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Monitoring adult population of Brinjal shoot and fruit borer through pheromone traps in eastern Uttar Pradesh

Naveen Kumar, Rajnish Kumar, Lavlesh Kumar, Kishan Lal and Devendra Kumar Yadav

Abstract
The field experiment was carried out in the Experimental field of Agricultural Research Farm of B.R.D.P.G. College, Deoria, Uttar Pradesh, during Kharif 2020 and 2021. Maximum moth catch of brinjal shoot and fruit borer was observed at 41st SMW with a mean number of 9 moths per trap in 2020 and 7.40 months per trap in 2021. The population of the brinjal shoot and fruit borer moths has a positive correlation with maximum temperature, minimum temperature, morning relative humidity, and evening relative humidity. However, rainfall has a negative correlation with moth population during Kharif 2020 and 2021.

Keywords: Brinjal shoot and fruit borer, pheromone trap, mass trapping, abiotic factor

Introduction
Brinjal, eggplant (*Solanum melongena* L.) is a warm-weather crop in the Solanaceae family that is mostly grown in tropical and subtropical parts of the world. Brinjal is widely grown in India, Bangladesh, Pakistan, China, and the Philippines. It is also popular in Egypt, France, Italy, Turkey, Syria, Indonesia, Taiwan, and the United States. After China (62%), India is the world's second-largest producer of brinjal, accounting for around 27.10% of total production (Taher *et al.*, 2017) [13]. In India, brinjal is the third largest vegetable crop farmed all year in all areas of the nation, accounting for 17.80 percent of total vegetable production (Ajabe *et al.*, 2019) [2]. It is grown on 8.01 thousand hectares in Uttar Pradesh, producing 275.40 thousand metric tonnes and 34.40 metric tonnes per hectare (Horticulture Statistics Division, 2018) [5]. Brinjal production is severely impacted at various stages of the crop by a complex of pests including sucking insect pest complex, defoliators, and Brinjal Shoot and Fruit Borer (BSFB) (Regupathy *et al.*, 1997; Ajabe *et al.*, 2019) [12, 2]. The Brinjal Shoot and Fruit Borer, *Leucinodes orbonalis* Guenee, has been identified as the most severe and destructive pest among these pests, incurring heavy losses in brinjal and being widespread across India (Patil, 1990) [9]. As a result of insect damage, fruits become unmarketable, with yield losses of up to 90%. (Dhandapani *et al.*, 2003; Baral *et al.*, 2006) [4, 3]. In the vegetative phase, the borer infection was reported to be 78.60 percent on top shoots, and subsequently transferred to flowers and fruits in the fruiting phase, with infestation reaching 66.66 percent (Yadav *et al.*, 2015) [15]. Farmers rely on excessive use of chemical pesticides to boost production costs, which has exacerbated pesticide negative effects. Several studies have found that using sex pheromone-based management strategies for monitoring pest incidence and determining peak period of activity is effective in this context (Tiwari *et al.*, 2009) [14]. Pheromone traps assist in monitoring and mass trapping, as well as seasonal activity, and this management technique addresses all biosafety and environmental issues (Mazumder and Khalequzzaman, 2010) [6]. The seasonal activity of *Leucinodes orbonalis* is also known to be influenced by environmental factors. Trap catches in relation to field infestation and weather factors are critical for developing an efficient IPM module in a specific location. The current study was carried out to learn about the seasonal fluctuations in the population dynamics of the brinjal shoot and fruit borer, as well as the influence of weather parameters on trap catch.

