

Seasonal Incidence of Tomato Fruit Borer *Helicoverpa armigera* (Hubner) in Gangetic Plain of Uttar Pradesh

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Abstract The field experiment was conducted with a view to study the fluctuation of pest population of tomato fruit borer, *Helicoverpa armigera* (Hub.) and their relation with the prevailing weather conditions in *kharif* season during 2012–13. The results revealed that borer incidence commenced in the 4th week of October 2012 with intensity (0.67 larvae / 5 plants). It was reached its peak population (5.83 larvae / 5 plants) in first week of December. The relationship between fruit borer damage and the major weather parameters was worked out through correlation coefficient studies. Significant negative correlation with maximum relative humidity ($r = -0.105$) and highly negatively significant with minimum relative humidity ($r = -0.438$) and mean relative humidity ($r = -0.389$). The correlation of pest population had positively significant with sunshine hours ($r = 0.224$) and non-significant with temperature and rainfall.

Keywords Correlation, *Helicoverpa armigera*, Meteorological parameters, *Lycopersicon*, Seasonal incidence.

Introduction

Vegetable crops contribute an important status in the

agricultural economy of India. The importance of vegetables in human nutrition is well known specially in India, where sizeable population comprises of vegetarians. Vegetables are rich and cheap source of vitamins and minerals. Tomato (*Lycopersicon esculentum* Mill.) is one of the most popular and commercially important vegetable crops in India. Andhra Pradesh, Bihar, Karnataka, Uttar Pradesh, Orissa, Maharashtra, Madhya Pradesh and Assam, are the largest producer of tomato in our country. The highest productivity of tomato is incurred by Spain having 66.81 t ha⁻¹ while India has only 17.50 t ha⁻¹. When we focus, on national scenario we get that, Andhra Pradesh contributed maximum production 6015.10 in thousand million tonnes but the highest productivity was occupied by Himanchal Pradesh (40.00 t ha⁻¹) [1].

Among many factors responsible for low yield of tomato, insect pests viz., the fruit borer, *Helicoverpa armigera* (Hubner) and sucking insect pests viz. whitefly, *Bemisia tabaci* Genn, Jassids, *Amrasca biguttula biguttula* (Ishida), thrips, *Thrips tabaci* Lind., Serpentine leaf miner, *Liriomyza trifolii* (Burgess) are highly destructive causing serious damage and are responsible for lowering the yield of tomato crop [2]. Among insect pests, the damage caused by fruit borer, *Helicoverpa armigera* (Hubner) surpass the loss caused by all other insect pests together and it has been reported that the loss due to this pest range from 20—50%. Therefore, keeping in view the economic importance of the crop and the magnitude of the damage caused by various insect pests, the

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Table 1. Effect of abiotic factors on seasonal incidence of fruit borer on tomato (2012-13). **--Correlation is significant at the 0.01 level.

