Andhra Pradesh J Agril. Sci. 5(1): 1-7, 2019

SEASONAL INCIDENCE OF SPOTTED POD BORER *Maruca vitrata* Geyer ON RICE FALLOW BLACKGRAM IN NORTH COASTAL ANDHRA PRADESH

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Date of Receipt:13.6.2018 Date of Acceptance: 19.10.2018

ABSTRACT

A field experiment was conducted at Agricultural College Farm, Naira, on seasonal incidence of spotted pod borer on rice fallow blackgram in North Coastal Andhra Pradesh during *rabi* 2017-2018. The incidence of *M. vitrata* revealed that the initial occurrence was observed on 52nd standard week *i.e.,* at 31DAS with a mean population of four larvae per 50 plants and reached a peak by 64 DAS (5th standard week) *i.e.,* at pod development stage with 329 larvae per 50 plants. Thereafter the larval population declined gradually with rise in maximum and minimum temperatures and reached minimum by 80 DAS (7th standard week) with a mean of 100 larvae per 50 plants. The larval population showed negative and non significant association with minimum temperature (r = -0.493), evening relative humidity (r= -0.218) and wind velocity (r= -0.015) while maximum temperature (r= 0.083) and mean sunshine hours (r= 0.181) has positive and non-significant while positive and significant correlation with morning relative humidity (r= 0.657).

KEY WORDS: Blackgram, seasonal incidence, spotted pod borer (*M. vitrata*), weather parameters,

INTRODUCTION

Pulses are wonderful gifts of nature. They are well known as cheap and excellent source of dietary proteins to humans and animals and also soil fertility restorers. India is the major country for the pulse production and consumption with a relative share of 25-28 per cent of the total global production. In most parts of the country it is grown traditionally as *kharif* (wet season) crop, but in Andhra Pradesh it is being cultivated mostly in *rabi* (dry) season both in uplands and in rice fallow conditions. In Andhra Pradesh, *rabi* blackgram is cultivated in an area of 2.96 lakh hectares with a production of 244 thousand tonnes and productivity of 936 kg ha^{-1} (Indiastat, 2014-15).

In North coastal districts of Andhra Pradesh rice fallow blackgram is cultivtaed in an area of 76,113 hectares of which Srikakulam district alone contributing an area of 42,117 hectares in rice fallow situations with a production of 331 thousand tonnes, but the productivity is 705 kg ha^{-1} , which is far below the state average, the major reason being the biotic causes including insect pest damage.

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On an average, 2.5 to 3.0 MT of pulses are lost anually due to pest problems in India (Rabindra *et al*., 2004). Among them, legume pod borer, *Maruca vitrata* (Geyer) is a major constraint for the production of blackgram at critical stages such as flowering and pod formation stages in the Southern zone of Andhra Pradesh (Chandrayudu *et al*., 2008). Because of its extensive host range and destructiveness, it became a persistent pest in pulses, being available throughout the year in different seasons / situations.

The Studies on the seasonal occurrence of blackgram pests, their natural enemy fauna in the pest prone area highly essential towards effective management of these pests.

MATERIALS AND METHODS

A bulk plot of 100 m^2 of with popularly growing cultivar of blackgram in North Coastal Andhra Pradesh *i.e*., LBG-752 in rice fallows was raised and maintained without any insecticidal application to study the seasonal incidence of spotted pod borer (*M. vitrata*) in relation to biotic and abotic factors *viz*., spiders, cocccinellids, maximum and minimum temperature, morning and evening

relative humidities and rainfall. The crop was sown on 27.11.2017 and complete germination is observed seven days after sowing. Inter cultivation operations like thinning and gap filling were taken 15 days after sowing. The first incidence of spotted pod borer was noticed at 31 days after sowing and the data was recorded as per the standard procedures

The incidence of spotted pod borer (*M. vitrata*) was recorded twice in a week on 50 randomly tagged plants at five different locations @ ten plants per location from the bulk plot of 100 m^2 from the inception of flowering and continued up to the crop maturity. The observations were taken by counting the number of larvae per plan on tagged plants.

The incidence of natural enemies was also recorded on the same plants that were selected for observing the incidence of *M. vitrata.* The number of coccinellid predators and spiders per plant were recorded at weekly interval from one week after sowing till crop maturity.

Abiotic factors such as maximum and minimum temperatures, morning and evening relative humidities, mean sunshine hours, rainfall and wind velocity were recorded daily to study the relationship with the occurrence of spotted pod borer,(*M. vitrata*) and natural enemies in rice fallow blackgram.

STATISTICALANALYSIS

The influence of abiotic factors on the occurrence of spotted pod borer (*M. vitrata*) on blackgram were statistically analyzed by subjecting the data to simple correlation and multiple linear regression (MLR) analysis (Gomez and Gomez, 1984).

