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Seasonal incidence of spotted pod borer, *Maruca vitrata* (Fabricius) (Crambidae, Lepidoptera) on greengram under unsprayed conditions

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ABSTRACT

Field experiment was conducted to study the seasonal incidence of spotted pod borer, Maruca vitrata on green gram at Regional Agricultural Research Station, Lam, Guntur during rabi, 2014-2015. The larval incidence of M. vitrata was observed from 33 days after sowing (DAS) i.e., second week of November on green gram and continued till the end of the crop growth. The peak larval incidence was observed at 53 DAS i.e., first week of December coinciding with peak flowering and pod development stage, thereafter the larval population declined gradually. The pest has disappeared by the maturity stage of green gram. The weather parameters namely maximum temperature, minimum temperature, rainfall, morning relative humidity and evening relative humidity together accounted for 63.38 per cent significant variation in larval population of M. vitrata. However the correlation between the weather factors and M. vitrata larval population revealed that maximum temperature, minimum temperature and morning relative humidity showed positive influence where as rainfall and evening relative humidity showed negative influence. However, none of them were significant except maximum temperature.

Key words: *Seasonal incidence, spotted pod borer, Maruca vitrata, % pod damage, green gram*

INTRODUCTION

Green gram (*Vigna radiata* (L.) Wilczeck) is the most important short duration crop locally known as moong and belongs to family leguminoceae. Around the world, the crop is cultivated in 5.0 M. ha with a production of 2.5 m. t. While in India it is grown in an area of about 26.06 lakh ha with production and productivity of 16.10 lakh tonne and 619 kg ha^{-1}, respectively[1]. Andhra Pradesh is the fourth major state of India contributing 15.5 % of the national production with 351 kg ha^{-1} average productivity of green gram. Studies on seasonal incidence are aimed at providing information on fluctuation in population density of the pest as well as peak period during the crop growth and helps to manage the pest. Considering the reasons of low yield of green gram, studies were undertaken on seasonal occurrence of pod borer, *Maruca vitrata* in green gram.

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MATERIAL AND METHODS

A field experiment was conducted at Regional Agricultural Research Station, Lam, Guntur during *rabi*, 2014-2015 to study seasonal incidence of spotted pod borer, *Maruca vitrata* on green gram. A bulk plot of 200 sq.m with a green gram variety LGG-460 was raised and maintained under unprotected conditions throughout the flowering and pod formation stages. The crop was sown on 16.10.14 and all the recommended agronomic practices of fertilizer application, irrigation, intercultivation and disease management were taken up as per the recommendations of ANGRAU. Two blanket sprays with selective insecticides were given against sucking pests to maintain the crop healthiness. The observations were made by counting the number of larvae per plant, number of damaged flowers or pods per plant and number of coccinellids on fifty randomly selected plants at five different locations @ ten plants per location at five days interval from one month after sowing and continued till the crop maturity. The weather parameters were recorded from the meteorological observatory at Regional Agricultural Research Station, Lam farm, Guntur. The influence of weather parameters on the incidence of spotted pod borer was worked out by simple correlation and multiple regression analysis[4].

RESULTS AND DISCUSSION

Influence of abiotic factors on the incidence of *M. vitrata* larvae on green gram

The data recorded on the larval incidence of *M. vitrata* in green gram were presented in Table 1, Plate 1 and Fig. 1. The data indicated the presence of *M. vitrata* larvae from second week of November to second week of January. The incidence started during second week of November *i.e.*, 4th week after sowing with a mean of five larvae per 50 plants and reached its peak level by first week of December *i.e.*, 7th week after sowing (43 larvae/50 plants). Thereafter, the larval incidence has decreased gradually and disappeared by second week of January. The present findings are in agreement with the observations of Damasiya *et al*.,[3] in green gram and Hutke *et al.*,[5] in cowpea.

