

## SEASONAL INCIDENCE OF FRUIT BORERS AND THEIR CORRELATION WITH METEOROLOGICAL FACTORS IN CHILLI, *CAPSICUM ANNUM* L. CROP

R.S. Meena<sup>1</sup>, \*B.L. Meena<sup>2</sup> and R.K. Meena<sup>3</sup>

<sup>1</sup>Department of Entomology, Rajasthan College of Agriculture,  
Maharana Pratap University of Agriculture and Technology, Udaipur

<sup>2</sup>Krishi Vigyan Kendra, Distt.-Sawai madhopur (Raj.)

<sup>3</sup>Krishi Vigyan Kendra, Hindon, Distt.-Kauroli (Raj.)

E-mail: blmpuat@gmail.com (\*Corresponding Author)

**Abstract:** A field experiment on seasonal incidence of tobacco caterpillar, *Spodoptera litura* Fab. and fruit borer, *Helicoverpa armigera* Hub. of chilli, *Capsicum annum* L. in relation to weather parameters was laid out at Rajasthan College of Agriculture Farm, Maharana Pratap University of Agriculture & Technology, Udaipur during *kharif* season of 2006-07 and 2007-08. Results revealed that the maximum population of fruit borer (3 larvae/ plant) was observed in last week of September and first week of October during 2006-07 and 2007-08, respectively. While, the tobacco caterpillar attained its peak (3.5 and 3.75 larvae/ plant) in first week of October during both the years. Correlation coefficient values worked out for fruit borers incidence and weather parameters revealed that the population of fruit borer and tobacco caterpillar was found negatively correlated with all the abiotic factors except maximum temperature, which was significantly positive for these pests. The losses in chilli crop were recorded maximum during second week of October with 33.60 and 34.20 per cent on number basis and 33.15 and 33.75 per cent on weight basis during both the years.

**Keywords:** Seasonal incidence, Fruit borere, Meteorological factors, Chilli

### Introduction

Chilli (*Capsicum annum* L.) is one of the important vegetable and condiments crop having immense commercial dietary and therapeutic values and grown throughout the year. It is cultivated throughout the country in about 7.67 lac hectares with annual production of 12.30 lac tonnes and average productivity of 1600 kg ha<sup>-1</sup> (Anonymous, 2010). In Rajasthan, it is cultivated in an area of 13,812 hectares with the production of 13,649 tonnes and productivity of 988 kg/ha (Vital statistics, 2009-10). Its high remunerative return allures the farmers to undertake its extensive cultivation not only in the state, but all over the country. In the state of Rajasthan, the productivity of chilli is 988 kg which low as compared to other states and average productivity of the country. The various factors are responsible for low yield of chilli, among which, insect and mite pests are of prime importance which significantly affects

both the quality and production of chilli. The yield losses range from 50-90 per cent due to insect pests of chilli (Nelson and Natrajan, 1994 and Kumar, 1995). Due to variation in the agro climatic conditions of different regions insects show varying trends in their incidence also in nature and extent of damage to the crop. Besides, some known and unknown factors also play a key role in determining the incidence and dominance of a particular pest or pest complex. Available scientific literature shows that not much information is available especially on seasonal incidence and influence of various environmental factors on the fluctuation of fruit borers on chilli crop in semi arid region conditions of Rajasthan. Hence a region oriented study on the seasonal incidence of fruit borers would give an idea about peak period of their activity and may be helpful in developing pest management strategy.

### MATERIALS AND METHODS

In order to study the seasonal incidence of tobacco caterpillar, *Spodoptera litura* Fab. and fruit borer, *Helicoverpa armigera* Hub. in field, the chilli variety "Pusa Jwala" which recommended for this region was used for the experiment, transplanting was done after 45 days i.e. on 15<sup>th</sup> July in the laid out fields at the spacing of 45 cm x 60 cm. The experiment was conducted at Rajasthan College of Agriculture Farm, Maharana Pratap University of Agriculture & Technology, Udaipur during *kharif* season of 2006-07 and 2007-08. To study seasonal incidence of fruit borers of chilli were done by counting the population of insect pests on five randomly selected tagged plants in three plots of 4.5 m x 3.0 m were maintained without employing any plant protection measures. The observation of fruit borers was recorded at weekly intervals during morning hours between 6:30 AM to 8:30 AM. The population of fruit borer was counted on five plants in each plot which were selected randomly, tagged and examined carefully with the help of magnifying glass. The weekly meteorological data on temperature, relative humidity and rain fall were recorded during the experimental period. Simple correlation was worked out between insect pest population and abiotic factors using the following formula:

