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Population fluctuation of brinjal shoot and fruit borer (*Leucinodes orbonalis* Guenee) in Eastern Uttar Pradesh

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Abstract
The present investigation was carried out during the *Kharif* season, 2017-18 at Student's Instructional Farm, N. D. University of Agriculture and Technology, Kumarganj, Faizabad (U.P.). The incidence of brinjal shoot and fruit borer (*Leucinodes orbonalis*) were recorded. Maximum and minimum shoot infestation was recorded in 48th SW and 4th SW i.e. 7.42 and 0.13 shoot damage/plant respectively. Maximum and minimum fruit infestation was recorded in 48th SW and 4th SW i.e. 8.04 and 0.81 fruit damage/plant respectively. Correlation coefficient was worked out between the incidence of insect pests and abiotic factors. In case of shoot infestation by brinjal shoot and fruit borer, the correlation was positive with maximum temperature while it was negative with minimum temperature, RH and rainfall. In case of fruit infestation by brinjal shoot and fruit borer, the correlation was negative with minimum and maximum temperature as well as with RH and rainfall.

Keywords: Brinjal shoot and fruit borer, SW (Standard week), correlation coefficient, RH (Relative humidity)

Introduction
Brinjal (*Solanum melongena* L.) is one of the widely used vegetable crops by most of the people and is popular in many countries *viz.*, Central, South and South East Asia, some parts of Africa and Central America (Harish *et al*., 2011) [1]. In India, brinjal is an important and indigenous vegetable crop extensively grown throughout North India. The area of cultivation under brinjal in India is 668.7 thousand hectares, with production of 12399.9 metric tons and productivity of 18.5 metric tons per hectare (Anonymous, 2017) [2].

Brinjal is attacked by numbers of insect pests of which some are considered as major pests causing enormous damage to the crop every year. Major insect pests attacking brinjal crop are brinjal shoot and fruit borer (*Leucinodes orbonalis* Guenee), whitefly (*Bemisia tabaci* Gennadius), jassid (*Amrasca biguttula biguttula* Ishida), epilachna beetle (*Henosepilachna vigintioctopunctata* Fabr.) and aphid (*Aphis gossypii* Glover) (Biswas *et al*., 1992) [3]. Among the major insect pests, brinjal shoot and fruit borer, *Leucinodes orbonalis* Guenee is the key pest of brinjal causing major damage in almost all the brinjal growing areas and is most destructive, especially in North India.

It is an internal borer which damages the tender shoots and fruits. Soon after hatching from eggs, young caterpillars bore into tender shoots near growing points into flower buds or into the fruits. Once the larva bores into petiole and midrib of leaves and tender shoots, it causes dead hearts (Mathur *et al.*, 2012a) [4]. The damaged shoots ultimately wither and drop off. This reduces plant growth, which in turn, reduces fruit number and size. Larval feeding inside the fruit results in destruction of fruits tissue. The feeding tunnels are often clogged with excreta of larvae. This makes even slightly damaged fruit unfit for marketing. It is also reported that there will be reduction in vitamin C content to an extent of 68 per cent in the infested fruits (Nayak *et al.*, 2014) [5]. An attempt has been made in order to assess the incidence of brinjal shoot and fruit borer in brinjal crop at different growth stages and their nature of damage in Eastern U.P.

Materials and Methods
The present investigation was conducted during *Kharif* season 2017-18 at Student's Instructional Farm, N.D. University of Agriculture and Technology, Kumarganj, Faizabad

(U.P.). Brinjal crop was regularly monitored at weekly intervals for recording incidence of brinjal shoot and fruit borer occurring after transplanting to 150 days after transplanting from incidence plot of experimental field. Healthy and *L. orbonalis* damaged shoots and total damaged fruits at each picking during fruiting stage were recorded by selecting 5 plants randomly from incidence plot of each replication. The data thus obtained were converted into percentage for drawing conclusions. The data on weather factors such as temperature (minimum & maximum), relative humidity and rainfall of the crop season were obtained to correlate the occurrence of brinjal shoot and fruit borer with weather factors.

