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Effect of Different Weather Parameters on Incidence of Pod Borer and Spotted pod Infesting *Vigna mungo*

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ABSTRACT

The infestation of pod borer (*Helicoverpa armigera*) was first observed in the third week of August (33rd SMW) with an average population of 0.2 larvae/mrl. The peak larval population, reaching 3.4 larvae/mrl, occurred during the third week of September (38th SMW). The infestation of pod borer showed a positive correlation with both maximum and minimum temperatures (r = 0.32, r = 0.29, respectively), morning relative humidity (r = 0.44), and evening relative humidity (r = 0.70), while exhibiting a negative correlation with rainfall (r = -0.55). Spotted pod borer (*Maruca vitrata*) infestation was observed throughout the crop growth period, from the fourth week of July to the first week of October. The infestation gradually increased, reaching its peak (3.33 larvae/mrl) during the second week of September (37thSMW). The infestation of spotted pod borer was positively correlated with minimum temperature (r = 0.30), morning relative humidity (r = 0.44), and evening relative humidity (r = 0.75), while negatively correlated with rainfall (r = -0.28) and maximum temperature (r = -0.15).

Key words : *Weather parameters, Vigna mungo, Pod borer, Spotted pod*

Introduction

Pulses are a staple in the human diet and are cultivated year-round in various agro-climatic conditions across India. Among the pulses, Black gram (*Vigna mungo* L. Hepper), commonly known as urd bean, is cultivated in diverse cropping systems such as mixed crops and intercrops due to its short duration (Panikkar *et al.*, 1990 and Singh, 2004). In India, it occupiesan area of 4.5 million hectares (kharif and rabi) withaverage production and productivity of 2.08 milliontonnes and 459 kg/ha, respectively (Anonymous, 2020). The black gram crop is vulnerable to several insect pests throughout its growth cycle, from sowing to harvest, both in the field and during storage. Among these pests, pod borers, specifically the spotted pod borer (*Maruca vitrata* Geyer) and the gram pod borer (*Helicoverpa armigera* Hubner), pose significant threats to black gram, leading to seed and pod damage. *Maruca vitrata* is a key pest that appears on the crop from the vegetative to reproductive stages, causing substantial damage to flowers by webbing and boring into pods. On the other hand, *H. armigera's* damage is generally confined to flower heads, seeds, and pods. The pod borers, *M. vitrata* and *H. armigera*, are considered significant contributors to economic losses for farmers (Reddy, 1998). The infestation of insect pests often forces farmers to resort to spraying various mixtures of insecticides. Unfortunately, this not only leads to economic losses but also has adverse impacts on the local flora and fauna, as well as the en-

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vironment. Considering the significance of abiotic factors, temperature, in particular, as a regulator of insect population dynamics, developmental rates, and seasonal occurrence, this study was conducted to investigate the seasonal incidence of gram pod borer and spotted pod borer on black gram.

Materials and Methods

A field experiment was carried out at the ARS Ummedganj-Kota, located approximately 12 km to the east of Kota. The research station is situated at an altitude of 258 meters above mean sea level, at coordinates 25°11′0" N latitude and 75°50′0" E longitude. During the kharif season of 2020, a field experiment was conducted to study the population dynamics of Pod borer and Spotted pod borer in black gram crops. The Pratap urd – 1 black gram variety was chosen for the experiment. The experimental design employed was a Randomized Block Design (RBD), with a planting arrangement of 30 x 10 cm and plot dimensions of 4.2 x 5.0 m². Throughout the entire growth season of the black gram crop, continuous monitoring was conducted to observe the fluctuations in the populations of Pod borer and Spotted pod borer. The observation of Pod borer and Spotted pod borer population was recorded per meter row length using the "vertical beat sampling technique" (Southwood, 1978). This was done in five randomly selected and tagged plants in a plot at weekly intervals, starting from 7 days after germination until the harvest of the crop. The data collected, including Pod borer and Spotted pod borer populations, was correlated with various weather parameters such as temperature, rainfall, relative humidity, and wind velocity. These weather parameters were recorded from the Meteorology section of Agriculture Research Station in Kota. Mean population values were calculated using statistical procedures. Subsequently, the collected data underwent further statistical analysis, including the calculation of correlation coefficients, to discern potential relationships between the collected variables.

Results and Discussion

Data on population dynamics of Pod borer and Spotted pod borer on black gram is presented in Table 1 and Figure 1.

Pod Borer (*Helicoverpa armigera* Hubner)

The Pod borer appeared during 33th SMW (2nd week of August) with an average population of 0.20 larvae/mrl/5 plant. The infestation increased gradually and attained its peak in the 3rd week of September (38th SMW) with a population of 3.40 larvae/mrl/ 5 plant, when the maximum temperature (35.80), minimum temperature (23.00), morning

Table 1. Population dynamics of *H. armigera* and *M. vitrata* infesting black gram variety Pratap urd – 1 during *kharif* 2020

