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Seasonal occurrence and impact of weather parameters on population dynamics of brinjal shoot and fruit borer (*Leucinodes orbonalis* Guenee) during *Kharif* 2020-21

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Abstract
A field experiment was carried out during *Kharif* 2020-21 at research cum instructional farm, Department of Horticulture, College of Agriculture, Raipur (C.G.) to study the seasonal incidence and impact of weather parameters on population dynamics of brinjal shoot and fruit borer (*Leucinodes orbonalis* Guenee). The activity of brinjal shoot and fruit borer was observed throughout the crop growth period. The infestation of *Leucinodes orbonalis* on developing shoots was first observed during fourth week after transplanting (32nd SMW) and reached its peak activity (9.92% shoot damage) during first week of October (40th SMW). However, the maximum fruit damage (50.2%) caused by *Leucinodes orbonalis* was observed during fourth week of October (43rd SMW). Correlation studies revealed that brinjal shoot borer showed positively significant correlation with minimum temperature, morning and evening relative humidity. While, brinjal fruit borer showed negatively significant correlation with minimum temperature, rainfall, morning and evening relative humidity and wind velocity while, showed positively significant correlation with sunshine hours.

Keywords: brinjal**,** *Leucinodes orbonalis*, seasonal incidence, SMW, weather parameters, correlation

Introduction
Brinjal (*Solanum melongena* L.) is an important vegetable crop grown in all the seasons. It is one of the prominent crops in India. Eggplant, often known as aubergine, is a member of the "Solanaceae" family, which includes over 2450 species divided into 95 genera (Mabberley, 2008). It's a native of the Indo-Burma region, and it's been reported to grow in India.

After potato, onion and tomato, brinjal or eggplant (*Solanum melongena* L.) is India's fourth most important vegetable, accounting for 9% of total vegetable production. The world production of brinjal is 54.1 million tones, led by China with 63 percent of the world's total and India with 24 per cent (Anonymous, 2014). India has second rank in both area and production and 8th in productivity in all brinjal growing country. It is grown in practically all Indian states, covering 0.741 million hectares and producing an anticipated 13 million metric tons per year with a yield of 17.4 metric tons per hectare in 2019-20 (NHB Database 2019-20). It is recognized to have therapeutic benefits in the treatment of diabetes and as a liver cure, in addition to its use as a fresh vegetable. Brinjal is a fantastic cholesterol-controlling fruit. Brinjal is also a good source of dietary fiber, which helps to reduce the risk of coronary heart disease.

Due to biotic and abiotic stressors, a significant amount of the brinjal yield is lost. From seedling until senescence, the brinjal (*Solanum melongena* L.) crop is infected with a slew of insect pests. It is home to about 140 insect problem species (Prempong and Bauhiun, 1977 and Sohi 1996). However, only 36 and 53 insects have been identified on this crop by Butani and Verma (1976) and Nayar *et al*. (1976). The brinjal shoot and fruit borer is the most serious of these, wreaking havoc on the crop throughout the year. This pest has been recorded from every brinjal-growing region on the planet.

The weather conditions prevailing in a region play an important role in occurrence and subsequent build-up of pest population. Keeping the importance of the brinjal crop in mind, the present study was undertaken to study Influence of weather parameters on incidence of major pests of brinjal.

Material and Methods

The field experiment was carried out at the research cum instructional farm of department of Horticulture, Indira Gandhi Krishi Viswavidyalaya, Raipur (C.G.) during *Kharif* season of 2020-21. Brinjal's crop popular variety 'VNR – 212' was transplanted on 29 June 2020, in an area of 20 x 10 m^2 with 70 X 60 cm^2 spacing. The incidence of brinjal shoot and fruit borer was recorded at weekly interval on randomly selected five plants from each spot starting from 7 days after transplanting to the late stage of the cropping season. Total number of plants and number of infested shoots from each spot were observed for shoot infestation. Thereafter its incidence was noticed by each fruit picking on randomly selected five plants. The numbers of healthy and damaged fruits of five randomly selected plants were counted at each picking. The seasonal fluctuation in the activity of brinjal shoot and fruit borer was observed by recording percentage of infested fruits at each picking. The Pearson correlation coefficients between meteorological parameters and pest population were also calculated.