Correlations were worked out to find out the relationship between *M. vitrata* and weather parameters (Table 2). The results revealed that maximum temperature (r = 0.654), minimum temperature (r = 0.237) and morning relative humidity (r = 0.211) showed positive non significant influence, whereas rainfall (r = -0.226) and evening relative humidity (r = -0.004) showed negative influence. Maximum temperature was found to exert independent positive influence on larval population while minimum temperature, rainfall, morning and evening relative humidity had non significant correlation. The present findings are in agreement with the findings of Sandhyarani (2013) and Damasiya *et al*. (2014) in green gram, and Bankar *et al*.,[2] in cowpea.

The multiple linear regression analysis indicated that all the weather parameters together were responsible for a significant variation of 63.38 per cent (R^2 = 0. 6338) on the larval incidence of spotted pod borer (Table 3). The present findings are in agreement with Rao[8], Krishna[6] and Sandhyarani[10] reporting that total variation in *M. vitrata* population due to all weather factors was up to 65 to 70 per cent.

Table 1: Seasonal incidence of *M. vitrata* larvae, per cent pod damage and coccinellid beetles in relation to weather parameters in green gram during *rabi* 2014-15

Period	Maximum Temperature (^{0}C)	Minimum Temperature (^{0}C)	Rainfall (mm)	Morning Relative Humidity (%)	Evening Relative Humidity (%)	*M. vitrata* larvae (No./ 50 plants)	Per cent pod damage (%)	Coccinellid beetles (No./ 50 plant)
04 - 08 Nov	29.5	15.97	67.00	96.00	70.00	0	0	0
09-13 Nov	25.84	23.36	0	94.29	59.57	0	0	0
14 - 18 Nov	25.84	23.36	0	94.29	59.57	5	0	2
19 - 23 Nov	30.41	20.9	9	94.29	63.43	12	10	5
24 - 28 Nov	30.64	23.24	36.20	98.29	74.00	20	22	8
29 - 03 Dec	30.71	21.97	0	97.14	60.29	32	36	9
04 - 08 Dec	31.71	21.97	0	97.14	60.00	43	45	10
09 - 13 Dec	30.8	17.73	0	92.57	52.57	29	34	12
14 - 18 Dec	29.84	22.13	0	86.71	67.86	21	27	9

19 - 23 Dec	29.84	16.74	0	88.14	56.00	19	23	7
24 - 28 Dec	29.17	16.74	0	88.14	56.57	16	19	5
29 - 02 Jan	28.93	17.46	0	91.88	59.75	10	15	5
03 - 07 Jan	28.93	17.46	0	91.88	59.75	6	9	4
08 - 12 Jan	30.07	21.94	0	95.14	58.43	3	0	2
13 - 17 Jan	29.61	14.64	0	86.43	52.14	0	0	0

Plate 1: Larva of *M. vitrata* on green gram

Fig. 1: Seasonal incidence of *M. vitrata* larvae in green gram during *rabi* 2014 –15

