Indian Journal of Applied Entomology **23**(2) : 85-89 (2009)

MONITORING OF ADULT POPULATIONS OF *HELICOVERPA ARMIGERA* (HÜBNER) ON CHICKPEA USING PHEROMONE TRAP IN SOUTHERN HUMID ZONE OF RAJASTHAN

S. RAMESH BABU, K.S. RUPAWAT AND PRASHANT P. JAMBHULKAR

Agricultural Research Station, MPUAT, Banswara – 327 001 (Raj.).

ABSTRACT

An experiment was conducted during *rabi* 2007 and 2008 at the ARS, Banswara to predict the peak populations of male moths of *Helicoverpa armigera* using pheromone trap and to initiate proper control measures in time. Maximum peaks were observed during 8th and 9th standard meteorological weeks during 2007-08 and 2008-09, respectively. Maximum temperature, morning relative humidity and sunshine hrs had positive correlation with male moth catches during 2007-08. Negative association was observed between minimum temperature, evening relative humidity, wind speed and pheromone male adult trap catches of *H. armigera*. During 2008-09, maximum temperature and evening relative humidity had significant positive and negative correlation with male moth catches, respectively. All other weather parameters were negatively associated with male moth catches in pheromone trap. The coefficients of determination (R^2) were 0.8808 indicating 88.08 per cent variations in male moth catches of *H. armigera* in chickpea crop due to various weather factors during 2007-08. This study may be useful for forecasting of pod borer, *H. armigera* in chickpea crop.

Key word: Pheromone trap, *Helicoverpa armigera,* correlation, regression, weather parameters, forecast.

INTRODUCTION

The chickpea pod borer, *Helicoverpa armigera* (Hübner) Hardurícki [(Lepidoptera: Noctuidae)] causes economic losses and as a polyphagous pest it is a major pest of important crops including cotton, pigeonpea, tomato, okra, and blackgram. In chickpea it attacks tender foliage, flowers and pods; under favourable conditions the pod damage reaches up to 90-95 per cent (Shengal and Ujagir, 1990). Recent climatic changes have also influenced the density of *H. armigera* population in different pulse crops (Srivastava, 2009). Use of pheromone trap to monitor its population is an important component in the IPM programme (Ahmed and Khalique, 2002). The present study was thus conducted to monitor and predict the population density of *H. armigera* infesting chickpea using pheromone trap at Banswara in Southern Rajasthan.

MATERIALS AND METHODS

The experiment was conducted at the Institutional farm of ARS, Banswara during *Rabi* 2007-08 and 2008-09. The chickpea variety Pratap Chana-1 was grown as a sole crop in a three blocks of 20×20m^2. All recommended agronomic practices were adopted for the whole season. The pheromone trap used in this study was obtained from Pest Control India (PCI) Pvt. Ltd., Bangalore, India. The pheromone trap was placed in each block at 1 m height above the ground level. Each pheromone lure was replaced with a new lure after an exposure of 25 days. The moths trapped were removed and counted at weekly intervals. Data on weather parameters were obtained from the Meteorological unit of ARS, Banswara. The relationship between weather parameters and pheromone trap catches of adult males of *H. armigera* was established by using simple correlation co-efficient and regression analysis.

RESULTS AND DISCUSSION

The results of correlation and regression analysis are presented in Tables-1 and 2. The various weather parameters and pheromone trap catches of male moths of *H. armigera* are depicted in Fig. (1) and Fig. (2) for 2007-08 and 2008-09, respectively.

Male moth catches of *H. armigera* in pheromone trap

The activity of male moths of *H. armigera* was noticed from November to March in chickpea with the maximum numbers of male moth catches inthe months of February and March. The intensity of mean male moths trapped were high (751) during 2008-09 as compared to that during 2007-08 (241.5). The differences in the male moth catches observed could be due to the fluctuations in the weather parameters. However, during years, a similar trend of moth population was recorded. The highest peak of 51.3 and 136.6 male moths/trap/week was obtained during 2007-08 and 2008-09, respectively (Fig. 1 and Fig. 2) that happened

Table 1: Correlation co-efficient between pheromone trap catches of *Helicoverpa armigera* and weather parameters during 2007-08 and 2008-09 on chickpea

Year	Max. Temp. (°C)	Min. Temp. (°C)	Max. RH (%)	Min. RH (%)	Rainfall (mm)	Sunshine (hrs)	Wind speed (Km/hr)
2007-08 (n=17)	0.322	–0.382	0.146	–0.496**	–	0.567*	–0.170
2008-09 (n=17)	0.476**	–0.251	–0.273	–0.456**	–0.261	0.471**	–0.432**

* Significant at 1% ** Significant at 5%

to be during the standard meteorological weeks 8 and 9 during 2007-08 and 2008-09, respectively. Earlier, Ahmed and Khalique (2002) noted that 1st week of March, mid-April and 1st week of June as the start, peak and end of male moth catches of *H. armigera* in pheromone traps, respectively. Moths capture increased gradually and reached its peak in the month of April (Hossain, 2008).

