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Population Dynamics of Major Insect Pests and their Natural Enemies on Black Gram, *Vigna mungo* (Linn.) Hepper

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Authors' contributions

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

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ABSTRACT

Insect pest populations are greatly influenced by abiotic factors, particularly temperature, relative humidity, and rainfall. Meteorological variables play a significant role in the seasonal dynamics of pest outbreaks, affecting their development, survival, and behavior. Previous studies have highlighted the strong correlations between environmental factors and pest populations, suggesting that climate change may intensify pest pressure on crops. An experiment was conducted at Adhartal farm, Integrated Farming System unit, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur during *Kharif* season 2022-23. Peak period of whitefly, jassid, Ladybird beetle, Spider, Dragonfly and damselfly recorded on 41st SW (*i.e.,* 2nd week of October), 40th SW (*i.e.,* 1st week of October), 37th SW (*i.e.,* 3rd week of September), 45th SW (*i.e.* 2nd week of November), 44th SW (*i.e.,* 1st week of November) and 40th SW (*i.e.,* 2nd week of October). YMV was recorded maximum during 47th SW (*i.e.,* 4th week of November). Sunshine and rainfall had positive and negative impact on spider population, respectively. First incidence of dragonfly was observed on 4 DOC and was available on the crop for about 101 days i.e., upto 104 DOC and attained one peak i.e., at 84 DOC. First incidence of damselfly was observed on 4 DOC and was available on the crop for about 101 days i.e., upto 104 DOC and attained one peak i.e., at 52 DOC. First incidence of YMV infection was observed on 32 DOC and was available on the crop for about 73 days i.e., upto 104DOC and attained one peak i.e., at 104DOC. It is imperative to identify natural predators and parasites, assess the degree of predation and parasitization, analyze abiotic factors conducive to their proliferation, and pinpoint safe biopesticides and biodynamics.

Keywords: Black gram; spider; dragonfly; damselfly;natural enemies.

1. INTRODUCTION

"Blackgram, *Vigna mungo* (Linn.) Hepper, also known as urdbean, mash, mungobean, mashkalai and black mapte *etc.* and belongs to the family Leguminaceae, sub family Papilionaceae In India after chickpea and pigeonpea, black gram is the third most important pulse crop due to its high nutritional value and is popularly known as "poor man's meat" and "rich man's vegetable". Black gram is a rich source of protein (25%), carbohydrate (60%), fat (1.3%) and phosphoric acid" (Jayaramasoundari, 2024). It is consumed in the form of "*Dal*". "Generally it is the chief constituent of papad, *idli* and *dosa*. It is grown in many cropping systems, as mixed and intercrop, in addition to sole cropping, which contributes to its popularity. It is used as nutritive fodder and also used as green manuring crop. Besides these, it fixes atmospheric nitrogen into the soil and improves the soil fertility. India is the largest producer as well as consumer of black gram. It accounts for about 13% of India's total pulse production. The major black gram producing states in India are Madhya Pradesh, Rajasthan, Uttar Pradesh, Tamil Nadu, Andhra Pradesh and Maharashtra. During 2021-22, Madhya Pradesh ranked 1st both in area (17.26 lakh ha) and production (8.61 lakh tonnes) with productivity of 500 kg/ha" (Anonymous, 2022). "Among them the sucking pest complex includes, whitefly (*Bemisia tabaci* Gennadius), Aphid (*Aphis craccivora* Koch), Jassid (*Empoasca* spp.) and green leaf hopper (*Nephotettix* spp. Stal), while Grasshopper (*Atractomorpha* spp. Saussure), Leaf webber (*Grapholita critica* Meyr), Grey weevil (*Myllocerus* spp. Marshall), Tobacco caterpillar (*Spodoptera litura* Fabricius), Bihar hairy caterpillar (*Spilosoma obliqua* Walker), Leaf miner (*Chromatomyia horticola* Goureau) and Epilachna beetle (*Epilachna* spp.) as foliage feeders" (Kundu *et al*., 2021; Gailce Leo Justin et al., 2015; Maneesha *et al.,* 2025[a,b]). Therefore, keeping in mind the above facts, the current research work was undertaken on the population dynamics of arthropods on black gram [*Vigna mungo (L.)*].

2. MATERIALS AND METHODS

Jabalpur, known as "The Marble City," is situated in the central region of Madhya Pradesh, positioned between 220 49' and 280 8' North latitude and 780 21' and 800 58' East longitude, at an elevation of 411.78 m above mean sea level. Jabalpur is part of the agro-climatic area of Kymore Plateau and Satpura Hills and is located in the rice-wheat cultivation zone of the state. The area's climate is generally semi-humid and subtropical. Temperature extremes range from a minimum of 20°C in December and January to a maximum of 45°C in May and June. The typical yearly precipitation varies from 1000 to 1500 mm, predominantly falling from mid-June to the first week of October, with sporadic light showers occurring during the winter months.

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"The black gram was sown on 25th August 2022 with T9 variety, spacing was row to row 30cm and plant to plant 10cm. Observations of various arthropods were recorded twice in a standard week (SW) on randomly selected 25 plants, which were initiated immediately after germination and were continued till crop maturity" (Garg and Patel, 2018). "Jassids (nymph and adult) population were recorded on two leaves each from upper, middle and lower canopy of the plant" (Kundu *et al*, 2021). "Adult whitefly per plant was counted with the help of cage (Marabi *et al*, 2017). Population of beetles and spiders were counted on per plant basis" (Sujatha and Bharpoda, 2017). "Count of adult dragonflies and damselflies were made by sweeping method with the help of hand net" (Moses *et al*, 2019). "A record of Yellow mosaic virus infested plants were also maintained which were carried out twice in a SMW and the infected plants were tagged during each observation" (Kulkarni *et al.*, 2019).

Simultaneously, a weekly record of meteorological data *viz.,* temperature, relative humidity, rainfall, sunshine hours, evaporation, vapour pressure and wind speedwere maintained for the entire cropping season which was obtained from the meteorological observatory located at College of Agricultural Engineering, JNKVV, Jabalpur.The influence of different meteorological parameters on arthropod population was studied by graphical superimposition technique.

