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To study the seasonal incidence of shoot and fruit borer (*Leucinodes orbonalis* Guenee) on brinjal (*Solanum melongena* L.) During Kharif season in Trans Yamuna region of Allahabad

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Abstract

The present study entitled, “To study the seasonal incidence of shoot and fruit borer, (*Leucinodes orbonalis* Guenee) on brinjal during Kharif season of 2016 in Trans Yamuna region of Allahabad” was undertaken at the Central Research Farm, SHUATS, Allahabad. The data so obtained through observation on various aspects were subjected to statistical analysis wherever necessary and the data was compiled. Results, thus obtained are presented aspect wise as the occurrence of *Leucinodes orbonalis* Guenee in Per cent shoot infestation was recorded in 2016 Kharif season was commenced from 34th standard week (August third week) on shoot with an average 3.85 % infestation. The borer population increased and gradually reached peak level of 33.5% of larval population at 42nd standard week (October third week) and decline in the trend was noticed this may be due to fall in congenial weather parameters and the per cent fruit data showed that from 39th standard week (third week of September) on shoot with an average 4.6% infestation. The borer population increased and gradually reached peak level of 40.5% of larval population at 46th standard week (second week November). Thereafter, declined trend was observed due to fall of maximum and minimum temperatures as optimum weather condition are decreasing. It was observed that the maximum temperature favoured the multiplication of shoot and fruit borer whereas, decline of maximum and minimum temperature lead to decline of the shoot and fruit borer population.

Keywords: Seasonal incidences, kharif, to study, brinjal, *Leucinodes orbonalis* Guenee, shoot and fruit borer, Allahabad

1. Introduction

Vegetable cultivation is one of the most profitable and dynamic branches of agriculture. It has become an important source of income for both farmers and field labours, serving as a vehicle for reducing poverty in rural areas. Brinjal (*Solanum melongena* Linnaeus) also known as eggplant is referred as the “King of vegetables” originated from India and now grown as a vegetable throughout the tropical, sub-tropical and warm temperate areas of the world. It is a most important vegetable in the Indian Subcontinent that accounts for almost 50% of the world’s area under its cultivation area under its cultivation. However, in India, the area is estimated as 7.5% of the total area of vegetables with 8% of the total production of vegetables (Roy *et al.* 2016). Brinjal fruit (unripe) is primarily consumed as cooked vegetable in various ways and dried shoots are used as fuel in rural areas. It is low in calories and fats, contains mostly water, some protein, fibre and carbohydrates. It is a good source of minerals and vitamins and is rich in total water soluble sugars, free reducing sugars, amide proteins among other nutrients (Singh *et al.* 2016). Brinjal is one of the most important solanaceous vegetables in South-East Asian countries. The major brinjal growing states in India are Andhra Pradesh, Karnataka, West Bengal, Tamil Nadu, Maharashtra, Orissa, Uttar Pradesh, Bihar and Rajasthan. Globally, India ranks second and China ranks first in the production of brinjal (57.9% of world output). In India, this crop occupies 71.13 lakh hectare area along with annual production of 135.57 (lakh tone) and productivity 19.1 MT per hectare. In Uttar Pradesh, the area under cultivation of brinjal is 3430 hectare producing 111.70 MT and the productivity is 8 MT/ha. Among the insect pests infesting brinjal, the major insect is the shoot and fruit borer, *Leucinodes orbonalis* (Guen.) The major constraints in economic cultivation of brinjal, insect pest infestation are a major bottleneck which poses threat for its production reported that the

shoot and fruit borer (on shoot) were more prevalent during vegetative phase of crop. *Leucinodes orbonalis* (Guen.) (Lepidoptera: Pyralidae) is an internal borer which damages the tender shoots and fruits. Attack of this pest causes considerable damage to brinjal crop each year, affecting the quality and yield of the crop. The Larvae of this pest cause 12-16% damage to shoots and 20- 60% damage to fruits.

2. Materials and methods

The present investigation was conducted at the Central Research Farm of Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad, Uttar Pradesh during Kharif season 2016. The research farm is situated on the right side of Allahabad Rewa road at 20 degrees and 15⁰ North, 60⁰ east longitude city and is about 129.2 cm above sea level. The site selected was uniform, cultivable with typical sandy loam soil having good drainage.

2.1 Cultural operations

2.1.1 Preparatory tillage

The soil was thoroughly prepared by ploughing followed by two harrowing. The field was cleaned by picking stubbles of previous crop. Before sowing of seeds on raised beds, one harrowing was done and the experimental plots were laid out as per the statistical design.