Effect of weather parameters on *H. armigera* male moth catches

The male moth population had a positive correlation with maximum temperature during both years though it was significant in 2008-09; 2007-08; whereas, the minimum temperature had a negative association with the male moth catches during both the years. Vaishampayan (1980) observed a negative and non-significant correlation between temperature and catches of *H. armigera* in pheromone traps that contradict our findings. The population of male moths was positively correlated with morning relative humidity during 2007-08; whereas, it was negatively correlated during 2008-09. While, during both the years evening relative humidity showed a significant negative association with the male moth catches (Table-1). The present findings conform to the findings by Aheer *et al.* (2009) who observed that temperature and relative humidity had a significant positive correlation and significant negative correlation with trapped moth population, respectively in cotton based agro-ecological sites. Vaishampayan (1980) also reported that relative humidity was unfavorable to population build-up of *H. armigera*. In our study sunshine hours/day had a significant positive effect on the population of *H. armigera* male moths during 2008-09. It was also noted that male moth catches showed a negative correlation with the wind speed in chickpea during both the years, though it was significant only during 2008-09. Rainfall was observed in 47th week (3rd week of November) during 2008-09 and it had a non-significant negative association with male moth catches of *H. armigera* in chickpea. Hossain (2008) observed that peak emergence of moth was highest possibly due to higher rainfall. Similarly, Jayaramiah and Babu (1990) also reported rainfall as an influencing factor on moth emergence of *H. armigera*.

Regression studies

Based on regression analysis by taking male moth catches of *H. armigera* (y) as a dependent variable and weather parameters (x) as independent variable the equations computed have been presented in Table-2.

Table 2: Regression analysis between pheromone trap catches of *Helicoverpa armigera* and weather parameters during 2007-08 and 2008-09 on chickpea

Year	Regression equation	R^2
2007-08 (n=18)	$Y=-139.79+1.64x_1-4.65*x_2+2.74**x_3-1.22**x_4-0.45x_5-4.00**x_6$	0.8808*
2008-09 (n=18)	$Y=-728.22+22.25x_1-19.36x_2+2.21x_3+4.39x_4+0.194x_5+7.07x_6-4.12x_7$	0.6297

* 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=Sunshine hours X_6=Wind speed (Km/hr) X_7=Rainfall (mm)

From the regression equation it could be deduced that an increase in 1°C of minimum temperature the male moth catches of *H. armigera* decreased by 4.65 per trap per week during 2007-08. Increase in morning relative humidity by 1 per cent increased the male moth catches by 2.74 per trap per week; while a decrease in evening relative humidity by 1 per cent decreased the catch by 1.22 per hectare per week. During 2007-08, an increase in wind speed of 1 km/hr reduced the male moth catches by 4.00 per trap per week. The coefficients of determination (R^2) were 0.8808 indicating 88.08 per cent variations in moth catches of *H. armigera* in chickpea due to various weather factors during 2007-08. These results were 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.