Results and Discussion

The results obtained from the present investigation as well as relevant discussion are summarized under following heads:

Per cent fruit borer caused by *Leucinodes orbonalis* Guenee

The data on the infestation of *L. orbonalis* on developing shoots of brinjal crop during *Kharif* 2020-21, presented in Table 1. The incidence of shoot borer (*L. orbonalis*) was first observed during first week of August (32nd SMW). Initially the percentage of shoot infestation was 2.2%. The peak incidence was recorded 9.92% shoot infestation during first week of October (40th SMW). After that the percentage of shoot infestation gradually decreased and pests might be shifted to brinjal fruits. The present finding concord with the findings of Gangwar and Singh (2014) [2] who also reported *L. orbonalis* infestation started from the last week of August and remained till last week of December *i.e.* this pest was found infesting the crop throughout the crop season. Mahesh and Men (2007) [7] reported that the shoot borer infestation (*Leucinodes orbonalis* G.) reached its peak activity during middle of October.

Per cent shoot borer caused by *Leucinodes orbonalis* Guenee

The incidence of the fruit borer (*L. orbonalis*) on brinjal fruits started in 36th SMW (3.12% fruit infestation) coinciding with the setting of brinjal fruits. The highest per cent fruit infestation (50.2%) of the brinjal shoot and fruit borer was recorded during fourth week of October (43rd SMW). In confirmation of the present findings, Nandi *et al.* (2017) [8] recorded highest per cent fruit infestation of the brinjal shoot and fruit borer during October at Bagalkot. Kumar *et al.* (2017) [6] recorded the highest incidence during 42nd SMW in the month of October at Varanasi.

Table 1: Seasonal occurrence of brinjal shoot and fruit borer (*Leucinodes orbonali*) during *Kharif* 2020-21

Standard meteoro-logical week (SMW)	Temperature (^{0}C)		Rain fall (mm)	Relative Humidity (%)		Wind Velocity (Km/h)	Sun Shine (hours)	BSFB Shoot infestation (%)	BSFB Fruit infestation (%)
	Max. Temp.	Min. Temp.		I	II				
28	33.4	25.0	67.5	88	74	7.2	2.8	0.0	0.0
29	33.0	26.1	39.8	86	71	5.9	4.4	0.0	0.0
30	32.3	25.9	29.9	86	68	5.5	3.8	0.0	0.0
31	33.3	26.0	23.6	89	69	5.9	3.3	0.0	0.0
32	30.5	25.5	81.6	92	77	7.1	1.5	2.2	0.0
33	28.4	25.1	71.2	93	86	10.4	0.5	3.0	0.0
34	31.0	25.5	29.8	89	74	7.8	2.0	6.8	0.0
35	29.8	24.6	235.8	93	75	8.2	3.7	7.86	0.0
36	32.9	26.0	8.0	91	74	3.0	4.9	9.2	3.12
37	33.2	26.0	64.0	91	67	3.4	6.0	8.64	3.64
38	32.7	25.8	16.4	89	71	2.9	3.6	7.9	4.4
39	32.8	25.3	0.0	90	59	5.1	5.3	9.06	8.86
40	31.8	25.0	12.8	90	63	2.6	4.0	9.92	12.98
41	32.5	25.3	0.0	90	66	4.4	5.0	4.42	23.2
42	31.9	24.4	7.0	90	60	5.0	6.5	3.22	33.42
43	32.6	20.1	0.0	87	35	2.1	8.0	2.46	50.2
44	31.8	17.4	0.0	82	30	2.2	7.6	1.82	36.4
45	30.3	12.5	0.0	87	28	2.1	8.5	1.64	39.62
46	32.7	18.9	0.0	87	37	2.9	8.5	0.42	42.4
47	31.0	15.9	0.4	88	35	2.8	7.4	0.28	46.68
48	28.6	14.7	0.0	81	35	4.0	6.2	0.2	39.34
49	30.7	11.9	0.0	89	33	1.3	7.3	0	34.6
50	30.2	15.8	0.0	86	37	2.4	3.7	0	46.84

