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Impact of meteorological factors on seasonal incidence of brinjal shoot and fruit borer, *Leucinodes orbonalis* Guenee

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Abstract
The seasonal incidence of brinjal shoot and fruit borer *Leucinodes orbonalis* Guen. on brinjal was studied at Regional research station, Aruppukottai**,** Tamilnadu during Kharif 2017. The shoot and fruit borer incidence on the shoot was initiated in the last week of July and peaked (32.20%) in the second week of October. The incidence of shoot and fruit borer on fruit was initiated in the second week of August and peaked (40.86%) in the third week of October. Among the weather parameters, maximum temperature showed a positive correlation, while relative humidity and rainfall showed a negative correlation with the shoot and fruit borer infestation. The statistically significant values showed that the incidence of borer population was due to the prevailing ecological conditions. The population increased and gradually reached peak level 40.86% larval population and decline in the trend was noticed this may be due to fail in congenial weather parameters.

Keywords: BSFB, *Leucinodes orbonalis*, kharif, seasonal incidence, correlation, weather parameters

Introduction
Solanum melongena L. (Brinjal) is one of the most important vegetables, highly cosmopolitan, and is considered a poor man's crop, grown under diverse agro-climatic conditions of the globe as a major vegetable crop [7] throughout the year. In India, the major brinjal growing states are Andhra Pradesh, West Bengal, Karnataka, Tamil Nadu, Maharashtra, Uttar Pradesh, Odisha, Bihar, and Rajasthan. Globally, after china thereby covers 50 per cent of the world's area under its brinjal cultivation, India ranks second top producer in the production of brinjal [1]. In India, brinjal cultivation covers an area of 7.22 lakh hectares, with 134.43 lakh tonnes of production and 18.6 tonnes yield per hectare was recorded. In Tamil Nadu, brinjal cultivation occupies 11, 100 ha area with 1.04 lakh tonnes of annual production during the year 2014-2015 recorded [4].
Among the major pests damaging the brinjal shoot and fruit borer *Leucinodes orbonalis* (Guenee) is the most important pest causes almost 70-92 per cent of yield loss [2]. After a month of transplanting the seedlings, infestation starts and continues till the end. Drooping of shoots in young plants can be the initial damage symptom by this pest; thereby, wilted shoots gradually wither and die away. Flower buds and fruits are damaged by the borer in later stages. Understanding the seasonal incidence of shoot and fruit borer is essential because variations in the weather condition significantly affect the extent of damage caused by the pest. Therefore, the work was to work out the correlation between the pest population and weather parameters to manage the pest at the right time.

Materials and Methods
To study the seasonal incidence of Brinjal shoot and fruit borer on brinjal, a field study was conducted near Regional Research Station, Aruppukottai**,** Tamilnadu on brinjal crop during *Kharif*, 2017 under prevailing weather conditions. Local Brinjal variety was transplanted for making observations. Crop raised according to recommended agronomic practices. Observations were made at weekly intervals throughout the cropping season on ten randomly selected plants from the untreated control plot. Collected weekly meteorological data (Rainfall, Temperature and Relative Humidity) for the period of 2017 to 2018 from the observatory at RRS, Data were studied for seasonal incidence of BSFB.

Besides this, correlation and regression analyses between abiotic factors and the borer population were also carried out [3].

The incidence of shoot and fruit borer worked by using the formulae:

Shoot infestation (%) = (No. of infested shoots ÷ Total No. of shoots)×100

Fruit infestation (%) = (No. of infested Fruits ÷ Total No. of Fruits)×100

Table 1: Influence of weather factors on the incidence of the shoot and fruit borer, *L. orbonalis* during Kharif, 2017