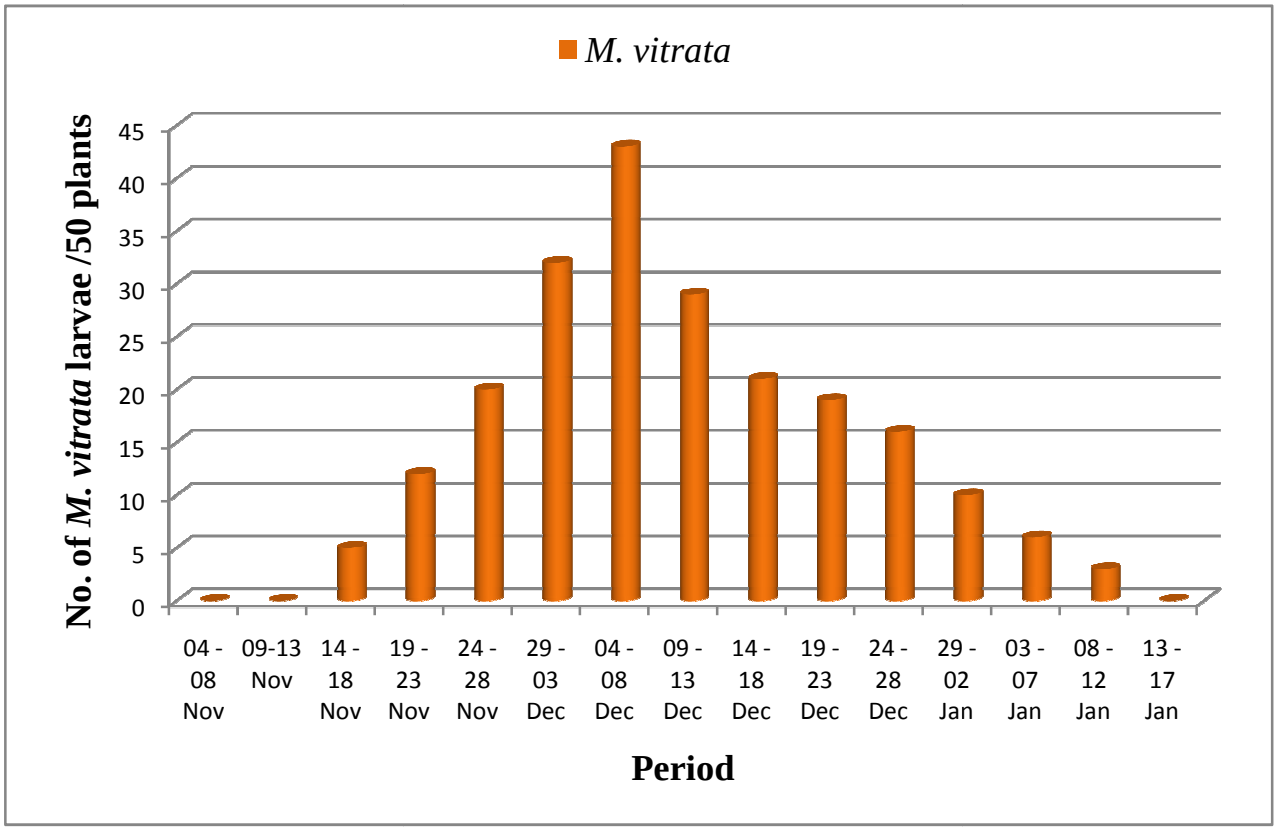


Table 2: Correlation of weather parameters with incidence of *M. vitrata*, per cent pod damage and coccinellid beetles in green gram during *rabi* 2014 –15

Variable	Correlation coefficients					
	Maximum Temperature (^{0}C)	Minimum Temperature (^{0}C)	Rainfall (mm)	Morning Relative Humidity (%)	Evening Relative Humidity (%)	*M. vitrata* (larva / 50 plants)
M. vitrata (larva /50 plants)	0.654*	0.237	-0.226	0.211	-0.004	---
Per cent pod damage (%)	0.660	0.143	-0.228	0.112	-0.007	0.983*
Coccinellid beetles (No. / 50 plants)	0.645	0.185	-0.240	0.084	0.031	0.921*

*Significant at 5% level

Table 3: Multiple linear regression between weather factors and *M. vitrata*, per cent pod damage and coccinellid beetles in green gram

Variable (Y)	Regression equation	R^2 Value
M. vitrata (larva /50 plants)	$Y = -207.933 + 5.728\ X_1 + 1.105\ X_2 - 0.218\ X_3 + 0.377\ X_4 - 0.026\ X_5$	0. 6338*
Per cent pod damage (%)	$Y = 8.631 – 0.526\ X_1 – 1.032\ X_2 - 0.121\ X_3 – 0.039\ X_4 + 0.503\ X_5 + 1.197\ X_6$	0.9868*
Coccinellid beetles (No. / 50 plants)	$Y = -2.6312 + 0.1679\ X_1 - 0.1119\ X_2 – 0.0417\ X_3 – 0.0861\ X_4 + 0.1591\ X_5 + 0.2599\ X_6$	0.8803*

*Significant at 5% level

X_1: Maximum temperature (^{0}C)
X_2: Minimum temperature (^{0}C)
X_3: Rainfall (mm)
X_4: Morning Relative Humidity (%)
X_5: Evening Relative Humidity (%)
X_6: *M. vitrata* (larva / 50 plants)