Standard week no.	Week of observation	Max temp	Temperature		Relative humidity			Rain-fall mm	Sun-shine (hour)	<i>Helicoverpa armigera</i>
			Min temp	Average	Max RH %	Min RH %	Ave- rage			
34	Aug 23-29	32.30	26.10	29.20	87	73	80	30.90	4.0	0.0
35	Aug 30 Sept 5	34.30	27.80	31.05	89	68	78.5	16.70	7.0	0.0
36	Sept 6-12	31.40	25.90	28.65	89	75	82	18.00	4.9	0.0
37	Sept 13-19	29.60	24.90	27.25	94	82	88	112.2	2.5	0.0
38	Sept 20-26	32.10	25.40	28.75	90	68	79	9.50	4.4	0.0
39	Sept 27-Oct 3	33.60	24.00	28.80	82	54	68	0.0	9.0	0.0
40	Oct 4-10	33.70	24.00	28.85	85	37	61	6.40	7.2	0.0
41	Oct 11-17	31.60	21.60	26.60	86	56	71	0.0	8.2	0.0
42	Oct 18-24	31.80	19.90	25.85	85	52	68.5	0.0	7.9	0.0
43	Oct 25-31	30.40	17.50	23.95	84	54	69	0.0	8.0	0.67
44	Nov 1-7	29.40	16.30	22.85	87	49	68	0.0	6.7	1.33
45	Nov 8-14	28.40	15.30	21.85	88	51	69.5	0.0	6.5	1.66
46	Nov 15-21	27.90	13.10	20.50	90	57	73.5	0.0	7.0	3.66
47	Nov 22-28	27.00	11.40	19.20	90	61	75.5	0.0	7.6	5.50
48	Nov 29- Dec 5	25.90	10.70	18.30	87	35	61	0.0	7.9	5.83
49	Dec 6-12	25.90	9.80	17.85	79	27	53	0.0	8.5	4.76
50	Dec 13-19	22.10	14.10	18.10	89	67	78	0.0	3.7	4.13
51	Dec 20-26	21.50	10.70	16.10	81	45	63	0.0	6.5	2.66
52	Dec 27-Jan 2	18.80	6.80	12.80	91	53	72	0.0	3.8	1.00
Correlation coefficient		0.607**	0.772**	0.730**	0.105	0.438	0.389	0.322	0.224	

present study was carried out to study the population build up of *Helicoverpa armigera* on tomato in relation to abiotic factors.

Materials and Methods

To record the population dynamics of fruit borer, the field experiment was conducted during *kharif* 2012–2013 at Vegetable Research Farm, Institute of Agriculture Sciences, BHU, Varanasi. Tomato variety Azad Type-6 was sown in bulk plot of 50 m² with maintaining 60 cm row to row and 40 cm plant to plant distance. Normal agronomic procedures were followed to grow up the crop. The pest population was recorded in this un-protected plot of tomato at 7 days interval from the occurrence or initiation of the pest infestation and was continued up to maturity. The incidence of tomato fruit borer was recorded in terms of number of larvae per five plants was recorded for the selected and tagged plants. Weather data were recorded simultaneously and correlated with the oc-

currence of the fruit borer. Among weather parameters morning relative humidity, evening relative humidity, average relative humidity, maximum temperature, minimum temperature, average temperature, sunshine hour and rainfall were considered for correlating with the occurrence of fruit borer. To work out the relationship between the occurrence of fruit borer and the weather parameters, correlation method was adopted.

Results and Discussion

The incidence of *Helicoverpa armigera* was observed throughout the cropping season. Initial incidence of pest was observed on 4th week of October, 2012 i.e., with mean infestation of 0.67 larvae per five plants (Table 1). The average maximum and minimum temperature prevailed during the initial infestation were 30.40°C and 17.50°C, respectively and the average morning and evening relative humidity was 84.0 and 54.0%, respectively. The fruit borer damage

reached to peak by first week of December with mean infestation of 5.83 larvae per five plants. The average maximum and minimum temperatures prevailing were 25.90°C and 10.70 °C, respectively and the average morning and evening relative humidity was 87 and 35%, respectively. There after the damage of fruit borer has declined gradually. The present results are in conformity with the result of [3] who revealed that the pest population increased starting from the first week of November and reached to its peak during the first week of December.

The relationship between fruit borer damage and the major weather parameters was worked out through correlation coefficient studies (Table 1). Significant negative correlation with maximum relative humidity ($r=-0.105$) and highly negatively significant with minimum relative humidity ($r=-0.438$) and mean relative humidity ($r=-0.389$). The correlation of pest population had positively significant with sunshine hours ($r = 0.224$) and non-significant with temperature,

rainfall. The present result are in conformity with [4] who revealed that the correlation coefficient of morning and afternoon relative humidity was negative (-0.76 and -0.73). The rainfall and larval population showed negative correlation coefficient but it was non-significant.

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