The Pharma Innovation Journal 2023; 12(9): 2957-2960

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; 12(9): 2957-2960

www.thepharmajournal.com
Received: 01-08-2023
Accepted: 03-09-2023

Manoj Kumar Gurjar
Research Scholar, Department of Entomology, College of Agriculture, SKRAU, Bikaner, Rajasthan, India

H. L. Deshwal
Professor and Head, Department of Entomology, College of Agriculture, SKRAU, Bikaner, Rajasthan, India

S. K. Yadav
Assistant Professor, Department of Entomology, College of Agriculture, SKRAU, Bikaner, Rajasthan, India

Shivani Choudhary
Research Scholar, Department of Entomology, College of Agriculture, SKRAU, Bikaner, Rajasthan, India

Vijay Kumar
Research Scholar, Department of Entomology, College of Agriculture, SKRAU, Bikaner, Rajasthan, India

Nanu Ram Sharma
Research Scholar, Department of Entomology, College of Agriculture, SKRAU, Bikaner, Rajasthan, India

Corresponding Author:
Manoj Kumar Gurjar
Research Scholar, Department of Entomology, College of Agriculture, SKRAU, Bikaner, Rajasthan, India

Seasonal incidence of shoot and fruit borer, *Earias* spp. on okra in relation to weather parameters

Manoj Kumar Gurjar, HL Deshwal, SK Yadav, Shivani Choudhary, Vijay Kumar and Nanu Ram Sharma

Abstract
A field experiment was carried out on seasonal abundance of shoot &fruit borer, *Earias* spp. on okra crop in relation to weather factors on variety Kashi Kranti was conceded at Instructional Farm, College of Agriculture SKRAU, Bikaner during *Zaid*, 2022 and 2023. Initially, the shoot damage was low, after that the damage increased gradually from 10th SMW & reached to its maximum in 14th SMW (1st week of April) during *Zaid* 2022 and 2023. The correlation coefficient between minimum temperature and shoot damage exhibited significant negative correlation (r= -0.647) during 2022. However, both maximum & minimum temperature presented a significant negative influences (r= -0.638 and -0.648) with shoot damage during 2023. Whereas, average relative humidity and rainfall (r= 0.579 and 0.559) presented a significant positive correlation with shoot damage during 2023 respectively. The start of fruit damage started in the 13th SMW (last week of March) on both number & weight basis during 2022 and 2023, and reached to its maximum in the 19th SMW (second week of May) during both the year of study. It was observed that maximum temperature (r= 0.801, 0.788 and 0.811, 0.800) & minimum temperature (r= 0.924, 0.931 and 0.954, 0.949) had significant positive correlation on % fruit damage of okra on number & weight basis during 2022 and 2023 respectively. However, mean relative humidity (r= -0.854, -0.628 and -0.846, -0.625) had significant negative correlation with % fruit damage both on number & weight basis during 2022 and 2023 respectively.

Keywords: Shoot and fruit borer, *Zaid*, correlation, okra and weather parameters

Introduction
Vegetables are an important sources of many nutrients required for healthy diet. Okra [*Abelmoschus esculentus* (L.) Moench] is one of the most important vegetable crop grown in India and commonly known as lady's finger or *Bhindi* belongs to family Malvaceae. India is the largest producer of okra in the world followed by Nigeria. In India, the okra crop is mainly cultivated in states of Maharashtra, West Bengal, Gujarat, Karnataka, Madhya Pradesh, Uttar Pradesh and Rajasthan (Shinde *et al.*, 2007) [14] occupies an area of 521 thousand hectares and annual yield of 6355 thousand metric tonnes with productivity of 12.20 metric tonnes (Anonymous, 2022) [2]. In Rajasthan, it is grown-up in an area of 4.28 thousand hectares and an annual production to the tune of 19.72 thousand metric tonnes with productivity of 4.61 metric tonnes (Anonymous, 2021) [3]. The main districts of Rajasthan which are producing okra are Bundi, Jodhpur, Kota, Sirohi, Hanumangarh, Sriganganagar, Bharatpur, Jaipur, Bikaner and Tonk.
The shoot & fruit borer (*E. insulana* & *E. vittella*) is one of the most severe pests of okra crop. The larvae bore into tender top growing shoots in the vegetative stage, flowers, floral buds & fruits of okra crop, causing in cessation, withering & drying of damaged shoots, tender leaves & heavy shedding of floral buds & flower. The damaged shoot droop, wither and dry up. The infested fruits present a deformed appearances and become unfit for human feeding and also obtaining seeds of okra. The borer has been observed to cause 24.6-26.0% damage to shoots of okra (Pareek *et al.*, 1986 & Zala *et al.*, 1999) [10, 16] & 40 to 100% injury to fruits (Dhawan & Sidhu, 1984, Shah *et al*., 2001, Pareek & Bhargava, 2003 and Shinnde *et al*. 2007) [5, 9, 12].

