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RESEARCH ARTICLE

Seasonal Incidence of Pod Borer Complex- Spotted Pod Borer, *Maruca Vitrata* (Geyer) and Pea Blue Butterfly, *Lampides Boeticus* (Linnaeus) in Black Gram In Relation To Weather Parameters

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ABSTRACT

Seasonal incidence of the spotted pod borer *M. vitrata* showed that the larval incidence appeared first at 42nd SW (14 larvae/ 50 plants) and had its highest peak at 45th SW (52 larvae/ 50 plants) during *Kharif* 2020. During *Rabi* 2020 – 2021, the pest appeared from 13th SW onwards (12 larvae/ 50 plants) and reached its highest peak at 16th SW (42 larvae/ 50 plants). Studies on seasonal incidence revealed that the peak population of the pod borers, spotted pod borer *M. vitrata* showed that the peak larval incidence at 45th Standard Week (SW) (52 larvae/ 50 plants) and at 16th SW (42 larvae/ 50 plants), the larval incidence of the pea blue butterfly, *L. boeticus* had its highest peak at 44th SW (52 larvae/ 50 plants) and 16th SW (46 larvae/ 50 plants) during *Kharif* 2020 and *Rabi* 2020 – 2021, respectively. The correlation study showed that a positive correlation was observed for *M. vitrata* at maximum (0.79) and minimum temperature (0.24), and rainfall (0.17). Negative correlation was recorded with maximum (-0.09) and minimum relative humidity (RH) (-0.12) and a positive correlation was observed with maximum (0.68) and minimum temperature (0.65), minimum RH (0.04) and rainfall (0.36). Negative correlation was recorded with maximum RH (-0.62), in *L. boeticus* a positive correlation was observed between the incidence of and maximum temperature (0.74), maximum (0.16), and minimum RH (0.13) and rainfall (0.33), a negative correlation was recorded with minimum (-0.15) and a significant positive correlation was observed with maximum (0.70) and minimum temperature (0.71), and minimum RH (0.17) and rainfall (0.43), while a negative correlation was recorded with maximum RH (-0.59) during *Kharif* 2020 and *Rabi* 2020 – 2021, respectively.

Keywords:Seasonal incidence, spotted pod borer, blue butterfly, weather parameters, *Maruca vitrata*, population dynamics.

INTRODUCTION

Black gram (*Vigna mungo* L. Hepper) is one of the most significant pulse crops in India and a short-season crop. In India, it is commonly referred to as urd

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bean or mash (Leguminaceae). It has a high protein content between 20.8 and 30.5 percent and total carbs between 56.5 and 63.7 percent (Kundagar *et al*., 2021). Black gram production in India is limited by a variety of factors, in which insect infestations being a key contributor (Singh and Kumar, 2016). Black and green gram yield losses in India were caused by insect infestations and varied from 7 to 35% (Selvam, 2018).

Pulses in India have been affected by more than 250 insect infestations. Black gram production is significantly reduced by roughly twelve insect species, which are pests (Soundararajan and Chitra, 2012). Pod borer complex include *Helicoverpa armigera* (Hubner), *Maruca vitrata* (Geyer), *Maruca* (Geyer), *Etiella zinckenella* (Treitschke), *Apion ampulum* (Faust) and *Lampides boeticus* (Linnaeus). Among the pod borers, *M. vitrata* is a major constraint for the production of black gram at critical stages such as flowering and pod formation (Selvam, 2018). So, the present investigation was carried out to know the seasonal incidence of borers on black gram in two seasons and their relationship with meteorological parameters.

MATERIALS AND METHODS

The population dynamics of borers on black gram in relation to abiotic factors were studied by conducting two field experiments *viz*., field experiment I at Kunnathur, Tirupur, Tamil Nadu during *Kharif* 2020 and field experiment II at the Eastern farm of Pandit Jawaharlal Nehru College of Agriculture and Research Institute (PAJANCOA and RI), Karaikal, U. T. of Puducherry during *Rabi* 2020 – 2021. VBN (Bg) 8 black gram variety seeds were sown in both seasons with 30 x 10 cm spacing, and the crop was raised successfully by adopting recommended agronomic practices as per the crop production guide 2020 of Tamil Nadu Agricultural University. For seasonal incidence, insect pests were recorded at weekly intervals in ten randomly selected plants and at five different locations from germination to harvest. Larvae of borers were assessed by counting the number of larvae per plant randomly. selected plants per plot (Selvam, 2018). In order to find out the specific impact of meteorological parameters on borers, the data on larval population recorded in the experimental plot were correlated with maximum and minimum temperature, maximum and minimum RH, and rainfall during *Kharif* 2020 and *Rabi* 2020 – 2021. Weather data were obtained from the meteorological observatory of PAJANCOA and RI, Karaikal, U.T. of Puducherry.

