*Original Research Article*

# STUDY ON POPULATION DYNAMICS OF INSECT PESTS OF COWPEA IN GIRD REGION OF MADHYA PRADESH


## ABSTRACT

A field experiment conducted at Research Farm, Rajmata Vijyaraje Scindia Krishi Vishwa Vidyalaya, Gwalior, Madhya Pradesh during *Kharif* season 2022-23. To study on the population dynamics of insect pests of cowpea during *Kharif*, 2022, incidence of insect pests was observed on *kharif*cowpea, namely aphid, *Aphis craccivora* (Koch) thrips, *Megleurothripsdistalis* (karny), Jassid, *Empoascakerri*(Pruthi) and whiteflies, *Acaudaleyrodesrachipora* (Singh). Results revealed that the The*A. craccivora*population first become apparent in third week of August (33$^{th}$ SMW) with 7.43. The activeness of *A. craccivora*per plant (19.89) was at peak level was recorded in the 37$^{th}$ standard week. The infestation of *E. kerri*and*A. rachipora*commenced in the second week of August (32$^{th}$ SMW) with a mean population of 0.91 *E. kerri*per plant and 1.89 *A. rachipora*per plant. At second week of September (36$^{th}$ SMW), mean value of *E. kerri*and *A. rachipora*population was reached their highest activity with 10.24 *E. kerri* and 5.45 *A. rachipora*per plant. *M. distalis* population appeared in first time in the fourth week of August (34$^{th}$ SMW) with 2.72 *M. distalis* per plant. The peak activity of *M. distalis* (6.89) was recorded in the 37$^{th}$ standard week, or second week of September. Population of *A. rachipora*and *E. Kerri showed* highly significant positive correlation with minimum temperature (r= 0.738*) and (r= 0.582*), and *A. rachipora*showed the positive correlation withmaximum temperature (r= 0.580*) respectively. However, the population of *A. craccivora*and *M. distalis*showed significant negative correlation with evening relative humidity (r= -0.519*) and (r= -0.582*).



**Keywords:** Cowpea, *A. craccivora*, *M. distalis*, *A. rachipora*, *E. kerri*, sucking pest


## Introduction

One of the main tropical pulse crops, cowpea [*Vigna unguiculata* (Linn.) Walp] is also known as southern pea, black eyed bean, chala or choli, chavli and lobia. It is a member of the leguminaceae family. It may be utilised as a crop for green manure, a vegetable, a green legume,

and fodder (Kumar *et al.*, 2017). Cowpea seeds provide a rich source of proteins and calories, as well as minerals and vitamins. A seed can consist of 23-25% protein, 50-67% carbohydrates, 8-9% moisture and it has very low 3.99% fat content (Rangel *et al*., 2003). Cowpea has high social and economic values as well as cultural, nutritional and medicinal importance. It is an efficient nitrogen fixing, heat and drought-tolerant legume (Bittenbender, 1990). In many parts of eastern and southern Africa and also Asia, Cowpea is used as a leafy vegetable and the leaf of this plant is the major final product (Saidia *et al*., 2007). In India, pulses occupied nearly 29.99 million hectares area with a production of 25.23 million tonnes during the year 2018-19 (Anonymous, 2018). It is grown all over India, more particularly in the central and Peninsular regions. Maharashtra, Andhra Pradesh, Karnataka, Tamil Nadu, Madhya Pradesh and Rajasthan are the principle states of Cowpea cultivation. Cowpea is infected with 21 insect pests, including aphids, *Aphis craccivora* (Koch); leaf hoppers, *Empoascakerri* (Pruthi); thrips, *Megaleurothrips distalis* (Karny); tobacco caterpillar, *Spodoptera litura* (Fab.), and spotted pod borer, *Maruca vitrata* (Geyer) which cause 65-100 percent losses. The study aimed in order to find out the correlation of aphid, *A. craccivora,*jassid, *E. fabae*, whitefly, *B. tabaci* and its natural enemies in Cowpea ecosystem with the abiotic parameters. Suitable understanding of the seasonal incidence of sucking insect pests is important due to variation in the weather conditions and changing sucking insect pest scenario on the cowpea.

## MATERIALS AND METHODS

The experiment was carried out at the research farm, College of Agriculture, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior, Madhya Pradesh, India. Randomized Block Design (RBD) with 3 replications was deployed during *Kharif*, 2021. The plot size was5.0 m X 3.6 m. For recording observations of insect-pest, ten plants were randomly selected and tagged in each net plot area. The observations on the insect-pest population were recorded froma marked area in three leaves (upper, middle and lower) of the same selected plants. The observations were recorded at weekly intervals starting from the second week after sowing till to the harvest of the crop. The whole experimental plot was kept free from any acaricides.The data was collected as the mean number of insect per leaf area per plant and were correlated with meteorological parameters. Then experimental data were subjected to statistical analysis using analysis of variance (ANOVA).

