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Seasonal Incidence of Brinjal Shoot and Fruit Borer, *Leucinodes orbonalis* Guene, (Lepidoptera: Crambidae) During *Kharif* Season

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A B S T R A C T

The field experiments were carried out at College of Horticulture, UHS, Bagalkot during *kharif* season of 2014-2015. The experiment was laid out in a Randomized Block Design. The peak shoot infestation was noticed around eighth week after transplantation during *kharif* season. Similarly, the fruit infestation was reached its maximum at 12th weeks after transplantation during *kharif* season. The incidence of *Leucinodes orbonalis* on brinjal shoots showed non-significant positive correlation with the maximum temperature, average temperature and rainfall. Whereas, the minimum temperature, morning relative humidity and evening relative humidity recorded non-significant negative correlation with shoot incidence. The incidence of *L. orbonalis* on brinjal fruits indicated non-significant positive correlation with maximum temperature. Whereas, the other weather parameters like minimum and average temperature, morning and evening relative humidity and rainfall showed non-significant negative correlation with fruit incidence.

Introduction

Brinjal (*Solanum melongena* L.) is one of the most important vegetables in South Asia which accounts for almost fifty per cent of the world's area under cultivation and also popular in some parts of Africa and Central America (Harish *et al.,* 2011). The area under brinjal cultivation in India is estimated at 7.22 lakh ha under cultivation with a production of 134.43 metric tons and productivity of 18.60 tonnes per hectare. In Karnataka, brinjal is cultivated over an area of 16.10 thousand ha with a production of 421.40 thousand tones (Annon, 2014). Unripe fruits are used primarily as vegetable in the country due to its nutritive value, as fruits are consisting of minerals like iron, phosphorous, calcium and vitamins like A, B and C, (Singh *et al.,* 1963). It has been reported as Ayurvedic medicine for curing the diabetes. In addition it is used as a good appetizer, good aphrodisiac, cardiotonic, laxative and reliever of inflammation. Brinjal plants are very much susceptible to insect pests attack right from seedling stage to final harvesting stage. Brinjal is attacked by 53 species of insect pests of which 8 are considered as major pests causing enormous damage to crop in every season in every year (Biswas *et al.,* 1992). Among the major insect pests, brinjal shoot and fruit borer (BSFB), *Leucinodes orbonalis*

is considered the most destructive pest of brinjal in India. The yield loss due to the pest is to the extent of 70-92 per cent (Eswara Reddy and Srinivas, 2004; Jagginavar *et al.*, 2009; Chakraborti and Sarkar, 2011).

Materials and Methods

To study the seasonal incidences of brinjal shoot and fruit borer, *Leucinodes orbonalis* during *kharif* season of2014-2015. Field experiments were carried out at College of Horticulture, Bagalkot. The experiment was laid out in a Randomized Block Design. The hybrid, Mahyco Super 10 was raised in 0.5 acre area following recommended agronomic practices (Anon., 2014). The total area is divided and made into five equal sized blocks each measuring 12 m x 10 m. All the agronomic practices were followed to raise the crop as per the recommended package of practices. The plant protection measures for sucking pests were common for all the treatments. But no plant protection measures were taken for brinjal shoot and fruit borer during the entire study period. Weekly metrological data on different weather parameters was recorded throughout the experimental period.

The seasonal incidences of Brinjal shoot and fruit borer was studied through installation of sex pheromone traps and recording infested shoots and fruits at regular interval. Totally five water traps with leucilure was installed in the field in such way that each block having one trap with a minimum of 10 m inter trap distance by leaving 2m from the border. The seasonal incidence of BSFB was studied by recording infested shoots and fruits. For this purpose, ten plants were selected randomly in each block (50 plants from 5 blocks). From each plant, number of healthy shoots, infested shoots and total number of shoots were recorded. To work out per cent fruit damage, weight of healthy fruits, weight of infested fruits and total weight of fruits were recorded at each harvest. The per cent shoot and fruit infestation was expressed by using following formulas;

$$\text{Shoot damage (\%)} = \frac{\text{Number of shoots infested per plant}}{\text{Total number of shoots per plant}} \times 100$$

$$\text{Fruit damage (\%)} = \frac{\text{Weight of infested fruits}}{\text{Total weight of fruits}} \times 100$$

Results and Discussion

Kharif season (2014-2015)

Shoot incidence

The incidence of shoot borer, *L. orbonalis* on *kharif* crop commenced during second week after transplantation (in the month of August) with a mean of 25.55 per sent shoot damage and reached its peak (43.43%) during eighth week after transplantation *i.e.* in the month of September (Table 1) (Fig. 1). The present results are in agreement with that of Sing *et al.*, (2000) who reported that the infestation was started at the end of August and reached peak in the third week of September. Similarly, Bharadiya and Patel (2005) also reported that the damage of shoot and fruit borer on shoots was highest during fourth week of September. The present investigations are in partial agreement with that of Jat *et al.*, (2002) who reported that the infestation of brinjal shoot borer commenced one week after transplantation.