(I = morning, II = evening, BSFB = Brinjal shoot and fruit borer

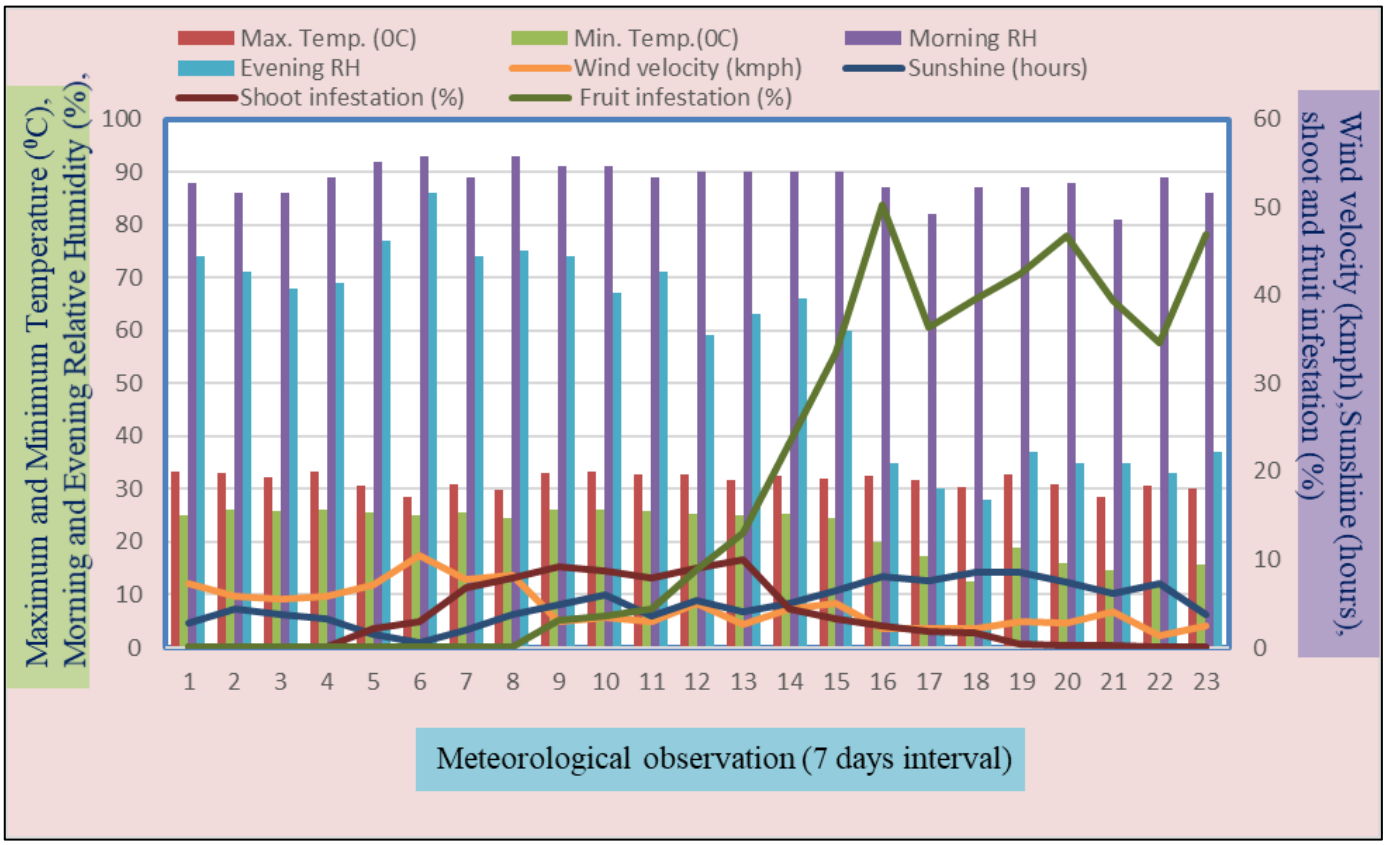

Fig 1: Brinjal shoot and fruit infestation (%) corresponding to weather conditions during the crop growth period

Effect of weather parameters on brinjal shoot and fruit borer

Per cent shoot damage caused by *Leucinodes orbonalis* Guenee

The data pertaining to simple correlation is presented in Table 2 for *Kharif* 2020-21. The data presented in Table 4.1.4 showed that population of percent shoot damage by L. *orbonalis* was positive and significant correlated with minimum temperature (r = 0.509*), morning relative humidity (r = 0.550*) and evening relative humidity (r = 0.434*), positively non-significant with maximum temperature (r = 0.172), rainfall (r = 0.236) and wind velocity (r = 0.047), while negative and non-significant correlated with sunshine hours (r = -0.195). Similarly, Arvind (2007) noticed that the maximum temperature showed a positive correlation with shoot infestation. Shukla and Khatri (2010) [9] stated that the maximum and minimum temperatures had a positive correlation with the abundance of pest on brinjal. Shaik (2012) [10] reported brinjal shoot and fruit borer population had positively significant relation with minimum temperatures.

Per cent fruit damage caused by *Leucinodes orbonalis* Guenee

Correlation was worked out to find out the relationship between the percentage of fruit infestation and major abiotic factors (Table 4.1.4). The data presented in Table 4.4 showed that population of per cent fruit damage by *L. orbonalis* was positively significant correlation with sunshine hours (r = 0.775*) and negatively significant correlation