2.1.2 Sowing of seeds on raised bed

The seeds of 'Banaras purple round' variety were sown on 20.06.2016 to raise the seedling in nursery. Regular watering and weeding were done up to transplanting of seedling to the main field.

2.1.3 Transplanting and gap filling

The seedlings were transplanted approximately after 5 weeks, in the main field on 29.07.2016 gap filling was done to maintain the plant population, keeping one plant per hill.

2.1.4 Application of Fertilizers

Application of fertilizers was done at the rate 60: 50: 50 kg N.P.K per hectare. Half dose of Nitrogen and full dose of Phosphorus and Potash were given at the time of transplanting. The remaining dose of nitrogen was applied one month after transplanting. Fertilizers were applied by ring method in the form of single super phosphate, urea and murate of potash.

2.1.5 Hoeing and weeding

Timely hoeing and weeding operations were carried out to conserve soil moisture and to remove weeds as and when needed.

2.1.6 Protective irrigation

Five protective irrigations were given during dry spell and as it were required.

2.1.7 Picking

Picking were done plot wise manually.

2.1.8 Yield

The yield per plot was recorded and converted to quintal per hectare.

2.2 Experimental Details

Season
Crop

Kharif
Brinjal

Design	Randomized Block Design
Replication	3
Plot size	2m x 1m
Total no. of plots	27
Total no of plots for objective no. 1 (Layout no.1) total length of area	12.5m
Total width of area	5m
Spacing	60x45 cm
Row to row distance	60 cm
Plant to plant	45 cm
Dose of Fertilizer	60:50:50, N.P.K. Kg/ha,
FYM	10 tones/ha.
Variety	Banaras Purple round
Seed rate	500 g /ha
Total length of the area	12 mt
Total width of the area	8.8 mt
Gross cultivated area	105.6 m ²
Net cultivated area	63 m ²
Main irrigation channel	1.0 m
Sub irrigation channel	0.5 m
Width of bund	0.3

2.3 Application of spray solution

Spraying was done with the help of a hand compression sprayer. Spraying was done preferably in the early morning hours when there is no wind.

Table 1: Dates of spray application.

S. No.	Spray application	Date of application
1	First spray	10.09.2016
2	Second spray	25.09.2016
3	Third Spray	10.10.2016

3. Methods of recording observations

Seasonal incidence: The damage percentages of brinjal shoot and fruit borer observation were recorded at 7 days' interval, from the occurrence or initiation of the pest infestation and were continued up to harvest. The incidence and damage of brinjal shoot and fruit borer were recorded from the five randomly selected and tagged plants by correlating with weather parameter. Weather data were recorded simultaneously from the Department of Agriculture Meteorology, SHUATS, Allahabad. Among weather parameters, relative humidity, maximum temperature, minimum temperature, sunshine hour and rainfall were considered for correlating with the occurrence and damage of brinjal shoot and fruit borer with mentioned formulae and as showed in the following Table No. 02.

a) On Shoot

Number Basis: The total number of shoots and number of shoots infested of five selected plants from each treatment replication wise were recorded.

$$\% \text{ Shoot infestation} = \frac{\text{No. of shoot infested}}{\text{Total no. of shoot}} \times 100$$

b) On Fruit

Number Basis: at each picking, the total number of fruits and number of fruits infested of five selected plants from each treatment replication wise were recorded.

$$\text{Fruit infestation} = \frac{\text{No. of fruit infested}}{\text{Total no. of fruit}} \times 100 \quad (\text{Yadav et al. 2015})$$

Table 2: Seasonal incidence of shoot and fruit borer of Brinjal during *Kharif* 2016.

