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# Population Dynamics of Gram Pod Borer, *Helicoverpa armigera* (Hubner) Hardwick on Cotton, Pigeonpea and Chickpea*

**C. C. Patel** and D. J. Koshiya**

Forage Research Project, Gujarat Agricultural University, Anand-388 110

## ABSTRACT

**The present study on population dynamics of *Helicoverpa* (*Heliothis*) *armigera* (Hubner) Hardwick was carried out at the College Farm, College of Agriculture, GAU, Junagadh (Gujarat) on cotton, pigeonpea and chickpea during the year 1993-94. The study clearly revealed that the pest commemnced its activity in the last week of July and remained active up to the end of October in cotton crop. During this period its population showed violent fluctuations with 3 different peaks in the first week of September, first week of October and third week of October, respectively. This was due to increasing trend of minimum temperature, rainfall, vapour pressure and relative humidity in the morning and evening. In pigeonpea crop the pest was active from first week of October to last week of November but the maximum population was recorded during the last week of October. Among the different physical factors of environment, significant effect in causing such fluctuation. The pest incidence on chickpea crop started third week of November and reached at in third week of December, when the crop was at podding stage. In this crop, the pest was active from November to February. Among the various factors, maximum and minimum tempera- as well as vapour pressure showed decreasing trend which helped in causing the population n-**

*...d., 1997)*

## INTRODUCTION

The gram podborer, *Helicoverpa armigera* (Hubner) *Hardwick,* previously considered as *Heliothis armigera* Hb. (Vaishampayan, 1977) in major pest of chickpea, cotton, pigeonpea and hybrid sorghum in India (Singh and Singh, 1974, Saharia and Dutta, 1975 and Srivastava and Singh, 1973). This insect causes 50 to 60 per cent damage to chickpea crop, which is the most preferred host of the insect. Distribution and abundance of animals are determined by combined effect of different components of the envir ...ature. Weather factors influence the most (Andrewartha and Birch, 1954). Present paper reports the result of effect of weather factors on population fluctuation of *H. armigera* larvae on cotton, pigeonpea and chickpea during 1993-94 at Junagadh.

## MATERIALS AND METHODS

The activity of pest in field on chickpea, cotton and pigeonpea was monitored during the year 1993-94 at College Farm, College of

* Part of Ph.D. thesis submitted to Gujarat Agricultural University, Sardar Krushinagar, Dist. Banaskantha by first Author

**Present address : Assistant Research Scientist, Forage Research Project, Gujarat Agricultural University, Anand-388 110.

Agriculture, Junagadh. Twenty quadrates were fixed in each crop and larval population was recorded from 10 randomly selected plants at weekly interval from each quandrate. The observations were taken continuously till the harvesting of the crops. The data on population obtained were correlated with weather parameters viz., minimum and maximum temperature, rainfall, morning and evening vapour pressure and relative humidity by using correlation regression analysis to know the instantaneous effect of weather parameters on population fluctuation of *H. armigera*.

## RESULTS AND DISCUSSION

The results on activity of *H. armigera* and role of physical factors of environment in fluctuation of the population was determined and data obtained are summarized in Table 1 and Fig. 1.

The data on larval population of this noctuid revealed that the pest was active from last week of July to the end of October in cotton crop. During this period, it showed violent fluctuations with 3 peaks of population. The pest incidence initiated in last week of July and increased from 5.0 to 8.0 larvae per 10 plants during first week of August. It has been surprisingly decreased during second and third week of August, but again increased and attained a peak (14.8 larvae per 10 plants) in first week of September. During September, the pest population showed fluctuating trend, however, the second peak of the population was observed in first week of October (17.00 larvae/10 plants). The highest population (24.3 larvae/10 plants) was recorded in third week of this month but thereafter it showed decreasing trend during next two weeks. Thus, three population peaks were observed in cotton crop during the season.

