International Journal of Environment and Climate Change

Volume 14, Issue 9, Page 816-821, 2024; Article no.IJECC.123366
ISSN: 2581-8627
(Past name: British Journal of Environment & Climate Change, Past ISSN: 2231–4784)

Seasonal Incidence of Insect Pests on Blackgram [*Vigna mungo* (L.) Hepper] in Malwa Region of Madhya Pradesh, India

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: https://doi.org/10.9734/ijecc/2024/v14i94458

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/123366

Original Research Article

Received: 08/07/2024
Accepted: 10/09/2024
Published: 16/09/2024

ABSTRACT

The study investigated the prevalence of major insect pests and their natural enemies in Blackgram crops, focusing on leaf hoppers, whiteflies, Bihar hairy caterpillars, spotted pod borers, stem flies, coccinellids and spiders. Throughout the crop period, the population dynamics of these pests were monitored, revealing varying levels of infestation. The high population of 5.60 leafhoppers per plant and 3.50 larvae per plant of Bihar hairy caterpillar were recorded during 35th week of the crop cycle. The high population of 6.90 whiteflies per plant, 2.60 spotted pod borer larvae per plant and 60 per

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Cite as: *Choudhary, Jaswant Singh, Shradha Parmar, Bharat Lal, and A.K. Choudhary. 2024. "Seasonal Incidence of Insect Pests on Blackgram [Vigna Mungo (L.) Hepper] in Malwa Region of Madhya Pradesh, India". International Journal of Environment and Climate Change 14 (9):816-21. https://doi.org/10.9734/ijecc/2024/v14i94458.*

cent of pod fly infestation were observed during 36th, 37th and 38th week of the crop cycle, respectively. The highest populations of coccinellids 2.40 beetles per plant in 35th week and 2.00 spiders per plant in 36th week recorded duringthe crop cycle. The maximum temperature and relative humidity showed significant positive correlation and minimum temperature and rainfall showed negative non-significant correlation with the population of leaf hopper, Bihar hairy caterpillar, whitefly, stem fly, spotted pod borer and coccinellids. Relative humidity showed positive significant correlation and maximum temperature, minimum temperature and rainfall showed negative non-significant correlation with population of spider.

Keywords: Blackgram; insect-pest; natural enemies; population dynamics; temperature; relative humidity; rainfall.

1. INTRODUCTION

The word "pulses" commonly known as peas, beans or lentils. Pulses are primarily produced in India. Pulses are the least expensive and most effective source of protein in a nation like India, According to Marinangeliand Jones [1]. The annual yield loss due to the insect pests has been estimated at about 30 per cent in Urd bean and Mung bean. The major insect pests which plays most important role in economic losses of blackgram are whitefly, *Bemisia tabaci* (Genn.), jassid, *Empoasca kerri* Pruthi, bihar hairy caterpillar, *Spilosoma oblique* Walker and tobacco caterpillar *Spodoptera litura* (Fab.) [2]. In India, blackgram is cultivated in 46.7 lakh ha area with production of 23.4 lakh tones and productivity of 501 kg/ha [3]. The blackgram can also be grown on a wide range of soil in different cropping system across varied agro-climatic regions of India. In Madhya Pradesh, the area, production and productivity of blackgram is 1788.80 thousand hectares, 1744.35 thousand tones and 655 kg/ha, respectively [3]. The *Maruca vitrata*, or spotted pod borer, is the most dreadful and severe pest that can seriously affect blackgram in field settings. It is recognized that in blackgram, it causes yield losses of 2-84 per cent and economic losses of 20-25 per cent [4]. The purpose of the current study was to determine the seasonal incidence of insect pests on blackgram (*Vigna mungo* (L.) Hepper) and how these pests relate to abiotic variables.

2. MATERIALS AND METHODS

The blackgram (Indra Urd -1) crop was grown in plots having size10×10 m^2 with the spacing of 30 × 10 cm at the research farm of RVSKVV, RAK College of Agriculture, Sehore, Madhya Pradesh. The experimental site falls under eastern part of Vindhyan Plateau in subtropical zone at the latitude of 23^0 12' North and longitude of 77^0 05' East at an altitude of 498.77 m from mean sea level (MSL). The weather conditions during the period of investigation is characterized by the temperature range of maximum temperature 28.45 to 32.85°C, minimum temperature 20.84 to 24.27°C, relative humidity 72.26 to 91.52 per cent and rainfall 9.0 to 399.3 mm during crop growth period. The crop was grown during the *Kharif*, 2022 following the recommended agronomics practices.