RESULT AND DISCUSSION

Seasonal incidence of the black gram spotted pod borer, *M. vitrata*

The larval incidence of the spotted pod borer, *M. vitrata* appeared first at 42nd SW (October) (14 larvae/ 50 plants) and had its highest peak at 45th SW (November) (52 larvae/ 50 plants) during *Kharif* 2020 (Table 1) (Fig. 1). During *Rabi* 2020 – 2021, the pest appeared from 13th SW onwards (April) (12 larvae/ 50 plants) and reached its highest peak at 16th SW (April) (42 larvae/ 50 plants) (Table 2) (Fig. 2). In both the season larval population declined at crop harvest with 8 larvae/ 50 plants at 48th SW (November) during *Kharif* 2020 and 19 larvae/ 50 plants at 18th SW (May) during *Rabi* 2020 – 2021.

Shejulpatil *et al*. (2020) reported that there were peaks of *M. vitrata* in Pigeon pea at 43rd SW (4th week of October) and 45th SW (1st week of November) and reached its lowest population at 52nd SW (last week of December) in *Kharif* 2017. Devi *et al*. (2019) reported that the incidence of *M. vitrata* on Pigeonpea was first noticed at 40th SW (1st week of October) and reached its peak level (6 larvae per plant) at 44th SW (1st of November) which coincided with the peak flowering stage of the crop, thereafter its incidence showed in decreasing trend during *Kharif* 2013. Biswas and Banerjee (2019) observed that spotted pod borer (*M. testulalis*) on black gram had been recorded maximum population in 7 WAS and 8 WAS during summer and *Kharif* 2016 and reached its peak in 10 WAS in both the seasons. Kundu *et al*. (2021) reported that the incidence of *M. vitrata* on black gram noticed at 13th SW (3rd week of March) and it reached its highest larval population at 19th SW (2nd week of May) and the damage continued till harvest in 2018 and 2019. These reports are in agreement with the present findings of *Kharif* 2020 and *Rabi* 2020 – 2021 seasonal incidence.

Seasonal incidence of the pea blue butterfly, *L. boeticus*

The larval incidence of the pea blue butterfly, *L. boeticus* appeared first at 42nd SW (October) (22 larvae/ 50 plants) with the highest peak at 44th SW (October) (52 larvae/ 50 plants) during *Kharif* 2020 (Table 1) (Fig. 1). During *Rabi* 2020 – 2021, larval incidence started from the 13th SW (April) (15 larvae/ 50 plants) and reached its highest

Table 1. Seasonal incidence of borers on black gram during Kharif 2020

Standard week (SW)	M. vitrata (Population/ 50 plants)	L. boeticus (Population/ 50 plants)	Temperature (^{0}C)		R.H (%)		Rain fall (mm.)
	Kharif 2020		Max.	Min.	Max.	Min.	
38	0	0	30.11	25.11	76.50	48.77	0.00
39	0	0	30.14	25.14	89.15	52.51	0.00
40	0	0	31.32	24.82	78.43	59.79	2.54
41	0	0	30.86	25.54	79.34	59.12	7.11
42	14	22	30.68	25.51	80.31	60.22	4.54
43	29	38	30.36	25.21	72.28	43.11	0.00
44	34	52	35.04	26.11	74.38	47.17	0.00
45	52	48	34.68	24.29	89.16	69.18	12.86
46	45	29	33.75	23.68	82	55.12	1.06
47	21	7	29.5	24.25	86.18	61.12	6.31
48	8	0	28.58	22.5	76.36	58.84	1.89