Materials and Methods
To observer the insect pests of okra crop, variety Kashi Kranti was sown on 10th February 2022 and 6th February 2023 in one plots of 10 x 9 m^2 size custody row to row & plant to plant distance of 30 and 15 cm, respectively for the two consecutive years. All agronomic practices were shadowed as per recommendation of package of practices of zone I C.

Method of observations

The data of shoot & fruit borer were also practical from the same 20 randomly selected & tagged plants during the crop period by optical count of the plants. The % shoot influx was calculated by including the total number of shoots & the numbers of damaged shoots. In another fruit borer damage, the observations were documented on influx of fruits both on number basis & weight basis at every harvesting. The % infestation of fruit on numbers basis was considered by including the infested & healthy fruits distinctly from the same selected and tagged plant. Weight of both the healthy and infested fruit were taken distinctly and level of influx was carried out in % of this. The observations were workout from infestation to continue till last picking of okra fruits. The whole experimental plots was retained free from spraying of any insecticides.

Per cent fruit damage on number basis was calculated by using given formula.

$$\text{Per cent fruits infestation (No. basis)} = \frac{\text{No. of infested/damaged fruits}}{\text{Total No. of fruits}} \text{X } 100$$

Similarly, the % fruit damage of Wt. basis was calculated by using given formula

$$\text{Per cent fruit damage (Wt. basis)} = \frac{\text{Wt. of infested/damaged fruits}}{\text{Total Wt. of fruits}} \text{ X } 100$$

Correlation with weather factors

To take the effects of seasonal abundance of shoot & fruit borer of okra, simple correlation was worked out between the shoot & fruit borer damage and abiotic issues by using the given formula.

$$r = \frac{\sum XY - \frac{\sum X \sum Y}{n}}{\sqrt{\left[\sum X^2 - \frac{(\sum X)^2}{n}\right]\left[\sum Y^2 - \frac{(\sum Y)^2}{n}\right]}}$$

Where,

R = Simple correlations coefficient

X = Variable *i.e.* abiotic constituent. (Maximum & minimum temp., mean relative humidity & total rainfall)

Y = Variable *i.e.* average No. of shoot and fruit borer damage

N = No. of paired observations

Results and Discussion

Shoot damage

The incidence of shoot damage (Table 1.1 and 1.2) on okra started in the 1st week of March (10th SMW). After that the shoot damage increased gradually and remain active upto first week of April during *Zaid* 2022 and 2023. The current results corroborates with the result who informed shoot damage beginning on five week old plants. Initially, the shoot damage was low, after that the damage increased gradually from 10th SMW & reached to its highest in 14th SMW (first week of April) during *Zaid* 2022 and 2023. The maximum shoot infestation (15.00%) was recorded at 43.0 °C, 19.9 °C, 28.50 per cent and 0.0 mm, maximum & minimum temp., average RH and rainfall during 2022 respectively, while during 2023 maximum shoot infestation 20.00 per cent was observed at 33.90 °C, 16.60 °C, 75.00 per cent and 10.40 mm, maximum & minimum temp., average RH and rainfall respectively.