Standard week	% Shoot infestation of <i>Leucinodes orbonalis</i>	Temperature		Humidity %		Rainfall (mm)	Wind Velocity	Sunshine (hr./day)
		Max.	Min.	Morning	Evening			
30 rd	0	33.68	24.22	90.42	63.71	1.11	2	3.82
31 st	0	35.34	28.02	90.71	58.71	0.42	2.77	5.45
32 nd	0	34.08	27.74	90.57	55.42	2.2	1.33	5.82
33 rd	0	33.8	27.14	88.2	55.4	4.3	1.28	5.1
34 th	3.85	33.1	27	91.7	56.7	25.9	2.22	2.7
35 th	6.25	35.82	27.28	90.57	53.42	6.94	0.25	5.07
36 th	11.5	35.14	27.2	87.85	53.85	0.65	2.26	8.08
37 th	15.8	35.25	27.28	89.42	54.28	4.91	1.26	8.34
38 th	18.5	33.28	26.87	89.14	62.57	1.14	0.87	6.62
39 th	22.8	30.25	26.22	89.42	66.28	8.08	0.66	5.28
40 th	26.8	34.65	26.68	87.42	53.85	6.37	2.22	7.45
41 st	30.7	34.48	26.34	89.85	52.28	1.42	1.01	8.52
42 nd	33.5	35.05	25.77	89.71	51.71	0	0.81	8.77
43 rd	27.5	34.37	24.8	90.28	53.71	0	1.01	8.75
44 th	26.86	33.97	19.82	90.71	54.42	0	1.08	8.57
45 th	17.5	33.14	18.2	91.85	55.71	0	1.02	6.91
46 th	10.3	32.74	16.91	91.42	53.85	0	0.66	8.51
47 th	8.3	31.97	15.37	92	48.57	0	0.61	8.42
48 th	2.5	29.51	15.15	92.85	54	0	6.37	0.56
r		0.146	0.044	-0.317	-0.163	-0.181	-0.367	0.657
t=		0.609	0.180	-1.378	-0.682	-0.758	-1.626	3.598
Results		NS	NS	NS	NS	NS	NS	S

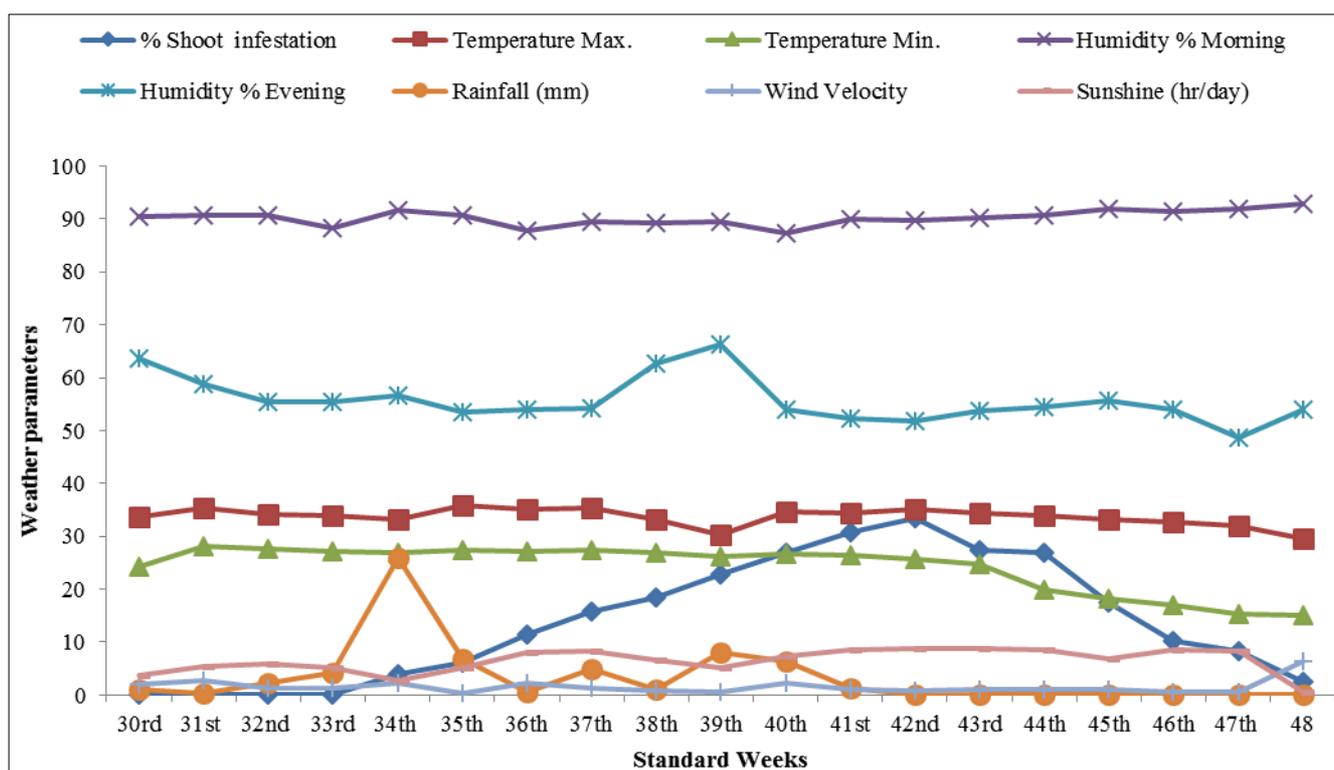


Fig 1: Graphical representation of seasonal incidence of shoot and fruit borer, (*Leucinodes Orbonalis Guenee*) during *Kharif* 2016.

