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Seasonal incidence of shoot and fruit borer, *Leucinodes orbonalis* Guenee infesting brinjal, *Solanum melongena* L.

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Abstract
The field experiment was conducted to study the seasonal incidence of shoot and fruit borer, *Leucinodes orbonalis* Guenee infesting brinjal during *rabi* season of 2017-2018 at Central Experimental Station, Wakawali, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli. The study on seasonal incidence revealed that the infestation of shoot and fruit borer was in the range of 5.35 to 25.00 per cent. The minimum infestation (5.35 ± 9.58 per cent) was recorded in 16th SMW (16th – 22nd February) it reached to peak (25%) in 17th SMW (23rd -29th April).The study on correlation between per cent mean infestation of shoot and fruit borer and weather parameters revealed that the minimum temperature (r=634) recorded positive significant correlation with per cent infestation of shoot and fruit borer.

Keywords: Seasonal incidence, shoot and fruit borer, *Leucinodes orbonalis* Guenee

Introduction
Brinjal (*Solanum melongena* L.) is one of the most common vegetable grown throughout the country for its purple, green or white pendulous fruits. It is member of Solanaceae family, which of Indian origin. Aubergine is the British name for brinjal and in United States, Australia and Canada, it is known by the name Eggplant, because fruits of the earlier cultivars resemble like eggs of goose or hen.

In India, it is most commonly used vegetable in almost every kitchen either whole or mixed with other vegetable as it can be grown throughout the year and available in all seasons. It is also used in ayurvedic medicine for curing diabetes, hypertension and obesity. It is also known for decreasing blood cholesterol. Brinjal has embedded itself deeply into the Indian culture.

In India, brinjal is cultivated on an area of 662.5 thousand hectare with total production of 12,515.2 thousand MT and average productivity is 18.9MT/ha. While in Maharashtra, it is cultivated on an area of 21,090 hectare with total production 407,640 MT and productivity is 19.33 MT/ha in 2015-16 (Anonymous, 2017) [1].

India ranks second in brinjal production after China. In India West Bengal is major brinjal producing state followed by Odisha, Gujarat, Bihar and Maharashtra. In case of productivity of brinjal in India, Uttar Pradesh ranks first followed by Karnataka and Andhra Pradesh.

Although brinjal being one of the chief vegetable crop grown in our country, it suffers economic losses due to infestation of various pests. Total eight insect species were found associated with brinjal crop from one week after transplanting upto crop harvest. Pests found attacking on brinjal were jassids (*Amrasca biguttula biguttula*, Ishida), aphids (*Aphis gossypii*, Glover), white fly (*Bemisia tabaci*, Gennadius), leaf roller (*Eublemma olivacae*, W.), shoot and fruit borer (*Leucinodes orbonalis*, Guenee), epilachna beetle (*Epilachna vigintioctopunctata*), leaf webber (*Psara bipunctalis)* and grass hopper (*Chrotogomus* spp.) [Gangwar and Singh, 2014] [3].

The shoot and fruit borer, *Leucinodes orbonalis* Guenee is the most destructive pest of brinjal at both vegetative and reproductive stages of almost all regions of India causing significant reduction in the yield by 40-80 per cent. After hatching, the young larvae bore into the petioles/growing shoots/flower buds/fruits and close the bore holes with frass, after entering in them. The larvae feed inside the midrib/flowers and in the pulp of fruit. The damaged shoots and flowers drop down. The large one or more round exit holes are visible on the fruits. Affected fruits get rotten from inside and such fruits lose their market value (Jyoti Raina and Yadhav, 2018) [5].

The meteorological factors play an important role in the seasonal incidence of pests. The temperature and relative humidity are the chief weather parameter that the largely direct the activity of the pest. By studying these parameters in detail and correlating them with incidence, one can predict the incidence of pests in advance, which help in deciding the plant protection measures. Hence, it was decided to study the seasonal incidence and its relations with weather parameters.