2.1 Statistical Analysis

2.1.1 Correlation and regression

"Correlation and regression between independent variables (abiotic factors) and dependent variable *i.e.* insect population were computed" by using the formula as suggested by Snedecor and Cochran (1967).

$$\text{Corrélation 'r' =n } \frac{\sum xy - \frac{\sum X \sum y}{n}}{\sqrt{\frac{\{\sum X^2 - (\sum X)^2\}}{n}\frac{\{\sum y^2 - (\sum y)^2\}}{n}}}$$

Where,

r = Correlation coefficient
∑xy = Sum of product of both variables x and y
∑x = Sum of variable x
∑y = Sum of variable y
$\sum x^2$ = Sum of square of variable x
$\sum y^2$ = Sum of square of variable y
n = Number of observations

2.1.2 Test of significance of correlation coefficient 'r'

For testing the significance of the correlations, they were compared with the table value at (n-2) degree of freedom at 5% and 1% significant level.

$$t=\frac{r}{\sqrt{1-r^2}}\sqrt{n-2}$$

Where,

t = Calculated 't ' value
r = Correlation coefficient
n = Number of observations

2.1.3 Regression

$$\hat{Y} = a + bx\ (R^2)$$

Where,

a = Intercept
b = Regression coefficient
R^2 = Coefficient of determination

3. RESULTS AND DISCUSSION

3.1 Whitefly, *Bemisia tabaci*

First appearance of whitefly was recorded in the 4th week of August (34th SW) and the population persisted to 47th SMW i.e. till harvest. The present findings are partially in accordance with the findings of Singh *et al.,* (2019) and Meena

(2021), as they elucidated "its first incidence during 1st week of July, 5th week of July, 1st week of August, respectively. Correlation studies indicated that sunshine and rainfall showed significant positive and negative impact on whitefly population, respectively". This finding is consistent with those of Singh *et al.* (2019) and Meena (2021) as they reported that "rainfall exhibited significant negative influence on the pest population". The correlation studies indicated that whitefly population showed significant positive and negative correlation with sunshine hours (r = 0.55) and rainfall (r= -0.52), respectively. The regression equations being: Y= 1.00 + 0.38x (R^2= 0.30) and Y= 3.90 - 0.01x (R^2= 0.22). The above equations indicates that with every unit increase in the sunshine hours and rainfall, there was an increase of 0.30 and decrease of 0.22 adult whitefly population / plant, respectively. Further, correlation analysis revealed that the whitefly population showed positive correlation with maximum temperature and evaporation (r = 0.26 and 0.22, respectively) and negative correlation with minimum temperature, morning and evening relative humidity, wind speed, morning and evening vapour pressure and rainy days (r =-0.13, -0.17, -0.26, -0.47, -0.18, -0.18 and -0.29, respectively), but were found to be non-significant.

3.2 Jassid, *Empoasca kerri*

First appearance of jassid was recorded in the 4th week of August (34th SW) and was available on the crop upto 47th SW (*i.e.* 4th week of November). Similar findings have been documented by Meena (2021) that the fist incidence of the pest was observed during the last week of August. These results are also congruent with Mohapatra *et al.,* (2018), who elucidated that the pest attained peak population during last week of September. The present observation is more akin to Meena (2021) as they also reported positive influence of minimum temperature on the pest population. Correlation studies indicated that the jassid population showed significant positive correlation with sunshine hours (r = 0.58). The regression equation being: Y= 0.35 + 0.45x (R^2= 0.34). The above equation indicated that with every unit increase in the sunshine hours there was an increase of 0.34 jassid population / 2 leaves. Correlation analysis further revealed that the jassid population showed positive correlation with maximum temperature and evaporation (r = 0.24 and 0.21, respectively) and negative correlation with minimum temperature, rainfall, morning and evening humidity, wind speed morning and evening vapour pressure and rainy days (r =-0.14, -0.52, -0.17, -0.26, -0.47, -0.19, -0.18 and -0.38, respectively), but were found to be non-significant.

3.3 Ladybird Beetle Complex

Ladybird beetles (viz. *Coccinella septumpunctata; C. transversalis* and *Cheilomenes sexmaculata*) were first observed during 4th week of August (34th SW) and remained active till 47th SW (*i.e.* 4th week of November). Ladybird beetle population attained peak during 37th SW (*i.e.* 3rd week of September), when maximum and minimum temperatures were 30.5 and 24.2°C, respectively. These results are also congruent with Jat and Rana (2018) who elucidated that ladybird beetle population attained its peak at 37th SW. The present findings are partially in accordance with the findings of Mohapatra *et al.,* (2018) as they reported that the predators attained peak population during last week of September to 2nd week of October. In the present study, morning and evening relative humidity showed positive impact on ladybird beetle population, but found to be non-significant. The present findings deviates from the findings of Mohapatra *et al.,* (2018) as they reported that relative humidity showed significant negative correlation with the population of coccinellids on black gram. Correlation analysis revealed that the ladybird beetle population showed non-significant positive correlation with maximum and minimum temperature, sunshine, morning and evening relative humidity, wind speed, morning and evening vapour pressure, evaporation and rainy days (r = 0.39, 0.19, 0.14, 0.23, 0.17, 0.02, 0.17, 0.17, 0.28 and 0.14, respectively). Whereas, a negative association was observed between jassid population and rainfall (r = -0.24), but found to be non-significant.

