



POPULATION DYNAMICS OF GRAM POD BORER *HELCOVERPA ARMIGERA* (HUBNER)

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ABSTRACT

The population dynamics of gram pod borer *Helicoverpa armigera* (Hubner) on chickpea was evaluated at the Agricultural Research Farm of B R D P G College, Deoria, Uttar Pradesh during rabi 2022-23. The larval incidence was initially recorded in 6th SMW (first week of February) (2.3 larvae/ plant) with a peak in 11th SMW (third week of March) (10.53 larvae/ plant). Larval incidence on chickpea variety Pusa-261 showed significant positive correlation with maximum temperature (0.837) and minimum temperature (0.804), whereas relative humidity (maximum and minimum) revealed non-significant negative correlation (-0.410), (-0.588), respectively. Correlation between rainfall and larval incidence was found positive and significant (0.734). However, all the weather parameters together contributed 94.18% towards larval incidence.

Key words: *Cicer arietinum*, gram pod borer, *Helicoverpa armigera*, population dynamics, correlation, multiple linear regression, Uttar Pradesh, eastern region, larva, polyphagous pests, standard week, rabi, Pusa-261.

Chickpea (*Cicer arietinum* L.) commonly known as gram or bengal gram most important pulse crop. Globally, India ranked first in area and production (FAOSTAT, 2020). India produces 11.91 million tons of chickpea from 9.99 million ha with an average production of 1192 kg/ ha (DES, GoI, 2020-21). However, chickpea production is not fully achieved a mid-different biotic and abiotic stresses (Chaturvedi et al., 2018). Among biotic factors, diseases, insect pests, nematodes, birds and vertebrates harm the crop but damage due to insects is more striking than others. Nearly 60 insect species are known to feed on chickpea. In eastern Uttar Pradesh the major insect pests which attack on chickpea crop are mainly *H. armigera* (Hubn.), *Spodoptera litura* (F.), *Agrotis ipsilon* (Hubn.), *Plusia orichalsia* (F) and *Bemisia tabaci* (Genn). Among these, *H. armigera* is the most destructive. Weather factors play a crucial role in the regulation of population (Hameed et al., 2015). The yield losses vary from 6.88 to 50% in the chickpea due to pod borer infestation (Singh et al., 2008) and 50-100% in favourable weather conditions particularly when there are frequent rains and cloudy weather during the cropping seasons (Saminathan et al., 2003). In India the population of *H. armigera* flourished during second half of February and outbreak situation were found throughout March. One possible reason may be probably owing to the optimum temperature and abundant food supply in the forms of pods (Shah and Shahzad, 2005). The best way

to overcome this situation is to destroy the pests at its initial stage of the life cycle. This is possible if timely predication of the occurrence of the pests can be made. Hence, an attempt has been made to investigate the incidence of pod borer (*H. armigera*) infesting chickpea in relation to the different meteorological parameters.

MATERIALS AND METHODS

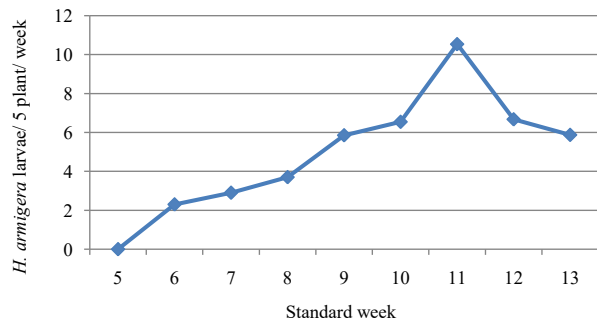
The study was conducted during rabi 2022-23 at the Agricultural Research Farm of B.R.D.P.G. College, Deoria, UP with the variety Pusa-261 sown with spacing 30x10 cm spacing and 7x2 m² plot size. All the normal agronomical practices recommended for the region were followed for raising the crop. No plant protection measure was taken throughout the crop season. During the experiment, the crop was left as untreated in the experiments, larval population of *H. armigera* were counted from 5 randomly selected plants. At the same time, observations on weather parameters viz., temperature (maximum and minimum), relative humidity (maximum and minimum) and rainfall were recorded daily. Observed larval population and weather data were averaged according to the subsequent standard meteorological week (SMW) for statistical analysis. The observations on population dynamics of gram pod borer larvae were recorded in a week (SMW) on randomly selected 5 plants in each plot by direct visual larval counting method from appearance till

