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Short communication

Effect of weather parameters on moth catches in pheromone trap for *Helicoverpa armigera* (Hübner) Hardwick infesting tomato

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Fruit Borer, *Helicoverpa armigera* (Hübner) Hardwick is a major pest of tomato widely distributed in tropics, subtropics and warmer temperate regions of the world. Young larvae of *H. armigera* feed on the foliage and late larval instars bore inside the fruit feed within and contaminated with the excreta. Such fruits are not preferred by consumers. The holes made on the fruits are circular and the larva feed on keeping the head portion only inside the hole. The yield loss by this pest is from 20 to 60 per cent (Tewari and Krishnamoorthy, 1984). The management of *H. armigera* at its peak activity is needed for minimization of loss in marketable fruit yield. Monitoring of pests in any crop is prerequisite for pest management. Malik *et al*. (2002) reported pheromone traps as a good tool to monitor and control *H. armigera*. Considering the severity of this pest in Banswara area of Rajasthan, the present investigation was undertaken to establish relation between the fluctuations of *H. armigera* male moth catches in pheromone traps and weather parameters that will help in timely management of *H. armigera* in tomato crop.

The experiment was conducted at ARS, Borwat Farm, Banswara during *rabi* 2009-10 and 2010-11. Tomato crop of local variety was grown as a sole crop and the pheromone trap was placed at 1 m height above the ground level. The pheromone trap used in this study was obtained from Pest Control India (PCI) Pvt. Ltd., Bangalore, India. The moths trapped were removed and counted at weekly interval. Data on weather parameters were obtained from the meteorological unit at ARS, Banswara. The relationship between weather parameters and pheromone trap catches was established by using simple correlation and regression analysis.

Periodical fluctuations of male moths

Pheromone traps provided an efficient tool for estimating fluctuations in population density and indicating adult peaks (Fig. 1). A total number of 2111 and 822 moths were captured during the first and second year, respectively. During 2009-10, the first peak in the number of trapped adults was detected during 5th standard week and the second marked increase in number of trapped adults, detected during 11 and 12th standard weeks, The adults trapping started in late November and the size of catches increased rapidly with the peak appearance (560 moths/trap/week) in 12th standard week (3rd week of March) during 2009-10. Similarly in 2010-11, the moth catches attained the first peak period during 8th Standard week (3rd week of February). The differences in peak period may be due to climatic differences occurred during both the years and another small peak was observed during 11th standard week. Mohapatra *et al*., (2007) reported that maximum number of male moth catches during third and fourth week of April in tomato whereas, the peak period of moth catches was observed in 8th and 9th standard weeks in chickpea (Ramesh Babu *et al*., 2009). In the present study, the moth populations were active from February to mid-April and decreased sharply in late April.

Correlation with weather parameters

The results of the correlation studies (Table 1) revealed that *H. armigera* moth populations were greatly influenced by weather conditions. Among the weather parameters, evening relative humidity (r=-0.540**) showed significant negative association with male moth catches during the year 2009-10. Similar results are reported by Ramesh Babu *et al*., (2009) in chickpea crop. All other weather parameters except wind speed had positive influence on the pheromone trap catches but it was non-significant. During 2010-11, all the weather parameters had non-significant positive influence except wind speed which had non-significnat negative influence. Vaishampayan (1980) observed a negative and non- significant correlation between temperature and catches of *H. armigera* in pheromone traps. The differences in results might be a function of differences in place and crops. The larval population was observed during fruit formation stage in tomato field. But, the larval count was not sufficient to correlate with weather parameters.

Regression with weather parameters

Various weather parameters caused 57 and 40 per cent significant variations in *H. armigera* male moth catches in tomato during the season 2009-10 and 2010-11, respectively. Similarly, 88 per cent variations in *H. armigera* male moth catches in chickpea were observed due to various weather parameters (Ramesh babu *et al*., 2009). During 2009-10, the regression equation indicated that an increase in 1^{0} C of maximum temperature increased the male moth catches of

Table 1: Correlation coefficient between H. armigera and wether parameters.