3.4 Spider Complex

Spiders were first observed during 4th week of August (34th SW) and remained active till 47th SW (*i.e.* 4th week of November). Spider population peaked during 45th SW (*i.e.* 2nd week of November). Sunshine and rainfall exhibited significant positive and negative influence on spider population, respectively. There is also dearth of reports on spider in black gram. Spider population showed significant positive and negative correlation with sunshine hours (r = 0.61) and rainfall (r= -0.58), respectively. The

Table 1. Incidence of arthropods & YMV infection on black gram at Jabalpur during 2022-23

SW	Insect pests		Natural enemies				YMV (%)
	Adult Whitefly/ plant	Jassid/ 2 leaves	Adult / plant		Adult / sweep		
			Ladybird beetle	Spider	Dragonfly	Damselfly	
34	1.14	0.56	0.08	0.04	1.00	0.33	0
35	1.44	1.20	0.14	0.08	0.33	0.50	0
36	2.04	1.46	0.20	0.10	0.83	0.67	0.00
37	2.54	2.10	0.66	0.14	0.83	1.33	0.00
38	3.10	2.48	0.48	0.22	1.00	0.83	1.01
39	3.18	3.34	0.46	0.18	0.00	1.00	5.2
40	5.56	6.56	0.50	0.20	0.67	1.50	14.1
41	6.62	5.62	0.52	0.26	0.83	0.17	24.00
42	3.42	4.14	0.28	0.22	1.00	0.50	27.65
43	4.18	3.72	0.46	0.28	0.83	0.67	32.96
44	4.56	4.36	0.36	0.24	1.67	1.33	44.83
45	3.98	3.44	0.44	0.32	0.50	0.83	52.80
46	3.68	3.68	0.34	0.14	0.83	0.17	60.42
47	2.08	1.72	0.12	0.08	0.67	1.00	73.76
SE(d)	1.48	1.59	0.17	0.08	0.36	0.41	24.56
Mean	3.39	3.17	0.36	0.18	0.79	0.77	24.05

Table 2. Correlation of abiotic factors on arthropods and YMV infection on black gram

Weather Parameters	Adult Whitefly/ plant)	Adult Jassid / 2 leaves	Adult / plant		Adult /sweep		YMV infected plants (%)
			Ladybird beetle	Spider	Dragonfly	Damselfly	
N	14	14	14	14	14	14	10
Maximum Temperature (^{0}C)	0.26 NS	0.24 NS	0.39 NS	0.28 NS	-0.19 NS	0.11 NS	-0.67*
Minimum Temperature (^{0}C)	-0.13 NS	-0.14 NS	0.19 NS	-0.22 NS	-0.23 NS	0.03 NS	-0.95**
Sunshine (hrs)	0.55*	0.58*	0.14 NS	0.61*	0.22 NS	0.06 NS	0.57 NS
Rainfall (mm)	-0.52*	-0.52 NS	-0.24 NS	-0.58*	0.05 NS	-0.22 NS	-0.50 NS
Morning Relative humidity (%)	-0.17 NS	-0.17 NS	0.23 NS	-0.11 NS	-0.17 NS	0.13 NS	-0.88**
Evening Relative Humidity (%)	-0.26 NS	-0.26 NS	0.17 NS	-0.32 NS	-0.17 NS	0.09 NS	-0.91**
Wind Speed Km/hr)	-0.47 NS	-0.47 NS	0.02 NS	-0.49 NS	-0.06 NS	-0.11 NS	-0.84**
Morning Vapour Pressure (mm)	-0.18 NS	-0.19 NS	0.17 NS	-0.26 NS	-0.24 NS	0.04 NS	-0.94**
Evening Vapour Pressure (mm)	-0.18 NS	-0.18 NS	0.17 NS	-0.25 NS	-0.24 NS	0.09 NS	-0.94**
Evaporation (mm)	0.22 NS	0.21 NS	0.28 NS	0.02 NS	0.03 NS	-0.10 NS	-0.58NS
Rainy days (nos.)	-0.29 NS	-0.38 NS	0.14 NS	-0.24 NS	0.10 NS	-0.02 NS	-0.56NS