The present result partially corroborate with the observation who reported peak shoot damage in second week of April (15th SMW). The minor difference in beginning of shoot damage and maximum period of occurrence may possibly due to the change in date of sowing and agro climatic conditions of the locality. The correlation coefficient with shoot damage and related abiotic factors were calculated during *Zaid* 2022 and 2023. The correlation coefficient of maximum and minimum temp and shoot damage presented non-significant negative & significant negative correlation (r= -0.280 and -0.647) during 2022. While, Maximum & minimum temp and shoot damage had negative significant correlation (r= -0.638 and -0.648) during 2023. Observed significant negative correlation between shoot damage and minimum temperature, support the present finding studied the occurrence of shoot loss with maximum & minimum temp and reported a negative significant influence, also support the present result. Contrary to present finding Agurla *et al.* (2017) [1] observed positive significant correlation between shoot damage & maximum and minimum temp., do not akin the present finding. The finding of Lal *et al.* (2020) [7] perceived positive significant effect between shoot damage and maximum temp., does not support the present result.

The mean relative humidity (r = 0.300) took non-significant positive correlation of shoot damage though, rainfall depicted no correlation (r= 0.0) with shoot damage during 2022 and mean relative humidity and rainfall (r= 0.579 and 0.559) presented positive significant influence of shoot damage during 2023 respectively. The current finding is in agreement with those who observed positive significant correlation between relative humidity and shoot damage.

Fruit damage

The beginning of fruits damage started in the 13th SMW (last week of March) during both years of result (4.92 and 5.30%) on number & (4.10 and 4.76%) weights basis during 2022 and 2023, respectively, which regularly increased & reached to its supreme with 18.73 and 17.44 per cent infestation on number and weight basis during 2022, respectively and 20.67 and 18.53 per cent infestation on number basis & weight basis during 2023, respectively in the second week of May during both the years of result. Pareek *et al.* (1986) [10] observed the damage of okra fruits started with the beginning of fruiting & continued till last picking of okra fruits corroborate the current findings. Similarly, described damage of pest on okra fruits happening 8th weeks later sowing and continued active up to the last picking of fruits akin the present result. The present result partially corroborate with the observation who recorded the beginning of fruit damage in first week of April (14th SMW).

The current finding does not get corroborate from the observation who reported the extreme fruit damage in 3rd week of June (24th SMW). The minor difference in commencement of fruit damage and maximum period of

abundance may possibly due to the difference in date of sowing and agro climatic conditions of the locality. The maximum damage of borers on fruits was recorded at 46.30 °C max temperature & 26.30 °C mini temperature, 23.14% average RH and 0.0 mm rainfall during 2022 while, it was extreme at 42.60 °C max and 22.20 °C mini temperature, 27.40 per cent average RH & 0.0 mm rainfalls during 2023.

The data obtainable in Table 1.1 and 1.2 naked that maximum & minimum temperature depicted significant positive influence (r= 0.801, 0.788 and 0.924, 0.931) on % fruit damage of okra on both number basis & weight basis respectively during 2022. Similar to 2022 the max and mini temperature (Table 1.2) had positive significant correlation (r= 0.811, 0.800 and 0.954, 0.949) on % fruit damage of okra both on number basis & weight basis respectively during 2023.

The present result corroborate with the finding who also observed positive significant correlation with both max and mini temperature. The current results are in accordance with those Lal *et al.* (2020) [7] reported positive significant correlation with max temperature & fruit borer influx. Contrary to present result Agurla *et al.* (2017) [1] reported negative significant correlation between fruit damage and maximum temperature, does not corroborate the current finding.

The mean relative humidity (r= -0.854 and -0.846) depicted negative significant effect on fruit injury of okra on both number basis & weight basis. But, rainfall showed no-correlation (r= 0.0 and 0.0) with fruit harm both on number & weight basis during 2022. The mean relative humidity (r= -0.628 and -0.625) had negative significant effect on fruit damage of okra fruits both on number & weight basiss, while, rainfall showed non-significant negative correlation (r= -0.292 and -0.296) with fruit damage on both number basis and weights basis during 2023. The current findings are in close akin with those Agurla *et al.* (2017) [1] who found significant negative correlation with fruit borer infestation and relative humidity. The current findings are also in accordance with Agurla *et al.* (2017) [1] who depicted that rainfall took negative non-significant influence between fruit borer damage.

