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ENTOMOLOGY

Population dynamics of major insect pest of blackgram [*Vigna Mungo* (L.) Hepper] in relation to weather parameters

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Abstract

The experiment was conducted during the *kharif* season of 2014. Population dynamics of major insect pests of blackgram highly affected by weather parameters like; temperature (maximum and minimum), relative humidity (maximum and minimum), rainfall, and sunshine hours. The result revealed that the highest population of whiteflies 8.07 adult/cage/plant and jassids 1.43 nymph and adult/ cage/ plant was recorded during 37th standard week. The population of whitefly and jassid showed non significant negatively correlation with maximum and minimum temperature and sunshine hours while significant positively correlation with maximum humidity whereas non significant positively correlation showed with total rainfall and minimum humidity. The highest population of spotted pod borer 2.13 larvae/plant was record during 38th standard week and flower thrips 3.47 nymph and adult/10 flowers was record during 37th standard week and spotted pod borer population showed significant positively correlation with sunshine hours while flower thrips and spotted pod borer population showed non significant positively correlation with maximum and minimum relative humidity and non significant negatively correlation with maximum and minimum temperature whereas population of spotted pod borer showed non significant negatively correlation with total rainfall, while population of thrips showed non significant positively correlation with total rainfall while sunshine hours showed non significant negatively correlation.

Highlights

- The study showed weather are one of the most factor which regulate the density of insect pests in blackgram ecosystem.
- The peek activity of insect pests was recorded during 38th standard week of crop growth.
- All insect pests of study showed negative correlation with maximum temperature while positive correlation with maximum relative humidity and total rainfall.

Keywords: Weather parameters, population, major insect pest and blackgram

Vigna mungo (L.) Hepper] commonly known as urdbean, mash, mashkalai black mapte etc., belongs to the family leguminosae; sub family Papilionaceae. It has rich source of protein phosphoric acid and established itself as a highly valuable with ability to improve the soil by fixing atmospheric nitrogen. The area under urd bean cultivation in India is about 3.25 million ha with production of 1.94 million tonnes and productivity 463 kg/ha (Directorate of Economics and Statistics 2012-13). Although a marked increase in area and productivity of urdbean has been obtained at state as well as country level in past two decades but it is still very far from being satisfactory as compared to the productivity level of 8-12qt/ha in some other countries. Among the major problems known to limit the yields of these

pulses, incidence of insect-pests are main constrains. Chhabra and Kooner (1985) found 54.3 per cent of losses caused by insect pests complex in urdbean.

There is more number of constraints in low production in black gram in India, out of those insect pests play major role in low production .The black gram are attacked by various insect pests such as whitefly (*Bemisia tabaci*), jassid (*Empoasca* spp.), and green leaf hopper (*Nephotettix* spp.), Grasshopper (*Atractomorpha* spp.), blister beetle (*Mylabris pustulata*), leaf webber (*Grapholita critica*), grey weevil (*Myllocerus* spp.), tobacco caterpillar (*Spodoptera litura*), hairy caterpillar (*Spilosoma obliqua*), gram caterpillar (*Helicoverpa armigera*), and Epilachna beetle (*Epilachna* spp.) appeared as foliage feeders. Flower thrips (*Caliothrips* sp.) and leaf miner (*Chromatomyia horticola*) were classified as pollen feeder and tissue borer, respectively. Peak population was observed when the crop was at the full vegetative stage in the first week of October (*kharif*). Thrips incidence was recorded from flowering to pod filling stage (Chandra and Rajak , 2004).

Materials and Methods

Field experiment was carried out at Institute of Agriculture Research farm BHU Varanasi, during *kharif* season of 2014. Popular cultivar, Pant U-31 was used for the study in Randomized Block Design (RBD) replicated thrice. The crop was raised in six plots with 3 × 3 m^2 size of each plot. The plant to plant and row to row distance was maintained as 30 × 10 cm. The data related to weather parameter *viz*., temperature, rainfall, relative humidity, and daily sunshine hours throughout the period of investigation was collected from Meteorology laboratory of Banaras Hindu University.