Materials and Methods

The field experiment was conducted at Vegetable Improvement Scheme, Central Experimental Station, Wakawali, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli during the rabi season of 2017-18. Seedlings of the brinjal cultivars (40 days old) were transplanted in the well prepared field. All the recommended package of practices was followed. The cultivars were kept unsprayed throughout the crop season. The details of the material used and methodology adopted during the present investigation are given below.

Size of plot	:	3.0m x 7.2m
Method of planting	:	On raised beds
Spacing	:	60 cm x 60 cm
Cultivar	:	Konkan Prabha
Date of transplanting	:	15th January, 2018

Method of recording observations

The observations were recorded at each picking i.e. on the basis of weight of healthy and infested fruits due to pest.

Per cent fruit infestation were calculated by the following formula,

$$\text{Per cent fruit infestation} = \frac{\text{Weight of infested fruits harvested}}{\text{Total weight of fruits harvested}} \times 100$$

In order to study the influence of abiotic factors (meteorological parameters) on pest incidence, the correlations were worked out with weekly weather data *viz*., average maximum and minimum temperatures, morning and evening relative humidity available at the meteorological observatory, Central Experimental Station, Wakawali, Tal. Dapoli, Dist-Ratnagiri.

Results and Discussion

The data on seasonal incidence of shoot and fruit borer is presented in Table 1.

The infestation of shoot and fruit borer at first harvest was observed from 11th Standard Meteorological Week (21.67 ± 9.58 per cent) and then it declined gradually from 12th SMW (19th – 25nd March). The mean infestation ranged from 5.35 to 25.00 per cent. The minimum infestation (5.35 ± 9.58 per cent) was recorded in 16th SMW (16th – 22nd February). It was maximum (25%) in 17th SMW (23rd -29th April).

The present findings are in conformity with the results of Anjali *et al.* (2012) [2]. They revealed that infestation of fruit borer was in range of 6.21 to 35 per cent. In present finding, the infestation of fruit borer was in the range of 5.35 to 25.00 per cent.

Data on correlation coefficient of per cent fruit infestation by shoot and fruit borer with weather parameters are shown in table 2 and illustrated in Fig. 1.

The per cent infestation of shoot and fruit borer exhibited positive correlation with maximum temperature, minimum temperature and evening relative humidity, while negative correlation with morning humidity. The minimum temperature (r=634) recorded positive significant correlation with per cent fruit infestation of shoot and fruit borer. The morning relative humidity (r=-0.474) recorded negative non-significant correlation with per cent infestation of shoot and fruit borer. The maximum temperature (0.390) and evening humidity (r=0.117) showed positive non-significant correlation with per cent infestation of shoot and fruit borer.

The present findings are in conformity with the results of earlier workers.

Mahmood *et al*. (1992) [6] revealed that the brinjal shoot and fruit borer had significant positive correlation with mean minimum temperature and positive but non-significant correlation with maximum temperature. Relative humidity had no significant contribution toward increasing or decreasing fruit infestation.

Anjali *et al*. (2012) [2] revealed that the per cent fruit infestation had a non-significant positive correlation with maximum temperature.

Shaik (2012) [8] found that brinjal shoot and fruit borer showed positive significant correlation with minimum temperature.

Payal Devi (2013) [7] revealed that brinjal shoot and fruit borer population showed significantly positive correlation with minimum temperature and negative non-significant relation with morning relative humidity.

Indirakumar *et al*. (2016) [4] revealed that per cent fruit infestation showed non-significant positive correlation with maximum temperature.

Sharma and Tayde (2017) [9] revealed that BSFB incidence showed significant positive correlation with minimum temperature and positive correlation with maximum temperature.