## RESULTS AND DISCUSSION

The seasonal incidence of sucking insect-pest *viz*. aphid [Aphis craccivora (Kock)], Jassid [*Empoascakerri* (Pruthi)], whitefly [*Bemisiatabaci* (Genn.)], and thrips [*Megleurothripsditalis* (Karny)] associated with cowpea crop and their simple correlation with abiotic factor *viz*. mean atmospheric temperature, mean relative humidity and total rainfall during successive seasons of 2022 have been presented in the Table 2 & 3.

### Aphid, *Aphis craccivora*(Koch)

It is evident from the data presented in Table 2 that the resultsrevealed that the population of *A. craccivora*was first become apparent in third week of August (33th SMW) with 7.43 aphids per plant. The activeness of aphid per plant (19.89) was at peak level was recorded in the 37$^{th}$ standard week, or third week of September. The aphid population per plant increased to its peak level (18.89 aphids) at 32.20ºC maximum and 24.90ºC minimum temperature, 95.40 % morning and 72.00 % evening relative humidity, 60.00 mm rainfall and 2.00 evaporation, respectively. There was a significantly negative correlation (r=-0.519) between aphid incidence and evaporation at the 5% level. The results are supported by Soratur*et al.* (2017)pest population was showing positive correlation with high temperature and the population of predators and other associated insect was showing negative correlation with minimum temperature, relative humidity and rainfall. Previously Similar finding by Gami *et al.*, (2002), Prajapati *et al.* (2020) and Choudhary *et al.* (2021).

### Jassid,*Empoascakerri*(Pruthi)

The data recorded on Jassid during *Kharif*, 2022 presented in Table 2 indicated that the infestation of jassid commenced in the second week of August (32$^{th}$ SMW). In the 36$^{th}$ standard week or second week of September, a mean value of jassid population was reached their highest activity with 10.24 jassid per plant. According to the results, there is a substantial positive correlation between the incidence of jassid and the minimum temperature (r=+0.582) at a 5% level. The results are supported by Khattak *et al.* (2004),Shukla *et al*. (2009) observed whitefly as the minor pest based on recurrent occurrence.

### Thrips,*Megalurothrips distalis* (Karny)

The observations on thrips recorded during Kharif, 2022 are presented in Table 2revealed thatthe thrips population appeared in first time in the fourth week of August (34th SMW). The peak activity of thrips (6.89 thrips) was recorded in the 37th standard week, or second week of September. There is a significant negative correlation between incidence of thrips and evaporation (r=-0.582) at the 5% level. The results are supported by Sharma *et al*. (2008) found that thrips (*Megalurothrips dorsalis*) cause extensive losses, Shukla *et al*. (2009) observed thrips were designated as the major pest based on recurrent occurrence, Egho (2010) demonstrated that *MegalurothripssjostedtiTrybomwas* the commonest major insect-pests on cowpea based on population build-up and per cent incidence, Patel *et al.* (2010) also recorded the populations of *Megaleurothrips sp.* on cowpea.

**Whitefly,*Acaudaleyrodesrachipora*(Singh)**

The data presented in Table 1 revealed that the thrips population appeared in first time in the fourth week of August (34th SMW). The peak activity of thrips (6.89 thrips) was recorded in the 37th standard week, or second week of September. There is a significant negative correlation between incidence of thrips and evaporation (r=-0.582) at the 5% level. The results are supported by Shukla *et al*. (2009) observed thrips were designated as the major pest based on recurrent occurrence, Egho (2010) demonstrated that *MegalurothripssjostedtiTrybomwas* the commonest major insect-pests on cowpea based on population build-up and per cent incidence, Patel *et al.* (2010) also recorded the populations of *Megaleurothrips sp.* on cowpea.

## CONCLUSION

From the results of objective first it was concluded that correlation coefficient between aphid (*A. craccivora)* population and evaporation was found significantly negative (r= -0.519), positive correlation between the incidence of jassid (*E. kerri*) and the minimum temperature (r=+0.582), significantly positive correlation (r=+0.580) and (r=+0.738) between incidence of whiteflies (*A. rachipora*) with maximum and minimum temperature, respectively and significant negative correlation between incidence of thrips and evaporation (r=-0.582).

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**Table 1: Weekly meteorological observation during the study period (July, 2022 to Sept, 2022)**