Material and Methods
The present experiment was carried out to study the population dynamics of brinjal shoot and fruit borer through a pheromone trap at Agricultural Research Farm of B.R.D.P.G. College,

Deoria, Uttar Pradesh during Kharif 2020 and 2021. Thirty-day-old brinjal seedlings (variety Pant Rituraj) were transplanted into experimental plots size 20m x 20m and all the agronomical practices viz. irrigation, fertilizer application and intercultural operations were followed as recommended for crops in this area to raise the crop without any crop protection measures. The pheromone traps were installed in the 400 m^2 okra plots without any plant protection measures. The pheromone traps were installed at a 10 m distance at each trap and then use a wire or thread to tie the trap. The lure was set inside the trap and the trap was placed 15 cm above the crop canopy. Such lures usually remain effective for one month but lures were replaced after 15 days to have effective catches. The traps were examined only for a week and the trap catches of male adults of the insects were expressed as the number of males trapped per week. The weather parameters like temperature (maximum, and minimum), relative humidity (morning and evening) and rainfall collected from the India Meteorological Department, India for two years of study were subjected to correlation analysis for establishing the relationship between the adult male population abundance and climatic parameters. The correlation between the pest population and weather parameters was computed by Pearson's correlation using SPSS (Version 24, SPSS, Inc. Chicago, II, USA).

Results and Discussion

The data presented in Tables-1and Figure-1 revealed that the trapped male moth population ranged from 1.80 to 9.00 moths/ trap during Kharif 2020. The first appearance of the moth was noticed during the 34th standard week (third week of August) with the 3.80 moths/ trap. The maximum mean number of male moths per trap was observed during 41st SW (first week of October) with the mean number of 9 moths per trap. After 41st SMW after this week, the male moth population gradually decreased and reached up to 1.80 moths/ trap during 48th SMW. The correlation analysis are find out the relationship between moth population and major weather parameters (Table 2) and revealed that the mean number of male moths had a significant positive correlation with maximum temperature (r = 0.791) and minimum temperature (r = 0.560), whereas a non-significant positive correlation was observed with morning relative humidity (r= 0.138) and evening relative humidity(r= 0.027). While rainfall showed non-significant negative correlation (r = -0.368) with moth population (Table 2).

The catches of male moths of brinjal shoot and fruit borer during Kharif 2021 (Table-3 and Figure-1) ranged from 1.20 to 7.40 moths/ trap. The initial population of male moths was recorded from the third week of August (34th SMW) to the first week of October (41st SMW) with 7.40 moths/ trap. The population of a male moth showed a decline after the 41st SWM and attained 1.20 moth/trap at the harvesting stage of the crop (Table-3 and Figure-1). The incidence of the male moth of brinjal shoot and fruit borer was slightly lower during the second-year trial, which may be due to the seasonal variability of both years. The correlation results during Kharif 2021 presented in Table-4 indicated that the male moth of brinjal shoot and fruit borer population exhibited a significant positive correlation with maximum temperature (r = 0.568) and morning relative humidity (r = 0.722), while a non-significant positive correlation was observed with minimum temperature (r = 0.367) and evening relative humidity (r = 0.121). Whereas rainfall (r= - 0.267) had shown a non-significant negative correlation with the male moth population of brinjal shoot and fruit borer. Brinjal shoot and fruit borer population growth and development differed dramatically across the country, most likely due to differences in agro-climatic conditions and crop types. The slight discrepancies in the current study's results were attributed to the time of pest infestation synchronization with temperature and other weather factors.

The present findings were in more or less conformity with the observations of Prasannakumar *et al.* (2011) [10] who revealed that the maximum populations of brinjal shoot and fruit borer (44.13 moths/trap) were recorded in the 41st standard week. Further, Tiwari *et al*. (2009) [14] illustrated the maximum activity of the moth population (19.33 moths per trap) was recorded in the 43rd SW. On the other hand, Rani *et al.* (2017) [11] reported the highest moth catches were in the 5th week of November (19.13 moths per trap, 48th SW). Ajabe *et al*. (2019) [2] observed the highest population of moths (15 moths per trap) during 51st SMW. Maximum temperature, and morning and evening relative humidity all demonstrated a positive and significant relationship with moth catches and fruit infestation, however, rainfall had a negative and non-significant relationship. Nayak *et al.* (2014) [5] revealed a significant positive correlation with temperature (maximum, minimum and average) and a negative correlation with relative humidity (both morning and afternoon). Rainfall did not influence the trap catch significantly.