harvesting of the crop. The data thus, collected were computed and subjected to statistical analysis. All the possible correlations between the larval population & weather factors and multiple linear regression model were worked out.

RESULTS AND DISCUSSION

The data in Fig. 1 indicated that the incidence of *H. armigera* on Pusa-261 ranged from 2.3 to 10.53 larvae/plant; with maximum and minimum being in the 11th (10.53 larvae/ plant) (3rd week of March) and 6th (2.3 larvae/ plant) (2nd week of February) SMW, respectively. These results are very similar to those of Bala (2020) as they reported that the *H. armigera* infestation on chickpea initiated during fifth SMW. It was highest in eleventh SMW during two consecutive years. These findings were also in line with Narayan et al. (2020) reported that the *H. armigera* infestation on chickpea initiated during fifth SMW (1.26 larvae m⁻²) during two consecutive years. Similarly, Gautam et al. (2018) stated the active period of *H. armigera* started from vegetative stage and remained till harvesting stage of chickpea.

It is evident that *H. armigera* larvae showed significant positive correlation with maximum,



Weather parameters	r-value
Maximum temperature (°C)	0.837**
Minimum temperature (°C)	0.804**
Maximum relative humidity (%)	-0.41
Minimum relative humidity (%)	-0.588
Rainfall (mm)	0.734*

Multiple regression equation	R ²
Y = -10.9534 + 0.116X ₁ + 0.349X ₂ + 0.171X ₃ - 0.195X ₄ + 0.867X ₅ , where, Y = <i>H. armigera</i> larval populations, X ₁ = maximum temperature, X ₂ = minimum temperature, X ₃ = maximum relative humidity, X ₄ = minimum relative humidity and X ₅ = rainfall.	0.9418

Fig. 1. Correlation and regression coefficients- larval incidence of *H. armigera* on chickpea vs weather factors (rabi, 2022-23)

minimum temperature and rainfall with r- value of 0.837, 0.804 and 0.734, respectively. However, it showed a negative and non-significant correlation with maximum and minimum relative humidity with r-value of -0.410 and 0.588, respectively. The result of present study are in agreement with the findings of Kumar et al. (2015) and Durga Bhadur et al. (2018). Similarly, Jhadhav et al. (2021), Kumar et al. (2018) and Singh et al. (2018) have also reported a positive correlation with maximum temperature. The results of present study are in conformity with those of Ray and Banerjee (2022), Kumar et al. (2019), Sproothi et al. (2017); Sharma et al. (2020) and Gautam et al. (2018) are not in accordance with the present findings. The multiple linear regression model (2022-23) was $Y = -10.9534 + 0.116X_1 + 0.349X_2 + 0.171X_3 - 0.195X_4 + 0.867X_5$, Where, Y = *H. armigera* larval population, X₁ = Tmax, X₂ = Tmin, X₃ = RHmax, X₄ = RHmin and X₅ = rainfall with r²-value of 0.9418. The present findings are in accordance with Kumar et al. (2018) who found the weather parameters together contributed 80.7%. Similarly, Durga Bahadur et al. (2018) also reported that the weather parameters together influenced 93 to 94% on incidence of *H. armigera* larvae in chickpea.

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AUTHOR CONTRIBUTION STATEMENT

All authors equally contributed.

CONFLICT OF INTEREST

No conflict of Interest.

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