| SMW | Week | AVT (°C) | | RH (%) | | Rainfall (mm) | Evaporation (mm) |
|---|---|---|---|---|---|---|---|
| | | Max. (°C) | Min. (°C) | Morning | Evening | | |
| 30 | 23 July -29 July | 32.20 | 26.10 | 91.10 | 76.20 | 3.40 | 3.10 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 31 | 30 July -05 Aug. | 33.40 | 26.60 | 88.80 | 58.50 | 27.00 | 3.00 |
| 32 | 06 Aug. -12 Aug. | 32.80 | 25.90 | 90.70 | 66.40 | 87.00 | 3.90 |
| 33 | 13 Aug. -19 Aug. | 30.30 | 21.70 | 88.40 | 74.40 | 64.60 | 3.70 |
| 34 | 20 Aug.-26 Aug. | 43.00 | 24.30 | 89.20 | 73.20 | 135.00 | 3.20 |
| 35 | 27 Aug.-02 Sept. | 34.20 | 25.90 | 86.20 | 60.50 | 9.80 | 4.40 |
| 36 | 03 Sept.-09 Sept. | 35.30 | 26.00 | 80.40 | 55.50 | 0.00 | 5.70 |
| 37 | 10 Sept.-16 Sept. | 32.20 | 24.90 | 95.40 | 72.00 | 60.00 | 2.00 |
| 38 | 17 Sept.-23 Sept. | 31.00 | 24.10 | 92.50 | 75.00 | 61.00 | 2.20 |
| 39 | 24 Sept.-30 Sept. | 32.50 | 23.80 | 89.10 | 58.00 | 13.80 | 2.50 |
| 40 | 01 Oct.-07 Oct. | 33.60 | 23.30 | 89.00 | 61.40 | 8.40 | 3.10 |
| 41 | 08 Oct. -14 Oct. | 29.90 | 21.70 | 94.20 | 70.20 | 103.00 | 3.20 |
| 42 | 15 Oct. -21 Oct. | 32.50 | 17.60 | 85.40 | 55.80 | 0.00 | 4.50 |
| 43 | 22 Oct. -28 Oct. | 32.90 | 15.30 | 81.00 | 47.40 | 0.00 | 3.90 |

**Source**: Weather data were recorded at meteorological observatory CoA, Gwalior (M.P).

**Table 2: Effect of abiotic factors on the seasonal incidence of sucking insect-pests on cowpea during *kharif*, 2022**

| WAS | SMW | Week | Insect-pests per plant | | | | AWT (°C) | | RH (%) | | Rainfall (mm) | Evaporation (mm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Aphid | Jassid | Whitefly | Thrips | Max. (°C) | Min. (°C) | Morning | Evening | | |
| 3 | 32 | 06 Aug.-12 Aug. | 0 | 0.91 | 1.89 | 0.00 | 32.80 | 25.90 | 90.70 | 66.40 | 87.00 | 3.90 |
| 4 | 33 | 13 Aug.-19 Aug. | 7.43 | 1.62 | 1.79 | 0.00 | 30.30 | 21.70 | 88.40 | 74.40 | 64.60 | 3.70 |
| 5 | 34 | 20 Aug.- 26 Aug. | 11.56 | 5.23 | 5.78 | 2.72 | 43.00 | 24.30 | 89.20 | 73.20 | 135.00 | 3.20 |
| 6 | 35 | 27 Aug.- 02 Sept. | 10.52 | 6.72 | 3.25 | 2.07 | 34.20 | 25.90 | 86.20 | 60.50 | 9.80 | 4.40 |
| 7 | 36 | 03 Sept -09 Sept. | 11.56 | 10.24 | 5.45 | 3.86 | 35.30 | 26.00 | 80.40 | 55.50 | 0.00 | 5.70 |
| 8 | 37 | 10 Sept.-16 Sept. | 19.89 | 8.63 | 5.10 | 6.89 | 32.20 | 24.90 | 95.40 | 72.00 | 60.00 | 2.00 |
| 9 | 38 | 17 Sept.-23 Sept. | 18.65 | 7.44 | 3.78 | 6.45 | 31.00 | 24.10 | 92.50 | 75.00 | 61.00 | 2.20 |
| 10 | 39 | 24 Sept.-30 Sept. | 15.25 | 8.11 | 2.55 | 6.18 | 32.50 | 23.80 | 89.10 | 58.00 | 13.80 | 2.50 |
| 11 | 40 | 01 Oct.- 07 Oct. | 16.36 | 9.54 | 3.55 | 6.55 | 33.60 | 23.30 | 89.00 | 61.40 | 8.40 | 3.10 |
| 12 | 41 | 08 Oct. - 14 Oct. | 9.25 | 7.14 | 1.89 | 3.07 | 29.90 | 21.70 | 94.20 | 70.20 | 103.00 | 3.20 |
| 13 | 42 | 15 Oct.- 21 Oct. | 7.85 | 2.71 | 1.17 | 1.77 | 32.50 | 17.60 | 85.40 | 55.80 | 0.00 | 4.50 |
| 14 | 43 | 22 Oct. - 28 Oct. | 8.3 | 0.00 | 0.00 | 0.00 | 32.90 | 15.30 | 81.00 | 47.40 | 0.00 | 3.90 |

**Table 3: Correlation between sucking insect-pest population and weather parameters during *Kharif* 2022.**

| S.N. | Pest | Average Weekly Temperature (°C) | | Relative Humidity (%) | | Rainfall (mm) | Evaporation (mm) |
|---|---|---|---|---|---|---|---|
| | | Maximum (°C) | Minimum (°C) | Morning | Evening | | |
| 1 | Aphid | 0.012 | 0.218 | 0.319 | 0.207 | -0.142 | **-0.590*** |
| 2 | Jassid | 0.090 | **0.582*** | 0.228 | 0.131 | -0.129 | -0.195 |
| 3 | Whitefly | **0.580*** | **0.738*** | 0.203 | 0.411 | 0.274 | -0.122 |
| 4 | Thrips | -0.032 | 0.399 | 0.436 | 0.209 | -0.101 | **-0.582*** |

***** Significant at 5 % level