The population of sucking insect pests (leafhoppers and white fly) were recorded by counting on three compound leaves i.e. top, middle and bottom portions/canopy of the randomly selected ten plants. The observations on the defoliators (Bihar hairy caterpillar), pod borers were recorded by counting the larval population on ten randomly selected plants as soon as their first appearance is noticed and continue till harvest of the crop at a weekly interval.

For observation on the stem fly ten randomly selected plants were uprooted in plot and brought to the laboratory. The roots of the uprooted plants were gently washed in tap water to remove adhered soil. The number of stem fly infested plants out of 10 plants were recorded at every seven days interval, started from one week after germination till harvest and expressed in per cent stem tunneled. The data thus obtained were analyzed by following standard statistical technique [5].

Populations of natural enemies (coccinellids and spider) were recorded on ten plants selected randomly at weekly interval starting from the appearance of insect pest and natural enemies till the maturity of the crop correlated with abiotic factors. The weekly meteorological data viz., rainfall temperature and relative humidity during crop season were recorded in meteorological observatory of R.A.K. College of agriculture, Sehore.

3. RESULTS AND DISCUSSION

Leafhopper: The population of the leafhopper was found between 31st SMW to 41st SMW with range from 0.30 to 5.60 leaf hoppers per plant. The population of the pest increased subsequently and attained its peak (5.60 leaf hoppers per plant) during 35th SMW and thereafter the population showed slight declination from the next week and reached a population of 1.30 leaf hoppers per plant at the end of harvesting in 41st (Table 1). The population of leafhopper showed significant positive correlation with maximum temperature and relative humidity, while non-significant positive correlation with minimum temperature and non-significant negative correlation with the rainfall (Table2). These finding are in accordance with the findings of Rachappa et al., [6].

Whiteflies: The population of the whiteflies was ranged from 0.70 to 6.90 whiteflies per plant during crop period. The populations of pest subsequently increase and attained its peak (6.90 whiteflies per plant) during 36th SMW and thereafter reduced and grasped a population of 1.90 whiteflies per plant at the end of harvesting in 41st SMW (Table 1). The population of whiteflies showed significant positive correlation with maximum temperature and relative humidity, while non-significant positive correlation with minimum temperature and non-significant negative correlation with the rainfall (Table 2). These finding are in accordance with the findings of Mohapatra et al. [2] and Kar, [7].

Bihar hairy caterpillar: Bihar hairy caterpillar is an important pest of the blackgram crop. The pest marked its first appearance during 33rd SMW with initial mean population of 1.40 larval per plant followed a gradual increase and attained peak population of 3.50 larval per plant during 35th SMW and thereafter reduced and attained a population of 0.50 larval per plant at the end of harvesting in 41th SMW (Table 1). The population of bihar hairy caterpillar showed significant positive correlation with maximum temperature and relative humidity, while non-significant positive correlation with minimum temperature and non-significant negative correlation with the rainfall (Table 2). These finding are in accordance with the findings of Mohapatra et al. [2] and Shreedhar et al. [8].

Spotted pod borer: The population of the spotted pod borer was ranged from 0.60 to 2.60 larvae per plant. The population of spotted pod borer attained its peak (2.60 larvae per plant) during 37th SMW and thereafter the population showed slight declination from the next week and reached a population spotted pod borer of 0.80 larvae per plant in 41st SMW (Table 1). The population of spotted pod borer showed significant positive correlation with maximum temperature and relative humidity, while non-significant positive correlation with minimum temperature and non- significant negative correlation with the rainfall (Table 2). These finding are in accordance with the findings of Sonune et al., [9].

Per cent infestations of stem fly: The per cent infestation of the stem fly was ranged from the 10 to 60 per cent. The per cent infestation of the stem fly was attained its peak 60 per cent in 38th SMW and thereafter in 41st SMW it reduced and reached to10 per cent infestation of stem fly at the end of harvesting time (Table 1). The infestation of stem fly showed significant positive correlation with maximum temperature and relative humidity, while non-significant positive correlation with minimum temperature and non-significant negative correlation with the rainfall (Table 2). These finding are in accordance with the findings of Fand et al., [10] and Gaur et al., [11].

