected tagged plants at each picking till the last picking of fruits. The data recorded on shoot and fruit damage and meteorological parameters were used for statistical analysis **(Panse, 1967)** [6]. The simple correlation was computed between shoot and fruit damage in relation to abiotic factors, viz.; maximum and minimum temperature, relative humidity and rainfall. The following formulae were used for calculating the correlation co-efficient is given below **(Gupta, 1996)**[5].

$$\text{Per cent shoot damage} = \frac{\text{Total number of damage shoots}}{\text{Total number of shoots}} \times 100$$

$$\text{Per cent fruit damage} = \frac{\text{Total number of damage fruit}}{\text{Total number of fruit}} \times 100$$

$$\textbf{Correlation coefficient} \quad = \frac{cov\,(xy)}{\sqrt{var\,(x)var\,(y)}}$$

Where,

r = correlation coefficient.

Cov(xy) = covarianceof thecharacters X and Y.

Var (x) and (y) = variance of the characters of X and Y, respectively.

RESULTS AND DISCUSSION

The data on the infestation of shoot and fruit borer *Eariasvittella*(Fab.) on okra crop during the *kharif* season is presented in (Table 1 and fig.1).The infestation ranged from 3.2 per cent (31stSMW) to 29.70 per cent (36thSMW). The incidence of shoot borer was observed in the 5th week after and it was continued up to harvesting. The peak incidence of shoot borer was recorded at 29.07 per cent shoot infestation at 36thSMW. The population was decreasing.The incidence of shoot and fruit borer ranged from 3.2 per cent to 36.42 per cent during the 38th to 42nd SMW. The incidence of the fruit borer on the fruits started from 38th SMW coinciding with the setting of fruits. During pest incidence increased and recorded a peak of 36.42 per cent at 39th SMW.

The peak incidence of shoot borer was recorded at 29.07 per cent shoot infestation at 36thSMW. Thereafter the population was decreasing. The above results corroborated the findings of earlier researchers, **Kantipudi*et al.*, (2017)** who observed the highest per cent shoot infestation in the second week of September. Similarly, **Gangwar and Singh (2014)** reported that *Earias vittella* infestation started from the last week of August and continued till the last week of December *i.e.*, this pest was found infesting the crop throughout the crop season.

The result indicated that maximum temperature positive correlation with shoot infestation (r = 0.319), negative correlation with fruit infestation (r = -0.242). Minimum temperature positive correlation with shoot infestation (r = 0.222), negative correlation with fruit infestation (r = -0.674). Morning relative humidity negative correlation with both shoot infestation (r = -0.091) and fruit infestation (r = -0.513). Evening relative humidity positive correlation with shoot infestation (r = 0.136), negative correlation with fruit infestation (r = -0.532). Rainfall negative correlation with both shoot infestation (r = -0.559) and fruit infestation (r = -0.611). Sunshine hours per day negative correlation with both shoot

infestation (r = -0.321) and fruit infestation (r = -0.667). Wind velocity positive correlation with shoot infestation (r = 0.213), negative correlation with fruit infestation (r = -0.748) (Table 2).

Table 1:-Seasonal incidences of shoot and fruit borer (*Earias vittella*) on okra in relation to abiotic factor during *kharif*2023.

S. NO.	Date of Observation	SMW	Per cent shoot infestation	Per cent fruit infestation	Temperature (oC)		Relative Humidity (%)		Rainfall (mm)	Sun shine hr/day	Wind velocity (km/hr)
					Maximum	Minimum	Morning	Evening			
1	16 Jul 23	29th	0	0	36	26.2	76	49	36	7	10
2	23 Jul 23	30th	0	0	38.1	26.4	73	48	16	8	12
3	30 Jul 23	31st	3.2	0	35.3	25.2	71	47	15	7	14
4	6 Aug 23	32nd	9.2	0	33.6	24.7	78	48	26	7	15
5	13 Aug 23	33rd	14.3	0	37.3	26.1	71	46	10	7	21
6	20 Aug 23	34th	18.4	0	37.3	26.1	69	50	06	6	14
7	27 Aug 23	35th	15.6	3.2	36.8	26.2	58	32	0	7	20
8	3 Sep 23	36th	29.7	7.9	38.5	25.6	63	42	0	0.7	17
9	10 Sep 23	37th	25.6	22.54	36.1	25.6	67	50	04	4	9
10	17 Sep 23	38th	16.5	27.45	33.6	24.4	75	49	09	7	10
11	24 Sep 23	39th	14.8	36.42	36.4	25.3	64	39	01	5	9
12	1 Oct 23	40th	15.0	34.3	37.8	23.1	72	44	0	2	6
13	8 Oct 23	41st	10.6	30.4	37.3	22.1	48	28	0	1.5	9
14	15 Oct 23	42nd	7.7	32.4	34.7	21.1	52	27	02	0	9
15	22 Oct 23	43rd	5.4	31.36	32.7	18.1	54	24	0	2	8
Mean			12.4	15.06	36.1	24.41	66.06	41.53	8.34	4.74	12.2