$$r_{xy} = \frac{\sum XY - \frac{\sum X \sum Y}{n}}{\sqrt{\left(\sum X^2 - \frac{(\sum X)^2}{n}\right) \left(\sum Y^2 - \frac{(\sum Y)^2}{n}\right)}}$$

Where,

$r_{xy}$  = simple correlation coefficient

x = variable i.e. abiotic component

y = variable i.e. mean number of insect pests

n = number of observations

The correlation coefficient (r) values were subjected to the test of significant using t test

$$t = \frac{r}{\sqrt{1-r^2}} \times \sqrt{n-2}$$

The calculated t-value was compared with tabulated t-value at 5 per cent level of significance.

## RESULTS AND DISCUSSION

The data presented in table 1 on the population of fruit borers in chilli crop revealed that leaf eating caterpillar and fruit borer were of regular occurrence and caused considerable damage to the crop. The infestation of fruit borer, *Helicoverpa armigera* Hub. larvae was started in third week of August (34<sup>th</sup> meteorological week) during 2006-07 and in second week of August (33<sup>rd</sup> meteorological week) during 2007-08 and remained continue upto last week of November (48<sup>th</sup> meteorological week). The population increased gradually and touched its peak with mean population of 3 larvae /plant in first week of October (40<sup>th</sup> meteorological week) during 2006-07 and in last week of September (39<sup>th</sup> meteorological week) during 2007-08. Thereafter, the population decline gradually and reached up to 0.5 larvae /plant in last week of November (48<sup>th</sup> meteorological week). The pest population exhibited positive correlation with maximum temperature while, the correlation negative with minimum, mean temperature, maximum, minimum and mean relative humidity and average rain fall during both years (Table 2). Results of the present investigation are supported by the findings of Odak (1981) who that the pod borer remain active from September to March on various crop, population was low from April to August.

Incidence of the tobacco caterpillar commenced in the last week of August (35<sup>th</sup> meteorological week) during 2006-07, while in 2007-08, the caterpillar infestation started in third week of August (34<sup>th</sup> meteorological week) and was continued upto fourth week of November (48<sup>th</sup> meteorological week). The population increased gradually and touched its peak the maximum mean population of 3.5 and 3.75 caterpillars /plant was noted during 2006-07 and 2007-08, respectively. Thereafter, the population decline gradually and reached to 1.5 and 1.0 caterpillars /plant in last week of November. The population exhibited a positive correlation with maximum temperature while the correlation was negative with minimum and mean temperature; maximum, minimum and mean relative humidity and average rainfall during 2006-07 and 2007-08, respectively. The present findings supported by

Pursureman and Jayraj (1983) who observed the optimum condition for development of *Sodoptera litura* Fab. was 25<sup>0</sup>C and 75 per cent relative humidity.

The infestation of fruit borers in term of damage was commenced in the last week of August in both years i.e. 2006-07 and 2007-08 and continued till last week of November. During the year 2006-07, maximum infestation (33.60%) was observed during 2<sup>nd</sup> week of October. The mean loss in fruit weight was 33.15 per cent. Similarly, in the year 2007-08, the infestation level was 34.20 per cent and weight loss was 33.75 per cent (Table 3 & 4). The present results are in agreement with that Sharma and Bharadwaj (2004) who reported heavy infestation of borers with infestation level 34.10 per cent and weight loss was 33.60 per cent infestation level was 34.80 per cent and weight loss was 34.20 per cent during 1999 and 2000, respectively.