Results and Discussion

The observations recorded on incidence of brinjal shoot and fruit borer (*Leucinodes orbonalis* G.) on NDB-2 at weekly intervals were subjected for analysis with prevailing environmental factors. The data evidences the active period of pests at various stages of crop growth. (Table 1 & 2 and Figure 1 & 2).

Table 1: Incidence of brinjal shoot and fruit borer on brinjal cultivar NDB-2 and abiotic factors during *Kharif* season, 2017-18

Standard Week (S/W)	Brinjal shoot and fruit borer		Temperature (°C)		Relative Humidity (R.H %)	Rainfall (mm)
	Mean shoot infestation (%)	Mean fruit infestation (%)	Minimum	Maximum		
36	0	0	26	34	80.1	49.4
37	0	0	26.7	34.7	78.7	0
38	0	0	25.8	32.7	84.8	88.2
39	2.01	0	25.2	33.1	82.4	20.6
40	3.53	0	24.8	33.8	79.9	0
41	2.93	0	23.9	33	79.1	0
42	3.34	0	21.4	33.7	71.7	0
43	4.45	5.13	16.7	32.7	67.5	0
44	4.37	5.74	17.9	29.9	75.2	0
45	5.24	6.51	15.3	29.2	73.6	0
46	5.75	6.65	13.9	29.3	66.7	0
47	6.21	7.32	11.9	26.8	66	0
48	7.42	8.04	8.1	25.9	63	0
49	4.65	7.57	9.8	26.1	66.7	0
50	3.64	5.98	10.1	25.5	71.2	0
51	2.51	4.26	8.1	23.3	78.2	0
52	2.46	3.47	8.4	19.4	85.6	0
1	1.7	2.43	4.7	15.1	84.3	0
2	1.02	1.98	5.2	13.8	87.8	0
3	0.66	1.29	4.8	21.8	74.1	0
4	0.13	0.81	5.9	21.3	74.8	0
5	0	0	7.2	24.3	70	0

Table 2: Correlation coefficient between incidence of brinjal shoot and fruit borer on brinjal cultivar NDB-2 and abiotic factors during *Kharif* season, 2017-18

Insect pests		Temperature (°C)		Relative Humidity (%)	Rainfall (mm)
		Minimum	Maximum		
Brinjal shoot and fruit borer	% shoot infestation	-0.1063	0.1324	-0.6575*	-0.4029
	% fruit infestation	-0.4270*	-0.1901	-0.6299*	-0.3554

***** Significant at 5% level of significance

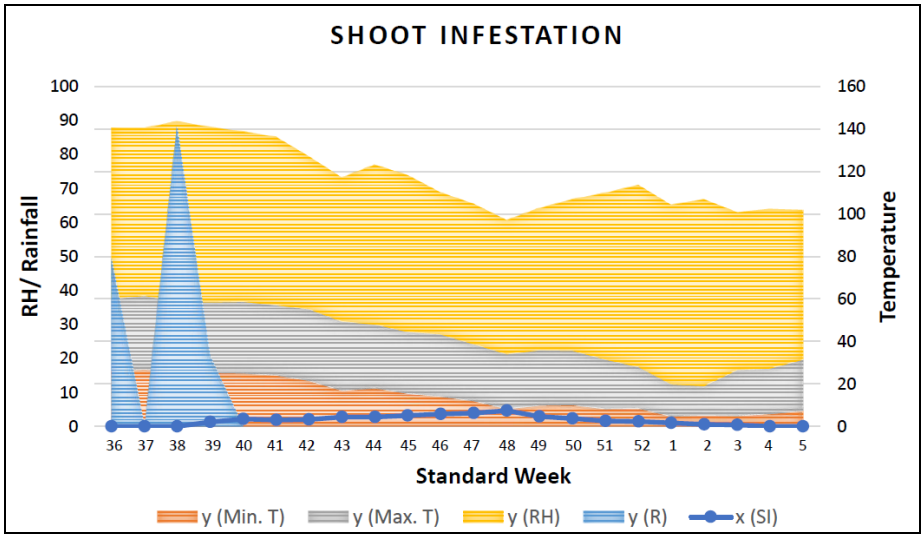

Fig 1: Shoot infestation by Brinjal shoot and fruit borer during *Kharif* season, 2017-18