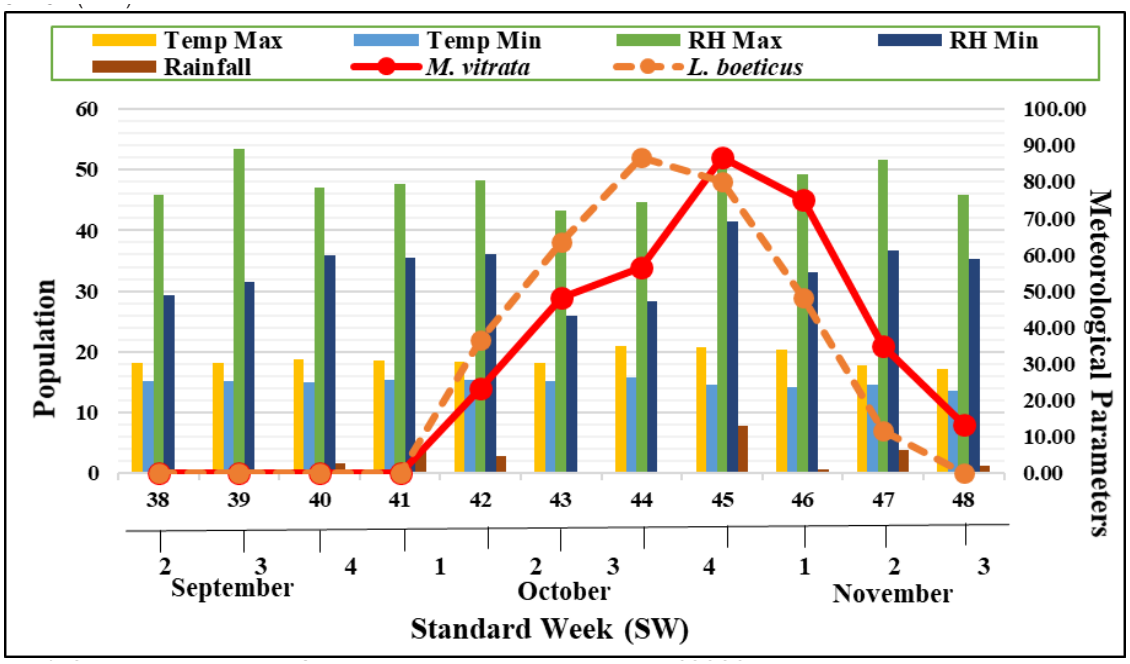

Fig. 1. Seasonal incidence of borers in black gram during Kharif 2020 and its relation with meteorological parameters

peak at 16th SW (April) (46 larvae/ 50 plants) (Table 2) (Fig. 2). In both the season, larval population declined at crop harvest with 7 larvae/ 50 plants (48th SW) (November) during *Kharif* 2020 and 17 larvae/ 50 plants (18th SW) (May) during *Rabi* 2020 – 2021.

Yadav *et al*. (2020) reported the appearance of blue butterfly (*L. boeticus*) on black gram at flowering and podding stage and it continued till the maturity of the crop. Rathore *et al*. (2017) reported that the larval incidence of *L. boeticus* on pigeonpea began with 0.75 larvae per 5 plants at 39th SW (end of September), and reached the highest peak of 2.25 larvae per 5 plants at 42nd SW (mid-October) during *Kharif* 2014. Bhadani and Patel (2019) reported *L. boeticus* in pigeon pea reached to the highest peak (4.3 larvae/ plant) at 43rd SW (5th week of October) during *Kharif* 2017 - 18 and 2018 - 19. Manisha *et al.* (2018) reported that larval activity of *L. boeticus* first appeared at 7th SW (3rd week of February) and major activity period was between March and April, and highest peak was recorded 1.55 larvae/ plant at 12th SW (4th week of March) in 2015.

