Scholars Journal of Agriculture and Veterinary Sciences **e-ISSN 2348–1854**
Sch J Agric Vet Sci 2017; 4(10):414-417 **p-ISSN 2348–8883**

(An International Publisher for Academic and Scientific Resources)

Effect of Weather on Fruit Borer, *Helicoverpa armigera* (Hub) Activity in Tomato

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Original Research Article

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Article History
Received: 11.10.2017
Accepted: 18.10.2017
Published: 30.10.2017

DOI:
10.36347/sjavs.2017.v04i10.004

Abstract: Study was conducted to ascertain the effect of weather i.e. temperature on fruit borer, *Heicoverpa armigera* (Hub.) activity, major insect-pest of Tomato in northern plains of India. Initial fruit infestation by *H. armigera* was recorded in November in the years of study i.e. 2012-13 and 2013-14 which declined during December-January and touched the peak i.e. 11.93 and 14.78 percent in the month of March. The correlation of *H. armigera* fruit damage (%) with maximum temperature was strongly positive (r= 0.5082 and 0.5393) and similarly with minimum temperature (r= 0.5880 and 0.6866) as well.

Keywords: *H. armigera*; temperature; tomato; fruit damage; correlation

INTRODUCTION

Tomato (*Lycoper siconesculentum* L.), belonging to solanaceae, is of the most important vegetable crop of India. It is grown in 0.882 M ha area with 18.7359 M mt production and 21.2mt/ha productivity [1] in the country. It is one of the important vegetable cropsgrown in the northern plains, part of 4th Agro-ecological region (AER) of the country. The production and productivity of tomato is severely hampered by various insect-pests infesting at different stages of crop growth. The key insect-pests of tomato in the region include Thrips (*Thripstabaci, Frankliniella sp.),* Aphid (*Myzuspersicae and Aphis gossypii),* white fly (*Bemisiatabaci*), Mites (*Tetranychus spp.),* Mealybugs (*Maconellicoccus sp., Phenacoccussolenopsis*) Tobacco caterpillar (*Spodopteralitura),* Leaf minor (*Liriomyzatrifolii*) and Fruit borer (*Helicoverpa armigera)* [2].

Out of these insect-pests, tomato fruit borer (*H. armigera*) is the major constraint in the higher production and productivity of tomato in the region. The yield losses caused by *H. armigera* in tomato have been reported to range from 20 to 88 per cent [3, 4]. Tomato fruit borer, *H. armigera* is a cosmopolitan, polyphagous insect-pest, distributed widely in Indian subcontinent [5]. Present study was carried out to ascertain the effect weather i.e. temperature on fruit borer activity in the region.

MATERIALS AND METHODS

Meteorological Standard Week (MSW) wise data records of tomato fruit borer incidence for years 2012-13 and 2013-14 were obtained form ICAR-NCIPM, New Delhi. These data records were collected form ten farmer farms (Table1) belonging to major tomato growing villages of Patiala district representing 4th AER region. Geographically, Patiala is located at 76.3°E longitude and 30.3°N latitude in the state of Punjab, India. MSW wise weather data particularly maximum and minimum temperature of Patiala was also obtained. *H. armigera* activity was recorded in terms of bored fruits (on number basis). Total number of fruits and bored fruits on individual plants were counted and thereafter percentage of bored fruits was worked out. Pest fruit infestation was recorded form two farmer fields (each near to one acre) selected from each village during *Kharif* season (October to March) of tomato crop. Observations in all the designated fields were taken on weekly basis. In each farm, five spots were selected randomly, four in the corners at least 5 feet inside of the field borders and one in the center of the field. Five random plants from each spot were chosen for recording observations.

RESULTS AND DISCUSSION

Tomato fruit borer, *H. armigera* activity was recorded on the basis of fruits infested by the pest. Weekly percent fruit damage records thus obtained was correlated with maximum and minimum temperature to signify the impact of weather on pest activity. Initiation of fruit infestation was observed during 46th-47thstandard weeks during the years of study. The fruit infestation progressively decreased till 4th-5thstandard week then gradually increased in successive standard weeks and attained its peak 11. 93 and 14.78between 10thand 11th standard weeks during 2012-13 and 2013-

14 years respectively as evident from Fig 1 and Fig. 2.Regarding the impact of temperature on *H. armigera* fruit infestation, it is obvious from Table 2 that both maximum temperature (r=0.5082 and 0.5393) and minimum temperature (r=0.5880 and 0.6866) demonstrated positive and strong role during the years in enhancing the fruit infestation. As regards to the effect of maximum temperature on minimum temperature it is clear from table 2 that there was a positive and significant impact on minimum temperature (r= 0.8309 and 0.7251) during both the years of study.