RESULTS AND DISCUSSION

During *rabi* 2017-18, the incidence of *M. vitrata* on blackgram was recorded and correlated with the corresponding meteorological data to understand the relationship during the season which varied in different months. The data recorded on the incidence of *M. vitrata* revealed that the initial occurrence was observed on 52nd standard week *i.e.,* at 31DAS with a mean populpopulation of 4 larvae per 50 plants per five locations in LBG – 752 The average maximum and minimum temperatures prevailed during the initial infestation of *M. vitrata* were 33.94 and 17.14^{0}C, while the average morning and evening relative humidities were 85.875 and 61.5 per cent, respectively. The population of coccinellids and spiders recorded during the initial incidence were 1.8 and 2.2 per 50 plants, respectively. This is in agreement with Hariprasad (2007) who reported that the incidence of *M. vitrata* started at 32 DAS. Hukte *et al*. (2014) revealed that the incidence of *M. vitrata* commenced from the 5th week after sowing.

The larval population increased gradually from 31 DAS and reached a peak by 64 DAS (5th standard week) *i.e.,* at pod development stage with 329 larvae per 50 plants The average maximum and minimum temperatures during the initial level of population were 32.78 and 14.42 ^{0}C, respectively and the average morning and evening relative humidities were 91.28 and 35.42 per cent, respectively. The population of coccinellids and spiders during the initial incidence were 92 and 81 per 50 plants respectively. This was in agreement with the findings of Lakshmi (2001), Dillirao (2001) Imosanen and Singh, (2005) who reported that the peak larval incidence of *M. vitrata* larvae was observed coinciding with the maximum flowering and podding stage of blackgram. Thereafter the larval population declined gradually with rise in maximum and minimum by temperatures and reached minimum by 80DAS (7th standard week), with a mean of 100 larvae per 50 plants. The average maximum and minimum temperatures prevailed were 33.07 and 17.85^{0}C, respectively and the average morning and evening relative humidities were 90.85 and 39.14 per cent, respectively. The population of coccinellids and spiders during this period was 36 and 84 per 50 plants respectively (Table 1).

Correlations were worked to find out the relationship between spotted pod borer population and the major weather parameters and natural enemies in LBG-752. The results indicated negative and non significant association between the spotted pod borer population and the minimum temperature (r = -0.493), evening relative humidity (r= -0.218) and wind velocity (r= -0.015). Relationship between the spotted pod borer population maximum temperature (r= 0.083) and mean sunshine hours (r= 0.181) was positive and non-significant while positive and significant correlation with morning relative humidity (r= 0.657) (Table. 2)

The relationship between the spotted pod borer and coccinellids (r = 0.777), spiders (r = 0.569) was positive and significant correlation which is in contradictory with the finding of Babu (2008) who reported positive but non significant correlation between natural enemies (coccinellids and spdiders) with the larval population of *M. vitrata.*

The present investigation results are in conformity with Reddy *et al*. (2001), Lakshmi (2001), Sivaramakrishna *et al*. (2004), Rao (2010) and Babu *et al*. (2009) who reported that significant positive correlation between the morning relative humidity and larval population of *M. vitrata*. Hukte *et al*. (2014), Dabhade *et al*. (2014) and Sravani *et al*. (2015) observed non significant negative correlation between evening relative humidity larval population of *M. vitrata*. Sahoo and Behra (2001), Banker *et al*. (2015) and Bairawa *et al*. (2017) reported positive non significant correlation between maximum temperature and larval population of *M. vitrata*. Srinivas (2003) confirmed negative non significant correlation with minimum temperature and larval population of *M. vitrata* in groundnut. Reddy *et al*. (2001) reported that wind velocity has negative non significant correlation with the larval population of *M. vitrata* in pigeonpea. Hukte *et al*. (2014) and Bairawa and Singh (2017) concluded a positive non significant correlation bright sunshine hours and larval population of *M. vitrata*.

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Table 1: Influence of abiotic and biotic factors on the seasonal incidence of pest complex on blackgram cultivar LBG-752 during *rabi,* 2017– 18

Standard week of derivation	Temperature (°C)		Relative Humidity (%)		Mean sunshine hours	Wind velocity	Natural enemies		*M. vitrata* population / 50plants/
	Max.	Min.	Morning	Evening			Coccinellids / 50 plants/	Spiders/ 50plants/	
48th week	30.21	17.08	74.8	39.14	7.71	0.91	0	0	0
49th week	28.6	17.42	85.14	46.71	2.35	1.18	0	0	0
50th week	30.85	18.35	82.57	47.85	2.85	0.5	2	1	0
51st week	30	15.42	88	50.71	3.67	0.71	5	7	0
52nd week	33.94	17.14	85.87	61.5	3.65	0.85	9	11	4
1st week	29.21	15	88.57	65.42	4.72	1.02	12	17	63
2nd week	30.6	15.77	87.71	41.28	4.8	0.7	14	18	153
3rd week	31.14	14.9	88.57	56.85	7	0.5	22	16	177
4th week	30.5	16.61	92	45.42	3.57	1.2	33	27	328
5th week	32.78	14.42	91.28	35.42	7.9	0.71	92	81	329
6th week	32.42	17.35	87.7	41.57	4.62	0.64	72	102	175
7th week	33.07	17.85	90.85	39.14	7.22	0.65	36	84	100
8th week	34.71	19.64	85.14	32.28	8.61	0.92	12	18	0

