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Correlation of weather parameters on the seasonal incidence of *Helicoverpa armigera* infesting *Cicer arietinum*

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ABSTRACT: Investigation taken up on the seasonal occurrence of *Helicoverpa armigera*, on *Cicer arietinum* L., revealed the presence of *H. armigera* from the 51st to 12th Standard Meteorological Week (SMW). Number of larvae found per plant ranged from 0.14 to 4.28. The larval population began to appear during the 51st SMW, with a mean of 0.66 larvae per plant and steadily increased until reaching its peak during the 6th SMW with a mean of 4.28 larvae per plant. Subsequently, the population declined, reaching a mean of 0.14 larvae per plant by the 12th SMW. The larval population of *H. armigera* displayed a highly significant negative correlation with both the maximum (r = -0.670**) and the minimum temperature (r = -0.665**).

KEY WORDS: Gram, pod borer, seasonal incidence, weather parameters

Gram, *Cicer arietinum* L., is considered the "King of Pulses" and the most important pulse crop grown in India. It belongs to the family Fabaceae and is vulnerable to the attack of more than 60 insect pests right from germination to maturity (Srivastava *et al.,* 2005). Among insect pests infesting gram, the pod borer *Helicoverpa armigeras* (Hubner) is the most serious one (Chhabra, 1980). Besides gram, it can also infest cotton, pigeon pea, tomato, sorghum, cowpea, groundnut, okra, peas, field beans, and soybeans (Subramanian and Mohankumar, 2006; Pimparkar and Raja, 2017). Due to its polyphagous nature, *H. armigera* is also known as the American cotton bollworm, corn earworm, tomato fruit borer, tobacco budworm, and carnation worm. It has been recorded feeding on 181 cultivated and uncultivated plant species belonging to 45 families. It is considered a damaging pest and has assumed as a national pest due to its high fecundity, high adaptability to diverse agro-climatic conditions, migratory behavior, and development of resistance capability against various insecticides (Sarwar *et al.,* 2009; Purabiya *et al.*, 2024). The larvae of *H. armigera* are foliage feeders as early and later instars move to the developing seeds and fruits leading to a drastic reduction in yield. A single larva can consume up to 30-40 pods in its life cycle (Taggar and Singh, 2011). The yield loss in grams due to *H. armigera* is 10 to 60 per cent in normal infestation and up to 85 to 90 per cent during severe infestation. In India, the extent of losses varies from 10 to 40 per cent (Purabiya *et al.*, 2024). The incidence of *H. armigera* has shown violent fluctuations due to

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changes in climatic conditions. The information on the seasonal occurrence of *H. armigera* as influenced by various weather parameters is very useful for developing various strategies to manage this pest. Although the seasonal incidence of *H. armigera* on gram has been reported in different regions of India, such information is limited particularly in south Gujarat. Therefore, the present investigation was carried out to study the seasonal incidence of *H. armigera* and its correlation with weather parameters in this zone.

The present investigation was carried out at the college farm, N. M. College of Agriculture, Navsari Agricultural University, Navsari, Gujarat, India during the Rabi 2021-22. The farm is situated at 72° 54' East longitude and 20° 57' North latitude and an altitude of 11.98m, above the mean sea level. The soil of the experimental area was heavy black soil. The plot size was 20.1m × 20m and the experimental area was 402m^2. Gram seeds of the variety Gujarat Gram-2 were sown in the 49th Standard Meteorological Week (SMW) (3rd December 2021) at the rate of 60 kg ha^{-1} by dibbling method in the field with row-to-row and plant-to-plant spacing of 30 and 10cm, respectively. Fertilizers were applied at the rate of 20:50:50kg NPK ha^{-1}. All the post-sowing recommended agronomic practices were followed to raise a crop successfully. However, the experimental area was kept free from insecticidal spray throughout the crop season to record the incidence of *H. armigera* on gram. To determine the seasonal incidence of *H. armigera*, fifty plants were randomly tagged from the four quadrates of the experimental area. The infestation of *H. armigera* population was estimated by counting the total number of larvae per plant. The observations were recorded at weekly intervals from tagged plants starting from 15 days after sowing (51st SMW) till the harvest of the crop. The weekly meteorological data on temperature (^{o}C), relative humidity, bright sunshine hours (hrs per day), and wind speed (km per hrs) in different standard meteorological weeks were obtained from the Agro-meteorological observatory, College farm, Navsari Agriculture University, Navsari during the Rabi 2021-22. The simple correlation coefficients were worked out between the population of *H. armigera* in different SMW and various weather parameters.