Observation	Shoot infestation (%)	Fruit infestation (%)	Max. temp. (^{0}C)	Min. temp. (^{0}C)	Avg. humidity (%)	Rainfall (mm)
SMW31	12.86	8.72	37.86	25.57	70.21	10.60
SMW32	13.13	12.20	36.36	24.71	77.50	8.54
SMW33	16.64	16.72	33.93	23.86	77.93	11.66
SMW34	17.23	20.00	35.71	24.57	77.36	2.03
SMW35	19.81	25.23	35.57	24.00	79.14	14.29
SMW36	21.43	27.00	33.86	24.29	78.50	0.74
SMW37	24.29	32.40	33.56	23.86	83.86	4.31
SMW38	25.00	31.69	34.00	22.21	68.64	0.00
SMW39	26.49	33.69	35.38	22.81	69.38	1.65
SMW40	29.72	34.00	35.29	26.14	67.64	0.71
SMW41	32.20	36.83	33.43	25.57	72.36	2.43
SMW42	29.10	40.86	33.71	25.86	69.43	0.29
SMW43	28.88	38.73	33.57	26.00	69.36	0.71
SMW44	26.14	32.36	24.29	23.71	81.07	2.57
SMW45	21.38	28.81	30.43	24.29	74.07	2.14
SMW46	16.84	24.81	32.71	24.86	72.43	0.57
SMW47	12.43	19.20	31.86	24.00	73.00	1.29
SMW48	11.92	18.49	27.57	23.29	88.36	12.29
SMW49	9.54	17.86	30.86	22.57	74.21	0.00
SMW50	8.43	15.96	30.86	23.14	74.14	0.00
SMW51	7.54	14.00	29.43	21.71	74.79	0.57
SMW52	5.41	13.56	29.86	21.29	70.71	0.00

Table 2: Correlation coefficient (r) of *L. orbonalis* incidence on brinjal with prevailing weather parameters

Season	Weather parameter	Correlation coefficient (r)	
		Shoot infestation (%)	Fruit infestation (%)
Kharif 2017	Maximum Temperature (^{0}C)	0.229	0.018
	Minimum Temperature (^{0}C)	0.584**	0.416
	Relative Humidity (%)	-0.224	-0.229
	Rainfall (mm)	-0.156	-0.358
R^2 (Coefficient of determination)		0.36	0.394

** Correlation is significant at the 0.01 level * Correlation is significant at the 0.05 level

Results and Discussion

Seasonal incidence of brinjal shoot and fruit borer *Leucinodes orbonalis* Guenee (Table 1) revealed that this pest occurred all over the year except extreme cold and hot months. The data were collected from the first week of July 2017 to the last week of December 2017. The incidence of shoot and fruit borer on shoot began in the last week of July and peaked (32.20%) in the second week of October. The shoot and fruit borer incidence on fruit started in the second week of August and reached its peak (40.86%) in the third week of October (Fig.1). The heavy infestation of shoot and fruit borer was observed from October 13.02% to November first week 13.88% (Table 1). There was a gradual decrease in the shoot and fruit borer's infestation till the end of December last week, 5.41% and 13.56 respectively.