The data on spotted pod borer incidence when subjected to multiple linear regression analysis in LBG-752 (Table 4), the following equation were arrived.

$Y = -499.50 – 16.02\ X_1 + 2.38\ X2 + 11.79\ X_3 – 1.22\ X_4 + 7.21\ X_5 + 17.75\ X_6 + 4.86\ X_7 – 2.177X_8$

The multiple linear regression analysis data (Table 3 & Fig 1) revealed that all the biotic abiotic factors togetherwere responsible for a total influence of 81.7 per cent ($R^2 = 0.81.7$) and in spotted pod borer population which was significant in LBG-752 which is in proximity to the findings of Babu (2008) who reported that all the weather factors together put forth 94.40 per cent of total variation in *M.vitrata* population in blackgram.

Table 2: Correlation between abiotic and biotic factors and *M. vitrata* on Blackgram during *rabi*, 2017 - 18

Abiotic & biotic factors (Weather parameters and natural enemies)	Correlation coefficient (*r*) in LBG - 752
X_1 – Maximum temperature (^{0}C)	0.083
X_2 – Minimum temperature (^{0}C)	-0.493
X_3 – Morning relative humidity (%)	0.657**
X_4 – Evening relative humidity (%)	-0.218
X_5 – Mean Sunshine Hours	0.181
X_6 – Wind Velocity	-0.015
X_7 – Coccinellids	0.777**
X_8 – Spiders	0.569**

**** Significant at 5% level**

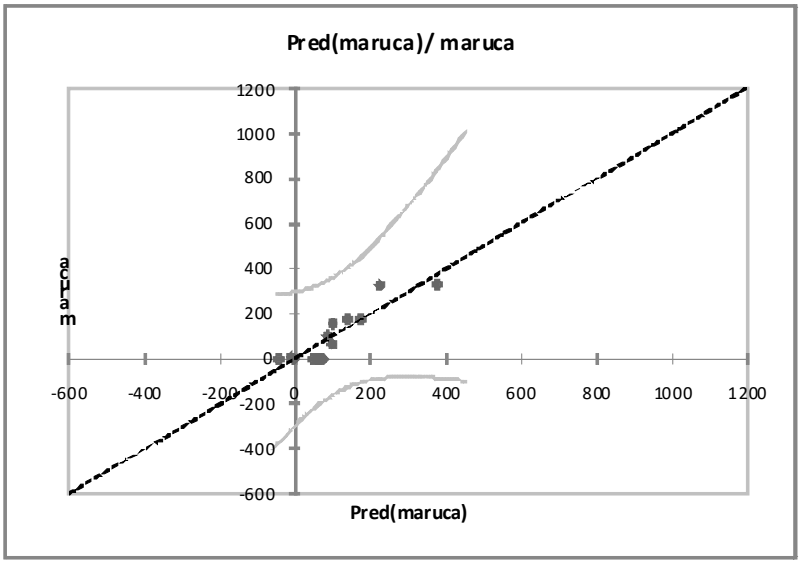

Fig 1. Relationship between the predatory population and larval population of *M. vitrata* logistic multiple linear regression

Table 3: Multiple linear regression between abiotic and biotic factors and *M. vitrata* on blackgram during *rabi*, 2017- 18

Variable	LBG-752		
	Partial regression coefficient	Standard error	t-value
X_1 – Maximum temperature (^{0}C)	0.615	29.465	-0.544
X_2 – Minimum temperature (^{0}C)	0.959	43.460	0.055
X_3 – Morning relative humidity (%)	0.261	8.975	1.307
X_4 – Evening relative humidity (%)	0.805	4.644	-0.264
X_5 – Mean Sunshine Hours	0.752	21.324	0.338
X_6 – Wind Velocity	0.904	138.404	0.128
X_7 – Coccinellids	0.203	3.198	1.521
X_8 – Spiders	0.384	2.229	-0.977
Intercept	-499.5		
Regression equation	$Y = - 499.50 – 16.02\ X_1 + 2.38\ X2 + 11.79\ X_3 – 1.22\ X_4 + 7.21\ X_5 + 17.75\ X_6 + 4.86\ X_7 – 2.177X_8$		
R^2	82.6		

**** Significant at 5% level**

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