*N= no. of observations * Significant at 5%, ** Significant at 1%,*

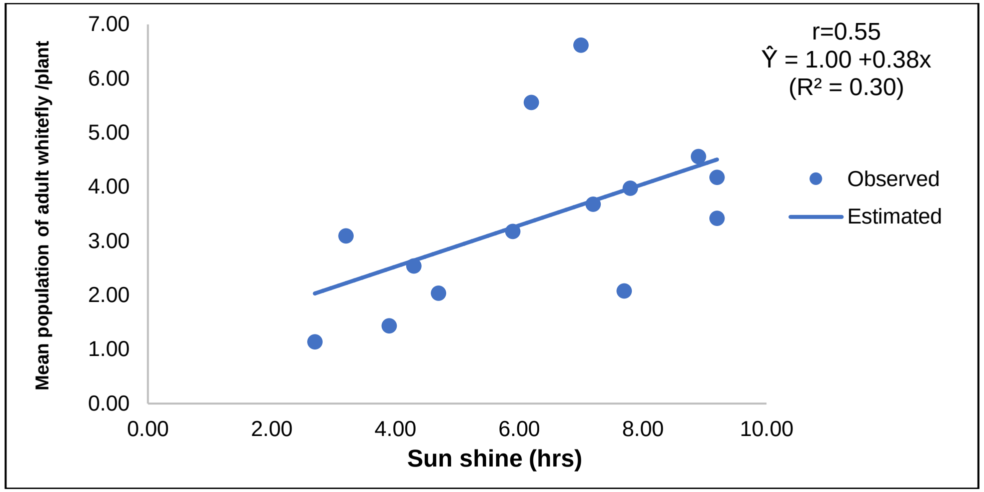

Fig. 1. Regression of sunshine on whitefly population

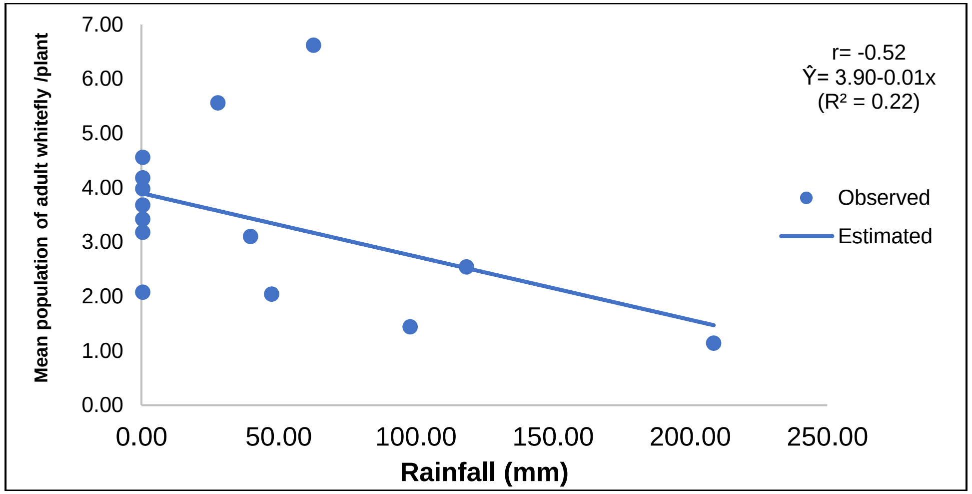

Fig. 2. Regression of rainfall on whitefly population

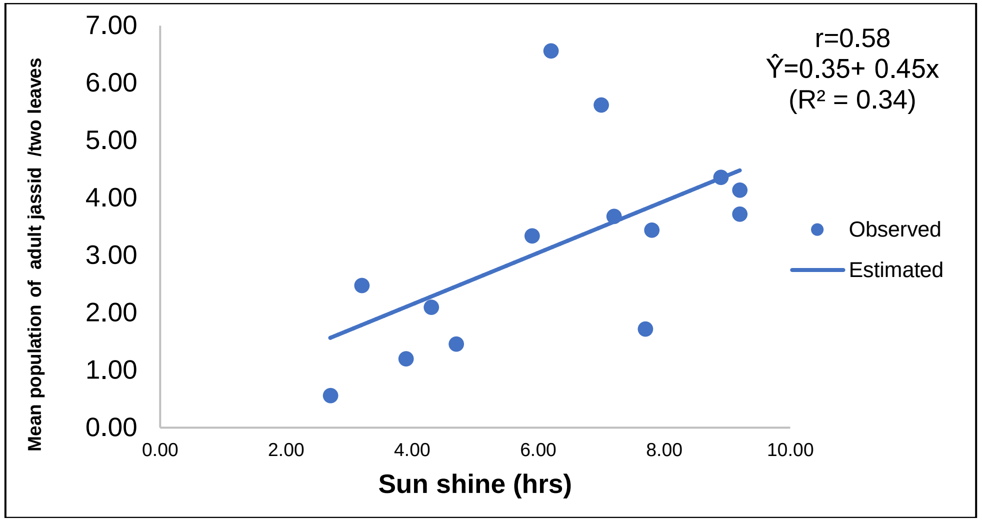

Fig. 3. Regression of sunshine on jassid population

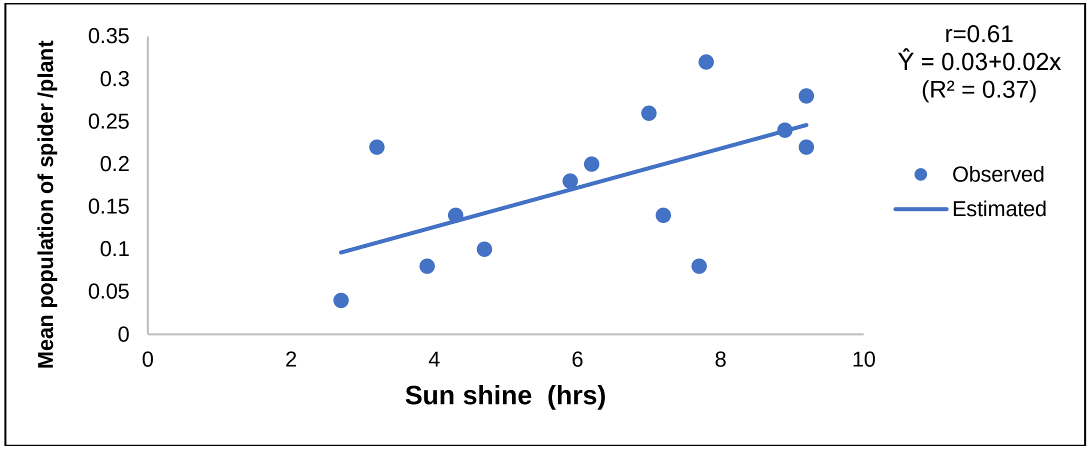

Fig. 4. Regression of sunshine on spider population

regression equations computed were: Y= 0.03 + 0.02x (R^2= 0.37); Y= 0.21 – 0.001x (R^2= 0.34). The above equations indicated that with every unit increase in the sunshine hours there was an increase of 0.37 spider / plant. While with every unit decrease in rainfall there was a decrease of 0.34 spider / plant. Correlation analysis further revealed that the spider population showed positive correlation with maximum temperature and evaporation (r = 0.28 and 0.02, respectively) and negative correlation with minimum temperature, morning and evening humidity, wind speed, morning and evening vapour pressure and rainy days (r =-0.22, -0.11, -0.32, -0.49, -0.26, -0.25 and -0.24, respectively), but were found to be non-significant.

3.5 Dragonfly

First appearance of dragonfly was observed during 4th week of August (34th SW) and remained active till 47 th SW (*i.e.* 4th week of November). Dragonfly population attained peak during 44th SW (i.e. 1st week of November), when maximum and minimum temperatures were 29.8 and 12.6°C, respectively. All the abiotic factors included in the study did not exhibit significant impact on the dragonfly population. No reports are available in the literature on the dragonfly in black gram. Correlation analysis revealed that the dragonfly population showed positive correlation with sunshine, rainfall, evaporation and rainy days (r = 0.22, 0.05, 0.03 and 0.10, respectively) and negative correlation with maximum and minimum temperature, morning and evening relative humidity, wind speed, morning and evening vapour pressure (r = -0.19, -0.23, -0.17, -0.17, -0.06, -0.24 and -0.24 respectively), but were found to be non-significant.

