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Incidence of cotton bollworm (*Helicoverpa armigera* Hibner) in relation to meterological parameters in the saline zone of West Bengal

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ABSTRACT

To study the relationship between weather parameters and the population of *Helicoverpa armigera,* cotton (cv. LRA- 5166) was grown during January, 2001 at Metakara, 24pgs, W.B. on an area of 500 m^2, by adopting full package of practices recommended for the crop in W.B. condition. Result revealed that the *H. armigera* population has significantly negative correlation with maximum temperature (Max-T, r =-0.78) and significantly positive correlation with afternoon relative humidity (Min-RH, r = 0.80). Result revealed that 30.5 to 32.5 ^oC Max-T coupled with 65 to 77 % Afternoon-RH caused heavy infestation of the insect in cotton crop.

Key words: Cotton bollworm, temperature and relative humidity

Cotton, the most important commercial crop in India, occupies third position in production in the world. Though fibre is the main product from cotton yet the seeds provide an important source of food for livestock. The crop is subjected to different types of insect pests. Insects are major constraints for profitable production of cotton. Among the different insects-pests of cotton, bollworms cause heavy losses by damaging the fruit bodies particularly flowers, buds and bolls (Rao *et.al.*, 2004). According to Thimmaiah, (1977) around 50% shedding of fruit bodies occurred due to bollworm alone. Environment i.e. the weather parameters plays crucial role for insect-pests biology and their seasonal occurrence. Temporary changes in climate have profound impact on agricultural production and on the use of energy and water resources (Gates, 1988). Such type of change affects the cotton production and bollworm incidence under field condition. Cotton is a non-traditional crop in West Bengal. Yet it faces lots of bollworm problems. Therefore, evaluation of the effect of weather factors on pest's population is an important prerequisite for pest forecasting. Thus, for developing effective control measure, information on population dynamics in relation to different weather parameters is very much essential. Therefore, the present study was undertaken to find the impact of different meteorological parameters on the population dynamics of *Helicoverpa armigera*. The weather factors such as temperature, rainfall and humidity usually act in an independent manner influencing the insect population to a greater / lesser extent depending on the weather situation and the insect species (Kisimoto and Dyck 1976).

MATERIALS AND METHODS

The field experiment was carried out during January 2001 at Metakara, 24pgs, W.B. To study the relationship between weather parameters and the population of *Helicoverpa armigera* cotton (cv. LRA- 5166) was grown on an area of 500 m^2, by adopting full package of practices recommended for the crop in W.B. condition. The entire field was divided into ten plot of 50 m^2 each and from each plot ten plants ware selected randomly and examined thoroughly for presence of *Helicoverpa armigera* on all plant parts (follower, bud, boll and leaves) every week (standard method) during the reproductive phase (April to June). For plant protection measures the crop was given one or two need based sprayings of recommended systemic insecticide for the control of sucking pest during the vegetative phase. No pesticide was used to control the bollworm pest, particularly *Helicoverpa armigera*. The recorded data were compiled and the larval population per plant during each standard meteorological week was worked out. Simple correlation and regression between the population of *Helicoverpa armigera* and each abiotic factor (Bright sunshine hour (BSS), Rainfall, Maximum temperature (Max-T), Minimum Temperature (Min-T), Morning relative humidity (Morning –RH), Afternoon relative humidity (Afternoon- RH) and Wind speed) were worked out separately.

RESULTS AND DISCUSSION

In the present study it is observed that the *H.armigera* builds up its population four months after sowing. Thereafter, it increased gradually and reaches at the peak during last week of May and after that the population decreased sharply (Fig. 1). The result indicated that the population possesses positive correlation only with Afternoon- RH, where as, other abiotic factors showed negative correlation (Table1). Similarly Choudhury, *et al.* (1999) reported negative correlation between *Helicoverpa armigera* with rainfall, wind speed and Min-T. Balsubramanium *et al.* (1982) reported

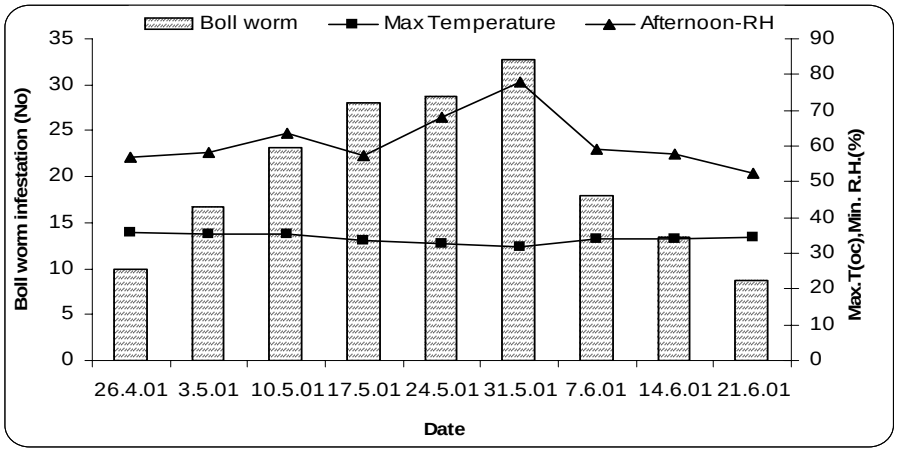

Fig. 1: Population dynamics of H. armigera in relation to weather parameters having significant correlation