In pigeonpea crop, larval population of *H. armigera* observed from first week of October to last week of November and fluctuated from 1.5 to 5.2 larvae per 10 plants (Fig. 1). The population gradually increased and the highest population (5.2 larvae/10 plants) was recorded during last week of October. It gradually declined in first week of November (3.1 larvae/10 plants) and thereafter remained almost static (1.5 to 1.7 larvae per 10 plants) upto the end of November. The lowest larval population (1.5 larval per 10 plants) was recorded during last week of this month and disappeared from the crop in the first week of December.

The data presented in Table 1 clearly indicate that the pest incidence in chickpea crop commenced during third week of November which gradually increased. Its highest intensity (6.3 larvae/10 plants) was recorded in third week of December and then gradually decreased. The lowest population (0.3 larvae/10 plants) was recorded in last week of February, when the crop was at maturity stage. Thus, the data clearly indicated that the pest was active from November to February in the crop.

Results on role of different physical factors of environment in causing the fluctuations of Heliothis population in chickpea, cotton and pigeonpea are given in Table 2.

The correlation study in cotton crop revealed that minimum temperature, rainfall, vapour pressure and relative humidity in the morning and evening were positively correlated with the population build up of this pest. Thus, it is clear that increase in minimum temperature, rainfall, vapour pressure and relative humidity in the morning and evening resulted in increase of population.

The correlation study in chickpea clearly showed that among the various physical factors of environment, minimum and maximum temperature as well as vapour

TABLE 1

**Effect of weather parameters on the incidence of *H. armigera* on chickpea, pigeonpea and cotton during the year 1993-94.**

| Standard week | Date of observation | Average larval population per 10 plants | | | Average temperature °C | | Average relative humidity | | Rainfall | Vapour pressure | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Chickpea | Pigeonpea | Cotton | Maximum | Minimum | Morning | Evening | mm | Morning | Evening |
| 31 | 03-08-93 | — | — | 5.0 | 29.3 | 25.1 | 87 | 58 | 0.0 | 23.3 | 16.4 |
| 32 | 09-08-93 | — | — | 8.0 | 31.8 | 25.3 | 88 | 65 | 1.4 | 23.2 | 21.8 |
| 33 | 16-08-93 | — | — | 4.7 | 33.4 | 21.2 | 87 | 56 | 0.5 | 22.4 | 21.3 |
| 34 | 24-08-93 | — | — | 4.5 | 32.5 | 24.7 | 87 | 58 | 1.8 | 22.8 | 19.6 |
| 35 | 30-08-93 | — | — | 32.5 | 33.8 | 24.2 | 83 | 53 | 0.0 | 21.9 | 20.1 |
| 36 | 06-09-93 | — | — | 14.8 | 33.2 | 24.0 | 86 | 54 | 1.3 | 22.3 | 19.9 |
| 37 | 13-09-93 | — | — | 12.5 | 34.1 | 23.8 | 84 | 48 | 0.0 | 21.5 | 18.8 |
| 38 | 20-09-93 | — | — | 15.0 | 34.5 | 23.4 | 85 | 50 | 21.9 | 20.7 | 19.6 |
| 39 | 27-09-93 | — | — | 12.0 | 32.2 | 23.1 | 94 | 76 | 41.1 | 22.7 | 24.1 |
| 40 | 04-10-93 | — | 3.3 | 17.0 | 35.2 | 23.5 | 87 | 49 | 0.0 | 21.8 | 20.3 |
| 41 | 11-10-93 | — | 3.5 | 14.5 | 37.8 | 24.0 | 70 | 39 | 1.7 | 19.4 | 17.3 |
| 42 | 18-10-93 | — | 4.0 | 24.3 | 32.5 | 23.5 | 94 | 68 | 59.7 | 22.8 | 22.9 |
| 43 | 25-10-93 | — | 4.6 | 10.5 | 32.9 | 21.8 | 92 | 61 | 96.4 | 21.8 | 20.8 |
| 44 | 01-11-93 | — | 5.2 | 5.5 | 33.5 | 17.4 | 86 | 42 | 0.0 | 16.4 | 16.0 |
| 45 | 08-11-93 | — | 3.1 | 0.0 | 33.5 | 15.2 | 74 | 31 | 0.0 | 13.7 | 11.8 |
| 46 | 15-11-93 | — | 1.6 | — | 33.0 | 21.8 | 75 | 51 | 3.0 | 17.4 | 17.7 |
| 47 | 22-11-93 | 1.6 | 1.7 | — | 33.7 | 15.6 | 77 | 27 | 0.0 | 14.0 | 10.6 |
| 48 | 29-11-93 | 1.7 | 1.5 | — | 33.9 | 10.0 | 70 | 19 | 0.0 | 8.3 | 7.6 |
| 49 | 06-12-93 | 2.1 | — | — | 33.2 | 13.2 | 73 | 29 | 0.0 | 11.5 | 10.8 |
| 50 | 13-12-93 | 2.5 | — | — | 32.9 | 12.1 | 74 | 27 | 0.0 | 9.9 | 10.0 |

