International Journal of Entomology Research
www.entomologyjournals.com
ISSN: 2455-4758
Received: 29-08-2021, Accepted: 14-09-2021, Published: 29-09-2021
Volume 6, Issue 5, 2021, Page No. 131-134

Incidence of brinjal shoot and fruit borer, *Leucinodes orbonalis* guen. In the southern agro-climatic zone of Tamil Nadu

Raja KM, S Arivudainambi
Department of Entomology, Faculty of Agriculture, Annamalai University, Annamalainagar, Tamil Nadu, India

Abstract
The seasonal incidence of shoot and fruit borer, *Leucinodes orbonalis* Guen. On brinjal was studied in the southern agro-climatic zone of Tamil Nadu during Rabi and Kharif, 2019. In rabi, the maximum of 9.51% shoot damage and 43.87% fruit damage was recorded. The per cent shoot damage showed significant negative correlation with minimum temperature and non-significant negative correlation with maximum temperature and rainfall. The percent fruit damage showed highly significant negative correlation with relative humidity. In kharif, the maximum of 5.95% shoot and 35.40% fruit damages were recorded. It was found that, the shoot damage was positively correlated with maximum and minimum temperatures. The relative humidity and maximum and minimum temperatures were negatively correlated with the fruit infestation.

Keywords: *Leucinodes orbonalis*, brinjal shoot and fruit borer, seasonal incidence

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 [1] 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 [2]. 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 [3]. 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 [4]. 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 crop is very much susceptible to insect pests attack right from seedling to final harvest. Brinjal shoot and fruit borer is one of the important pests which cause economic damage. The developmental period of the brinjal shoot and fruit borer varies according to the environment; the life cycle is prolonged during Kharif and shortened during Rabi [5]. The shoot and fruit borer incidence was almost nil during winter season [6].

In the southern agro-climatic zone of Tamil Nadu the region specific brinjal cultivars such as MDU 1, PKM 1, and Co 1 are cultivated mainly and the potential yield in the region is about 35 tonnes/ha. But in reality, of the several constraints; shoot and fruit borers (*Leucinodes orbonalis* Guenee; Pyralidae) take a foremost share of the accountable-loss and in severe conditions the damage may go up to 50 per cent or more. The yield loss due to the pest is to the extent of 70-92 per cent [7, 8, 9]. Further the pattern of infestation is varying according to the seasons and stage of the crop. *L. orbonalis* also survive on certain common solanaceous weed plants which is available in plenty in the southern region of Tamil Nadu. It is a known fact that the buildup of population and number generations in the crop period is governed by the weather parameter. Knowledge on the correlation between weather and population build up would be a contributing factor for designing and scheduling an effective and sustainable management practice. Though certain articles in this aspect are published earlier, location specific information is the need of the hour.

Materials and Methods
To study the seasonal incidences of *Leucinodes orbonalis* during kharif and rabi season in 2019. Field experiments were carried out at Southern zone of Tamil Nadu covering Madurai, Theni and Dindugal districts. The experiments were laid out in a Randomized Block Design. The variety MDU1 was raised in one acre by following recommended agronomic practices. The total area was divided and made into five equal sized blocks. But no plant protection measures were undertaken during the entire study period. Weekly metrological data on different weather parameters was recorded throughout the experimental period. The incidence was recorded once in a week time and for this purpose, twenty plants were selected randomly in each block (100 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, number of healthy fruits, number of infested fruits and total number of fruits were recorded at each harvest. The per cent shoot and fruit infestation was expressed by using following formulas;

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

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

Besides this, correlation analysis between abiotic factors and the shoot and fruit damage on were also carried out [10].

Results and Discussion

In Rabi season, the maximum of 9.51% shoot damage was recorded on 7th standard week, when the maximum and minimum temperature and rainfall were 31^{0}C, 17.4^{0}C and 0.09mm respectively. The percent shoot damage recorded on the vegetative stage of the crop were 4.44%, 6.22%, 9.02%, 9.51%, 8.15% and 7.83% on 4th, 5th, 6th, 7th, 8th and 9th standard week respectively. During 1st and 17th standard week, zero percent shoot damage was noted. From 1st to 3rd standard weeks and the last eight standard weeks (10th to 17th), the percent shoot damage was less than 3.01%.

Fruit damage was observed from the 8th standard week. The percent fruit damage was high on 14th standard week (43.87%), when maximum and minimum temperature were 37.2^{0}C and 24.5^{0}C respectively and low on 8th standard week (0.67%), when rainfall noted was 0.57 mm. Percent fruit damage crossed 30% in six standard weeks. The flowering and initial stage of fruiting period (8th to 11th standard week) showed infestation of less than 25 % (0.67 % to 23.73 %) (Table1).