3.6 Damselfly

First appearance of damselfly was observed during 4th week of August (34th SW) and remained active till 47th SW (*i.e.* 4th week of November). Maximum population of damselfly was attained during 40th SW (i.e. 2nd week of October). All the abiotic factors included in the study did not exhibit significant impact on the damselfly population. However no information is available in the literature on dragonfly in black gram. Damselfly population showed exhibited positive correlation with maximum and minimum temperature, sunshine, morning and evening relative humidity, morning and evening vapour pressure (r= 0.11, 0.03, 0.06, 0.13, 0.09,0.04 and 0.09, respectively), whereas negative correlation with rainfall, wind speed, evaporation and rainy days (r = -0.22, -0.11, -0.10 and -0.02 respectively), but were found to be non-significant.

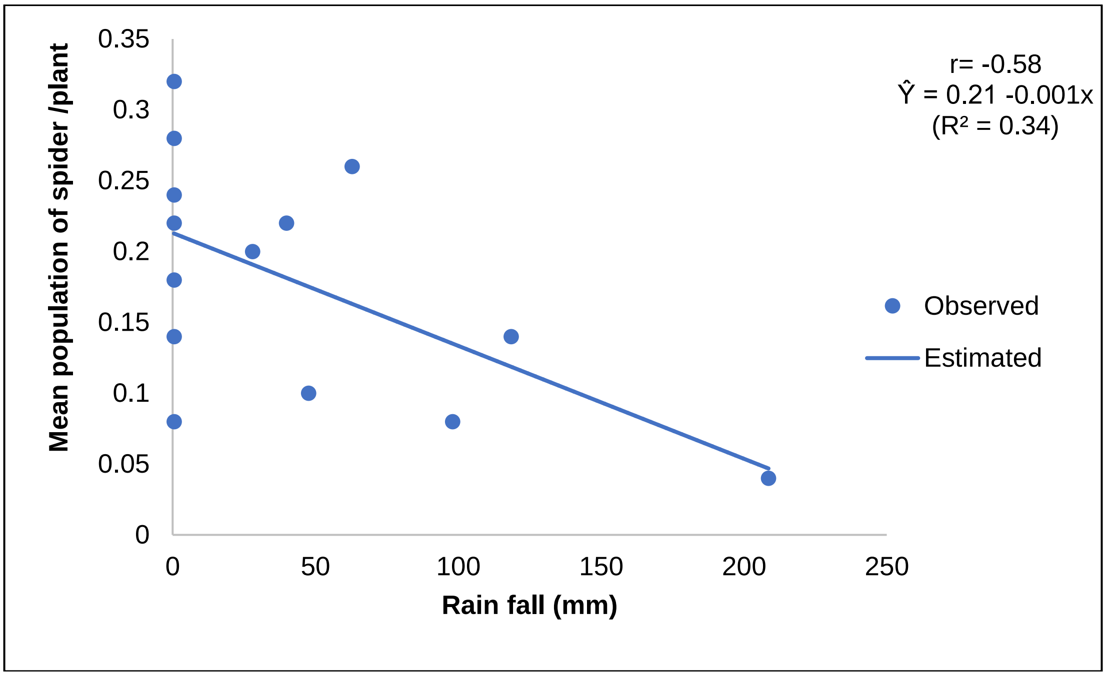

Fig. 5. Regression of rainfall on spider population

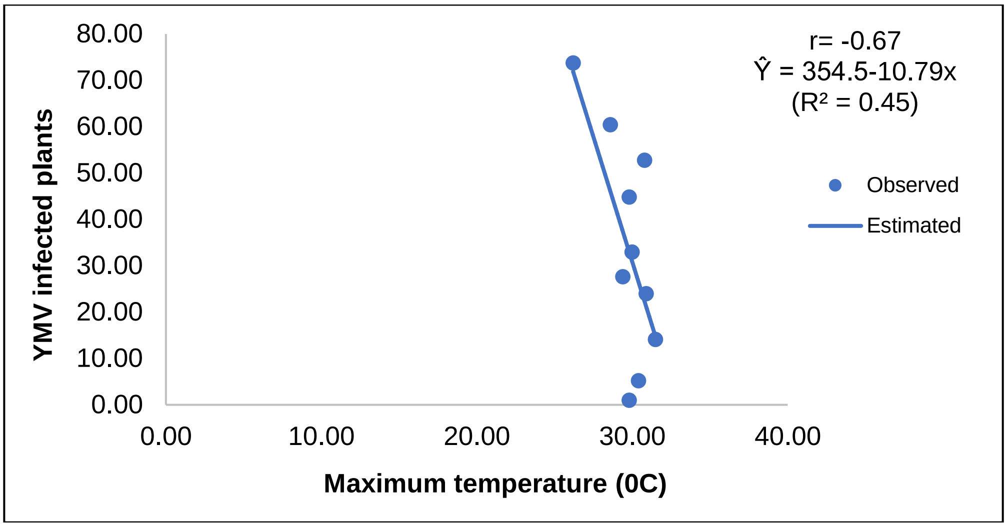

Fig. 6. Regression of maximum temperature on YMV infection