Table 1: Description of pest datasets recorded form 10 tomato farms for 2012-13 to 2013-14

S. No.	Farm		*H. armigera* (% fruit damage)
1.	FF1	Mean	3.77
		SD	4.79
		Range	20.37
2.	FF2	Mean	3.45
		SD	4.34
		Range	21.97
3.	FF3	Mean	3.92
		SD	6.26
		Range	33.33
4.	FF4	Mean	4.91
		SD	6.99
		Range	37.62
5.	FF5	Mean	3.09
		SD	3.39
		Range	12.89
6.	FF6	Mean	3.34
		SD	3.37
		Range	11.31
7.	FF7	Mean	4.31
		SD	5.92
		Range	23.41
8.	FF8	Mean	3.64
		SD	4.29
		Range	15.23
9.	FF9	Mean	2.48
		SD	3.02
		Range	10.66
10.	FF10	Mean	3.06
		SD	3.58
		Range	13.76

Table 2: Correlation of bored fruits (%) with temperature in tomato crop

Factors	Infested fruits (Y)	2012-13	
		Max. Temp. ($X_{1)}$	Min Temp. (X_2)
Y	1.0000	0.5028	0 .5880
X_1	-	1.0000	0.8309
X_2	-	-	1.000
		2013-14	
Y	1.0000	0.5393	0.6866
X_1	-	1.0000	0.7251
X_2	-	-	1.000

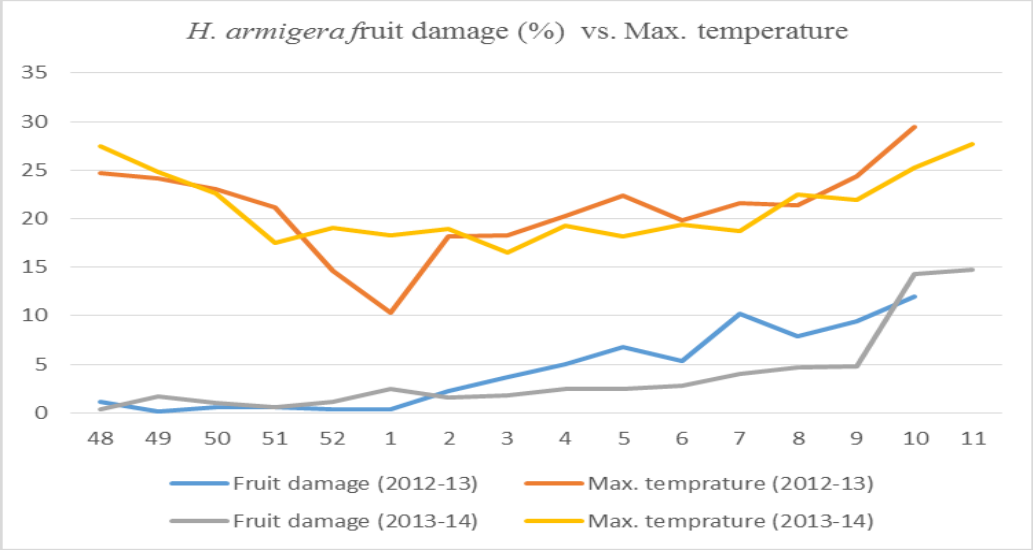

Fig-1: MSW wise Fruit infestation by *H. armigera*vs Max temperature

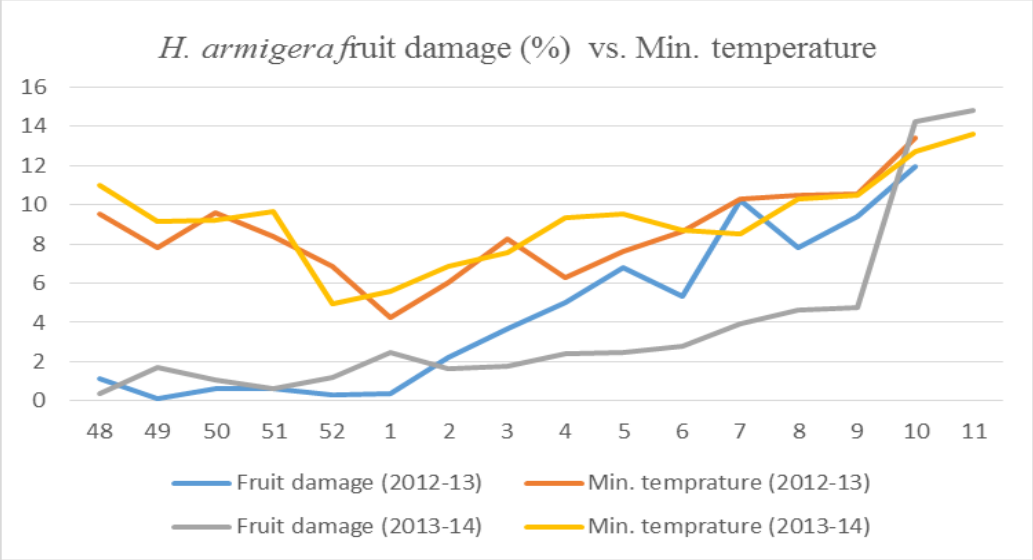

Fig-2: MSW wise fruit infestation by *H. armigera*vs min temperature

In the years of study, Fruit infestation by *H. armigera* initiated in second half of November, declined during December–January months when temperature is low and reached its peak in the month of March. Similar findings have been reported by Parihar and Singh [6] that temperature has positive impact on enhancing the fruit infestation. Tripathi and Sharma [7] also noted that temperature of 12-21^{0}c is most favorable for *H. armigera* development. Similarly, Sharma and Chaudhari [8] found the impact of temperature positively associated with the *H. armigera* activity in tomato crop. Thus, the present study is in alignment with these earlier findings. Kumar *et al.*, [9] too reported fruit borer activity in Tomato at peak during the month of March and exhibited significant positive correlation with the temperature confirming to the findings of the present investigation. Results of the study further confirm to the earlier findings that temperature is an important abiotic factor affecting the tomato fruit borer, *H. armigera (*Hub) activity.

ACKNOWLEDGEMENT

We are thankful to ICAR-National Research Centre for Integrated pest Management (NCIPM), New Delhi for providing data records and also the support to carry out the present study.

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