Influence of abiotic factors on pod damage caused by *M. vitrata* in green gram

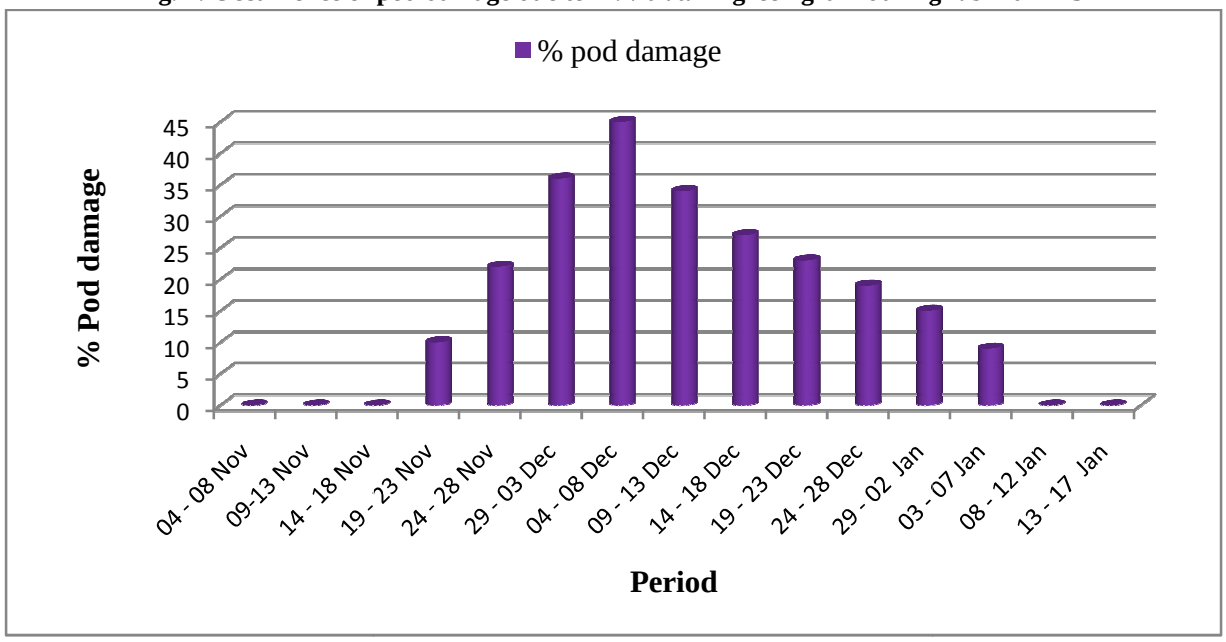
The data recorded on the pod damage due to *M. vitrata* in green gram are presented in Table 1, Plate 2 and Fig. 2. The pod damage also showed similar trend as of larval population on green gram. The pod damage started during third week of November with a mean of 10 per cent of damage and reached its peak level by first week of December (45 per cent of damage). Thereafter, the pod damage gradually decreased and no damage was observed by second week of January.

Correlations were worked out to find out the relationship between pod damage and weather parameters (Table 2). The results revealed that the maximum temperature (r = 0.660), minimum temperature (r = 0.143) and morning relative humidity (r = 0.112) showed positive and non significant influence whereas, rainfall (r = -0.228) and evening relative humidity (r = -0.007) showed negative and non significant influence. However, there was a positive (r = 0.983) and significant correlation between the occurrence of pod damage and the larval population of spotted pod borer. The present findings are in agreement with the findings of Rao[9] in rice fallow blackgram and Sonune *et al*.,[11] in blackgram.

The multiple linear regression indicated that all the weather parameters and larval incidence of *M. vitrata* together were responsible for 98.68 per cent (R^2 = 0. 9868) of significant variation in the pod damage due to spotted pod borer in green gram (Table 3). The present findings are in agreement with the findings of Krishna[6] and Rao[9] who reported that total variation in per cent pod damage due to all weather factors around 70 per cent in blackgram and rice fallow blackgram, respectively.