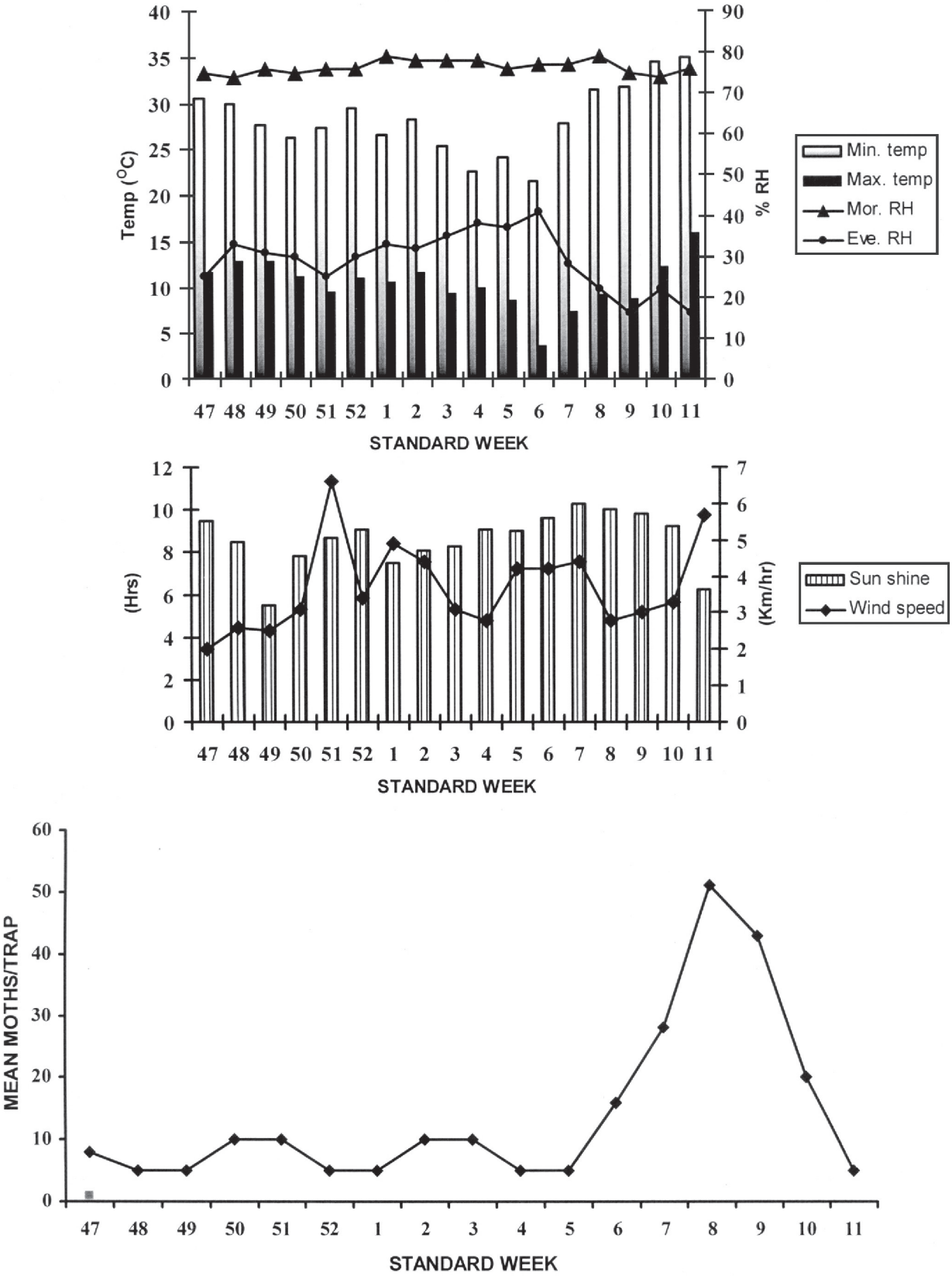

Fig. 1: Fluctuations of weather factors and pheromone trap catches of *Helicoverpa armigera* recorded during *Rabi* 2007-2008