The results of the present investigation revealed that the activity of larvae of *H. armigera* commenced from 51st SMW and continued till 12th SMW, which ranged from 0.14 to 4.28 larvae per plant. The larval population increased continuously from the 51st to the 6th SMW and then declined up to the 12th SMW. During the 6th SMW, the *H. armigera* larval population showed a peak by recording 4.28 larvae per plant which might be due to formation of seeds during that period. In the subsequent weeks, the population decreased and reached 0.14 larvae per plant during the 12th SMW (Fig. 1). The present findings are similar to the findings of Kumar and Srivastava (2017) who reported that the incidence of *H. armigera* on gram crop commenced from the 51th SMW with 0.5 and 1.0 larvae per five plants, during the years 2001 and 2002, respectively. The larval population showed its peak with 6.50 and 6.25 larvae per five plants in 6th SMW during the years 2001 and 2002, respectively. Similarly, Bhagat and Chandraker (2020) observed that the infestation of *H. armigera* initiated on the crop during 51st SMW with a mean population of 1.65 and 1.72 larvae per meter row during 2016-17 and 2017-18, respectively. The pest touched its peak with a mean population of 4.49 and 4.12 larvae per meter row in the 5th and 6th SMW during 2016-17 and 2017-18, respectively.

The correlation coefficient analysis between the larval population of *H. armigera* and weather parameters (Table 1) revealed that the larval

Table 1. Correlation coefficients between the larval population of *Helicoverpa armigera* on gram and weather parameters from the 51st to 12th SMW during Rabi 2021-22

Weather parameters	r- values
Maximum temperature (TMax) (°C)	-0.670**
Minimum temperature (TMin) (°C)	-0.665**
Morning relative humidity (MRH) (%)	0.530
Evening relative humidity (ERH) (%)	0.253
Wind speed (WS) (km/hr)	0.272
Bright sunshine hours (BSSH) (hrs/day)	0.264

**Highly significant at 1% level of significance

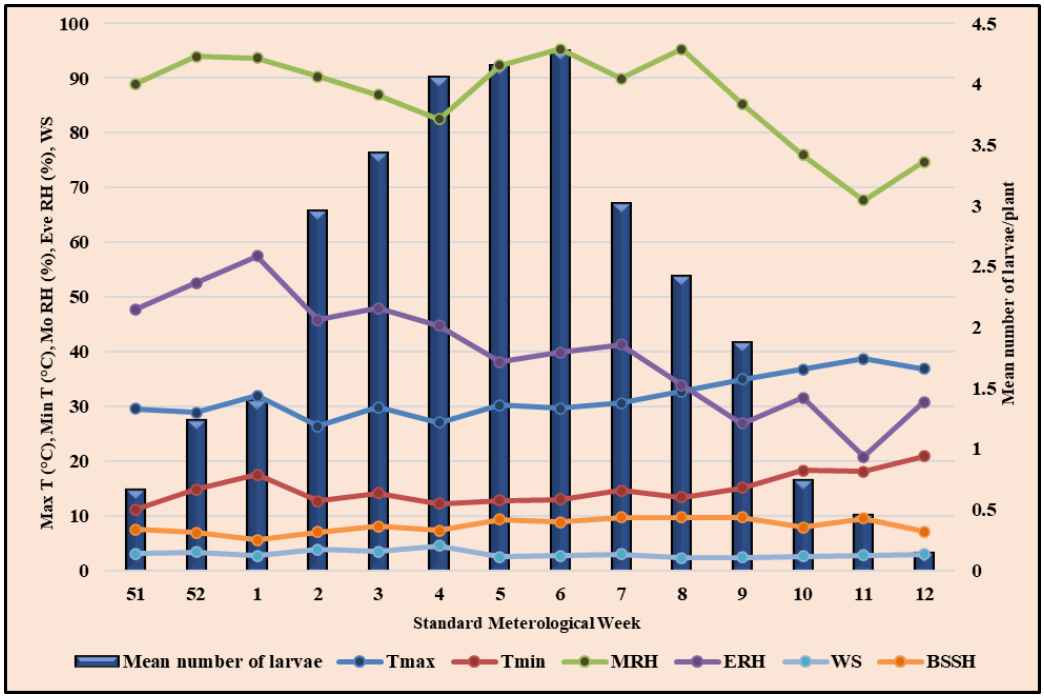

Fig. 1 Seasonal incidence of *Helicoverpa armigera* on gram from the 51st to 12th SMW during Rabi 2021-22; Larvae - Mean number of larvae per plant; TMax - Maximum temperature; TMin -Minimum temperature; MRH - Morning relative humidity; ERH - Evening relative humidity; WS - Wind speed (km/hr); BSSH - Bright sunshine hours (hrs/day)