The findings of correlation studies were similar to Nayak *et al.* (2014) [8] revealed a significant positive correlation between maximum temperature and minimum temperature. Meena *et al*. (2018) [7], observed that maximum temperature, minimum temperature, and average relative humidity in the morning had a significant and positive correlation with the moth population, whereas Ahmad *et al.* (2018) [1], found that adult catches have positive and significant associations with minimum temperature and, while maximum temperature, rainfall, evening relative humidity, wind speed have positive and non-significant relationships, and morning relative humidity has a negative and non-significant relationship. Similarly, Rani *et al.* (2017) [11] observed a positive and significant relationship between moth catches with maximum temperature, and morning and evening relative humidity, however, rainfall had a negative and non-significant relationship.

Table 1: Monitoring adult population of shoot and fruit borer through pheromone traps during Kharif 2020

SW	Date of observation	Mean number of male moths caught/ pheromone trap	Temperature (°C)		Relative Humidity (%)		Total Rainfall (mm)
			Max.	Min.	Mor.	Eve.	
34th	17-Aug-2020	3.80	32.78	26.70	79.67	69.17	7.90
35th	24-Aug-2020	4.40	32.91	26.94	75.57	70.86	2.60
36th	31-Aug-2020	6.20	34.24	27.33	72.71	63.29	1.34
37th	07-Sep-2020	3.80	33.09	26.77	85.00	76.57	6.51
38th	14-Sep-2020	3.20	32.30	26.21	85.14	81.29	9.26
39th	21-Sep-2020	2.20	22.19	14.66	77.57	59.57	15.19
40th	28-Sep-2020	4.60	28.69	21.34	62.57	57.29	0.20
41th	05-Oct-2020	9.00	34.00	24.07	73.43	60.86	0.00
42th	12-Oct-2020	8.20	34.37	23.73	72.00	62.71	0.00
43th	19-Oct-2020	7.00	33.15	21.00	77.50	59.00	0.00
44th	26-Oct-2020	6.60	32.60	22.20	79.00	54.00	0.00
45th	02-Nov-2020	3.40	29.64	15.81	78.14	53.71	0.00
46th	09-Nov-2020	4.20	30.13	15.19	70.86	61.71	0.00
47th	16-Nov-2020	2.80	27.07	15.03	72.71	60.00	0.44
48th	23-Nov-2020	1.80	26.44	11.79	73.71	56.86	0.00

S.W. = Standard week, Max. = Maximum, Min. = Minimum, Mor. = Morning, Eve. = Evening

Table 2: Correlation studies between brinjal adults shoot and fruit borer pheromone catch with weather parameters during Kharif 2020

Variable	Mean number of male moth	T_{MAX}	T_{MIN}	RH_{MOR}	RH_{EVN}
T_{MAX}	0.791^{**}				
T_{MIN}	0.560^{*}	0.808^{**}			
RH_{MOR}	0.138	0.533^{*}	0.442		
RH_{EVN}	0.027	0.370	0.642^{**}	0.691^{**}	
RF	-0.368	-0.362	0.128	-0.069	0.511^{*}

Table 3: Monitoring adult population of shoot and fruit borer through pheromone traps during Kharif 2021