| 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. | 11. | 12. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 51 | 20-12-93 | 6.3 | — | — | 31.8 | 9.7 | 78 | 21 | 0.0 | 8.4 | 7.7 |
| 52 | 27-12-93 | 6.3 | — | — | 29.7 | 8.5 | 73 | 42 | 0.0 | 7.6 | 12.5 |
| 01 | 03-01-94 | 5.9 | — | — | 31.7 | 9.9 | 77 | 34 | 0.0 | 7.9 | 11.9 |
| 02 | 10-01-94 | 4.4 | — | — | 30.1 | 12.7 | 85 | 37 | 0.5 | 10.7 | 11.2 |
| 03 | 17-01-94 | 2.9 | — | — | 27.5 | 8.8 | 77 | 37 | 0.0 | 7.5 | 10.2 |
| 04 | 24-01-94 | 2.1 | — | — | 33.3 | 14.6 | 79 | 36 | 0.0 | 12.0 | 20.7 |
| 05 | 31-01-94 | 2.4 | — | — | 30.7 | 10.5 | 63 | 29 | 0.0 | 7.9 | 9.2 |
| 06 | 07-02-94 | 1.5 | — | — | 31.4 | 14.6 | 75 | 33 | 0.0 | 11.1 | 10.8 |
| 07 | 14-02-94 | 2.0 | — | — | 31.6 | 13.5 | 78 | 44 | 0.0 | 12.2 | 15.3 |
| 08 | 21-02-94 | 1.8 | — | — | 31.0 | 11 5 | 74 | 58 | 0.0 | 9.6 | 18.6 |
| 09 | 28-02-94 | 0.3 | — | — | 35.9 | 16.. | 69 | 27 | 0.0 | 11.8 | 11.7 |

