RESEARCH ARTICLE

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Influence of environmental factors on infestation of fruit and shoot borer *Earias vittella* F. on okra (*Abelmoschus esculahtus* L)

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ABSTRACT

The observations were made on the infestation of fruit and shoot borer Earias vittella vis-à-vis environmental factors on okra crop in a random block design (RBD) at Chandrashekher Azad Agriculture University, Kanpur. The square root transformation and correlation showed that among different abiotic factors (temperature, relative humidity and rainfall), temperature play dominant role in expression of insect infestation. However, crop phenology and natural biocontrol agents play their role, which may also dependent of environmental factors. The finding revealed that the maximum temperature and minimum relative humidity favours the infestation of Earias vittella in okra crop.

Key words: *fruit and shoot borer, okra, rainfall, relative humidity, temperature*

INTRODUCTION:

Okra (*Abelmosthus ecsuleutus* L) commonly known as lady's finger is an important summer vegetable of India. It contains large quantities of carbohydrate, proteins and vitamin C (Duvauchelle and Joshua 2011). Okra is a nutritious vegetable which plays an important role to fulfill demand of people when vegetable are scanty in the market. Okra mucilage is suitable for medicinal and industrial application and about 48,508 metric tons of okra is produced from 11786 hectares of land per year in India (Singh 1987).

The main causes of poor production are the attack of various pests and lack of knowledge about cultural practices among the Indian farmers. Okra is susceptible to the attack of various insects from seedling to fruiting stage such as: okra fruit and shoot borer, okra jassid, white fly, aphids etc. Among them, okra fruit and shoot borer *Earias vitella* are the most serious pests which cause direct damage to tender leaves, shoot and fruits; and about 70% marketable yield is recorded due to attack of this insect pest.

Beside India, *Earias vitella* cause up to 40-50% damage to okra fruit in some areas of South Asian countries (Srinivasan et al. 1959). Moreover, Krishnaiah (1980) reported that the losses extent up to 35% in harvestable fruit of okra due to attack of fruit and shoot borer. The attack of *Earias vittella* on okra starts 4-5 weeks after the germination in kharif and summer season. The attacked top tender shoots dry up while flowers, buds and developing fruit fall down pre-maturely. Larvae of *Earias vittella* enter in the shoot tips of young plant and bore into fruits. The affected fruit are unfit for human consumption. Reproduction and survival in insect are influenced by a number of environmental factors including temperature, day length, humidity, rainfall. Temperature may also have great influence upon the total number of egg production as well as the ovipositional behaviour of insect (Cammel and Knight 1992).

Insect are capable of surviving only within certain environmental limits, so one can predict the occurrence of peak activities of a given pest through better understanding of preferred environmental factor. The present study was therefore made to determine the role of different environmental factors on infestation of fruit and shoot borer on okra.

MATERIALS AND METHODS:

Two year studies were conducted to determine the role of weather parameters on the fluctuation of fruit and shoot infestation caused by *Earias vittella* on okra at Chandrashekher Azad Agriculture University, Kanpur. The experiments were laid out in a random block design (RBD). The intensity and infestation of *Earias vittella* on okra were recorded by counting of infested shoot on randomly selected five plants from each replicates. The fruits picked from the plants were stored separately in two groups *i.e.,* infested and fresh fruits. The percentage of infestation was calculated on the basis of weight of healthy and damage fruits and intensity was recorded by counting larval holes of damaged fruits.

$$\text{Extent losses or fruits \%} = \frac{\text{Total yield of Okra fruit } \left(\frac{q}{h}\right) - \text{Yield of fresh fuits of okra fruit } \frac{q}{h}}{\text{Total Yield } \frac{q}{h}} \times 100$$

The complete observations were taken at weekly interval during both the experimental years, starting from 4-5 week after germination. Meteorological data relevant to temperature, relative humidity and rainfall during the course of study were also recorded from the meteorological department of C.S.A. University, Kanpur. The data were subjected to square root transformation and simple correlation.

RESULT:

The observations on weather parameters correlate with the infestation of fruit and shoot borer on okra varies with the fluctuation of weather parameters. The maximum fruit and shoot infestation was recorded in the month of July with a maximum temperature of 41.44˚C, minimum temperature of 24.40˚C with an average temperature of 32.92˚C, and relative humidity was 35.32% during the second week of July. It was found to be the most favorable for maximum infestation of fruit and shoot borer *i.e.,* 21.76 and 30.78% during both the experimental years, respectively. With maximum temperature of 45.20 ˚C minimum temperature of 2.15˚C average temperature of 36.38˚C and relative humidity of 41.95%. On basis of both the year the maximum fruit and shoot infestation i.e. 18.64 and 31.12% respectively with maximum temperature of 44.03˚C and minimum temperature of 26.20˚C.

The data (Table 1) shows that all the weather factors had significant correlation with the fruit infestation of okra. The maximum, minimum and average temperature shows a positive response, whereas the relative humidity and rainfall exerted the negative response because rainfall is not good for the larvae and insect metamorphosis.

The observations (Table 1) shows that all weather factors showed significant effect on the shout infestation except the minimum temperature during the experiment. The rainfall showed a non-significant correlation with a negative response. The maximum temperature and average temperature showed a positive significant effect, whereas the minimum temperature exerted non significant correlation with the shoot infestation.

Table 1: Correlation between fruit and shoot infestation (%) caused by *Eonias vittella* and weather parameters on Okra

Weather factor	Fruit infestation		Shoot Infestation	
	2004	2005	2004	2005
Max. Temp (˚C)	0.648**	0.808**	0.736**	0.812**
Min. Temp (˚C)	– 0.165*	0.642**	– 0.075^{ns}	0.452*
Aug. Temp. (˚C)	– 0.441**	0.900**	– 5.08*	0.702**
R.H. (%)	– 0.684**	– 0.498*	0.810**	0.512*
Rainfall (mm)	– 0.632**	– 0.55**	0.749**	0.452*

* = Significant at 5 %, ** = Significant at 1 %, ^{ns} = Non significant

DISCUSSION:

Trends in insect infestation on okra may be affected by both biotic and abiotic factors including crop phenology, natural biocontrol agents and environmental factors. Among them temperature may have dominant role in the expression of insect infestation due to their cold blooded nature (Bale et al. 2002). Khurana and Verma (1990) also observed lower incidence (12.5%) of *Earias vittella* during 1983 in condition having maximum and minimum temperature of 34.3˚C and 20.5˚C, respectively, with a mean RH of 73% and frequent rainfall between May and September.

In okra crop the rain may dislodge the egg and neonate laves. Furthermore the secretions from the larvae at biting points of okra fruits mix with water and the young larvae are get entangle due to their stickiness (Kadam and Khaire 1995). Comparable finding were reported by Shukla et al. (1997), who observed significant and positive correlation of mean maximum temperature with percent fruit damage with *r* valves of 0.634 and 0.638 in the year 1993.

Therefore, present study on the infestation of fruit and shoot borer vis-à-vis weather parameters may be concluded that the maximum temperature is favorable for infestation of *Earias vittella* on okra. However, with the help of present observations we can make an effective plan of management to avoid the maximum yield loss by the infestation of fruit and shoot borer on okra. Further elaborative studies on the influence of all these aspects on pest infestation of okra from different part of India are needed.

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