Table 3: Seasonal incidence of shoot and fruit borer of Brinjal during *Kharif* 2016.

Standard week	% Fruit infestation of <i>Leucinodes orbonalis</i>	Temperature		Humidity %		Rainfall (mm)	Wind Velocity	Sunshine (hr./day)
		Max.	Min.	Morning	Evening			
30 rd	0	33.68	24.22	90.42	63.71	1.11	2	3.82
31 st	0	35.34	28.02	90.71	58.71	0.42	2.77	5.45
32 nd	0	34.08	27.74	90.57	55.42	2.2	1.33	5.82
33 rd	0	33.8	27.14	88.2	55.4	4.3	1.28	5.1
34 th	0	33.1	27	91.7	56.7	25.9	2.22	2.7
35 th	0	35.82	27.28	90.57	53.42	6.94	0.25	5.07
36 th	0	35.14	27.2	87.85	53.85	0.65	2.26	8.08
37 th	0	35.25	27.28	89.42	54.28	4.91	1.26	8.34
38 th	0	33.28	26.87	89.14	62.57	1.14	0.87	6.62

39 th	4.6	30.25	26.22	89.42	66.28	8.08	0.66	5.28
40 th	5.5	34.65	26.68	87.42	53.85	6.37	2.22	7.45
41 st	8.5	34.48	26.34	89.85	52.28	1.42	1.01	8.52
42 nd	13.5	35.05	25.77	89.71	51.71	0	0.81	8.77
43 rd	26.8	34.37	24.8	90.28	53.71	0	1.01	8.75
44 th	32.5	33.97	19.82	90.71	54.42	0	1.08	8.57
45 th	38.8	33.14	18.2	91.85	55.71	0	1.02	6.91
46 th	40.5	32.74	16.91	91.42	53.85	0	0.66	8.51
47 th	29.5	31.97	15.37	92	48.57	0	0.61	8.42
48 th	18.75	29.51	15.15	92.85	54	0	6.37	0.56
	r	-0.320	-0.838	0.529	-0.397	-0.400	-0.116	0.366
	t=	-1.391	-6.319	2.572	-1.786	-1.800	-0.480	1.624
Results		NS	S	S	NS	NS	NS	NS

