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Original Research Article

Seasonal Incidence of Lepidopteran Pests (*Helicoverpa armigera* Hub. and *Spodoptera litura* Fab.) in Tomato

Soumyashree Sravani Mahapatra[1*], B. K. Sahoo[1] and B. Kariyanna[2]

[1]Orissa University of Agriculture and Technology was established in Bhubaneswar, Orissa, India
[2]University of Agricultural Sciences, Raichur, Karnataka, India
**Corresponding author*

A B S T R A C T

The *Helicoverpa armigera* and *Spodoptera litura* are act as a limiting factor in harvesting high yields of healthy and quality tomato fruits. The abiotic factors *viz.*, temperature, relative humidity (R.H) and rainfall are known to have profound influence on the occurrence, population build up and activity of these pests in tomato. Maximum population of *H. armigera* was noticed during 5th Standard week of February 2017 (3.60 per plant) followed by 4th Standard week of January (3.10 per plant) whereas incidence of *S. litura* was highest in 5th standard week of February (2.0 per plant). As compared to *H. armigera*, the incidence of *S. litura* was found to be quite less during the period of observation (October 2016-March 2017). Both the borers *i.e H. armigera* and *S. litura* was negatively correlated to mean maximum temperature (-0.13 and -0.10), mean minimum temperature (-0.47 and -0.43), evening RH (-0.52 and -0.49) and rainfall (-0.36 and -0.32) while a positive correlation was witnessed so far morning R.H (0.31 and 0.28).

Keywords

Tomato, *Helicoverpa armigera*, *Spodoptera litura* and seasonal incidence

Introduction

Tomato is the third largest vegetable crop after potato and sweet potato in the world, but it tops the list of canned vegetables. It is an important condiment in most diets and a very cheap source of vitamins, like A, C, E, fibers and minerals (Olaniyi, 2010). Insect pest act as a limiting factor in harvesting high yields of healthy and quality tomato fruits. Because of its fleshy nature about sixteen insects and other pests species cause damage to the tomato crop in India resulting in use of large volume of pesticides which leave their toxic residues (Bhutani, 1977).

Among the various pests, the tomato fruit borer, *Helicoverpa armigera* Hubner is most destructive. The pest is highly polyphagous and reported on nearly 181 host plants (Manjunath *et al.*, 1987). Another insect that sabotages this crop leading to the decrease in the yield is the tobacco cutworm, *Spodoptera litura* (Fab.) which is nocturnal and can completely wither away the leaves from the plant. These pests affect the crop yield and quality of fruits thereby reducing its market value.

Devi *et al.*, (1991) monitored *H. armigera* with a light trap and showed the pest to be prevalent during March-May, coinciding with the active vegetative or flowering and late crop growth stages of *Rabi* crops. Although, their seasonal abundance was influenced by various weather factors, yet,

the mean maximum temperatures of 25.9-27.5°C were conducive to the activity of the moths. Singh *et al.,* (2004) studied the seasonal bionomics of *H. armigera* in Northern Rajasthan. The results showed seventh and sixth generations of the pest during 1997-98 and 1998-99, respectively. In 1997-98, the pest completed its first generation on cotton and gram; its second and third generation on gram; its fourth generation on tomato and its succeeding generation on cotton. Reddy and Kumar (2004) studied correlation between abiotic factors and incidence of tomato fruit borer. The results showed that egg and larval populations attained a peak in March-April, and the population declined in October-November. There was highly significant positive correlation between the egg and larval populations with the maximum and minimum temperatures and the total number of rainy days. Seasonal incidence is a preliminary survey which is carried out to investigate the sensitivity of occurrence of the pest to the different meteorological parameters.