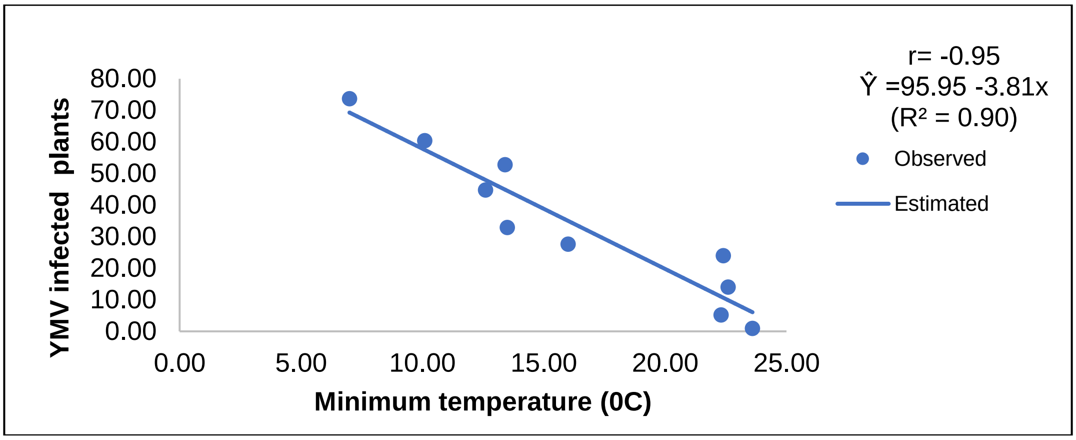

Fig. 7. Regression of minimum temperature on YMV infection

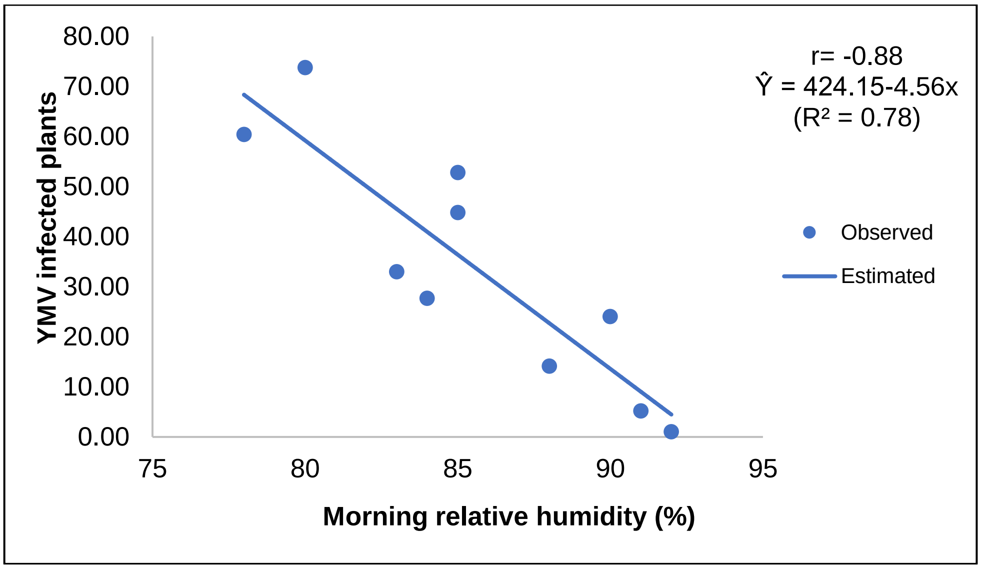

Fig. 8. Regression of morning relative humidity on YMV infection

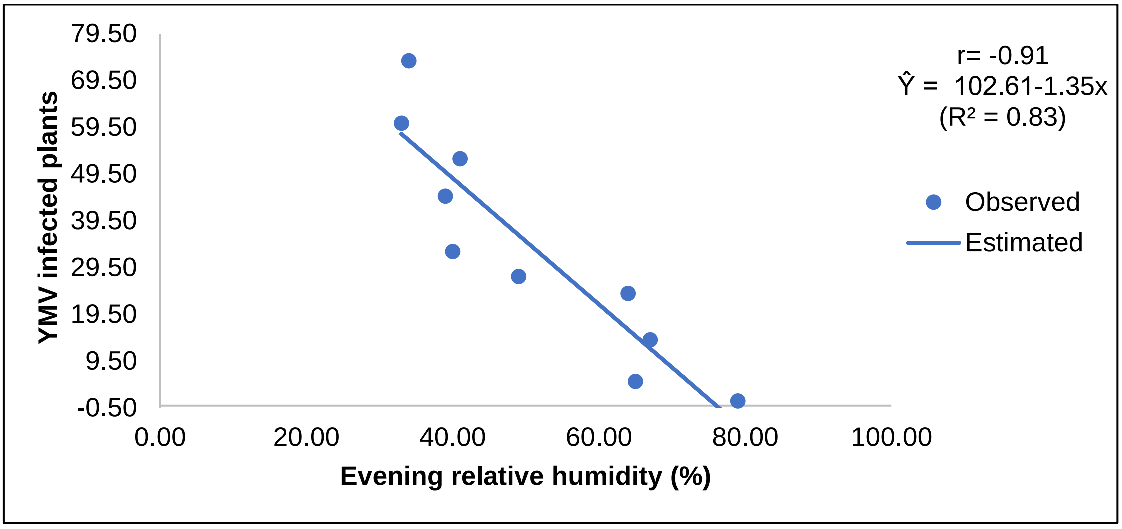

Fig. 9. Regression of evening relative humidity on YMV infection

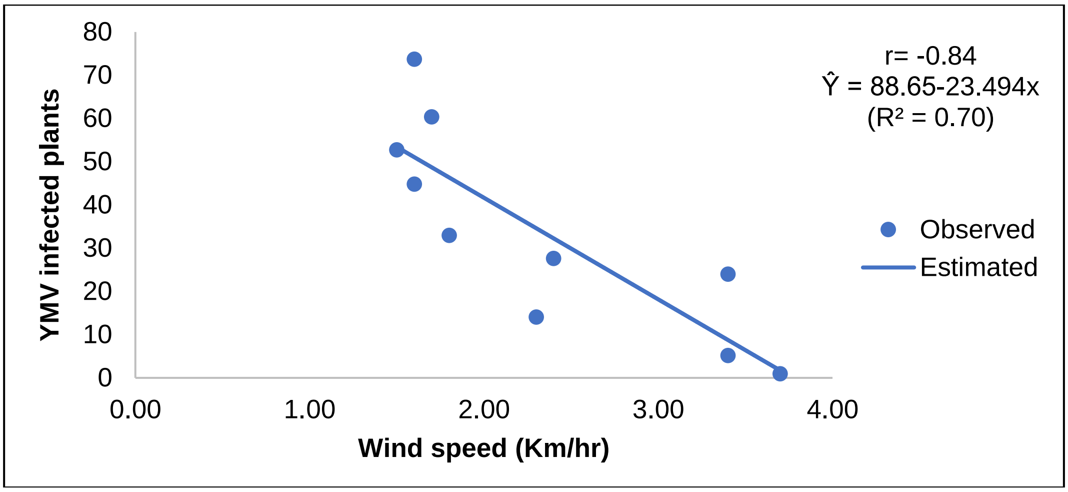

Fig. 10. Regression of wind speed on YMV infection

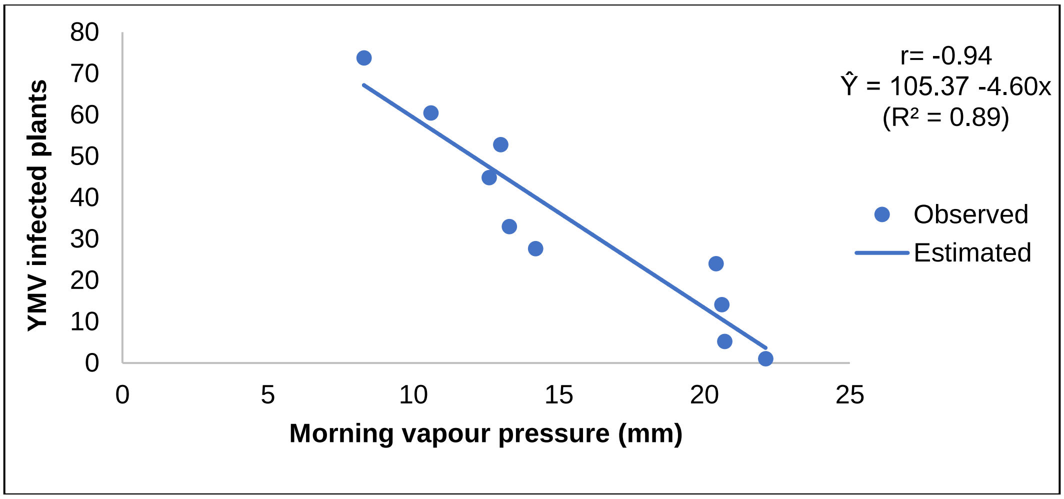

Fig. 11. Regression of morning vapour pressure on YMV infection

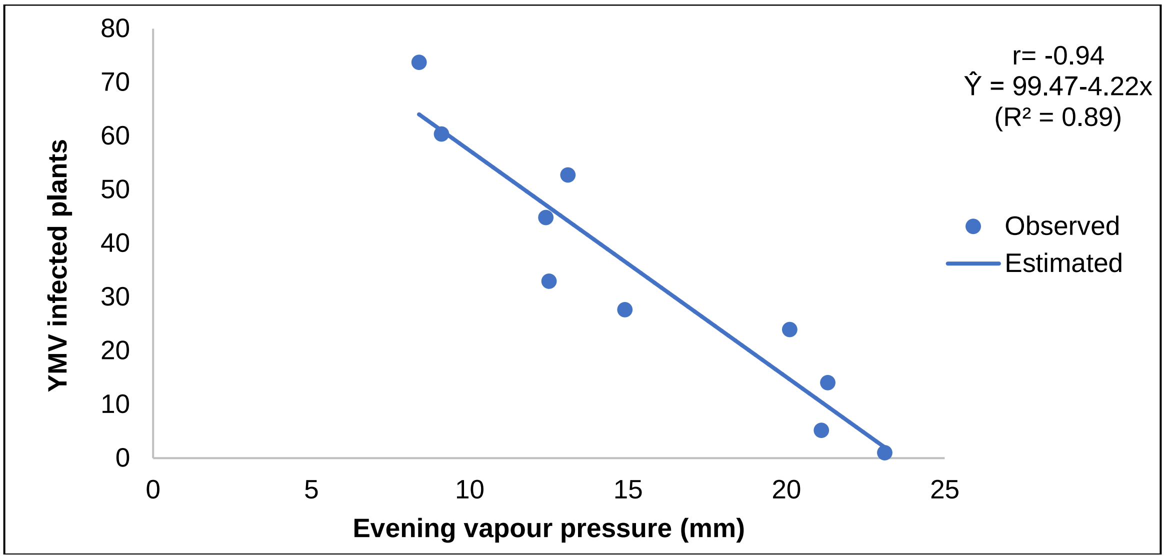

Fig. 12. Regression of evening vapour pressure (mm) on YMV infection

3.7 Infection of Yellow Mosaic Virus (YMV) in *Kharif* Black Gram

First appearance of YMV was recorded during 3rd week of September (38th SW) and was maximum during 47th SW (i.e. 4th week of November). Maximum and minimum temperature, morning and evening relative humidity, wind speed, morning and evening vapour pressure showed significant negative impact on YMV infection. There is dearth of reports on YMV in black gram. YMV infection showed significant negative correlation with maximum and minimum temperature, morning and evening relative humidity, wind speed, morning and evening vapour pressure (r= -0.67, -0.95, -0.88, -0.91, -0.84, -0.94 and -0.94, respectively). The regression equations computed were: Y= 354.50–10.79x (R^2= 0.45); Y= 95.95–3.81x (R^2= 0.90); Y= 424.15–4.56x (R^2= 0.78);Y= 102.61–1.35x (R^2= 0.83); Y= 88.65- 23.49x (R^2= 0.70); Y= 105.37–4.60x (R^2= 0.89) and Y= 99.47- 4.22x (R^2= 0.89). From the above equations it may be expressed that with every unit increase in maximum and minimum temperature, morning and evening humidity, wind speed, morning and evening vapour pressure, there was a decrease of 10.79 ,3.81, 4.56, 1.35, 23.49, 4.60 and 4.22% YMV infection, respectively.

Whereas it was positively correlated with sunshine hours (r=0.57) and negatively correlated with rainfall, evaporation and rainy days (r = -0.50, -0.58 and - 0.56, respectively), but were found to be non-significant.