## REFERENCES

- [1] Anonymous, 2010. Indian Horticulture Data Base. 2010. National Horticulture Board, Ministry of Agriculture, Govt. of India, Gurgaon. pp. 8.
- [2] Anonymous, 2010. Rajasthan Agricultural at a glance.2009-10. p. 87.
- [3] Kumar, N.K.K. 1995. Yield loss in chilli and sweet pepper due to *Scirtothrips dorsalis* Hood. (Thysanoptera: Thripidae). *Pest Management in Horticulture Ecosystems*.**1**: 61-69.
- [4] Nelson, S.J. and Natarajan, S. 1994. Economic threshold level of thrips in Semi-dry chilli. *South Indian Horticulture*. **42** : 336-338.
- [5] Odak, S.C. 1981. Seasonal history of gram pod borer *Heliothis armigera* (Hub.). In: *Annual Progress Report of Integrated Control of Gram Pod Borer, Heliothis armigera* (Hub.), Deptt. of Entomology, JNKVV, Jabalpur (M.P.): 4-8.
- [6] Parasuraman, S. and Jayaraj, S. 1983. Effect of temperature and relative humidity on the development and adult longevity of the polyphagous *Spodeptera litura* (Feb.) (Lepidoptera :Noctuidae). *Indian Journal of Agricultural Sciences*, **53**: 582-584.
- [7] Sharma, K.C. and Bhardwaj, S.C. 2004. Seasonal incidence of *Helicoverpa armigera* infesting tomato. *Indian Journal of Applied Entomology*, **18**: 125-129.

**Table 1. Incidence of fruit borers on chilli crop during *kharif*-2006-07 and 2007-08**

S. No.	St. Week	Fruit borer/ plant		Tobacco caterpillar/ plant	
		2006-07	2007-08	2006-07	2007-08
1	29	0.00	0.00	0.00	0.00
2	30	0.00	0.00	0.00	0.00
3	31	0.00	0.00	0.00	0.00
4	32	0.00	0.00	0.00	0.00
5	33	0.00	0.25	0.00	0.00
6	34	0.25	0.50	0.00	1.00
7	35	0.50	0.50	1.00	1.25
8	36	0.75	1.25	1.75	1.50
9	37	1.00	1.50	2.00	2.25
10	38	1.50	3.00	2.25	2.25
11	39	2.75	3.00	2.50	2.75
12	40	3.00	2.25	3.50	3.75
13	41	2.25	2.75	3.00	3.25
14	42	2.50	2.00	3.25	3.50
15	43	1.75	2.50	3.00	3.25
16	44	2.25	1.75	2.75	3.00
17	45	1.75	2.00	2.50	2.50
18	46	1.50	1.25	2.25	2.50
19	47	1.00	0.50	3.00	2.75
20	48	0.50	0.50	1.50	1.00

**Table 2. Correlation between key abiotic factors and fruit borers population on chilli**

Insect Pests	Year	Temperature (°C)			Relative Humidity (%)			Rainfall (mm)
		Maxi	Mini	Mean	Maxi	Mini	Mean	
Fruit borer	2006-07	0.7660*	-0.2270	-0.0610	-0.6620*	-0.6330*	-0.6680*	-0.5510*
	2007-08	0.5690*	-0.4010	-0.2430	-0.3400	-0.5001*	-0.4557	-0.4696
Tobacco Caterpillar	2006-07	0.6810*	-0.1880	-0.0390	-0.6530*	-0.7170*	-0.7280*	-0.6280*
	2007-08	0.5935*	-0.5544*	-0.3974	-0.5089*	-0.6790*	-0.6338*	-0.5752*