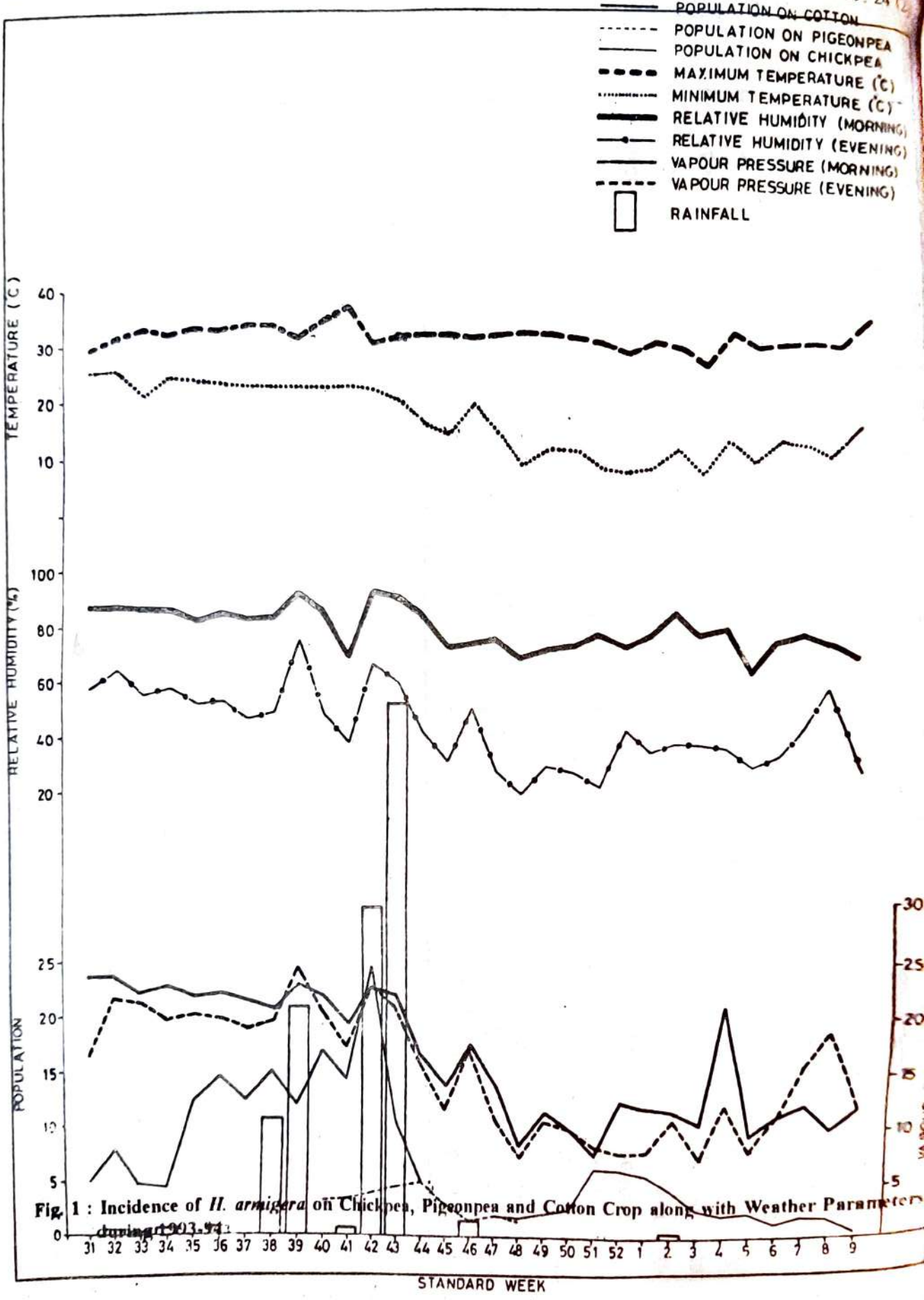



**Fig. 1 : Incidence of *H. armigera* on Chickpea, Pigeonpea and Cotton Crop along with Weather Parameters during 1993-94**

TABLE 2

**Correlation of larval population of *H. armigera* in different crops with weather parameters (1993-94).**

| Crop | Weather parameters | | | | | | |
|---|---|---|---|---|---|---|---|
| | Temperature(°C) | | Rain-fall | Vapour pressure | | Relative humidity | |
| | Maxi-mum | Mini-mum | mm | Morn-ing | Even-ing | Morn-ing | Even-ing |
| Chickpea | -0.58* | -0.81* | -0.17 | -0.71* | -0.55* | -0.11 | -0.20 |
| Pigeonpea | -0.03 | -0.06 | 0.22 | 0.09 | 0.03 | 0.11 | 0.06 |
| Cotton | -0.16 | 0.41* | 0.53* | 0.49* | 0.51* | 0.52* | 0.68 |

* Significant at 5% level.

pressure in the morning and evening were negatively correlated with population build up of this pest indicating that fall in this factors caused rise in population, whereas other factors could not showed any market effect on the fluctuation of the pest population. However, none of the factors showed such effect in population build up of this pest in pigeonpea. Balasubramanian *et al.* (1981) in Tamil Nadu and Bapodra (1988) in Gujarat also observed significant, negative correlation between the larval population and the manimum temperature on cotton and chickpea, respectively. Thus, the present findings are in conformity of the earlier reports.

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