Table 2. Seasonal incidence of borers on black gram during Rabi 2020 – 2021

Standard week (SW)	M. vitrata (Population/ 50 plants)	L. boeticus (Population/ 50 plants)	Temperature (^{0}C)		R.H (%)		Rain fall (mm.)
	Rabi 2020 –2021		Max.	Min.	Max.	Min.	
09	0	0	31.14	20.16	92.86	57.00	0.00
10	0	0	31.87	23.16	89.29	60.43	0.00
11	0	0	32.26	22.23	90.57	58.86	0.00
12	0	0	32.41	23.00	89.43	60.57	0.00
13	12	15	34.77	25.46	90.00	54.00	0.00
14	29	21	36.36	25.89	88.43	54.71	0.00
15	32	34	34.43	25.40	90.00	61.43	2.30
16	42	46	35.27	26.03	86.71	61.00	0.36
17	37	31	35.86	26.81	82.57	60.14	0.00
18	19	17	35.69	25.96	88.43	60.00	1.36
19	0	11	35.77	26.79	87.86	62.29	0.43

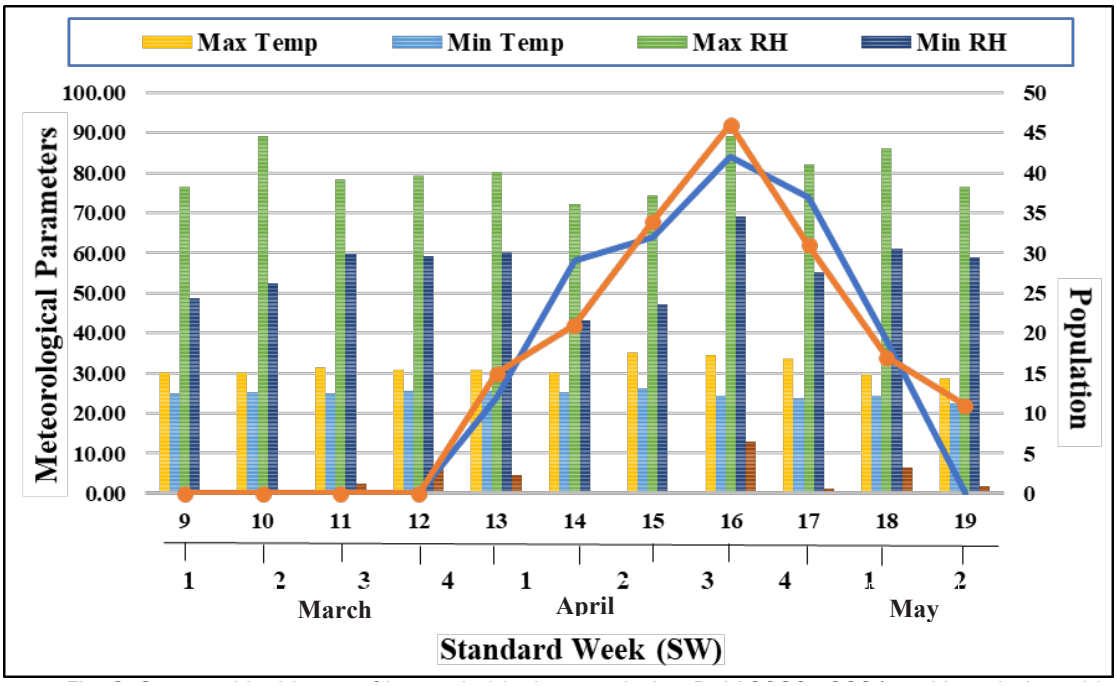

Fig. 2. Seasonal incidence of borers in black gram during Rabi 2020 - 2021 and its relation with meteorological parameters

The above results are in agreement with the present findings of *Kharif* 2020 and *Rabi* 2020 – 2021 seasonal incidence.

Influence of meteorological parameters on the incidence of the spotted pod borer, M. vitrata

The correlation study showed that a significant positive correlation was observed between *M. vitrata* and maximum temperature (0.79). Non-significant positive correlation was recorded with minimum temperature (0.24) and rainfall (0.17), and non-significant negative correlation was recorded with maximum (-0.09) and minimum RH (-0.12) during *Kharif* 2020 (Table 3).

During *Rabi* 2020 – 2021, a significant positive correlation was observed between *M. vitrata* and maximum (0.68) and minimum temperature (0.65) and non-significant with minimum RH (0.04) and rainfall (0.36). Significant negative correlation was recorded with maximum RH (-0.62) (Table 3).