Table 1.1: Infestation of shoot and fruit borer on okra in relation to weather parameters during *Zaid* 2022

SMW	Period of observations		Abiotic factors				Shoot damage (%)	Damage of fruits (%)	
			Temperature (°C)		Average Relative Humidity (%)	Rainfall (mm)		Number basis	Weight basis
	From	TO	Max.	Min.					
10	05.03.2022	11.03.2022	32.5	13.9	51.45	0	5	0	0
11	12.03.2022	18.03.2022	40	19.1	42.3	0	5	0	0
12	19.03.2022	25.03.2022	39	19	38.05	0	10	0	0
13	26.03.2022	01.04.2022	41.4	18.8	27.4	0	10	4.92	4.10
14	02.04.2022	08.04.2022	43	19.9	28.5	0	15	8.74	7.82
15	09.04.2022	15.04.2022	42.6	23.1	28.85	0	0	12.75	11.35
16	16.04.2022	22.04.2022	42.4	24.5	24.65	0	0	14.21	13.81
17	23.04.2022	29.04.2022	43.7	25.4	23.1	0	0	15.38	15.18
18	30.04.2022	06.05.2022	43.1	26.8	25.85	0	0	16.92	16.37
19	07.05.2022	13.05.2022	46.3	26.3	23.14	0	0	18.73	17.44
Correlation coefficient between insect pest population of okra with weather parameters									
Temperature (°C) Maximum							-0.280	0.801**	0.788**
Temperature (°C) Minimum							-0.647*	0.924**	0.931**
Mean Relative Humidity (%)							0.300	-0.854**	-0.846**
Rainfall (mm)							-	-	-

* Significant at 5.0% level; **Significant at 1.0% level

Table 1.2: Infestation of shoot and fruit borer on okra in relation to weather parameters during *Zaid* 2023

SMW	Period of observations		Abiotic factors				Shoot damage (%)	Damage of fruits (%)	
			Temperature (°C)		Average Relative Humidity (%)	Rainfall (mm)		Number basis	Weight basis
	From	TO	Max.	Min.					
10	05.03.2023	11.03.2023	33.2	13.8	45.85	0	5	0	0
11	12.03.2023	18.03.2023	32.9	15.8	43.37	3.4	5	0	0
12	19.03.2023	25.03.2023	30.8	14.7	57.4	14.2	10	0	0
13	26.03.2023	01.04.2023	32	15	52.15	4	15	5.30	4.76
14	02.04.2023	08.04.2023	33.9	16.9	45.05	10.4	20	9.24	8.60
15	09.04.2023	15.04.2023	39.4	20.1	30.2	0	0	13.75	12.43
16	16.04.2023	22.04.2023	39.1	20.6	34.3	1.8	0	15.97	15.14
17	23.04.2023	29.04.2023	36.5	19.5	31.55	0	0	17.10	16.45
18	30.04.2023	06.05.2023	34.9	20.3	52.2	9.4	0	18.58	17.10
19	07.05.2023	13.05.2023	42.6	22.2	27.4	0	0	20.67	18.53
Correlation coefficient between insect pest population of okra with weather parameters									
Temperature (°C) Maximum							-0.638*	0.811**	0.800**
Temperature (°C) Minimum							-0.648*	0.954**	0.949**
Mean Relative Humidity (%)							0.579*	-0.628*	-0.625*
Rainfall (mm)							0.559*	-0.292	-0.296

* Significant at 5.0% level; **Significant at 1.0% level

Conclusion

The peak shoot damage was perceived in the 1st week of April (14th SMW). The maximum and minimum temperature depicted negative significant effect with shoot influx, whereas, mean relative humidity & rainfall depicted significant positive correlation between shoot influx. The extreme fruit infestation was recorded in the second week of May (19th SMW). The max and mini temperature depicted significant positive correlation with fruit damage but, mean relative humidity depicted negative significant influence with fruits damage.