Plate 2: Pod damage by *M. vitrata* in green gram

Fig. 2: Occurrence of pod damage due to *M. vitrata* in green gram during *rabi* 2014-15

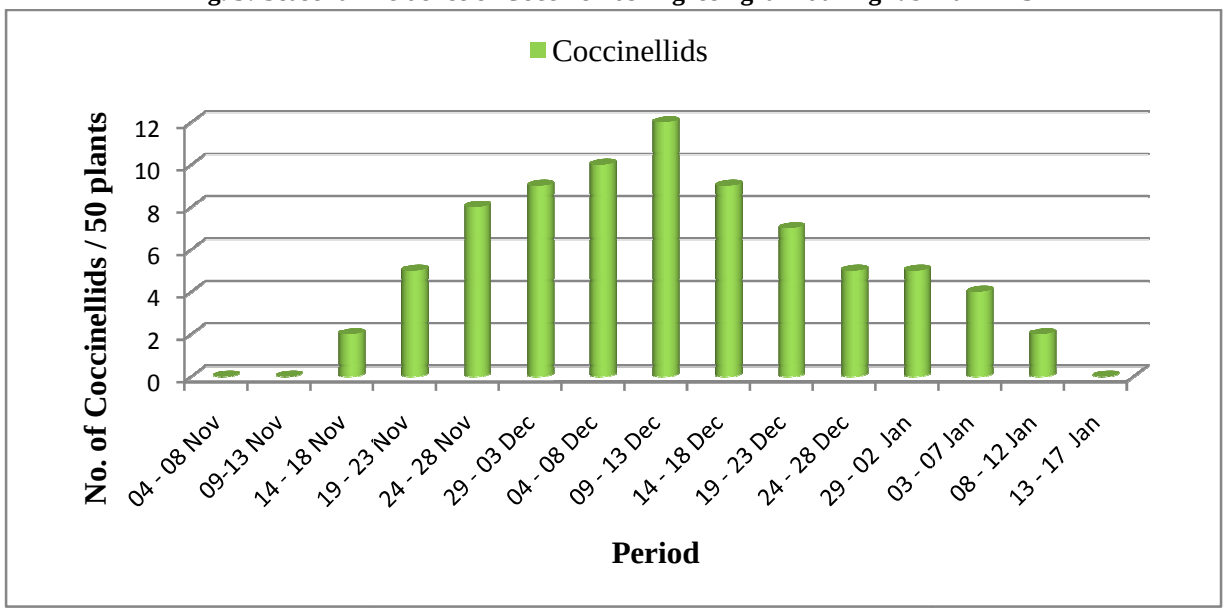


Influence of abiotic factors on occurrence of coccinellids in green gram

The data recorded on the occurrence of coccinellids (*Coccinella septempunctata* and *Menochilus sexmaculatus*) in green gram are presented in Table 1. The occurrence of coccinellids started during second week of November with a mean of two per 50 plants and reached their peak level by second week of December with a population of 12 per 50 plants. The present observations are in agreement with the findings of Srujana[12] in blackgram.

Correlations studies were done to find out the relationship between the incidence of natural enemies and weather parameters (Table 2). The results revealed that the maximum temperature (r = 0.645), minimum temperature (r = 0.185), morning (r = 0.084) and evening relative humidities (r = 0.0312) had positive influence where as rainfall (r = -0.240) showed negative influence, but none of them were significant. However, there was a positive (r = 0.921) and significant correlation between the incidence of coccinellids and the larval population of spotted pod borer. Patra *et al*.,[7] reported that temperature had positive impact on coccinellid population whereas rainfall had negative influence in cotton.

Fig. 3: Seasonal incidence of Coccinellids in green gram during *rabi* 2014 –15



The multiple linear regression analysis indicated that the total influence of all the weather parameters and larval incidence of *M. vitrata* was upto 88.03 per cent (R^2 = 0. 880) on the occurrence of coccinellids beetles and it was significant (Table 3). Srujana[12] reported that the total variation in natural enemies population due to all weather factors was up to 97.26 per cent in blackgram which was in proximity with present findings. The incidence of coccinellid beetles was high during second week of December which can be attributed not only to higher incidence of *M. vitrata* larvae, but also due to more availability of pollen to adult coccinellids at peak flowering and pod formation stage in green gram.

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