Sampling Technique

Population of major insect pests of blackgram was recorded early in the morning using split cage/ plant at weekly intervals from 15 days after germination to harvesting on blackgram crop. Appropriate sampling techniques were adopted for estimating different insect pests population given below:

Insect Pest Complex (Whitefly, Jassid and Aphid)

The split cage method was used to record the population of sucking insect on five randomly tagged plants selected from each plot and counting them. The total number of adults and nymphs of whitefly and jassid were counted on entire tagged plants; whereas the aphid was counted from nymph and adult/10cm twigs. A hand-held magnifying lens (6×) with LED illumination was used to count the flower thrips in the field.

Flower Thrips (*Caliothrips indicus*)

The flower thrips was recorded and counted on ten randomly selected flowers/plant from each plot. All stages of pests (both nymphs and adults) were observed and counted with the help of magnifying glass.

Pod Borer (*Maruca vitrata*)

Pod borer population was recorded by counting the number of larva per plant taken from five randomly selected plants. The observations were taken at weekly interval.

Result and Discussion

Whitefly, *Bemisia tabaci* (Genn.)

Infestation of sucking insect pests observation recorded from blackgram was free access to natural insect pest infestation. The initial mean population of whitefly started from 34th standard week (3.87 whitefly/cage) and reached the peak in 37th standard week (8.07 whitefly /cage) (Table 1) and The population of whitefly showed non significant negatively correlation with maximum and minimum temperature and sunshine hours and significant positively correlation with maximum humidity while total rainfall and minimum humidity showed non significant positive correlated. These findings are in accordance with the findings of Yadav *et al.* (2015) and Singh and Kumar (2011).

Jassid, *Empoasca kerri* (Pruthi)

Empoasca kerri is an important pest of the blackgram crop. The pest marked its first appearance during 34th standard week with initial mean population of 0.87 jassids/ cage followed a gradual increase and attained peak population of 1.43 jassids/cage during 37th standard week (Table 1) and the population of jassid with temperature (maximum and minimum) and sunshine hours showed non significant negatively correlation and significant positively

correlation with maximum humidity while total rainfall and minimum humidity was non-significant positively correlation (Table 2). These findings are in accordance with the findings of Nayak *et al*. (2004) and Yadav *et al*. (2015).

Aphid, *Aphis craccivora* (Koch)

The aphid was noticed for the first time during 34th standard week with scanty population of 5.40 aphids /10cm twigs/plant followed a gradual increase and highest population of 17.00 aphids/10cm twigs/ plant was recorded during 37th standard week. Population of *Aphis craccivora* showed significant negatively correlation with maximum temperature and significant positively correlation with maximum relative humidity while non significant negatively correlation with minimum temperature and sunshine hours and non significant positively correlation with minimum relative humidity and total rainfall. (Vikrant *et al*. (2013) and (Swaminathan *et al.* (2007).

Flower thrips, C*aliothrips indicus* (Begnall)

The incidence of this pest commenced after flowering of the blackgram crop. The infestation of thrips started from 36th standard week with mean population of 2.83 nymph and adult/10 flowers and reached the peak population in 37th standard week with 3.27 nymph and adult/10 flowers. The maximum and minimum temperature and sunshine hours showed non significant negatively correlation, while maximum and minimum relative humidity and total rainfall showed non significant positive correlation with population of flower thrips on blackgram crop. Our report was findings accordance to Chandra and Rajak, (2004), Vikrant *et al*. (2013) and Khan *et al*. (2011).

Spotted pod borer, *Maruca vitrata* (Gey.)

The observed data revealed that the population of spotted pod borer was ranging from 0.47 to 2.13 larvae per plant during *kharif* season. The pest population of spotted pod borer marked its first notice during 36th standard week with population of pod borer 0.47 larva /plant. The population gradually increased with peak population of 2.13 larva /plant in 38th standard week. Its population remained in the field up to 39th standard week and attained lowest population of 1.53 larva/plant. The population of spotted pod borer was found significant positively correlation with sunshine hours while non significant positively correlation with maximum and minimum relative humidity and non significant negatively correlation with maximum and minimum temperature and total rainfall (Umbarkar *et al.* 2010).