4. CONCLUSION

First incidence of whitefly was observed on 4 days old crop (DOC) and was available on the crop for about 101 days *i.e.,* up to 104 DOC and attained one peak *i.e.,* at 56 DOC. Sunshine and rainfall had positive and negative impact on whitefly population, respectively. First incidence of jassid was observed on 4 DOC and was available on the crop for about 101 days *i.e.,* upto 104 DOC and attained one peak *i.e.,* at 48 DOC. Sunshine had positive influence on jassid population. First incidence of predatory lady bird beetles (LBB) was observed on 4 DOC and was available on the crop for about 101 days *i.e.,* upto 104 DOC and attained one peak *i.e.,* at 24 DOC. First incidence of predatory spider was observed on 4 DOC and was available on the crop for about 101 days *i.e.,* upto 104 DOC and attained one peak *i.e.,* at 92 DOC. Sunshine and rainfall had positive and negative impact on spider population, respectively. First incidence of dragonfly was observed on 4 DOC and was available on the crop for about 101 days *i.e.,* upto 104 DOC and attained one peak *i.e.,* at 84 DOC. First incidence of damselfly was observed on 4 DOC and was available on the crop for about 101 days *i.e.,* upto 104 DOC and attained one peak *i.e.,* at 52 DOC. First incidence of YMV infection was observed on 32 DOC and was available on the crop for about 73 days *i.e.,* upto 104DOC and attained one peak *i.e.,* at 104DOC.

5. SUGGESTIONS FOR FURTHER WORK

The validation of conclusive outcomes necessitates rigorous testing of biopesticides and biodynamics in both in-vitro and in-vivo settings, contributing to the formulation of effective pest management strategies. It is imperative to identify natural predators and parasites, assess the degree of predation and parasitization, analyze abiotic factors conducive to their proliferation, and pinpoint safe biopesticides and biodynamics. These steps are critical and align with contemporary needs in pest management.

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 the writing or editing of this manuscript.

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COMPETING INTERESTS

Authors have declared that they have no known competing financial interests OR non-financial interests or personal relationships that could have appeared to influence the work reported in this paper.

REFERENCES

Anonymous. (2022). *Annual progress report*. Directorate of Pulses Development, Bhopal, Government of India. http://dpd.gov.in.

Gailce Leo Justin, C., Anandhi, P., & Jawahar, D. (2015). Management of major insect pests of black gram under dryland conditions. *Journal of Entomology and Zoology Studies, 3*(1), 115–121.

Garg, V. K., & Patel, Y. (2018). Influence of weather parameters on population dynamics of whitefly in kharif legumes. *Annals of Plant and Soil Research, 20*(4), 371–374.

Jat, S. K., & Rana, B. S. (2018). Occurrence of common aphidophagous natural enemies on black gram. *Journal of Entomology and Zoology Studies, 6*(2), 2716–2719.

Jayaramasoundari, R. (2024). Enhancing Productivity and Profitability of Black Gram (Vigna mungo) Through Cluster Front Line Demonstrations. Indian Journal of Agricultural Research, 58(5), 806-810.

Kulkarni, S., Shobharani, M., & Raja. (2019). Integrated management of yellow mosaic disease (YMD) of mung bean. *International Journal of Current Microbiology and Applied Science, 8*(8), 859–864.

Kundu, B., Chaudhuri, N., Dhar, T., & Ghosh, J. (2021). Population dynamics of important insect pests on black gram in relation to weather parameters during pre-kharif season in terai of West Bengal, India. *Journal of Entomology and Zoology Studies, 9*(1), 1131–1135.

Maneesha, Ghugal, S. G., Sunil, T., Tare, S., Sapre, B., Dwarka, Shukla, S., Sinha, P., & Das, S. B. (2025a). Bio-efficacy of biodynamic applications against sucking pest of black gram (*Vigna mungo* L.) and their impact on natural enemies. *International Journal of Plant & Soil Science, 37*(8), 721–729.

Maneesha, Shukla, S., Panthi, N., Patel, S., Tare, S., Sinha, P., Dwarka, & Das, S. B. (2025b). Study the succession of different arthropods on black gram [*Vigna mungo* (Linn.) Hepper]. *Journal of Scientific Research and Reports, 31*(8), 804–815.

Marabi, R. S., Das, S. B., Bhowmick, A. K., Pachori, R., Vibha, & Sharma, H. L. (2017). Seasonal population dynamics of whitefly in soybean. *Journal of Entomology and Zoology Studies, 5*(2), 169–173.

Meena, S. M. (2021). Population dynamics of whitefly (*Bemisia tabaci*) and jassid (*Empoasca kerri*) infesting black gram [*Vigna mungo* (L.) Hepper]. *Journal of Research and Chemistry, 2*(1), 1–3.

Mohapatra, M. M., Singh, D. C., Gupta, P. K., Chandra, U., Patro, B., & Mohapatra, S. D. (2018). Seasonal incidence of major insect-pests on black gram, *Vigna mungo* (Linn.) and its correlation with weather parameters. *International Journal of Current Microbiology and Applied Sciences, 7*(6), 3886–3890.

Moses, S., Kishor, D. R., Misra, A. K., & Ahmad, M. A. (2019). Monitoring of important predators associated with major insect pests of rice during kharif season 2017 at Pusa, Samastipur. *Journal of Entomology and Zoology Studies, 7*(1), 476–478.

Singh, R. I., Kumar, A., Khan, M. A., Tiwari, R. K., & Panday, A. K. (2019). Insect pests of black gram and their management in Vindhya Region. *Legume Research: An International Journal, 49*(1), 246–251.

Snedecor, G. W., & Cochran, W. G. (1967). *Statistical method* (pp. 381–418). Oxford and IBH Publishing Company.

Sujatha, B., & Bharpoda, T. M. (2017). Succession of major insect pests and impact of abiotic factors in green gram. *Agric. Update, 12*(10), 2788–2794.

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