population of *H. armigera* had a highly significant negative correlation with the maximum temperature (r=-0.670**) and minimum temperature (r=-0.665**). Whereas, the larval population showed a non-significant positive correlation with the morning relative humidity (r = 0.530), evening relative humidity (r = 0.253), wind speed (r = 0.272), and the bright sunshine hours (r = 0.264). The present findings are in line with the earlier reports of Kaneria *et al.* (2018) who reported that there was a highly significant negative correlation between the *H. armigera* larval population with the maximum temperature (r = -0.739**) and minimum temperature (r=-0.725**). Similarly, Chatar *et al.* (2010) observed that there was a highly significant negative correlation of the larval population of *H. armigera* with the maximum temperature (r=-0.751**). Furthermore, Bala (2020) noted that the larval population of *H. armigera* had a non-significant positive correlation with the morning relative humidity, evening relative humidity, and bright sunshine hours. Reddy *et al.* (2009) reported that the larval population of *H. armigera* had a non-significant positive correlation with wind velocity and bright sunshine hours, which also supports the present findings. Based on the above findings, it can be concluded that the larval population of *H. armigera* had a highly significant negative correlation with the maximum temperature and minimum temperature under Gujarat conditions.

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REFERENCES

Bala S.C. (2020) Population fluctuation and management of gram pod borer, [*Helicoverpa armigera* (Hubner)] infesting gram in new alluvial zone of West Bengal, India. Journal of Entomology and Zoology Studies 8(1): 262–266.

Bhagat J.K. and Chandraker V.S.H. (2020) Surveillance of pod borer, [*Helicoverpa armigera* (Hubner)] and its natural enemies on chickpea at Sahaspur Lohara blocks. Journal of Pharmacognosy and Phytochemistry 9(3): 1995–2000.

Chatar V.P., Raghvani K.L., Joshi M.D., Ghadge S.M., Deshmukh S.G. and Dalave S.K. (2010) Population dynamics of pod borer, [*Helicoverpa armigera* (Hubner)] infesting chickpea. International Journal of Plant Protection 3(1): 65–67.

Chhabra K. (1980) Pest problems in gram and their control. In: Proc. Discussion cum Training Seminar on Pest and Disease Management in Pulses, PAU, Ludhiana. p11–18.

Kaneria P.B., Kabaria B.B., Chudasama K.A., Patel T.M. and Bharadiya A.M. (2018) Effect of weather parameters on the seasonal incidence of [*Helicoverpa armigera* (Hubner)] Infesting chickpea in Saurashtra conditions, Gujarat, India. International Journal of Current Microbiology and Applied Sciences 7(12): 548–552.

Kumar V. and Srivastava A.K. (2017) Seasonal incidence of [*Helicoverpa armigera* (Hubner)] in Gram crop. Plant Archives 17(1): 216–218.

Pimparkar P. and Raja A.I. (2017) Growth and development responses of *Helicoverpa armigera* (Lepidopteran: *Noctuidae*) to artificial diet. International Journal of Research in Bioscience, Agriculture and Technology 2: 134–136.

Purabiya P. N., Patel P. B. and Jena M. K. (2024) Biology and Morphometry of Gram Pod Borer *Helicoverpa armigera* Hubner Infesting Gram *Cicer arietinum* L. Journal of Advances in Biology and Biotechnology 27(1): 13–28.

Reddy V., Anandhi P., Elamathi S. and Varma S. (2009) Seasonal occurrence of pulse pod borer *Helicoverpa armigera* on chick pea at eastern UP region. Agriculture Science Digest 29(2): 60–62.

Sarwar M., Ahmad N. and Toufiq M. (2009) Host plant resistance relationships in chickpea (*Cicer arietinum* L.) against gram pod borer *Helicoverpa armigera*. Pakistan Journal of Botany 41(6): 3047–3052.

Subramanian S. and Mohankumar S. (2006) Genetic variability of the bollworm, *Helicoverpa armigera* occurring on different host plant. Journal of Insect Science 6(26): 1–8.

Srivastava C.P., Ahmad R., Ujagir R. and Das S.B. (2005) *Helicoverpa armigera* management in pulses-present scenario and future strategies. In: Recent advances in *Helicoverpa armigera* management (eds. H. Sexena, A.B. Rai, R. Ahamad and Sanjeev Gupta), Indian Society of Pulses Research and Development, Kanpur, India. pp265–286.

Taggar G.K. and Singh R. (2011) Integrated management of insect pests of Rabi pulses. Theory and Practice of Integrated Pest Management. In: Ramesh Arora, B. Singh and A.K. Dhawan (eds) Theory and Practice of Integrated Pest Management, Scientific Publishers, Jodhpur, India. pp454–472.

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