During kharif, the maximum of 5.95% shoot damage on 33rd standard week and 35.40% fruit damage on 40th standard week was noted. The percent shoot damage was drastically increased from 0.28 to 5.95% (27th to 33rd standard weeks). 34th and 36th standard weeks showed 5.68% and 5.50% shoot damage respectively. 36th to 43rd standard weeks recorded less than 3% shoot damage (2.89 to 0.07%). The minimum of 0.07% shoot damage was reported in 43rd standard week, when maximum and minimum temperatures were 31.73^{0}C and 24.27^{0}C respectively.

The percent fruit damage increased between 12.73% and 35.40% from 35th to 43rd standard week. The highest fruit damage of 35.40% was reported on 40th standard week, when maximum and minimum temperatures were 31.08^{0}C and 24^{0}C respectively. The lowest damage of 12.73% was seen on 35th standard week, when maximum and minimum temperatures were 33.33^{0}C and 25.67^{0}C. From 37th to 41st standard weeks, the per cent fruit damage was in the range between 30.26 and 35.40%. During initial stage of fruiting (35th and 36th standard week) and the final harvesting stage of the crop (42nd and 43rd standard week), the fruit infestation was less than 30% (Table 2).

Simple correlation analysis carried out with the data recorded during Rabi revealed that the per cent shoot damage was negatively correlated with maximum and minimum temperature and rainfall and positively correlated with relative humidity and wind velocity in. However, during kharif season, it was found that the shoot damage was positively correlated with maximum and minimum temperatures. The relative humidity, rainfall and wind velocity were found to be negatively correlated. The above findings are in line with Shukla and Khatri (2010)[11], who also reported that, the maximum and minimum temperatures, evaporation, and sunshine hours positively correlated with shoot damage, while relative humidity had a negative influence.

Reports of Chetan Nandi (2017) [12], in relation to the incidence of *L. orbonalis* on brinjal shoots showed non-significant positive correlation with the maximum temperature and significant positive correlation with minimum temperature. Whereas, the relative humidity recorded significant negative correlation with shoot incidence. These findings are in corroboration with our results.

Our findings are in accordance with the results of Muthukumar *et al.* (2003) [13], who reported positively correlation in the per cent fruit damage infestation with maximum and minimum temperatures, rainfall and wind velocity and negatively correlated with relative humidity during rabi season. Shiji and Kumar (2004) [14] [15] stated that, the relative humidity and temperature were negatively associated with the fruit infestation. Similar observations were recorded in khari. But, rainfall showed positive correlation and it was highly significant.

Tables

Table 1: Seasonal Incidence of Brinjal shoot and fruit borer (Rabi) -2019

Standard week	Minimum temperature (ºC)	Maximum temperature (ºC)	Relative humidity (%)	Rainfall (mm)	Wind velocity (km/h)	Pest incidence – Brinjal Shoot and fruit borer	
						Percent shoot damage	Percent fruit damage
1	17.6	29.2	66.4	0.65	0.61	0.00	0.00
2	17.2	28.5	66.0	3.11	1.87	1.11	0.00
3	18.0	29.5	67.2	2.86	1.85	2.48	0.00
4	18.9	29.9	68.2	1.99	2.25	4.44	0.00
5	18.7	29.6	66.5	1.09	1.52	6.22	0.00
6	16.9	31.8	55.1	0.00	1.68	9.02	0.00
7	17.4	31.0	54.8	0.09	2.21	9.51	0.00
8	17.3	32.1	55.9	0.51	1.84	8.15	0.67
9	17.5	32.0	56.2	0.07	2.42	7.83	14.33
10	22.1	33.2	58.8	8.45	1.27	3.01	22.73
11	21.4	32.9	58.5	11.60	1.68	2.05	23.73
12	22.8	33.7	59.1	9.11	1.74	1.45	32.53
13	23.3	33.9	59.0	11.28	1.99	0.76	31.80
14	24.5	37.2	48.9	1.36	1.57	0.66	43.87
15	24.0	36.1	48.4	3.94	2.02	0.33	39.93
16	25.2	37.6	48.5	2.95	2.10	0.02	35.20
17	26.1	37.8	49.2	2.91	1.43	0.00	32.73
						-0.69201	0.93260