Correlation between weather parameters and shoot incidences

The per cent shoot damage was positively correlated with maximum temperature, average temperature and rainfall ($r = 0.285$, $r = 0.075$ and $r = 0.037$, respectively). However, these parameters were statistically non- significant.

Whereas, minimum temperature, morning relative humidity and evening relative humidity had negative non- significant correlation (r = -0.189, r = -0.101 and r = -0.017, respectively) (Table 2). The present findings are in agreement with those of Sing *et al.*, (2000) and Anjali *et al.*, (2012) who reported a positive correlation between temperature and pest multiplication, whereas, it was negatively correlated with relative humidity.

Fruit incidences

The incidence of BSFB on fruit was noticed during fifth week after transplantation i.e. in the month of September (34.05%). Thereafter, the infestation increased gradually and reached to its maximum (51.41%) during 12th week after transplantation (October month). The infestation persisted up to 18th week after transplantation (second week of December) (Table 1) (Fig. 1).

The present results are in agreement with the results of Shukla and Khatri (2010) and Kumar and Sing (2012) who reported the infestation of fruit borer from October to December. Similarly, Sing *et al.*, (2006), Oommen and Kumar (2004) and Jat *et al.*, (2002) noticed the peak activity of pest on brinjal fruits in first, third and fourth week of October, respectively.

Fig.1 Weekly incidence of brinjal shoot and fruit borer, *Leucinodes orbonalis* after transplantation during *kharif* season of 2014-15

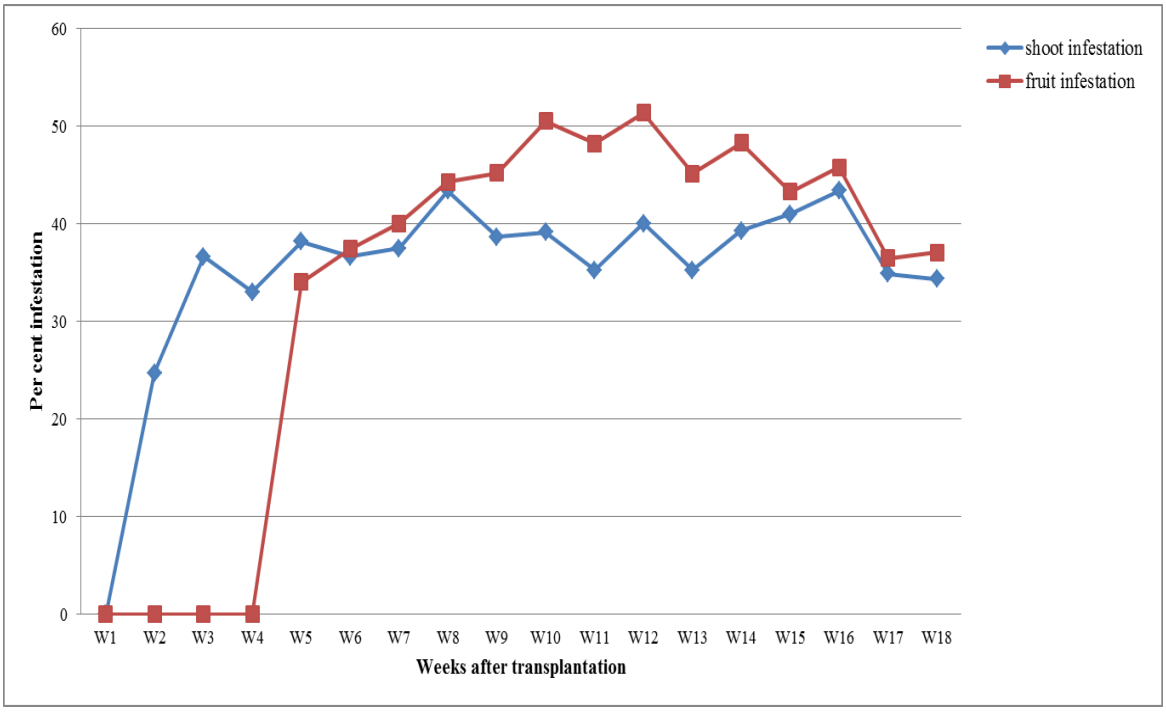

Table.1 Incidence of brinjal shoot and fruit borer, *Leucinodes orbonalis* at different weeks after transplantation during *kharif* season

