Seasonal incidence of gram pod borer, *Helicoverpa armigera* (Hubner) and spotted pod borer, *Maruca testulalis* (Geyer) on greengram in relation to weather parameters

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**Abstract**

A field experiment was conducted to seasonal incidence of gram pod borer, *Helicoverpa armigera* (Hubner) and spotted pod borer, *Maruca testulalis* (Geyer) on greengram variety of IPM-02-03. The initial population of gram pod borer and spotted pod borer were 0.50 larvae/10 plants and 0.66 larvae/10 plants, respectively. The population gradually increased and reached the peak population was 8.50 larvae/10 plants and 9.66 larvae/ten plants, respectively. The correlation coefficient worked out that the infestation of gram pod borer and spotted pod borer on greengram crop showed that the negatively significant correlation with maximum temperature ($r = -0.79$ and $-0.78$), respectively. The population of spotted pod borer showed positive significant correlation with relative humidity ($r = 0.71$). The population of both insects showed non-significant correlation with minimum temperature, and rainfall at 5 per cent level of significance.

**Keywords:** Greengram, *Helicoverpa armigera*, *Maruca testulalis* and seasonal incidence

**Introduction**

Greengram *Vigna radiata* (L.) Wilczek (family: Leguminosae) is one of the most important *Kharif* pulse crop grown in Rajasthan. It is cultivated across seasons in different environments and in variable soil conditions in the South and South-East Asia, Africa, South America and Australia (Parihar et al. 2017) [12]. It is one of the most widely cultivated pulse crop after chickpea and pigeonpea (Ved et al. 2008, Swaminathan et al., 2012) [13, 19]. In India, during 2018-19 the total area and production of pulses is 29.03 million hectares, 23.39 million tonnes but greengram occupied 47.56 thousand hectares, 2339.75 thousand tonnes. In Rajasthan, the total area and production of pulses is 5.90 million hectares, 3.67 million tonnes but greengram occupied 2466.21 thousand hectares, 1220.29 thousand tonnes (Anonymous 2018-19) [2]. India is the largest producer and consumer of greengram in the world which accounts about 10-12 per cent of the total pulse production in the country. The major producing states in India being Andhra Pradesh, Orissa, Maharashtra, Madhya Pradesh and Rajasthan accounting for about 70 per cent of total production. In Rajasthan the major greengram growing districts are Jaipur, Sikar, Jhunjhunu and Nagaur. It has the unique ability to fix atmospheric nitrogen (58-109 kg/ha) in symbiotic association with *Rhizobium* bacteria, which not only enables it to meet its own nitrogen requirement but also benefits the succeeding crops (Ali, 1992) [1]. It is used as a green manure crop. It is also used as cattle feed along with roughage crops.

The area under greengram has increased in the last two decades mainly because of the availability of short duration cultivars but multitude of pest still creating bottleneck in higher productivity due to infestation from germination to maturity of the crop. The insect pests exercising heavy toll of greengram crop include pod borer complex viz, gram pod borer, *Helicoverpa armigera* (Hubner), blue butter fly, *Lampides boeticus* L., spotted pod borer, *Maruca testulalis* (Geyer), pod bug, *Riptortus spp* are major pests of greengram (Sundararajan and Chitra 2017) [18]. The effect of weather parameters on the incidence of insect pests provide suitable know how about the friendly weather conditions for development of insect pests, thus immensely helpful in formulating the management strategy against them (Tamang et al. 2017) [20]. Gram pod borer, *H. armigera* is a polyphagous pest of sporadic nature and inflicts losses of various magnitudes to cotton, pigeonpea, sorghum and other crops of economic importance. It is widely distributed throughout India and has been recorded feeding on 181 cultivated and
uncultivated plant species belonging to 45 families (Manjunath et al. 1989) [8]. Gram pod borer, *H. armigera* is one of the most devastating crop pest worldwide (Sigsgaard et al., 2002) [17]. Sixty cultivated and sixty-seven wild host plants attacked by *H. armigera* have been recorded from India (Karim, 2000) [7]. Spotted pod borer, *M. testulalis* is the most formidable and potential pest cause extensive damage to greengram under field conditions. The low yield of greengram is attributed to the regular outbreaks of spotted pod borer, because of its extensive host range and destructiveness, it became a persistent pest in greengram. It is reported that 20–30 per cent pod damage in greengram is caused due to spotted pod borer (Zahid et al., 2008) [25] and most damaging pest during flower bud and also the post flowering stage (Nair, 1986 [11] and Yadav and Yadav, 1983) [24], Atachi and Dijhou (1994) [3]. The study aimed in order to find out the correlation of gram pod borer, *H. armigera* and spotted pod borer, *M. testulalis* in greengram ecosystem with the weather parameters. Suitable understanding of the seasonal incidence of gram pod borer and spotted pod borer pests is important due to variation in weather conditions and changing pod borer complex scenario on the greengram crop.