SW	Date of observation	Mean number of male moths caught/ pheromone trap	Temperature (°C)		Relative Humidity (%)		Total Rainfall (mm)
			Max.	Min.	Mor.	Eve.	
34th	17-Aug-2021	2.40	31.40	25.40	91.40	78.70	60.40
35th	24-Aug-2021	1.80	31.40	25.00	88.60	74.60	114.60
36th	31-Aug-2021	5.40	33.00	25.70	85.00	62.00	0.00
37th	07-Sep-2021	2.20	33.50	24.70	84.10	68.60	27.20
38th	14-Sep-2021	2.60	32.20	24.80	89.60	63.40	9.40
39th	21-Sep-2021	2.80	33.40	24.20	84.00	57.70	2.40
40th	28-Sep-2021	1.60	32.90	23.50	90.90	60.60	7.30
41th	05-Oct-2021	7.40	33.20	20.50	87.00	50.10	0.00
42th	12-Oct-2021	1.40	30.60	20.60	87.60	67.00	420.20
43th	19-Oct-2021	5.60	29.70	16.60	89.00	44.00	0.00
44th	26-Oct-2021	5.00	29.70	14.10	87.60	37.30	0.00
45th	02-Nov-2021	2.20	28.10	13.00	90.70	40.70	0.00
46th	09-Nov-2021	3.33	27.40	12.30	91.60	38.60	0.00
47th	16-Nov-2021	2.60	26.30	11.40	90.40	37.60	0.00
48th	23-Nov-2021	1.20	25.20	10.80	92.00	46.10	0.00

S.W. = Standard week, Max. = Maximum, Min. = Minimum, Mor. = Morning, Eve. = Evening

Table 4: Correlation studies between adults of brinjal shoot and fruit borer pheromone catch with weather parameters during Kharif 2021

Variable	Mean number of male moth	T_{MAX}	T_{MIN}	RH_{MOR}	RH_{EVN}
T_{MAX}	0.568^{*}				
T_{MIN}	0.367	0.910^{**}			
RH_{MOR}	0.722^{**}	-0.683^{*}	-0.522		
RH_{EVN}	0.121	0.654^{**}	0.884^{**}	-0.271	
RF	-0.267	0.072	0.189	-0.092	0.427

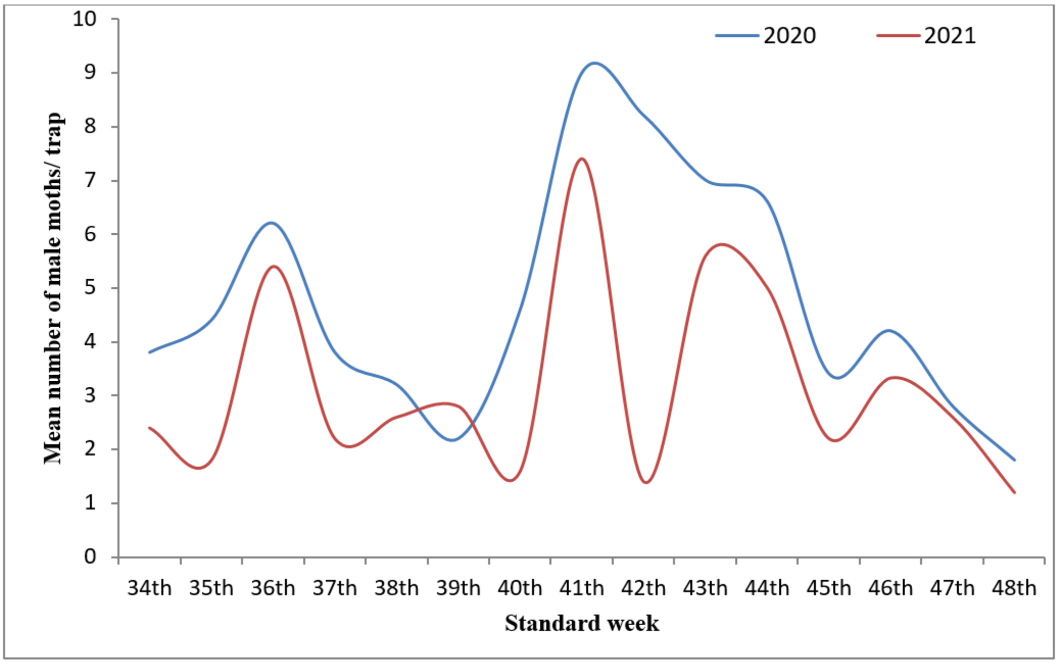

Fig 1: Monitoring of brinjal shoot and fruit borer during Kharif 2020 and 2021

Conclusion

Pheromones definitely play a significant role in insect pest management programmes. Monitoring of brinjal shoot and fruit borer maximum and lowest moth captures variation detected in meteorological weeks, correlation studies indicated that there was a significant and non-significant influence of different weather factors and field infestation.

