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Population Dynamics of Spotted Pod Borer, *Maruca vitrata* (Fabricius) in Greengram

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ABSTRACT: An experiment on the population dynamics of spotted pod borer, *Maruca vitrata* (Fabricius) (Lepidoptera: Crambidae) in greengram was conducted at Anand Agricultural University, Anand, Gujarat during *kharif* 2021. The incidence of spotted pod borer commenced in the third week of August [34thStandard Meteorological Week (SMW)] and it continued up to the harvest of the crop in the 42nd SMW. The spotted pod borer population fluctuated between 0.48 to 2.45 larva(e)/plant with a peak population during the third week of September (38th SMW). A higher incidence of spotted pod borer was observed during the 37th to 42ndSMW. The larval population of *M. vitrata* exhibited a significant positive correlation with bright sunshine hours (r = 0.7336) and significant negative correlation with the wind speed (r = – 0.7006).

Keywords: Population dynamics, *Maruca vitrata,* Greengram, Spotted pod borer.

INTRODUCTION

Pulses are an important food crop worldwide, especially in India, where they are the major source of vegetable proteins and micronutrients including iron for poorer sections of the population (Nair *et al*., 2013). Greengram [*Vigna radiata* (L.) Wilczek], also known as mungbean, belongs to the family Fabaceae. The biological value of wheat or rice improves greatly when it is combined with greengram because of the complementary relationship of the essential amino acids (Suradkar *et al*., 2015). In India, during 2019-20, greengram occupied an area of 45.81 lakh hectares witha total production of 25.09 lakh tonnes and productivity of 548 kg/ha (Anonymous, 2020). The major greengram producing states in India are Rajasthan, Madhya Pradesh, Maharashtra, Karnataka and Bihar (Anonymous, 2020). A total of 64 species of insects have been reported to be attacking greengram in the field condition (Anonymous, 2014). It has also been estimated that 30 per cent of pod damage is caused by spotted pod borer in greengram (Umbarkar and Parsana 2014). Weather conditions have an impact on the population of numerous insect pests, including the spotted pod borer. Keeping in view the above points, the present investigation on population dynamics of spotted pod borer, *Maruca vitrata* (Fabricius) in greengram was carried out.

MATERIAL AND METHODS

In order to study the population dynamics of spotted pod borer in greengram, a field experiment was conducted at Agronomy Farm, Bansilal Amrutlal College of Agriculture, Anand Agricultural University, Anand, Gujarat during *kharif* 2021. Greengram crop was raised by adopting standard agronomical practices. The crop was sown on July 19, 2021 at a spacing of 45 cm between two rows. The spacing between two plants within the row was approximately 10 cm. The whole experimental plot was kept free from the application of any insecticides.

The size of the experimental plot was 9.0 × 10 m. The entire plot was divided into four (4.5 × 5.0 m) sectors. To record observations on larval population, 10 plants were randomly selected from each sector. From each selected plant, the number of larva(e) per plant was counted. The observations were recorded at weekly intervals starting from flower bud formation and continued till the harvest of the crop. Finally, the mean larval population of spotted pod borer per plant at a weekly interval was worked out.

To record the observations on pod damage, five plants were randomly selected from each sector and the number of healthy as well as damaged pods were counted. The observations were recorded during the green pod stage. A simple correlation was worked out between larval population of *M. vitrata* and weather parameters *viz.*, bright sunshine (BSS), rainfall (RF), wind speed (WS), maximum (MaxT) and minimum (MinT) temperature, morning (RH_1) and evening (RH_2) relative humidity, morning (VP_1) and evening (VP_2) vapour pressure, vapour pressure deficit (VPD). The data on weather parameters were obtained from the

meteorological observatory located at Anand Agricultural University, Anand, Gujarat.

RESULTS AND DISCUSSION

Population dynamics of *M. vitrata.* The data on the weekly larval population of *M. vitrata* are given in Table 1. The incidence of spotted pod borer in greengram crop commenced during the fifth week after sowing *i.e.* third week of August (34th SMW) and it persisted up to the harvest of crop (42nd SMW). The spotted pod borer population ranged from 0.48 to 2.08 larvae/plant. Initially, the population was low (0.48 larvae/plant), which gradually increased and attained a peak (2.45 larvae/plant) during the third week of September *i.e.*9th weeks after sowing (38th SMW). After that, the population gradually decreased and it was recorded up to the harvest of crop in the third week of October (42nd SMW). A higher incidence of spotted pod borer (>2.00 larvae/plant) was observed during the 37th to 42nd SMW (8th to 13th WAS).

Table 1: Population of spotted pod borer and pod damage in greengram.