The multiple linear regression analysis showed that all the weather parameter together was responsible for significant variation of 82 and 79 per cent on larval incidence of *M. vitrata* (Table 3) during *Kharif* 2020 and *Rabi* 2020 – 2021, respectively.

Rathore *et al.* (2017) studied the incidence of spotted pod borer (*M. testulalis*) in pigeonpea with weather parameters and exhibited that the pest population had positive non-significant with temperature, while non-significant negatively correlated with RH during *Kharif* 2014. Sravani *et al*. (2015) stated that maximum and minimum temperature and morning RH showed positive influence with *M. vitrata* larval population, where as rainfall and evening RH exhibited negative influence. However, none of them were significant except maximum temperature in green gram in *Rabi* 2014 – 2015. Kundu *et al*. (2021) also expressed that the incidence of *M. vitrata* on black gram exhibited a strong positive association with maximum and minimum temperature, morning and evening RH, and rainfall. These findings corroborate the present findings of the *Kharif* 2020 and *Rabi* 2020 – 2021 seasons.

Influence of meteorological parameters on the incidence of the pea blue butterfly, L. boeticus

It was found that a significant positive correlation was observed between *L. boeticus* and maximum temperature (0.74) and non-significant with maximum (0.16) and minimum RH (0.13) and rainfall (0.33). Non-significant negative correlation was recorded with minimum temperature (-0.15) during *Kharif* 2020 (Table 3).

During *Rabi* 2020 – 2021, significant positive correlation was observed with maximum (0.70) and minimum temperature (0.71), and non-significant with minimum RH (0.17) and rainfall (0.43). Non-significant negative correlation was recorded with maximum RH (-0.59) (Table 3).

The multiple linear regression analysis showed that all the weather parameter together was responsible for significant variation of 77 and 80 per cent on larval incidence of *L. boeticus* (Table 3) during *Kharif* 2020 and *Rabi* 2020 – 2021, respectively.

Biswas and Banerjee (2019) reported that blue butterfly population was significant negatively associated with maximum and minimum temperature and significant positively correlated with rainfall in green gram in summer and *Kharif* 2016 in West Bengal. Manisha *et al.* (2018) reported that the incidence of blue butterfly had non-significant positive correlation with maximum and minimum temperature, rainfall and evening RH and non-significant negative correlation with morning RH during 2015 – 2016. These findings

Table 3. Correlation and multiple linear regression between meteorological parameters and the population of borers in black gram during *Kharif* 2020 and *Rabi* 2020 – 2021

Insects	Temperature (°C)		RH (%)		Rainfall (mm)
	Max.	Min.	Max.	Min.	
	Kharif 2020				
M. vitrata	0.79*	0.24	-0.09	-0.12	0.17
	$Y=180.52+6.88X_1-11.63X_2+ 0.42X_3 -2.44X_4+3.78X_5$				
L. boeticus	0.74*	-0.15	0.16	0.13	0.33
	$Y=46.78+7.30 X_1-4.66X_2-0.31X_3-2.33X_4+3.66X_5$				
	Rabi 2020 – 2021				
M. vitrata	0.68*	0.65*	-0.62*	0.04	0.36
	$Y=124.47+5.87X_1-8.32X_2+0.43X_3-2.38X_4+3.51X_5$				
L. boeticus	0.70*	0.71*	-0.59	0.17	0.43
	$Y=119.81+5.71X_1-8.42X_2+0.10X_3-1.65X_4+2.97X_5$				

* Significance at 5 per cent level

X_1-Maximum temperature (°C) X_2-Minimum temperature (°C) X_3- Maximum RH (%) X_4- Minimum RH (%) X_5-Rainfall (mm)

are in agreement with the present findings of *Kharif* 2020 and *Rabi* 2020 – 2021 seasons.

CONCLUSION

The seasonal incidence of M. vitrata and L. boeticus on black gram varied between Kharif 2020 and Rabi 2020–2021, with peak infestations occurring during the flowering and pod formation stages. Correlation analysis revealed that maximum and minimum temperatures significantly influenced the population dynamics of both species, whereas relative humidity and rainfall had mixed effects. The study underscores the role of weather parameters in pest outbreaks and emphasizes the need for climate-based pest management strategies to minimize yield losses in black gram cultivation.

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