with minimum temperature (r= -0.831*), rainfall (r = -534*), morning relative humidity (r = 0.532*), evening relative humidity (r = -0.923*) and wind velocity (r = -0.690*), while maximum temperature showed negatively non-significant (r = -0.225) with per cent fruit damage by *L. orbonalis.* Kantipudi *et al.* (2017) [4] evolved negative correlation between rainfall, evening relative humidity and the fruit infestation by *L. orbonalis.* Mondal *et al.* (2014) [5] found significantly negative correlation of minimum temperature with fruit damage due to *L. orbonalis.* Thus the findings of the above workers are more or less in line with the present findings.

Table 2: Correlation coefficient between brinjal shoot and fruit borer and weather parameters

Weather parameter	BSFB Shoot infestation		BSFB Fruit infestation	
	'r' value	'b_{yx}'	'r' value	'b_{yx}'
Maximum Temperature (°C)	0.172	---	-0.225	---
Minimum Temperature (°C)	0.509*	0.377	-0.831*	-3.289
Rainfall (mm)	0.236	---	-0.534*	-0.200
Morning Relative humidity (%)	0.550*	0.667	-0.532*	-3.448
Evening Relative humidity (%)	0.434*	0.084	-0.923*	-0.963
Wind velocity (kmph)	0.047	---	-0.690*	-5.637
Sunshine (hours)	-0.195	---	0.775*	6.667

* Significant at 5% level of significance (table value, 2.080)

Conclusion

It may be concluded from the results that peak infestation of brinjal shoot and fruit borer on developing shoots and fruits was observed during first week of October (40th SMW) and fourth week of October (43rd SMW), respectively. It can also be concluded that seasonal occurrence of brinjal shoot and fruit borer is greatly influenced by abiotic factors.

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