Table 1: Seasonal incidence of shoot and fruit borer (*L. orbonalis*) infesting brinjal

SMW	Period	Temperature (◦C)		Relative humidity (%)		Mean per cent fruit infestation
		T max	T min	Morning	Evening	
4	22/01/2018 to 28/01/2018	32.34	13.23	84.86	62.14	0.00
5	29/01/2018 to 04/02/2018	34.43	12.23	82.83	52.57	0.00
6	05/02/2018 to 11/02/2018	32.91	14.83	80.14	61.43	0.00
7	12/02/2018 to 18/02/2018	34.43	15.4	78.86	54.86	0.00
8	19/02/2018 to 25/02/2018	35.26	16.46	77.00	63.14	0.00
9	26/02/2018 to 04/03/2018	38.77	15.73	68.14	44.57	0.00
10	05/03/2018 to 11/03/2018	36.43	17.69	76.86	41.00	0.00
11	12/03/2018 to 18/03/2018	37.23	19.84	62.43	43.57	21.67
12	19/03/2018 to 25/03/2018	35.14	16.69	67.00	47.14	20.36
13	26/03/2018 to 01/04/2018	34.83	18.14	85.29	71.57	13.62
14	02/04/2018 to 08/04/2018	36.4	20.23	82.71	74.00	16.41

15	09/04/2018 to 15/04/2018	37.51	20.89	78.29	71.00	11.89
16	16/04/2018 to 22/04/2018	37.94	22.83	79.43	84.29	5.35
17	23/04/2018 to 29/04/2018	37.86	20.43	72.29	68.71	25.00
18	30/04/2018 to 06/05/2018	36.14	22.31	71.14	54.43	17.33
SD (±)						9.58

SMW- Standard Meteorological Week

Table 2: Correlation coefficient of per cent infestation of shoot and fruit borer with weather parameters

Climatic parameters	Correlation coefficient (*r*)
Maximum temperature (T_{max})	0.390
Minimum temperature (T_{min})	0.634*
Morning relative humidity	-0.474
Evening relative humidity	0.117

*Significant at 0.05 per cent level r= 0.514

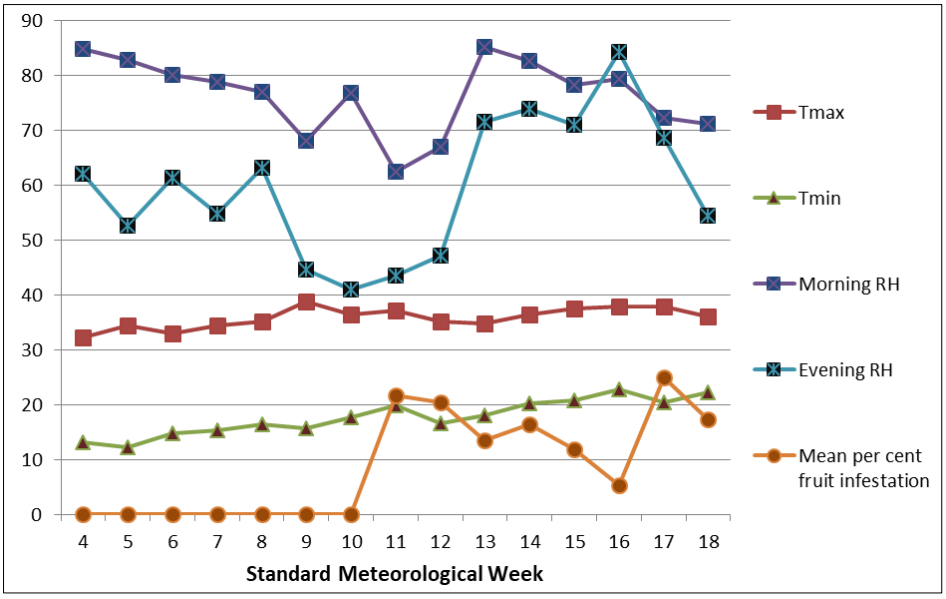

Fig 1: Mean per cent infestation of shoot and fruit borer in relation to weather parameters

Conclusion

The meteorological factors play an important role in the seasonal incidence of the pests. The study on seasonal incidence revealed that the infestation of shoot and fruit borer was in the range of 5.35 to 25.00 per cent. The minimum infestation (5.35 ± 9.58 per cent) was recorded in 16th SMW (16th – 22nd February) it reached to peak (25%) in 17th SMW (23rd -29th April).The study on correlation between per cent mean infestation of shoot and fruit borer and weather parameters revealed that the minimum temperature (r=634) recorded positive significant correlation with per cent infestation of shoot and fruit borer.

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