SMW (Duration)	Date of observation	Temperature (°C)		Relative humidity(%)		Rainfall (mm)	No. of larvae/mrl	
		Max.	Min.	Morn.	Even.		Pod borer	Spotted pod borer
31(30Jul–05 Aug)	3-8-2020	35.43	22.79	79.00	55.86	63	0.00	0.00
32(06Aug–12 Aug)	10-8-2020	34.71	21.90	80.14	67.86	11	0.00	0.13
33(13Aug–19Aug)	17-8-2020	35.40	23.69	65.71	57.14	111	0.20	0.46
34(20 Aug –26 Aug)	24-8-2020	34.64	23.14	84.83	64.57	107.5	0.46	1.20
35(27 Aug – 02 Sep)	31-8-2020	34.29	22.86	84.29	77.29	43.1	1.06	2.26
36(03 Sep – 09 Sep)	7-9-2020	34.29	22.93	84.14	82.29	93	1.60	2.93
37(10 Sep – 16 Sep)	14-9-2020	34.86	23.21	81.71	76.14	0.00	2.60	3.33
38(17 Sep – 23 Sep)	21-9-2020	35.80	23.00	81.71	75.14	0.00	3.40	3.20
39(24 Sep – 30 Sep)	28-9-2020	35.67	23.43	88.57	78.71	24.6	2.53	1.93
40(01 Oct – 07 Oct)	5-10-2020	35.39	22.50	82.14	78.14	0.00	1.40	1.06
Total					13.25	16.5		
CorrelationCoefficient (r)								
Max. temp. (°C)					0.328	-0.151		
Min. temp. (°C)					0.297	0.306		
Morning R.H. (%)					0.444	0.447		
Evening R.H. (%)					0.706*	0.755*		
Rainfall (mm)					-0.553	-0.289		

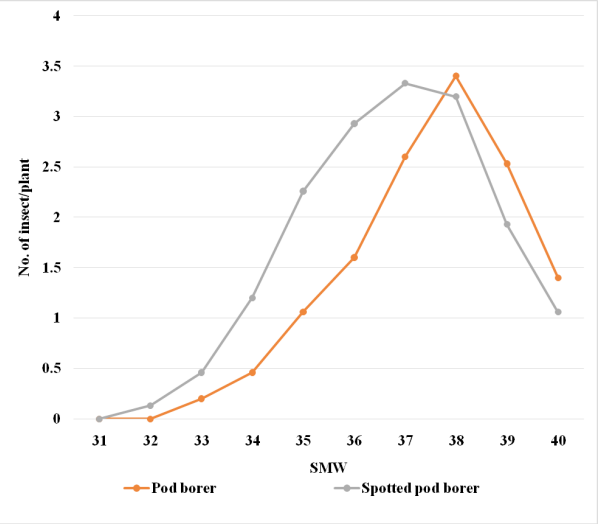

Fig. 1. Population dynamics of *H. armigera* and *M. vitrata* infesting black gramvariety Pratap urd – 1 during kharif 2020

relative humidity (81.71), evening relative humidity (75.14) and rainfall was 00 mm. Thereafter, the infestation declined and reached to its minimum levels (1.40larvae/mrl/ 5 plant) during 1st week of October (40th SMW). Pod borer infestation showed positive correlation with morning relative humidity (r = 0.44) and evening relative humidity (r = 0.70) and along with maximum and minimum temperature respectively (r = 0.32, r = 0.29). The negative correlation rainfall (r = -0.55). The results of present investigation are in acquiescence with the findings of Kapoor and Shankar *et al.*, 2019, who reported positive correlation with temperature (r = 0.46, r = 0.36) between maximum and minimum, respectively and negative correlation with rainfall (r = -0.25). Biswas and Banerjee, 2019 showed the negative correlated with maximum temperature (r = -0.82) and rainfall (r = -0.18).

Spotted pod borer (*Maruca vitrata* Geyer)

The Spotted pod borer appeared during 32th SMW (2nd week of August) with an average population of (0.13 larvae/mrl/5 plant). The infestation gradually increased and attained it's peak in the 2nd week of September (37th SMW) with a population of 3.33larvae/mrl/5 plant, when the maximum temperature (34.86), minimum temperature (23.21), morning relative humidity (84.29), evening relative humidity (76.14) and rainfall 0.00 mm. Thereafter, the infestation declined and reached to its minimum population (1.06 larvae/mrl/ 5 plant) during 1st week of October (40th SMW). Spotted pod borerinfestation showed positive correlation with morning relative humidity (r = 0.44), evening relative humidity (r = 0.70) and along with minimum temperature (r = 0.45). The negative correlation with maximum temperature (r = -0.15) and rainfall (r = -0.28). The present finding is accordance with the results obtained by sravani *et al.*, 2015 who reported that negative correlation(r = -0.22) between rainfall. The results of present investigation are in acquiescence with the findings of Kapoor and Shankar *et al.* 2019 who reported negative correlation with rainfall (r = -0.25) and positive correlation with minimum temperature (r = 0.58). Tamang *et al.*, 2017 found the negative correlation with maximum temperature (r = -0.46) and positive correlation with minimum temperature (r = 0.79).

Conclusion

The population dynamics of Pod borer and Spotted pod borer on black gram were observed during the kharif season of 2020. The initiation of Pod borer population (0.20 larvae/mrl/5 plant) started after the 2nd week of August, reaching its peak (3.40 larvae/mrl/5 plant) in the 3rd week of September (38th SMW). Pod borer population showed positive correlation with maximum and minimum temperature, morning relative humidity, and evening relative humidity, while exhibiting negative correlation with rainfall. Similarly, the initiation of Spotted pod borer population (0.13 larvae/mrl/5 plant) occurred after the 2nd week of August, reaching its peak (3.33 larvae/mrl/5 plant) in the 2nd week of September (37th SMW). Spotted pod borer population showed negative correlation with maximum temperature and rainfall, and positive correlation with minimum temperature, morning relative humidity, and evening relative humidity.

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Declaration of Conflicting Interests

The author(s) declared no conflicts of interest con-

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