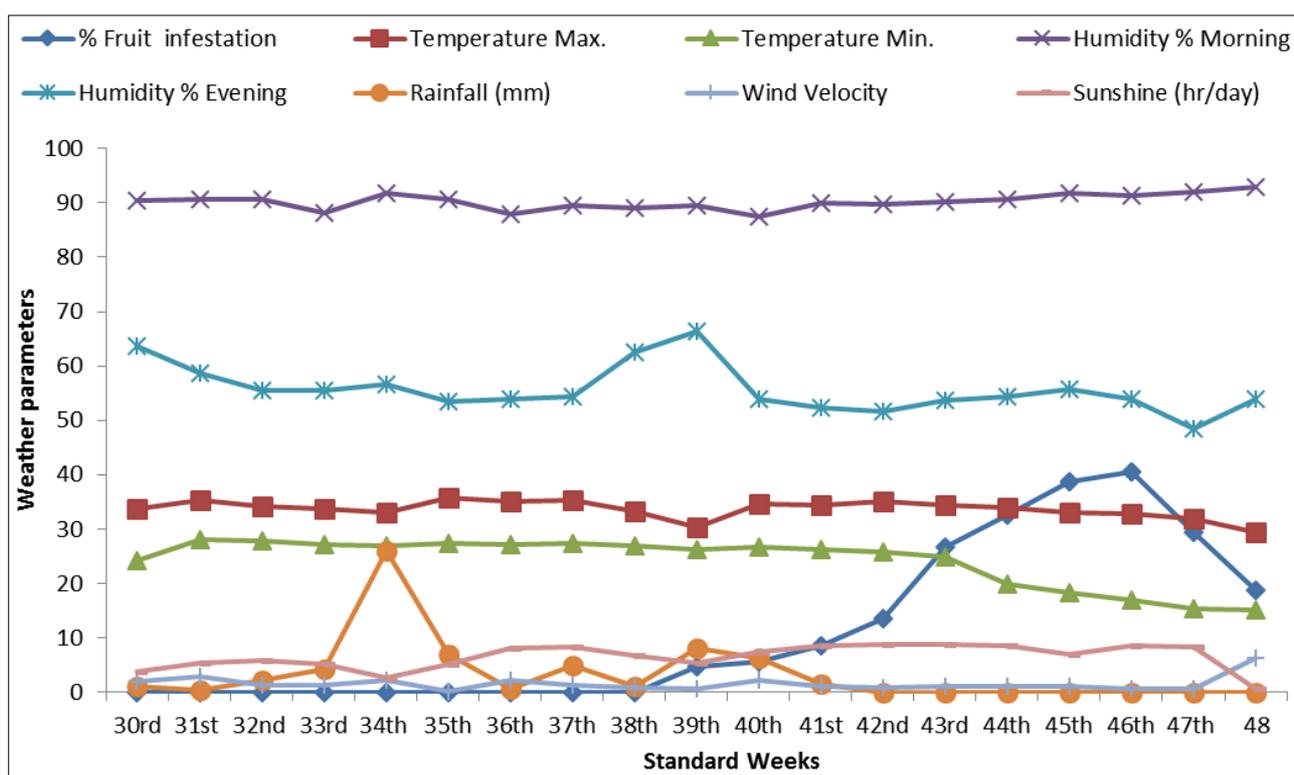


Fig 2: Graphical representation of seasonal incidence of shoot and fruit borer, (*Leucinodes Orbonalis Guenee*) during *Kharif* 2016.

4. Results and discussion

The present study entitled, 'To study the seasonal incidence of shoot and fruit borer, (*Leucinodes orbonalis* Guenee) on brinjal during *Kharif* season of 2016' in Trans Yamuna region of Allahabad' was undertaken at the central research farm, SHUATS, Allahabad and data reveals that,

4.1 Per cent shoot infestation

Studies on the incidence of shoot and fruit borer population with weather parameters given in table No.02 below. Shoot infestation of *Leucinodes orbonalis* Guenee 2016 *Kharif* season was commenced from 34th standard week (August third week) on shoot with an average 3.85% infestation. The borer population increased and gradually reached peak level of 33.5% of larval population at 42nd standard week (October third week). The population increased and gradually reached peak level 33.5% larval population and decline in the trend was noticed this may be due to fall in congenial weather parameters. The pest builds up as correlating with max temperature and declined as it falls.

4.2 Per cent fruit infestation

Studies on the incidence of shoot and fruit borer population

with weather parameters given in table No. 03 below fruit infestation of *Leucinodes orbonalis* Guenee 2016 *Kharif* season was commenced from 39th standard week (third week of September) on shoot with an average 4.6% infestation. The borer population increased and gradually reached peak level of 40.5% of larval population at 46th standard week (second week November) The population increased and gradually reached peak level 40.5% larval population and decline in the trend was noticed this may be due to fall in congenial weather parameters.

5. Discussion

5.1 Per cent shoot infestation

Studies on the incidence of shoot and fruit borer population with weather parameters during *Kharif* season 2016. The occurrence of *Leucinodes orbonalis* Guenee in Per cent shoot infestation was recorded in 2016 *Kharif* season was commenced from 34th standard week (August third week) on shoot with an average 3.85 % infestation. The borer population increased and gradually reached peak level of 33.5% of larval population at 42nd standard week (October third week) and decline in the trend was noticed this may be due to fall in congenial weather parameters. The pest builds

up was correlating with max temperature and declined as it falls. Kaur *et al.* (2014) [6] made the similar findings.

5.2 Per cent fruit infestation

The occurrence of *Leucinodes orbonalis* Guenee in Per cent fruit infestation was commenced from 39th standard week (third week of September) on shoot with an average 4.6% infestation. The borer population increased and gradually reached peak level of 40.5% of larval population at 46th standard week (second week November). Thereafter, declined trend was observed due to fall of maximum and minimum temperatures as optimum weather condition are decreasing. The probable reason for such finding may be that the occurrence of *Leucinodes orbonalis* Guenee might be due to congenial weather factor like temperature, wind velocity, humidity, and sunshine hours prevailed during the investigation. It was observed that the maximum temperature favoured the multiplication of shoot and fruit borer whereas, decline of maximum and minimum temperature lead to decline of the shoot and fruit borer population. Similar findings have been reported by Shukla and Khatri (2010) reported adult of shoot and fruit borer increased considerably in the month of Oct. to Nov. and decreased in subsequently weeks of Dec. Maximum shoot and fruit damage was recorded in third weeks of Oct. This was supported by Kumar and Singh (2013) [7].

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