Reference

1. Ahmad SI, Pathania SS, Nehru RK, Wani AR. Population dynamics of brinjal fruit and shoot borer, *Leucinodes orbonalis* (Lepidoptera: Pyralidae) in Kashmir. Indian Journal of Entomology. 2018;80(2):435-40.
2. Ajabe SS, Jayewar NE, Gaikwad AD, Ambad RB. Monitoring of brinjal shoot and fruit borer *Leucinodes orbonalis* by using sex pheromone and the impact of abiotic factors on trap catches. Journal of Entomology and Zoology Studies. 2019;7(5):350-352.
3. Baral K, Roy BC, Rahim KM, Chatterjee H, Mondal P, Mondal D, *et al*. Socio Economic Parameters of Pesticide Use and Assessment of Impact of an IPM Strategy for the Control of Eggplant Fruit and Shoot Borer in West Bengasl, India. Tashkent, Uzbekistan: AVRDC, 2006.
4. Dhandapani N, Shelkar UR, Murugan M. Biointensive pest management in major vegetable crops: An Indian perspective. Journal of Food Agriculture and Environment. 2003;1(2):330-339.
5. Horticulture Statistics Division, 2018. Ministry of Agriculture and Farmers Welfare, Horticultural crops for 2018-2019.
6. Mazumder F, Khalequzzaman M. Eggplant shoot and fruit borer *Leucinodes orbonalis* Guenéemale moth catch in sex pheromone trap with special reference of lure elevation and IPM. Journal of Bioscience. 2010;18:9-15.
7. Meena RK, Naqvi AR, Meena DS, Meena AK. Monitoring of gram pod borer through sex pheromone traps in chickpea and their correlation with abiotic factors. Journal of Entomological Research. 2018;42(4):499-502.
8. Nayak US, Baral K, Khuntia A, Rath LK. Monitoring of brinjal shoot and fruit borer (*Leucinodes orbonalis* Guenee) through pheromone traps and the impact of abiotic factors on trap catch. Journal of Crop and Weed. 2014;10(1):143-6.
9. Patil PD. Technique for mass rearing of the brinjal shoot and fruit borer, *Leucinodes orbonalis* Guen. Journal of Entomological Research. 1990;14(2):164-72.
10. Prasannakumar NR, Chakravarthy AK, Naveen AH, Narasimhamurthy TN. Influence of weather parameters on pheromone traps catches of selected lepidopterous insects pests on vegetable crops. Curr. Biotic. 2011, 4(4).
11. Rani AT, Chakravarthy AK, Kammar V, Prabhakara MS. Sex pheromone trapping plan for the management of brinjal shoot and fruit borer *Leucinodes orbonalis* Guenee Indian Journal of Entomology. 2017;79(4):440-448.
12. Regupathy A, Palanisamy S, Chandramohan N, Gunathilagaraj K. A guide on crop pests. Sooriya desk Top Publishers, Coimbatore, 1997.
13. Taher D, Solberg SØ, Prohens J, Chou YY, Rakha M, Wu TH. World vegetable center eggplant collection: origin, composition, seed dissemination and utilization in breeding. Frontiers in Plant Science. 2017, 1484.
14. Tiwari G, Prasad CS, Nath L. Moths trapping of Brinjal shoot and fruit borer, *Leucinodes orbonalis* Guenee. Annals of Plant Protection Sciences. 2009;17(2):319-21.
15. Yadav A, Sachan SK, Yadav A, Yadav T. Biology of brinjal shoot and fruit borer, *Leucinodes orbonalis* G. under lab condition at 35ºC temperature and 90% relative humidity during 2009 and 2010. Plant Archives. 2015;15(2):889-93.