Conclusion

Study of population dynamics of insect pests is one of the most important objective of pest management. Population dynamics provides the data of seasonal fluctuation and peek activity of insect pests. Correlation study of insect pests with pests population also provides information about weather influence on insect pest population. The information collected in this study is useful in insect pest management.

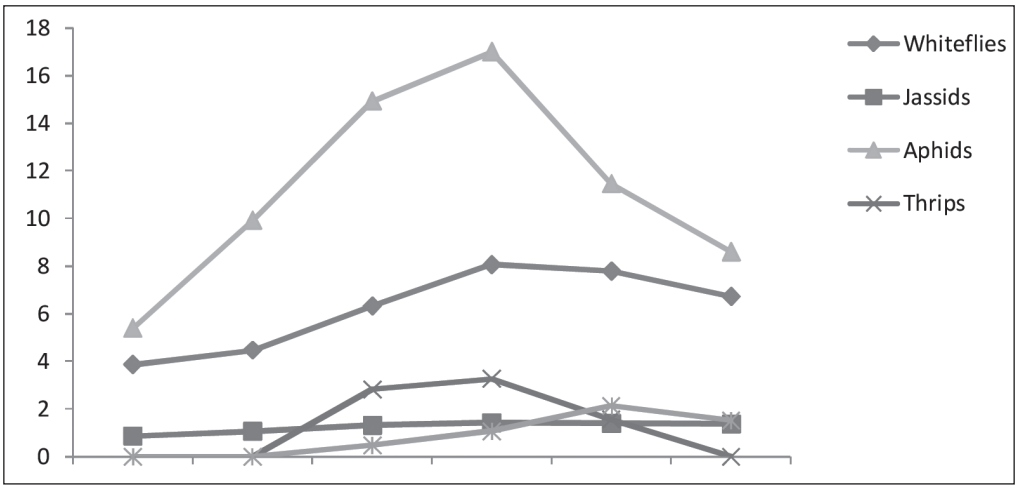

Fig. 1 : Population dynamics of insect pests of blackgram during Kharif 2014

Table 1: Population dynamics of major insect pests of blackgram (*Vigna mungo* (L.) Hepper) during kharif season of 2014

Dates of Observation (Standard Week)	Max. Temperature (°C)	Min. Temperature (°C)	Max. Relative Humidity (%)	Min. Relative Humidity (%)	Total Rainfall (MM)	Sunshine hours	Mean No. of insect pests				
							Whiteflie/ plant/ cage	Jassids/ plant/ cage	Aphid /plant	Thrips/10 flower	Pod borer larvae/ plant
34 (17 Aug-23)	35.1	27.5	77	60	14	6.7	3.87	0.87	5.40	0.00	0.00
35 (24 Aug-30)	33	27.1	84	71	6.5	5.3	4.47	1.07	9.93	0.00	0.00
36 (31 Aug-06)	32.7	26.4	85	69	34.9	6	6.33	1.33	14.93	2.83	0.47
37 (07 Sept-13)	31.9	25.8	91	80	11	4	8.07	1.43	17.00	3.27	1.07
38 (14 Sept-20)	33.3	26	87	72	13.7	5.2	7.80	1.40	11.47	1.57	2.13
39 (21 Sept-27)	33.4	24.3	85	56	2.1	9.3	6.73	1.37	8.60	0.00	1.53

Correlation coefficient of insect pests with weather parameters

Abiotic factor	Whitefly	Jassid	Aphid	Thrips	Pod borer
Coefficient of correlation (r) for population and atm. max. temperature	-0.69179	-0.77471	-0.91982**	-0.72055	-0.277
Coefficient of correlation (r) for population and atm. min. temperature	-0.68572	-0.76109	-0.22486	-0.10929	-0.73499
Coefficient of correlation (r) for population and max. relative humidity	0.883921*	0.894718*	0.856384*	0.696513	0.581601
Coefficient of correlation (r) for population and min. relative humidity	0.481395	0.405804	0.805056	0.737778	0.090293
Coefficient of correlation (r) for population and total rainfall	0.034648	0.087364	0.420707	0.598529	-0.21933
Coefficient of correlation (r) for population and sunshine	-0.23569	-0.11611	-0.61362	-0.61666	0.100089**

*correlation is significant at 0.05 level **correlation is significant at 0.01 levels

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