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Seasonal incidence of spotted pod borer [*Maruca vitrata* (Geyer)] on green gram [*Vigna radiata* (L.) Wilczek]

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Abstract
The present investigation was conducted at the research plot of the Department of Entomology at Central Research Farm (CRF), Sam Higginbottom University of Agriculture Technology and Sciences, Prayagraj, during the *Kharif* season of 2024-25. The incidence of spotted pod borer *Maruca vitrata* In greengram was appeared during 35th SMW (1.55) and remained active till the 40th SMW the peak activity was observed on 38th SMW (4.07) larvae/ten plant. The population of spotted pod borer showed significant positive correlation with maximum temperature (r = 0.61*) and minimum temperatures showed positive but non-significant correlations (r = 0.24NS). Regarding humidity, both maximum and minimum humidity levels displayed non-significant positive correlation(r = 0.05NS and r = 0.12NS respectively). Rainfall exhibited a non-significant negative correlation (r = -0.11NS).

Keywords: Green gram, larval population, *Maruca vitrata*, seasonal incidence, temperature

1. Introduction
Greengram [*Vigna radiata* (L.) Wilczek] is also known as mungbean or moong, is a leguminous plant species belonging to the Fabaceae family. It is a self-pollinated diploid (2n=2x=22) crop with typical papilionaceous flower bearing 5 sepals, 5 petals, 10 diadelphous (9+1) stamens and monocarpellary ovary with hairy style.
Green gram is also used as a green manuring crop. It is a leguminous crop that has the capacity to fix atmospheric nitrogen 30-40 kg N/ha. Green gram is highly nutritious pulse which contains 24 per cent of high-quality protein, 1.3 per cent fats, 56.6 per cent carbohydrates, and 3 per cent dietary fibre's. It is rich in minerals having 140 mg calcium, 8.4 per cent iron, and 280 mg phosphorous. Green gram is one of the important pulse crops due to its nutritional and industrial values.
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) [8]. The major producing states in India are Andhra Pradesh, Orissa, Maharashtra, Madhya Pradesh and Rajasthan accounting for about 70 per cent of total production (Meena *et al.*, 2021) [6].
India is the major producer of green gram in the world, and it is grown in almost all the states. It is grown on about 40.38 lakh hectares with a total production of 31.5 lakh tonnes with a productivity of 783 kg/ha and contributes 11% to the total pulse production in the year 2021-22. In *Kharif* 2022-23, green gram production was 17.5 lakh tonnes (1st advance estimates) in an area of 33.37 lakh hectares (agricoop.nic). According to India's 1st advance estimates during 2023-24, production was 39.80 lakh tonnes (Anonymous, 2023-24) [1].
In India, 64 species have been reported attacking green gram right from seedling stage upto pod formation stage (Lal, 1985) [5]. Of the insect pests attacking green gram, *Maruca vitrata* (Geyer) is the most destructive and major pest as it causes 35 to 40 per cent (Bindra, 1968) [3] and 20 to 30 per cent (Rahman, 1998) [9] pod damage. It feeds on various parts like buds, flowers and pods of green gram. The infested flowers and pods webbed together and larvae feed on webbed plant parts by remaining hidden within the nest (Chatterjee and Bhattacharya, 1986) [4].
Hence, this study aims to clarify the correlation between weather conditions and the spotted pod borer (*M. vitrata*) in the greengram ecosystem. Due the unpredictable weather changes and their effects on the greengram crop, an extensive understanding of seasonal pest incidence is essential. With the aim to improve pulse cultivation and preserve food security and sustainable agricultural practices,

this research attempts to clarify the complex relationships between pest management techniques, meteorological factors, and pulse production.

Materials and Methods

The experiment was conducted at Central research farm, Naini, Prayagraj, Uttar Pradesh, India, on greengram crop during Kharif season 2024. The greengram of variety IPM-02-3 were sown in separate plots of 5 m x 3 m size, keeping row to row and plant to plant distance of 30 cm and 10 cm, respectively. The observations on population of spotted pod borers *Maruca vitrata* 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 computed between spotted pod borers, *Maruca vitrata* and abiotic factors *viz*., maximum and minimum temperature, relative humidity and rainfall.

The following formula was used for calculating correlation coefficient: (Meena *et al.*, 2021) [6].

$$r = \frac{N\sum xy - (\sum x)(\sum y)}{\sqrt{N\sum x^2 - (\sum x)^2 . N\sum y^2 - (\sum y)^2}}$$

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 the population of spotted pod borers was recorded soon after their appearance. All the observations were recorded early in the morning.

Result and Discussion: The result showed that earliest occurrence of spotted pod borer in 2024 rainy season commenced from 35th standard week with an average infestation 1.55% (Table 1).The infestation per cent increased and gradually reached peak level of 4.07% at 38th standard week at 33.860C maximum temperature and 26.710C minimum temperature, 85.71% maximum and 68.6% minimum relative humidity and 13.4 mm rainfall. The population of spotted pod borer showed significant positive correlation with maximum temperature and minimum temperatures showed positive but non-significant correlations. Regarding humidity, both maximum and minimum humidity levels displayed non-significant positive correlation. Rainfall exhibited a non-significant negative correlation.