\* Significant at 5 per cent level

**Table 3. Incidence of fruit borers in chilli crop along with meteorological parameters (July to November 2006)**

S.No.	Date of observation	Temperature (°C)			Relative Humidity (%)			Rainfall (mm)	Fruit Infestation (%)	Weight loss (%)
		Maximum	Minimum	Mean	Maximum	Minimum	Mean			
1.	26/08/2006	29.20	22.60	25.90	97.40	48.10	72.75	00.90	18.20	17.60
2.	02/09/2006	30.10	23.40	26.75	94.40	73.30	83..85	29.20	20.80	20.15
3.	09/09/2006	31.40	21.40	26.40	85.00	58.80	71.91	0.00	22.15	21.70
4.	16/09/2006	33.80	22.20	28.00	85.00	54.90	69.95	5.70	23.10	22.60
5.	23/09/2006	32.60	22.10	27.35	85.00	73.00	79.00	3.30	27.30	26.80
6.	30/09/2006	35.20	20.20	27.70	70.40	22.70	46.55	0.00	28.10	27.40
7.	07/10/2006	33.10	18.70	25.90	73.10	34.70	53.90	0.00	29.75	29.10
8.	14/10/2006	34.40	18.70	26.55	71.40	27.70	49.55	0.00	33.60	33.15
9.	21/10/2006	32.40	16.80	24.60	73.80	32.70	53.25	0.00	31.30	30.60
10.	28/10/2006	31.50	14.50	23.00	80.60	25.50	53.05	0.00	30.10	29.40
11.	04/11/2006	31.30	14.20	22.75	86.40	38.70	62.55	0.00	28.00	27.30
12.	11/11/2006	30.20	13.00	21.60	84.40	42.60	63.50	0.00	26.75	26.10
13.	18/11/2006	29.70	12.60	21.15	83.60	38.40	61.00	0.00	24.10	23.60
14.	25/11/2006	26.30	9.80	18.05	79.30	29.10	54.20	0.00	22.60	22.10

\*Average of three replications

**Table 4. Incidence of fruit borers in chilli crop along with meteorological parameters (July to November 2007)**

S.No.	date of observation	Temperature (°C)			Relative Humidity (%)			Rainfall (mm)	Fruit Infestation (%)	Weight loss (%)
		Maximum	Minimum	Mean	Maximum	Minimum	Mean			
1.	26/08/2007	31.50	23.70	27.60	95.00	75.00	85.00	73.8	19.20	18.50
2.	02/09/2007	31.00	23.60	27.30	87.00	67.00	77.00	23.8	21.75	21.10
3.	09/09/2007	31.90	21.40	26.65	82.00	55.00	68.50	0.0	22.40	21.90
4.	16/09/2007	33.70	22.90	28.30	84.00	51.00	67.50	1.8	24.10	23.50
5.	23/09/2007	31.60	21.30	26.45	83.00	48.00	65.50	7.8	28.10	27.60
6.	30/09/2007	34.10	16.30	25.50	70.00	24.00	47.00	0.0	30.40	29.75
7.	07/10/2007	33.30	15.70	24.50	64.00	27.00	45.50	0.0	31.60	31.10
8.	14/10/2007	33.60	13.10	23.35	58.00	16.00	37.00	0.0	34.20	33.75
9.	21/10/2007	32.90	14.30	23.60	65.00	18.00	41.50	0.0	32.15	31.60
10.	28/10/2007	31.70	14.00	22.85	69.00	26.00	47.50	0.0	31.75	31.15
11.	04/11/2007	33.70	15.50	24.60	69.00	22.00	45.50	0.0	29.00	28.50
12.	11/11/2007	31.60	13.10	22.35	67.00	18.00	42.50	0.0	27.75	27.10
13.	18/11/2007	30.20	9.80	20.00	65.00	18.00	41.50	0.0	25.30	24.75
14.	25/11/2007	29.10	10.50	19.80	75.00	31.00	53.00	0.0	23.60	22.60

\*Average of three replications

**Table 5. Correlation between key abiotic factors and per cent fruit infestation and weight loss in chilli**

Fruit damage by borer	Year	Temperature (°C)			Relative humidity (%)			Rainfall (mm)
		Maximum	Minimum	Mean	Maximum	Minimum	Mean	
Infestation (per cent)	2006-07	0.597*	-0.376	-0.249	-0.802	-0.548	-0.678	-0.395
	2007-08	0.543*	-0.534	-0.333	-0.842	-0.799	-0.822	-0.605
Weight loss (per cent)	2006-07	0.600	-0.381	-0.253	-0.804	-0.544	-0.676	-0.399
	2007-08	0.554*	-0.522	-0.320	-0.839	-0.793	-0.816	-0.603

\* Significant at 5 per cent level