Weeks after transplantation	Shoot infestation (%)	Fruit infestation (%)
Week 1	0.000 (0.40)^{d}	0.00 (0.401)^{g}
Week 2	25.55 (27.79)^{c}	0.00 (0.401)^{g}
Week 3	36.67 (36.93)^{ab}	0.00 (0.401)^{g}
Week 4	33.05 (32.25)^{bc}	0.00 (0.401)^{g}
Week 5	38.20 (38.17)^{ab}	34.05 (35.65)^{f}
Week 6	36.67 (37.00)^{ab}	37.46 (37.70)^{ef}
Week 7	37.53 (37.48)^{ab}	40.08 (39.28)^{de}
Week 8	43.43 (41.22)^{a}	44.35 (41.75)^{bc}
Week 9	38.63 (38.42)^{ab}	45.24 (42.27)^{bc}
Week 10	39.17 (38.68)^{ab}	50.57 (45.32)^{a}
Week 11	35.19 (36.31)^{ab}	48.28 (44.81)^{ab}
Week 12	40.08 (39.24)^{ab}	51.41 (45.81)^{a}
Week 13	35.29 (36.37)^{ab}	45.17 (42.23)^{ab}
Week 14	39.33 (38.81)^{ab}	48.38 (44.03)^{ab}
Week 15	41.01 (39.79)^{ab}	43.38 (41.19)^{cd}
Week 16	42.50 (40.67)^{a}	45.80 (42.60)^{bc}
Week 17	34.90 (36.20)^{ab}	36.52 (37.17)^{ef}
Week 18	34.39 (35.79)^{abc}	37.10 (37.51)^{ef}
SEm ±	2.931	0.871
CD @ 5%	8.245	2.458

*Mean of six replications
Figures in parentheses are Arc sine transformed values
Figures in each column followed by same alphabet (s) do not differ significantly at 5 % level

Table.2 Correlation between weather parameters and incidence of brinjal shoot and fruit borer, *Leucinodes orbonalis* during *kharif* season

Weather parameters	Correlation coefficient (r)	
	Shoot damage	Fruit damage
Maximum Temperature (^{0}C)	0.285	0.291
Minimum Temperature (^{0}C)	-0.189	-0.288
Average Temperature (^{0}C)	0.075	-0.036
Rainfall (mm)	0.037	-0.347
Relative humidity (%) I	-0.101	-0.155
Relative humidity (%) II	-0.017	-0.191

Relative humidity I – Morning relative humidity
Relative humidity II – Evening relative humidity

Correlation between weather parameters and fruit incidences

The incidence of BSFB on fruit was found positively correlated with maximum temperature (r = 0.291) and negatively correlated with other weather parameters such as minimum temperature, average temperature, rainfall, morning relative humidity and evening relative humidity (r = -0.288, r = -0.036, r = - 0.347. r = -0.155 and r = - 0.191, respectively). These findings clearly indicated that none of the weather parameters had either positive or negative significant influence on population dynamics of BSFB (Table 2).

The present studies get support from the work of Sing *et al.*, (2000), Jat *et al.*, (2002) and Oommen and Kumar (2004) who also obtained similar results. The minimum and average temperature, morning and evening relative humidity and rainfall had non-significant effect on borer infestation.

The present findings are in also conformity with those of Naik *et al.*, (2008), Sing *et al.*, (2009) and Shukla and Khatri (2010) who also reported a non-significant effect of minimum temperature, relative humidity and rainfall on the fruit borer infestation.

The studies on seasonal incidences of brinjal shoot and fruit borer during *Kharif* season revealed that, the peak shoot infestation was noticed around eighth week after transplantation during *kharif* season. Similarly, the fruit infestation was reached its maximum at 12th weeks after transplantation during *kharif* season. The incidence of *L. orbonalis* on brinjal shoots showed non-significant positive correlation with the maximum temperature, average temperature and rainfall. Whereas, the minimum temperature, morning relative humidity and evening relative humidity recorded non-significant negative correlation with shoot incidence. The incidence of *L. orbonalis* on brinjal fruits indicated non-significant positive correlation with maximum temperature. Whereas, the other weather parameters like minimum and average temperature, morning and evening relative humidity and rainfall showed non-significant negative correlation with fruit incidence.

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