Year	Maxi. temp. (°C)	Mini. temp. (°C)	Mor. RH (%)	Eve. RH (%)	Windspeed (km h^{-1})	Sunshine (hrs)
2009-10 (n=21)	0.308	0.034	0.102	-0.540**	-0.051	0.244
2010-11# (n=19)	0.148	0.154	0.175	0.019	-0.076	0.294

**Significant at 5% # NS

Table 2: Regression equations for prediction of moth trap catches of *H. armigera* in tomato

Year	Simple regression prediction equations	SE(±)	R^1
2009-10	$Y=-398.968+10.91x_1+-5.22x_2+7.36x_1+-9.80x_4+-9.44x_5+-1.7x_6$	94.48	0.57**
2010-11	$Y=-832.44+0.031x_1+15.75x_2+6.74^{**}x_1+-0.40x_4+-12.48x_5+-23.5x_6$	54.19	0.40**

**Significant at 1%, *Significant at 5%X_1= Maximum temperature (°C) X_2= Minimum temperature (°C) X_3= Morning relative humidity (%) X_4= Evening relative humidity (%) X_5= Wind speed (km/hr) X_6= Sunshine (hrs)+ SE

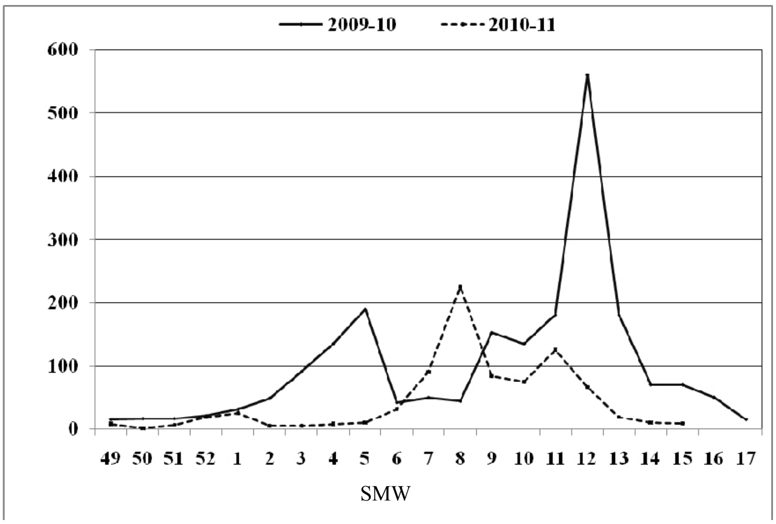

Fig. 1: Weekly male moth catches in pheromone trap of *H. armigera* in tomato

H. armigera by 30.3 per trap per week. Similarly, increase in 1% morning relative humidity increased the male moth catches of *H. armigera* to the tune of 7.7 moths per trap per week. Whereas, increase in 1^0 C minimum temperature and 1 Per Cent evening relative humidity reduced the moth catches by 5.2 and 9.8 moths per trap per week, respectively in tomato. Similar observation was also made in chickpea crop by Ramesh Babu *et al*., (2009). In the year 2010-11, the overall regression equation indicated that increase in 1Per Cent of morning humidity increased the male moth catches of *H. armigera* by 6.74 per trap per week. These results are contradictory to the results of Aheer *et al*., (2009) who reported that relative humidity, minimum temperature and maximum temperature contributed 8.40, 10.23 and 2.43 per cent to the population fluctuation of the moth at river, vegetable and orchard sites, respectively.

It may be concluded that a better understanding of *H. armigera* population dynamics may provide the basis for forecasting outbreaks in tomato. Thus, pheromone traps may serve as a warning device indicating the possibility of potential attack and to initiate timely management of *H. armigera* in tomato.

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