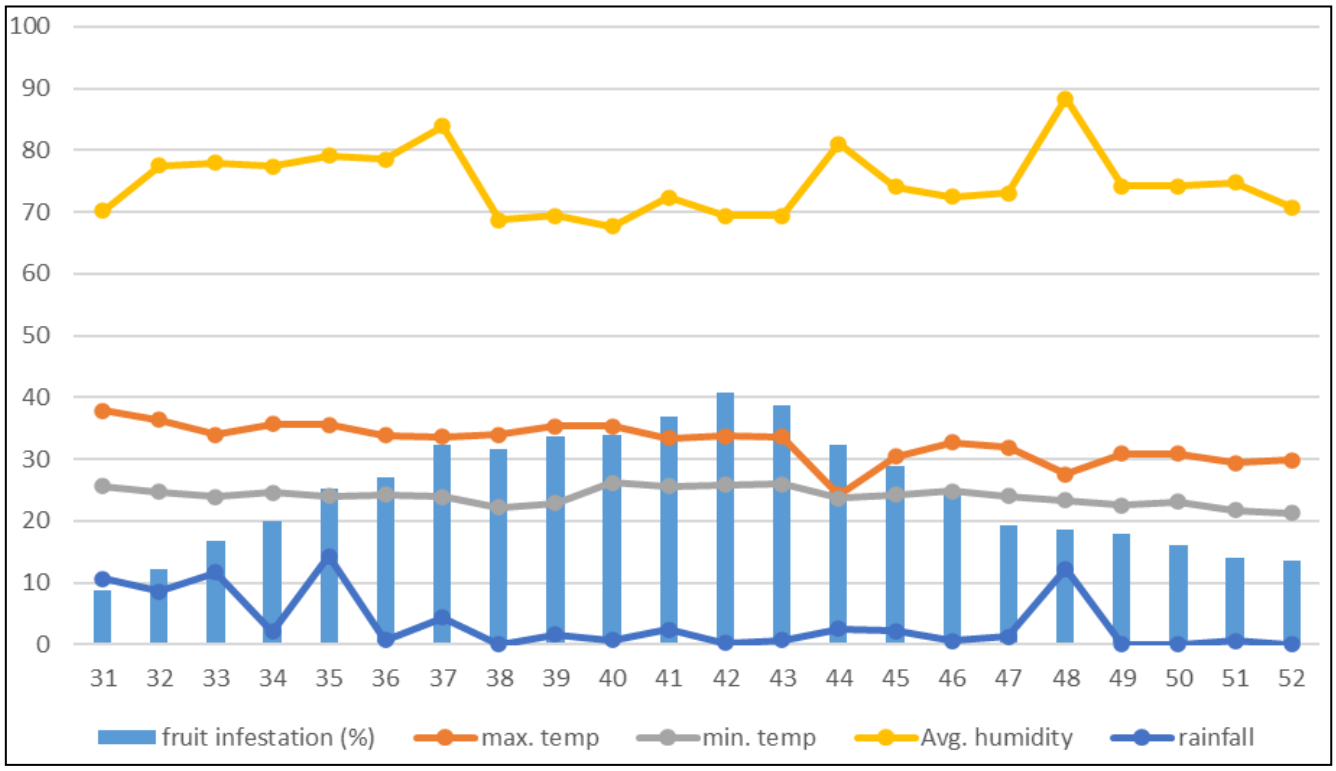

Fig 1: Impact of abiotic factors on seasonal incidence of fruit and shoot borer

The correlation coefficient between weather parameters and seasonal incidence of the shoot and fruit borer revealed that the mean temperature recorded a significant positive correlation with the shoot and fruit borer seasonal incidence with a correlation coefficient of r = +0.229 and 0.180 (Shoot and fruit infestation, respectively). Mean relative humidity negatively correlated with the seasonal incidence of the shoot and fruit borer r = -0.224 and -0.229. A negative correlation was observed between total rainfall and seasonal incidence of the shoot and fruit borer r = -0.156 and -0.358, respectively (Table 2).

From the earlier reports it was observed that both maximum and minimum temperature and brinjal shoot and fruit borer incidence recorded a positive [9]. In the contrary, it was reported that the maximum and minimum temperatures, evaporation, and sunshine hours positively correlated with shoot damage, while relative humidity had a negative influence. Fruit damage had a positive association with maximum and minimum temperatures, evaporation, and a negative association with relative humidity [6]. Also the same was stated that the relative humidity and temperature were negatively associated with the fruit infestation [8]. A positive association of brinjal shoot and fruit borer infestation with maximum temperature and relative humidity was recorded but was non-significant [10]. Many researchers have also indicated that the shoot and fruit borer occurrence all around the year in different regions of South East Asia [5].

Conclusion

It is evident from the present study that the insect pests population's occurrence was due to the prevailing ecological conditions. The infestation gradually increased and peaked at the end of October (i.e., 42nd SMW), and after that, the decline was observed as the temperature decreased. Hence, brinjal shoot and fruit borer management during Kharif sown brinjal under semi-arid tropical regions should be initiated suitably from August onwards using an integrated approach.

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