**Materials and Methods**

The experiment was conducted at Agronomy Farm, S.K.N. College of Agriculture, Jobner (Rajasthan) on greengram crop during *Kharif*, 2018. The greengram of variety IPM 02-03 were sown in separate plots of 3 m x 2.5 m size, keeping row to row and plant to plant distance of 30 cm and 10 cm, respectively. The observations on population of pod borers *H. armigera* and *M. testulalis* on ten plants per plot were randomly selected and tagged. The larval population was recorded at weekly interval on ten tagged plants from the beginning of incidence till harvesting of the crop. The simple correlation was work out between computed between pod borers *H. armigera* and *M. testulalis* and abiotic factors viz., maximum and minimum temperature, relative humidity and rainfall.

The following formula was used for calculating correlation coefficient:

\[
\begin{align*}
\rho &= \frac{N \sum xy - (\sum x)(\sum y)}{\sqrt{N \sum x^2 - (\sum x)^2} \cdot N \sum y^2 - (\sum y)^2} \\
\end{align*}
\]

Where,

- \( r \) = Simple correlation coefficient  
- \( x \) = Independent variables i.e. abiotic components  
- \( y \) = Dependent variables i.e. pests  
- \( N \) = Number of observations

The observation on population of pod borers were recorded soon after their appearance. All the observations were recorded early in the morning.

**Result and Discussion**

**Gram Pod borer, *H. armigera***

It is evident from Table- 1 that the population of gram pod borer, *H. armigera* appeared in the 31st standard meteorological week (0.50 larva/ ten plants). The population gradually increased and reached the peak (8.50 larva/ ten plants) in 36th standard meteorological week when the minimum temperature, maximum temperature and relative humidity was 22.9°C, 30.5°C and 81 per cent, respectively. Thereafter the population gradually declined.

*Umbarkar et al. (2010)* [21] observed the population of gram pod borer, *H. armigera* started appearing at pod formation stage of the crop with population density of 0.34 larvae per plant during 31st standard meteorological week and the pest population increased fast during succeeding week, and peak density was 3.42 larva/ plants in 36th standard meteorological week. After reaching the peak, the gram pod borer population declined rapidly with the maturity of the greengram, which partially corroborates with the present findings. The present finding also get support from the finding of Varini (2000) [22] who observed the gram pod borer on blackgram from 6th week after sowing and the highest population was found during 10th week after sowing. Kanhere et al. (2013) [6] recorded data on the seasonal incidence of *H. armigera* and showed that appearance of larvae commenced after 37th day after sowing. Rathore et al. (2017) [14] also observed the *H. armigera* appearing 32nd standard meteorological week on pigeonpea crop, who reported the similar activities of the gram pod borer, *H. armigera*. The correlation coefficient worked out revealed that the gram pod borer infestation greengram crop showed negative significant correlation with maximum temperature (\( r = -0.79 \)) and negative non-significant correlation with minimum temperature (-0.28) and positive non-significant correlation with relative humidity (\( r = 0.68 \)) and rainfall (\( r = 0.51 \)). Jakhar et al. (2016) [15] observed that the maximum temperature had negative significant correlation in four years and also found non-significant correlation with minimum temperature, relative humidity and rainfall supported that non-significant correlation with minimum temperature, relative humidity and rainfall at 5 per cent level of significance.

**Spotted pod borer, *M. testulalis***

The population of spotted pod borer, *M. testulalis* appeared in the 31st standard meteorological week (0.66 larvae/ ten plants). The population gradually increased and reached the peak (9.66 larvae/ ten plants) in 36th standard meteorological week when the minimum temperature, maximum temperature and relative humidity was 22.9°C, 30.5°C and 81 per cent, respectively. The population of spotted pod borer, *M. testulalis* started appearing at pod formation stage of the crop with population density of 0.75 larvae per plant during 32nd standard meteorological week and the pest population increased fast during succeeding week, and peak density was 3.81 larva/ plants in 34th Standard Meteorological Week (Umbarkar et al., 2010) [21]. After reaching the peak, the spotted pod borer population declined rapidly with the maturity of the greengram. Similar trend of pest population was also recorded by Saxena et al. (1984) [16], Pithava (1996) [13], Varini (2000) [23] and Hinsu (2005) [4] in kharif season of various pulse crops. The correlation coefficient was worked out between mean gram spotted pod borer, *M. testulalis* population and weather parameters, viz., maximum and minimum temperature, relative humidity and rainfall. The correlation coefficient worked out revealed that the spotted pod borer, infestation on greengram crop showed negative significant correlation with maximum temperature, (\( r = -0.78 \)), negative non-significant correlation with minimum temperature (-0.22) and positive significant correlation with relative humidity (\( r = 0.71 \)). Mergana Sreekanth et al (2015) [9] and Tamang et al. (2017) [20], Reddy et al. (2017) [15] supported that the maximum temperature had negative significant correlation in both years (\( r = -0.46 \)) and (\( r = -0.34 \)) and also observed that the positive significant correlation with relative humidity (\( r = 0.129 \)).
The population of gram pod borer, *H. armigera* and spotted pod borer, *M. testulalis* showed that the negative significant correlation with maximum temperature, while non-significant correlation with minimum temperature and rainfall. The population of spotted pod borer, *M. testulalis* showed positive significant correlation with relative humidity.

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### References
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