	-0.42384	0.90709
	0.09450	-0.71741
	-0.47325	0.48878
*	0.35819	0.03545

Table 2: Seasonal Incidence of Brinjal shoot and fruit borer (Kharif)-2019

Standard Week	Minimum Temperature (ºC)	Maximum Temperature (ºC)	Relative Humidity (%)	Rainfall (mm)	Wind Velocity (Km/h)	Pest incidence – Brinjal Shoot and fruit borer	
						Percent Shoot Damage	Percent Fruit Damage
27	25.40	34.73	52.93	7.49	4.73	0.28	0.00
28	24.40	33.20	51.93	6.04	4.37	1.22	0.00
29	26.07	35.33	53.60	6.74	4.52	2.47	0.00
30	25.07	34.40	52.53	5.29	4.66	4.25	0.00
31	25.73	33.33	57.80	9.20	3.20	4.86	0.00
32	24.73	32.60	56.93	10.47	3.06	4.79	0.00
33	26.40	34.07	58.47	11.29	3.43	5.95	0.00
34	25.40	33.53	57.53	8.94	2.94	5.68	0.00
35	25.67	33.33	57.60	7.37	2.43	5.50	12.73
36	24.87	32.73	61.27	11.54	2.76	2.89	21.00
37	24.00	31.73	60.47	10.57	3.06	2.00	30.26
38	25.27	33.13	61.53	11.34	3.27	1.67	34.40
39	25.00	32.73	60.87	13.06	3.23	1.11	35.33
40	24.00	31.08	65.40	22.29	2.07	0.45	35.40
41	23.13	30.87	64.67	19.56	2.65	0.29	33.33
42	24.13	32.20	66.07	19.72	2.73	0.23	27.73
43	24.27	31.73	65.47	20.24	2.96	0.07	24.53
						0.66148	-0.62821
						0.44194	-0.75746
						-0.42743	0.83090
						-0.56820	0.73004
						-0.00654	-0.61369

Conclusion

In Rabi season, the shoot damage showed significant negative correlation (-0.69201) with minimum temperature. The highly significant negative correlation (-0.71741) was observed between percent fruit damage and relative humidity. In Kharif, shoot damage was negatively correlated with rainfall, relative humidity and wind velocity. The fruit damage was significantly affected by temperature and wind velocity. It is concluded that the Brinjal shoot and fruit borer infestation was found in both the seasons but the incidence was high in kharif.

References

1. Rai M, Gupta PN, Agarwal RC. Catalogue on eggplant (*Solanum melongena* L.) germplasm Part - I. National Bureau of Plant Genetic Resources, Pusa Campus, New Delhi, 1995, 1-3.
2. Alam SN, Rashid MA, Rouf FMA, Jhala RC, Patel JR. Development of an integrated pest management strategy for eggplant fruit and shoot borer in South-Asia. Technical Bulletin 28, AVRDC- The World Vegetable Center, Shanhua, Taiwan, 2003, 56-61.
3. http://www.nhb.gov.in/Statistics.aspx?enc=BcPDPFDGSqfmXL/d3ilepxW3DSFpqSg63I878wt4P5Q1430wZgnyHY+gzknW7Tc42/qqoGkEtxeXwn5JY20gsw==. Accessed on 5th Jan, 2018.
4. Singh SV, Singh KS, Malik YP. Seasonal abundance and economic losses of shoot and fruit borer, *Leucinodes orbonalis* on brinjal. Indian Journal of entomology Research,2000:62(3):247-252.
5. Oommen S, Kumar A. Seasonal incidence of insect pests of brinjal. Indian Journal of Applied Entomology,2004:18(1):65-66.
6. Kumar S, Singh D. Seasonal fluctuation and extent of losses of Leucinodes orbonalis Guen. on *Solanum melongena* L. Annals of Plant Protection Science,2012:20(2):318-321.
7. Eshwara Reddy, Srinivasa SG. Management of shoot and fruit borer, *Leucindoes orbonalis* (Guene.) in brinjal using botanicals/oils. Pestology,2004:28:50-52.
8. Jagginavar SB, Sunitha ND, Biradar AP. Bio efficacy of flubendiamide 480 SC against brinjal fruit and shoot borer, *Leucinodes orbonalis* Guene. Karnataka Journal of Agricultural Science,2009:22(3):712-713.
9. Chakraborti S, Sarkar PK. Management of *Leucinodes orbonalis* Guenee on eggplant during the kharif season in India. Journal of Plant Protection research, 2011:51(4):325-328.
10. Gomez KA, Gomez AA. Statistical procedures for agricultural research: John Wiley & Sons, 1984, 153.
11. Shukla A, Khatri SN. Incidence and abundance of brinjal shoot and fruit borer. The Bioscan,2010:5:305-308.
12. Chetan Nandi, Gangadhar N, Jakatimath S, Prafulkumar MV. Seasonal Incidence of Brinjal Shoot and Fruit Borer, Guene, (Lepidoptera: Crambidae) During Kharif Season. International Journal of current Microbiology and Applied Sciences,2017:6(12):1088-1093.
13. Muthukumar M, Kalyanasundaram. Influence of biotic factors on the incidence of major insect pests in brinjal (*Solanum melongena* L.). South Indian Horticulture.2003:1(1/6):214-218.

14. Shiji O, Kumar A. Seasonal incidence of insect pests of brinjal. Indian Journal of Applied Entomology. 2004; 18:65-66.
15. Khan A, Al-salem S. Seasonal variation effect on airborne pollutants. Journal of Environmental Research and Development,2007:1:215-218.