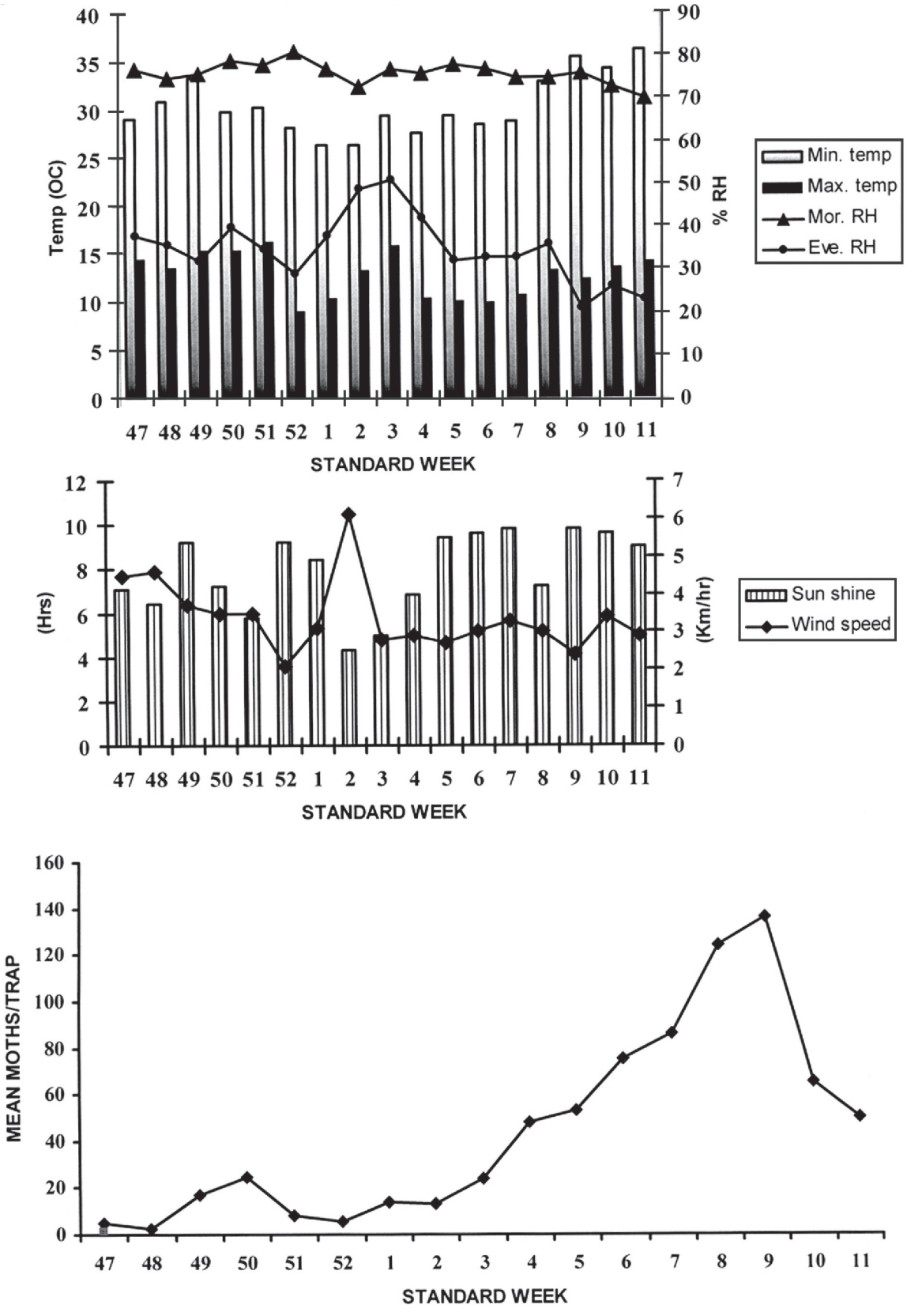

Fig. 2: Fluctuations of weather factors and pheromone trap catches of *Helicoverpa armigera* recorded during *Rabi* 2008-2009

REFERENCES

Aheer, G.M., Ali, A. and Akram, M. (2009). Effect of weather factors on populations of *Helicoverpa armigera* moths at cotton-based agro-ecological sites. *Entomology Research*, **39**: 36-42.

Hossain, M.A. (2008). Monitoring and evaluation of chickpea pod-borer *Helicoverpa armigera* (Hubner) (Lepidoptera: Noctuidae) by Using Pheromone Traps. *Bangladesh Journal of Science and Industrial Research,* **43**: 419-426.

Jayaramiah, M. Babu, H.C.S. (1990). Present status of *Helicoverpa armigera* in pulse and strategies for its management in Karnataka. *Proceeding First National Workshop Helicoverpa Management*, Directorate of Pulse Research, Kanpur, India, 30st August, 1990.

Ramasubramaniam, T. and Regupathy, A. (2004). Evaluation of Indoxacarb against pyrethroid resistant population of *Helicoverpa armigera* Hub. *Journal of Entomology*, **1**: 21-23.

Shengal, V.K. and Ujagir, R. (1990). Effect of synthetic pyrethroids, neem, extracts and other insecticides for the control of pod damage by *Helicoverpa armigera* on chickpea and pod damage-yield relationship at Patancheru in Northern India. *Crop Protection*, **9**: 29-32.

Srivastava, C.P. (2009). Impact of climate change on insect pests of pulses and their management. 3-5 in *National Conference: Applied Entomology, Impact of global warming on the incidence and management of insect pests in agriculture,* Entomological Research Association, MPUAT, Udaipur, Rajasthan, India.

Vaishampayan, S.M. (1980). Seasonal abundance and activity of gram pod borer moths *Heliothis armigera* on light trap equipped with mercury vapour lamp at Jabalpur. *Indian Journal of Entomology,* **7**: 147-154. www.agricoop.nic.in/Agristatistics.htm.