References

1. Agurla R, Reddy CN, Kumari DA, Srinivasa DC. Seasonal incidence and correlation of abiotic factors against okra shoot and fruit borer *Earias vittella* (Fab.) during *Kharif* season. Contemporary Research in India. 2017;7(3):2231-2137.
2. Akhila N, Kumari AD, Nayak HM, Vijaya D. Population dynamics of pests in okra variety Arka Anamika in relation to weather parameters. International Journal of Pure and Applied Bioscience. 2019;7(1):405-411.
3. Anonymous. Agricultural Research Data Book, 2022. ICAR- Indian Agricultural Statistics Research Institute, Pusa New Delhi; c2022.p. 163.
4. Anonymous. Agriculture Statistics 2020. Department of Agriculture, Government of Rajasthan, Jaipur; c2021.
5. Dhawan AK, Sidhu AS. Incidence and relative abundance of different species of spotted bollworm on okra at Ludhiana. Punjab Journal of Research, Punjab Agricultural Universality. 1984;21(4):533-542.
6. Jat SL. Eco-friendly management of major insect pests of okra *Abelmoschus esculentus* (L.) Moench in semi-arid ecosystem of Rajasthan. Ph.D. (Ag.) thesis, submitted to S.K.N. Agricultural University, Jobner, Jaipur; c2019.
7. Lal B, Singh UC, Bhaduaria NS, Tomar SPS, Pradyumn S. Seasonal incidence of major insect pests of okra, *Abelmoschus esculentus* (L.) and their natural enemies. Journal of Entomology and Zoology Studies. 2020;8(3):736-740.
8. Meena NB. Management of major insect pests of okra (*Abelmoschus esculentus* (L.) Moench. M.Sc. (Ag.) thesis, submitted to Swami Keshwanand Rajasthan Agricultural University, Bikaner; c2013.
9. Pareek BL, Bhargava MC. Estimation of avoidable losses in vegetable crops caused by borers under semi-arid conditions of Rajasthan. Insect Environment. 2003;9:59-60.
10. Pareek BL, Sharma GR, Bhatanagar KN. Seasonal incidence of major insect pests of okra in semi-arid region of Rajasthan. Annals of Arid Zone. 1986;25(3):222-224.
11. Rajput GS, Tayde A. Population dynamics and comparative efficacy of certain novel insecticides, botanicals and bioagents, against shoot and fruit borer *Earias vitella* (Fab.) of okra crop [*Abelmoschus esculentus* (L.) Moench]. Journal of Entomology and Zoology Studies. 2017;5(4):1667-1670.
12. Shah BR, Jhala RC. Population dynamics of major insect pests of okra, *Abelmoschus esculentus* (L.) Moench in relation to weather parameters. National Conference on Plant Protection-New Horizons in the Millennium, held at Rajasthan College of Agriculture Udaipur; c2001.p. 4.
13. Sharma RP, Swaminathan R, Bhati KK. Seasonal incidence of fruit and shoot borer of okra along with climatic factors in Udaipur region of India. Asian Journal of Agricultural Research. 2010;4(4):232-6.
14. Shinde BD, Sartake MB, Nemade PW, Sable YR. Bioefficacy of botanical, microbial and synthetic insecticides against okra fruit borer. Pestology. 2007;31(3):19-22.
15. Singh HP, Bajad VV, Chamroy T. Seasonal incidence and field efficacy of insecticides against shoot and fruit borer, *Earias vittella* (fab.) on okra *Abelmoschus esculentus* (L.). Plant archives. 2015;15(1):389-392.
16. Zala SP, Patel JR, Patel NC. Impact of weather on magnitude of *Earias vittella* (Fab.) infesting okra. Indian Journal of Entomology. 1999;61(4):351-355.