The correlation study conducted to understand the relationship between *Maruca vitrata* incidence and meteorological parameters in green-gram revealed significant and non-significant associations. The incidence of M. vitrata exhibited a significant positive correlation with maximum temperature (r = 0.61*), indicating that higher maximum temperatures favour the population build up and activity of this pest in green-gram fields. In contrast, minimum temperatures showed positive but non-significant correlations (r = 0.24NS), suggesting a weaker influence on pest development. Regarding humidity, both maximum and minimum humidity levels displayed non-significant positive correlations (r = 0.05NS and r = 0.12NS respectively) with M. vitrata incidence, implying that while humidity might contribute to pest activity, it does not exert a strong or consistent impact under field conditions during the study period. Rainfall exhibited a non-significant negative correlation (r = -0.11NS) with pest incidence, suggesting that increased rainfall may slightly suppress pest abundance, although the relationship was not statistically significant. Overall, the study highlights that among the meteorological factors analysed, maximum temperature plays a critical role in influencing *Maruca vitrata* incidence. These findings supported by previously observed by Ojha *et al.*, (2022); Bhuva, K. J. and Patel, S. D. (2022); Meena *et al.*, (2021); Singh *et al.*, (2019) [2, 6, 7, 10]. Underscore the importance of closely monitoring maximum temperature trends during the cropping season for effective forecasting and timely implementation of integrated pest management strategies in green-gram cultivation.

Table 1: The incidence of spotted pod borer (*Maruca vitrata*) during Kharif season.

Month	SMW	Incidence	Temp ^{0}c		Humidity %		Rainfall
			Max	Min	Max	Min	
August	32	00.00	33.51	27.37	81.29	61.10	09.17
	33	00.00	33.29	27.26	81.71	59.00	08.74
	34	00.00	33.80	27.11	91.29	65.90	13.10
	35	01.55	32.89	26.74	86.57	61.40	07.34
September	36	02.05	34.91	27.49	81.00	57.10	02.77
	37	02.95	35.83	27.14	79.29	62.40	00.00
	38	04.07	33.86	26.71	85.71	68.60	13.40
	39	03.45	34.83	27.17	88.71	70.00	09.87
October	40	03.32	35.86	26.31	88.71	58.00	00.20
	41	03.26	36.20	25.00	92.29	58.10	00.00
	42	03.12	36.46	22.69	92.86	48.40	00.00
	43	01.20	36.83	21.17	91.00	53.30	00.00
	44	00.65	31.89	20.51	91.14	67.00	00.00
November	45	00.00	31.31	19.86	91.29	52.60	00.00
	Result	01.00	00.61*	00.24^{NS}	00.05^{NS}	00.11^{NS}	-00.11^{NS}
	Mean	01.83	34.39	25.18	87.35	60.21	04.61
	Standard Deviation	01.52	01.73	02.84	04.76	06.31	05.35
	Std. Error	01.13	00.30	00.57	00.51	00.81	02.50

Note: SMW: Standard Meteorological Week.

Table 2: Correlation Analysis: Pearson Correlation Matrix

	Incidence	Maximum	Minimum	Maximum	Minimum	Rainfall
Incidence	1.000	0.610*	0.242NS	0.050NS	0.119NS	-0.112NS
Maximum	0.610*	1.000	0.170NS	0.062NS	-0.318NS	-0.312NS
Minimum	0.242NS	0.170NS	1.000	-0.657*	0.454NS	0.617*
Maximum	0.050NS	0.062NS	-0.657*	1.000	-0.214NS	-0.256NS
Minimum	0.119NS	-0.318NS	0.454NS	-0.214NS	1.000	0.640*
Rainfall	-0.112NS	-0.312NS	0.617*	-0.256NS	0.640*	1.000

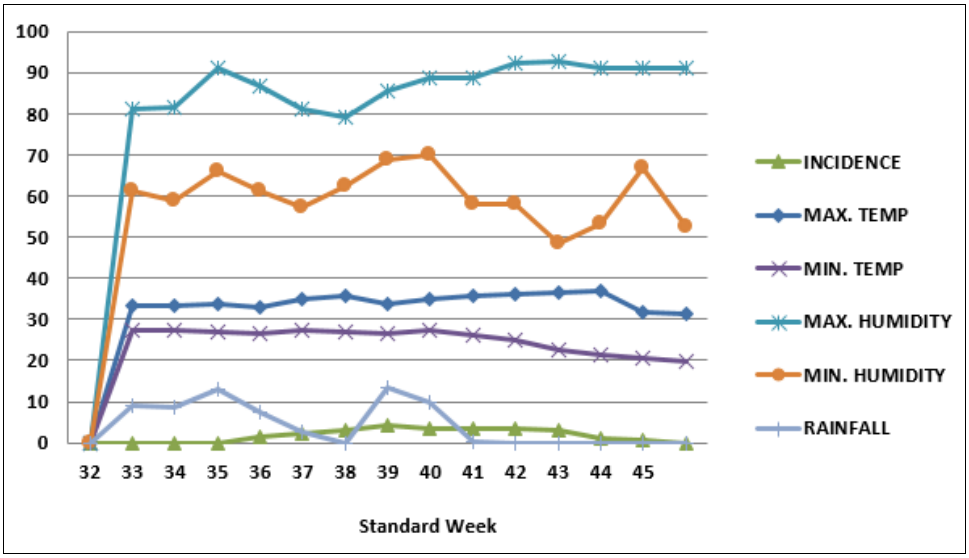

Fig 1: Incidence of *Maruca vitrata* during Kharif season 2024-25

Conclusion

The result obtained from this study demonstrates that the activity of spotted pod borer was appeared during 35th SMW (1.55) and remained active till the 40th SMW the peak activity was observed on 38th SMW (4.07) larvae / ten plant. The population of spotted pod borer showed significant positive correlation with maximum temperature (r = 0.61*) and minimum temperatures showed positive but non-significant correlations (r = 0.24NS). Regarding humidity, both maximum and minimum humidity levels displayed non-significant positive correlation (r = 0.05NS and r = 0.12NS respectively). Rainfall exhibited a non-significant negative correlation(r = -0.11NS).

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