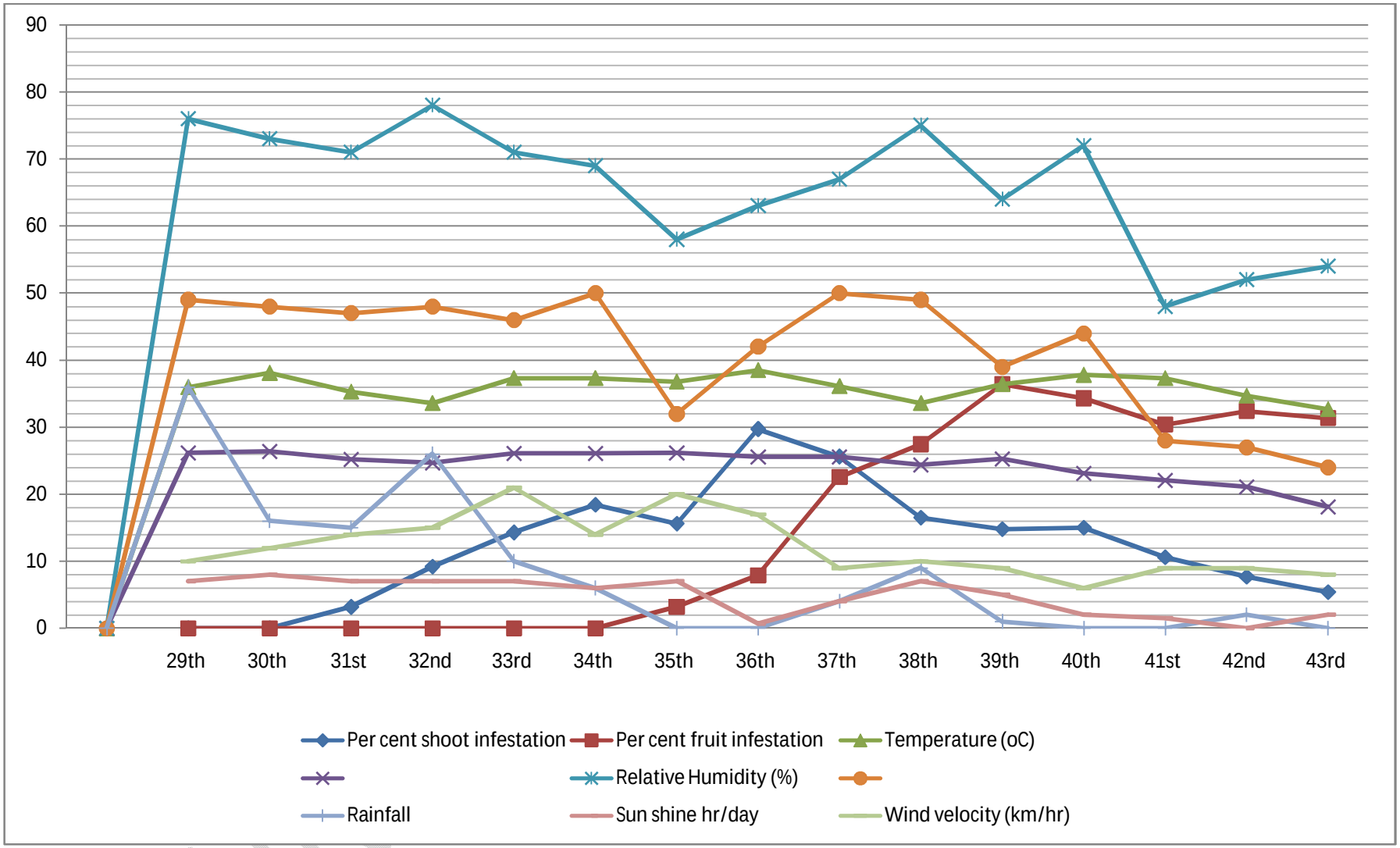

Fig:-1 Seasonal incidences of shoot and fruit borer (*Earias vittella*) on okra in relation to abiotic factor during *kharif* 2023.

Table 2.Correlation analysis between seasonal incidence of shoot and fruit borerand abiotic factors during *kharif*2023

Abiotic factors	Correlation (r) Per cent shoot infestation	Correlation (r) Per cent fruit infestation
Maximum temperature (^{o}C)	0.319*	-0.242*
Minimum temperature (^{o}C)	0.222*	-0.674*
Morning Relative Humidity (%)	-0.091*	-0.513*
Evening Relative Humidity (%)	0.136*	-0.532*
Rainfall (mm)	-0.559*	-0.611*
Sun shine hr/day	-0.321*	-0.667*
Wind velocity (km/hr)	0.213*	-0.748*

Conclusion:

The study reveals that the *Earias vitella* infestation on okra crop during the *kharif* season 2023 with a peak infestation in 36thand 39th SMW. The seasonal incidence of shoot and fruit borer, *Earias vittella* (Fab.) on okra maximum and lowest infestation observed in various meteorological weeks, correlation studies indicated that there was a significant and non- significant influence of different weather factors and field infestation.

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