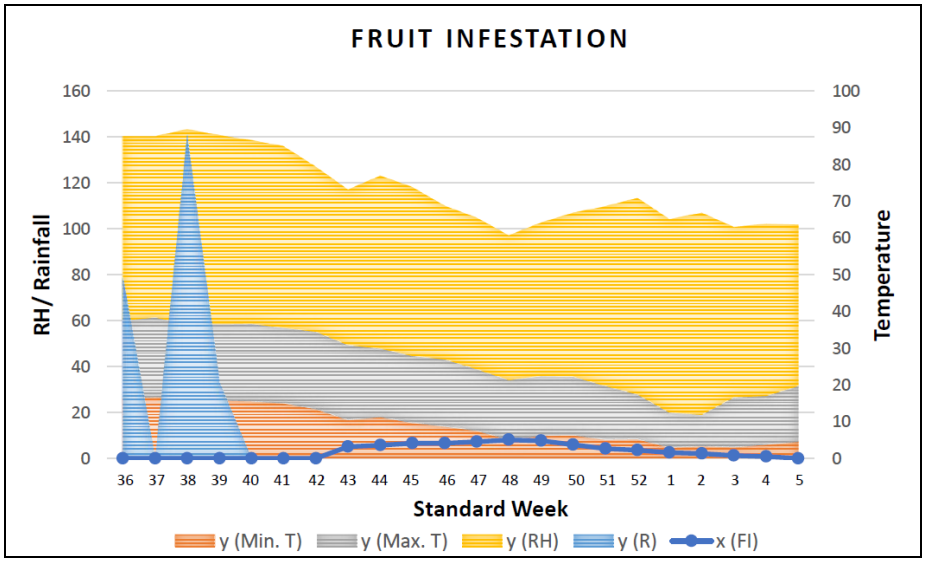

Fig 2: Fruit infestation by Brinjal shoot and fruit borer during *Kharif* season, 2017-18

The incidence of *L. orbonalis* was noticed for the first time in 39th SW at minimum and maximum temperature of 25.2 °C and 33.1 °C, relative humidity of 82.4 per cent and rainfall of 20.6 mm. The maximum infestation of 7.42 per cent damaged shoots/plant was recorded in 48th SW whereas maximum infestation of 8.04 per cent damaged fruits/plant on number basis was recorded in 48th SW itself. However, the minimum infestation of 0.13 per cent damaged shoots/plant observed in 4th SW whereas minimum infestation of 0.81 per cent damaged fruits/plant on number basis was recorded in 4th SW itself. The similar case has been reported by Sahu *et al.* (2017) [6] that the incidence of shoot and fruit borer was commenced from 34th standard week with an average 0.65% infestation. The shoot and fruit borer population increased and gradually reached peak level of 5.80% infestation at 41st standard week.

The shoot infestation had negative and non-significant correlation with minimum temperature while positive but non-significant correlation was observed with maximum temperature whereas negative but significant correlation was observed with relative humidity. Correlation was negative and non-significant with rainfall. This study corroborates with the studies of Prasad and Logiswaran (1997) [7] who reported that a significant positive correlation with maximum temperature, relative humidity (RH) and a negative correlation with minimum temperature during winter 1991.

The fruit infestation had negative but significant correlation with minimum temperature while negative and non-significant correlation was observed with maximum temperature whereas negative but significant correlation was observed with relative humidity. Correlation was negative and non-significant with rainfall. The study is supported by the findings of Nandi *et al.* (2017) [8] who reported that the fruit infestation was non-significantly correlated with maximum temperature, minimum temperature and evening relative humidity. However, other factors were significant (negative) with fruit infestation.

Conclusion

It is evident from the table and figure that the infestation by brinjal shoot and fruit borer is greatly influenced by environmental factors. The infestation gradually increases and reached peak level at the end of November (i.e. 48th SW) and thereafter declined trend was observed as the temperature decreases. Hence it is suggested that the control measures should be undertaken from mid-October month in order to manage the pest population significantly.

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