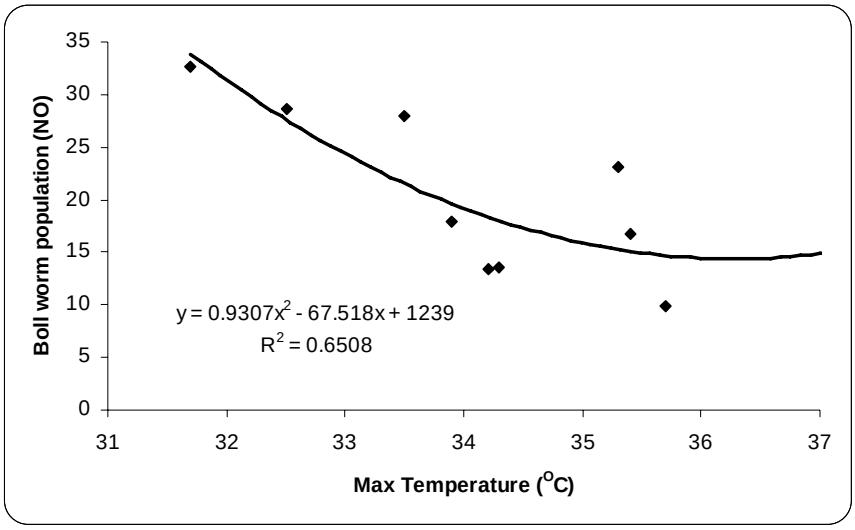

Fig. 2: Bollworm population – Maximum temperature relationship during the crop growing period

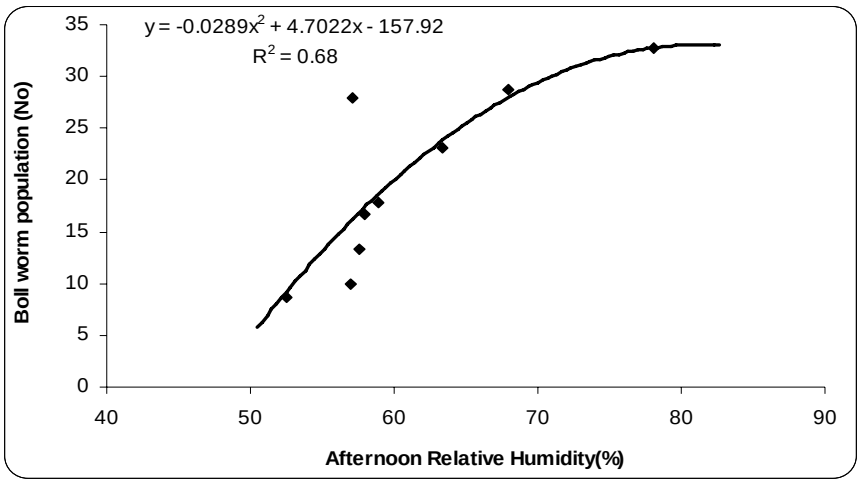

Fig. 3: Bollworm population – Afternoon relative humidity relationship during the crop growing period

Table 1: Correlation coefficient and regression equation of cotton bollworm with respect to weather parameters

Sl. No	Weather parameters	Correlation coefficient	Regression equation
1	Bright sunshine hour (hr day^{-1})	-0.33	
2	Rainfall (mm)	-0.17	
3	Maximum temperature (^{O}C)	-0.78*	$y = 0.9307x^2 - 67.518x + 1239$
4	Minimum temperature	-0.16	
5	Morning relative humidity	-0.12	
6	Afternoon relative humidity	0.80*	$y = -0.0289x^2 + 4.7022x - 157.92$
7	Wind speed (kmph)	-0.02	

* - Significant at 5% level

that the incidence of *Helicoverpa armigera* in relation of weather parameters showed significantly positive correlation with Max-T and BSS as well as significantly negative correlation with Min-T and Morning –RH.

Among all the meteorological factors only Max-T and Afternoon-RH have significant influence on the population build up of the insect. The insect population was at its maximum magnitude when Max-T ranged between 31 to 32 ^{O}C. Thereafter, with increase in temperature (up to 34 ^{O}C) the boll worm population decreased at a steeper rate followed by a moderate decrease at 35 ^{O}C. However, after that, the population remained at a constant level. Based on the regression analysis of *Helicoverpa armigera* population with Max-T, the second order polynomial relationship was found (r=0.65) (Fig. 2). The bollworm population increased with an increasing rate when Afternoon-RH increased from 50 to 67%. Thereafter, the increment rate decreased when Afternoon-RH ranged in between 70 to 75%. However beyond 82% of Afternoon -RH, the bollworm population became more or less constant. A second order polynomial relationship was also existed between bollworm population and Afternoon -RH with regression co-efficient 0.68 (Fig. 3).

CONCLUSION

The behaviour of any living organism is influenced greatly by different weather parameters. From the present investigation it is concluded that the *H. armigera* population is greatly influenced by the afternoon time temperature and relative humidity. When 30.5 to 32.5 ^{O}C Max-T coupled with 65 to 77 % Afternoon - RH may cause heavy infestation of bollworm insect in cotton.

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