The abiotic factors *viz.*, temperature, relative humidity (R.H) and rainfall are known to have profound influence on the occurrence, population build up and activity of the pests in tomato. Chandel *et al.,* (2005) reported that the activity of *H. armigera* started on chick pea from October onwards. The population was low (1 larva/ 10 plants) and it gradually increased in second week of November to December and at first fortnight of December it was observed on pigeon pea with low population (2 larvae/10 plants). Singh *et al.,* (2011) observed *Helicoverpa* larval population and fruit damage in 50th standard week during 2005-06 & 52nd standard week in 2006-07 respectively. The present study is the smaller endeavor to fill the breach in the seasonal incidence of *H. armigera* and *S. litura*

Materials and Methods

Field trial was conducted during *Rabi*, 2016-17 at the Central Research Farm, Department of Entomology, Orissa University of Agriculture and Technology (OUAT), Bhubaneswar. (20^0 $15^{'}$ N, latitude and 85^0 $52^{'}$ E, longitude) at an elevation of 25.9 m above MSL. During cropping season of *Rabi*, 2016-17 observations were recorded on the population of *H. armigera* and *S. litura* from five randomly selected plants in morning hours during crop growth period.

The period and peak period of activity of each of the insect pests were recorded during the weekly observations starting from seedling to harvesting stage i.e 43rd standard week to 9th standard week.

Data obtained from the weekly observation of tomato variety were correlated with the prevailing weather parameters like maximum and minimum temperature and morning and evening relative humidity (RH) and rainfall to study the population fluctuation phenomena in relation to weather changes.

The data obtained on various aspects were subjected to statistical analysis after necessary transformation. Statistical interpretation of data was done following the Fischer's analysis of Variance technique as given by Panse and Sukhatme (1967) at 5% level of significance.

Results and Discussion

Seasonal activity of Insect pests on tomato can be seen from the Table.1 that the incidence of *Helicoverpa armigera* and *Spodoptera litura* was noticed in 1st Standard week of January 2017 (1.40 and 0.40 per plant, respectively).

Table.1 Seasonal incidence of fruit borers on tomato (larvae/plant)

Month	SW	Week Period	DAP	Stage of plant	*H. armigera*/plant	*S. litura*/plant
October, 2016	43	22-28	7	Seedling	0	0
November,2016	44 45 46 47	29/10- 4/11 5-11 12-18 19-25	14 21 28 35	Seedling Seedling Seedling Vegetative	0 0 0 0	0 0 0 0
December,2016	48 49 50 51 52	26/11- 2/12 3-9 10-16 17-23 24-31	42 49 56 63 70	Vegetative Vegetative Flowering Fruit formation Fruit development	0 0 0 1.4 2.1	0 0 0 0.4 0.8
January, 2017	1 2 3 4	1-7 8-14 15-21 22-28	77 84 91 98	Fruit development Fruit development Fruit development Fruit development	2.6 2.7 3.0 3.1	1.2 1.3 1.6 1.7
February, 2017	5 6 7 8	29/1-4/2 5-11 12-18 19-25	105 111 119 126	Fruit development Fruit harvesting Fruit harvesting Fruit harvesting	3.6 2.9 2.4 1.6	2.0 1.8 1.6 0.6
March, 2017	9	26/2-4/3	133	Fruit harvesting	1.0	0.2

DAP- Days After Planting SW-Standard week

Table.2 Correlation Coefficients (r) of occurrence of fruit borers in tomato with Meteorological parameters

Fruit borers	Temperature (℃)		RH (%)		Rainfall(mm)
	Max	Min	Morning	Evening	
Helicoverpa armigera	-0.13	-0.47	0.31	-0.52	-0.36
Spodoptera litura	-0.10	-0.43	0.28	-0.49	-0.32

Maximum population of *Helicoverpa armigera* was noticed during 5th Standard week of February 2017 (3.60 per plant) followed by 4th Standard week of January (3.10 per plant) whereas incidence of *Spodoptera litura* was highest in 5th standard week of February (2.0 per plant). As compared to *Helicoverpa armigera*, the incidence of *Spodoptera litura* was found to be quite less during the period of observation (October 2016-March 2017).

The correlation between weekly average population of *Helicoverpa armigera* and *Spodoptera litura* was worked out against weekly mean maximum temperature, minimum temperature, morning R.H, evening R.H and weekly total rainfall are depicted in Table 2.