3.1 Natural Enemies

Coccinellids beetle: The population of the coccinellids (larvae and adults beetles) was ranged from 0.10 to 2.40 per plant. The population of coccinellids attained its peak (2.40 per plant) during 35th SMW and thereafter the population of the insect showed slight declination from the next week and reached a population of 1.00 coccinellids per plant at the end of harvesting in 41st SMW. The population of coccinellids showed significant positive correlation with maximum temperature and relative humidity, while non-significant negative correlation with minimum temperature and non-significant positive correlation with the rainfall (Table 2). These finding are in accordance with the findings of Kavita et al., [12].

Spider: The population of the spider was ranged from 0.30 to 2.00 spiders per plant. The population of spider attained its peak (2.00 spiders per plant) during36th SMW and thereafter the population of spider reached a population of 0.70 spiders per plant at the end of harvesting in

Table 1. Seasonal incidence of insect pest of Blackgram and their natural enemies during *Kharif* 2022

SMW	Temperature ˚C		Relative Humidity (%)	Rainfall (mm)	Population of sucking pests per plant (Three compound leaves)		Population of defoliators or pod borer per plant		Per cent plant infestation due to stem fly	Population of Natural enemies per plant	
	Max.	Min.			Leaf hopper	White fly	Bihar hairy caterpillar	Spotted podborer		Coccinellids	Spider
31	31.82	24	83.26	63.5	0.30	-	-	-	-	0.10	0.30
32	28.45	23.98	84.25	114.4	0.50	0.70	-	-	10	0.50	0.80
33	30.64	22.78	77.59	193.2	1.20	1.80	1.40	0.60	20	1.60	1.30
34	31.7	22.30	72.26	399.3	3.30	2.70	1.80	0.80	30	2.30	1.50
35	31.82	22.61	79.68	9.00	5.60	4.50	3.50	1.30	40	2.40	1.80
36	33.1	24.02	91.52	9.4	4.80	6.90	2.40	2.00	50	2.10	2.00
37	32.14	24.27	89.59	109.2	4.30	6.40	1.80	2.60	50	1.90	1.40
38	32.85	21.87	85.25	51.7	3.10	5.20	1.60	2.10	60	1.70	1.10
39	32.81	21.75	78.26	14.3	2.60	4..80	1.40	1.50	50	1.40	1.00
40	32.2	21.05	81.59	90.7	2.10	3.20	0.90	1.00	20	1.30	0.90
41	31.5	20.84	79.35	43.4	1.30	1.90	0.50	0.80	10	1.00	0.70

Table 2. Relationship between weather parameters and insect pest and natural enemies of Blackgram during *Kharif* 2022

Weather parameters	Incidence of insect pest					Natural enemies	
	Leafhopper	Whitefly	Bihar hairy caterpillar	Spotted pod borer	Per cent infestation due to Stem fly	Coccinellids	Spider
Maximum temperature (°C)	0.562**	0.687**	0.476**	0.690*	0.633*	0.450**	0.309**
Minimum temperature(°C)	0.094^{NS}	0.064^{NS}	0.0255^{NS}	0.028^{NS}	0.006^{NS}	-0.098^{NS}	0.195^{NS}
Relative Humidity (%)	0.752**	0.843**	0.663**	0.891**	0.913**	0.747**	0.654**
Rainfall (mm)	-0.135^{NS}	-0.302^{NS}	-0.069^{NS}	-0.274^{NS}	-0.200^{NS}	0.220^{NS}	0.095^{NS}

***= Significant at 5 per cent level (0.423)*

41st SMW. The population of spider showed significant positive correlation with the relative humidity, while non-significant positive correlation with maximum temperature, minimum temperature and rainfall (Table 2). These finding are in accordance with the findings of Shreedhar et al., 2024 and Jakhar and Chaudhary [13].

4. CONCLUSION

In conclusion, one of the most crucial goals of pest control is the investigation of the season all occurrences of insect pests. This gives information on the peak activity and seasonal fluctuations of insect pests. The population of insect pests can be correlated with weather factors to learn more about how the weather affects the population of insect pests. The data gathered for this study is quite beneficial for managing insect pests.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

ACKNOWLEDGEMENTS

The authors thank Head of Department, Department of Entomology, RVSKVV, RAK College of Agriculture, Sehore for providing all necessary facilities and support for carrying out the research work.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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