Month	Week	SMW	WAS	No. of larva(e)/plant	Pod damage (%)
August, 2021	III	34	5	0.48	-
	IV	35	6	1.20	-
September, 2021	I	36	7	1.43	20.32
	II	37	8	2.20	22.40
	III	38	9	2.45	24.77
	IV	39	10	2.23	29.27
October, 2021	I	40	11	2.18	31.78
	II	41	12	2.13	31.27
	III	42	13	2.08	27.98

Note: SMW: Standard Meteorological Week, WAS: Week after sowing

Umbarkar *et al*. (2010) reported that the incidence of *M. vitrata* commenced in the 5th week after sowing with a population density of 0.75 larvae/plant. Patel and Borad (2014) also reported that the *M. vitrata* first appeared in the 34th SMW (4th week of August) and persisted till the 44nd SMW (1st week of November). They also reported higher activity of *M. vitrata* during 37th SMW (3rd week of September) to 43rd SMW (5thweek of October). Kumar and Singh (2016) also observed that the larval population of *M. vitrata* in blackgram ranged from 0.47 to 2.13 larvae per plant during *kharif* season.

Pod damage due to *M. vitrata.* The data on the weekly per cent pod damage during the green pod stage are given in Table 1. The pod damage due to spotted pod borer during 1st week of September was 20.32 per cent. In the following weeks, it gradually increased and reached peak (31.78%) during 1st week of October. After that, pod damage gradually decreased and it was recorded up to harvest (27.98%) in the third week of October (42nd SMW).Overall, the pod damage fluctuated between 20.32 to 31.78 per cent. Naik and Mallapur (2015) also reported that the pod damage due to the spotted pod borer in blackgram peaked (24.8%) during the last week of September.

Correlation between weather parameters and larval population of spotted pod borer. The data on the correlation between weather parameters and larval population of spotted pod borer are given in Table 2, which indicated that bright sunshine hours (r = 0.7336) had significantly positive correlation, while the wind speed (r = -0.7006) had significantly negative correlation with spotted pod borer population. The maximum temperature (r = 0.2584), morning relative humidity (r = 0.1973), rainfall (r = 0.2871) and vapour pressure deficit (r = 0.0360) showed non-significant positive correlation with spotted pod borer population. The minimum temperature (r = -0.2625), evening relative humidity (r = -0.0721), morning (r = -0.0811) as well as evening (r = -0.1148) vapour pressure were non-significantly negatively correlated with larval population of spotted pod borer population.

Umbarkar *et al*. (2010) reported that all the weather parameters, except minimum temperature, were non-significantly correlated with the *M. vitrata* population. Patel and Borad (2014) also reported that the bright sunshine hours had a significant positive association with *M. vitrata* population on greengram. Thus, the present finding corroborates earlier findings. The population of *M. vitrata* had highly significant negative correlation with wind speed (r = - 0.882) whereas, bright sunshine hours (r = 0.586) showed significant positive association on cowpea.

Table 2: Correlation coefficient (r) between weather parameters and larval population of spotted pod borer in greengram (n = 9).

Weather Parameters	Correlation coefficient
Maximum Temperature, °C (Max. T)	0.2584
Minimum Temperature, °C (Min. T)	-0.2625
Morning Relative Humidity, % (RH_1)	0.1973
Evening Relative Humidity, % (RH_2)	-0.0721
Bright Sunshine Hours, hrs/day (BSS)	0.7336*
Rainfall, mm (RF)	0.2871
Morning Vapour Pressure, mm of Hg (VP_1)	-0.0811
Evening Vapour Pressure, mm of Hg (VP_2)	-0.1148
Wind Speed, km/ hr (WS)	-0.7006*
Vapour pressure deficit, mm of Hg (VPD)	0.0360

*Significant at 5% level of significance

CONCLUSIONS

From the present study, it can be concluded that the infestation of *M. vitrata* in the *kharif* greengram crop commenced during the 5th week after sowing (34th SMW) and it persisted up to the harvest of crop in the third week of October (42nd SMW). A higher incidence of spotted pod borer (>2.00 larvae/plant) was observed during the 37th to 42nd SMW (8th to 13th WAS), whereas the peak larval density was observed during the 9th week after sowing (38th SMW). Correlation studies indicated that the larval population of spotted pod borer exhibited a significant negative correlation (r = -0.7006) with wind speed and a significant positive correlation(r = 0.733) with bright sunshine hours.

FUTURE SCOPE

Early pest management of crops benefits from forecasting the peak abundance of pests. To increase the effectiveness of pest management in greengram, data from such studies can be used to create a population dynamics model for *M. vitrata*. The results of the correlation clearly demonstrated the significance of weather conditions in the prevalence of *M. vitrata*.

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Conflict of Interest. None.

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