It can be observed from the table that the incidence of both the borers *i.e H. armigera* and *S.litura* was negatively correlated to mean maximum temperature (-0.13 and -0.10), mean minimum temperature (-0.47 and -0.43), evening R.H (-0.52 and -0.49) and rainfall (-0.36 and -0.32) while a positive correlation was witnessed so far morning R.H (0.31 and 0.28) was concerned; however in none of the cases the correlation was found to be significant.

In the present study a non-significant negative correlation was observed with the population of both the borer species and abiotic factors like mean maximum, mean minimum temperature and evening RH. Kakati *et al.,* (2005) also have studied a similar phenomenon with respect to *H. armigera.* However, Radhika (2013) observed that the maximum and minimum temperature were significantly positively correlated during Rabi, 2009 when pheromone trap catches were taken into consideration. However, the above findings do not match with the present finding. Similarly Meena and Bairwa (2014) also observed a negative and non-significant relationship between mean maximum and mean minimum temperature on *H. armigera* population. In present finding we observed non-significant negative relation with rainfall. The present finding draws ample support from the findings of Sharma *et al.,* (2013). As regard to *S. litura* is concerned, a negative and non-significant relationship exhibited between *S. litura* population and mean maximum and mean minimum temperature. Shakya *et al.,* (2015) also studied a similar phenomenon on tomato with respect to *S. litura.*

References

Bhutani D K. 1977. Insects of vegetable: tomato, *Pesticides*, 11(1).

Chandel SF, Singh PK and Ahmad R. 2005. Population dynamics of *Helicoverpa armigera* (Hubner) and *Campoletis chloridae* on different crops, *Annals of Plant Protection Sciences,* 13(2): 379-383.

Devi N, Raj D and Singh M. 1991. Seasonal abundance of two noctuid pests (*Plusia orichalcea* Fabr. and *Heliothis armigera* Hubner) in North West himalayas (India), *Journal of Entomological Research*, 15: 120-124.

Kakati M, Saikia DK and Nath RK. 2005. Seasonal history and population build-up of tomato fruit borer, *Heliothis armigera* (Hub.) (Lepidoptera: Noctuidae), *Research on Crops*, 6(2):371-373.

Manjunath TM, Bhatnagar VS, Pawar CS and Sithanathan. 1987. Economic importance of *Heliothis armigera* spp. In India and assessment of their natural enemies and host plants, *Proceeding of the International Workshop on Biology of Heliothis*, 11-15 November, 1985, New Delhi, India.

Meena LK and Bairwa B. 2014. Influence of abiotic and biotic factors on the incidence of major insect pests of tomato, *The Ecoscan*, 8(3/4): 309-313.

Olaniyi JO. 2010. Vegetable production can be adopted as a strategy for improving livelihood and alleviating the nutritional status of the people, *African Journal of Food Sciences*, 4(6): 398 - 402.

Radhika P.2013.Influence of weather on the seasonal incidence of insect pests on groundnut in the scarce rainfall zone of Andhra Pradesh, *Adv.Res. J.Crop improve*., 4(2):123-126

Reddy NA and Kumar CTA. 2004. A study on correlation between abiotic factors and incidence of tomato fruit borer, *Helicoverpa armigera* (Hubner) (Lepidoptera: Noctuidae), *Mysore Journal of Agricultural Sciences*, 38(3): 417-421.

Shakya K P, Haseeb M and Manzoor U.2015. Seasonal incidence of *Spodoptera litura* infesting tomato (Lycopercison esculentum), *Biotic Environment* 21(2&3):49-51.

Sharma D, Maqbool A, Ahmad H and Jamwal VVS. 2013. Meteorological factors influencing insect pests of Tomato, *Ann. Pl. Protec. Sci*. 21(1):68-71.

Singh K, Raju SVS and Singh DK. 2011. Population Succession of tomato fruit borer (*Helicoverpa armigera*) on tomato (*Lycopersicon esculentum* Mill.) agro-ecosystem in eastern region of U.P, *Vegetable Science*, 38(2):152-155.

Singh V, Siag RK and Vijay Prakash. 2004. Seasonal bionomics of *Helicoverpa armigera* (Hub.) in Northern Rajasthan, *Haryana Journal of Agronomy*, 20(1/2): 62-64.