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# Seasonal Incidence of Sucking Pests and Their Natural Enemies on Moth Bean [*Vigna aconitifolia*(Jacq.) Marechal]

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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

A field experiment was conducted at the College of Agriculture, NAU, Bharuch (Gujarat) to study the seasonal incidence of sucking pests and their natural enemies and their correlation with weather parameters on moth bean during *kharif* -2023. The studies on seasonal incidence indicated that jassid infestation began in the 1$^{st}$ week of August (31$^{st}$ SMW) and peaked during the 1$^{st}$ week of September (35$^{th}$ SMW). Whitefly infestation also began in the 1$^{st}$ week of August (31$^{st}$ SMW) achieved its peak during 2$^{nd}$ week of September (36$^{th}$ SMW). The population of thripscommenced from 1$^{st}$ week of August (31$^{st}$ SMW) reached its peak during2$^{nd}$ week of

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September (36th SMW). The population of ladybird beetle appeared from 2nd week of August (32th SMW) and reached its peak during 2nd week of September (36th SMW). The population of *chrysoperla* appeared from 2nd week of August(32nd SMW) and reached its peak population during 2nd week of September (36th SMW). Among the different environmental factors, morning relative humidity had a significant positive impact on the jassid and whitefly population. Bright sunshine hours showed significant positive influence on thrips and whitefly population. However no significant correlation was observed between ladybird beetle and *Chrysoperla* population with weather parameters.

*Keywords: Moth bean; seasonal incidence; sucking pests; ladybird beetle; Chrysoperla.*

## 1. INTRODUCTION

"Moth bean, *Vigna aconitifolia* (Jacq.) Marechal commonly known as "moth" is one of the important pulse crops and well suited for arid and semi-arid regions of the country. Among *kharif* pulses, it has the maximum drought tolerance capacity. Plants cover large area on the surface, conserve moisture and protect soil from erosion. Moth bean belongs to family *Leguminosae*, sub-family *Papilionaceae*. Moth bean is an annual plant. Its tap roots go deeper in soil which can extract moisture from lower horizons in the soil. Stem is branched with plant height of about 30 to 35 cm. Leaves are trifoliate and leaflets are lobed and divided in 3 to 5 parts. Flowers are papilionaceous and mostly self-pollinated" (Kukvaya et al., 2018). "In India, moth bean occupies an area of 9.68 lakh ha with production of 3.21 lakh tonnes and productivity of 332 kg/ha whereas in Gujarat, it occupies an area of 0.12 lakh ha with production of 0.05 lakh tonnes and productivity of 462 kg/ha during year 2019 – 2020" (Anon., 2021). "Jassids and whiteflies also act as vector of yellow mosaic virus apart from causing direct damage by desaping" (Satyavir et al., 1984). "Termites, galerucid beetles, mites and surface grass hoppers are minor pests, while jassid, whitefly, thrips, black weevil, pulse beetle and white grubs are major pests of moth bean" (Bhathesar et al*.,* 2021).

## 2. MATERIALS AND METHODS

A field experiment was conducted at College of Agriculture, NAU, Bharuch (Gujarat) to study the seasonal incidence of sucking pests and their natural enemies and their correlation with weather parameters on moth bean during *kharif* - 2023. For this, moth bean var. GMO-2 was sown at a distance of 45 cm x 10 cm in a plot of 20 m x 20 m and the crop was raised successfully by adopting recommended agronomical practices. The crop was kept free from the insecticidal application throughout the season. Whole plot was divided into five sectors and five plants were selected randomly from each sector. Populations of sucking pests were recorded from the 5 tagged plants at weekly intervals from germination of crop till harvesting of the crop. The population of adults and nymphs of jassid [*Empoasca motti* (Pruthi.)], whitefly [*Bemisia tabaci* (Genn.)] and thrips [*Caliothrips indicus* (Bagnall)] were recorded from three leaves (upper, middle and lower) of each randomly selected plants and mean pest population was worked out. Population of natural enemies such as ladybird beetle and *Chrysoperla* were also recorded from selected plants and mean value was calculated.

## 3. RESULTS AND DISCUSSION

**Jassid, *E. motti*:** The data represented in the Table 1 shows that jassid population commenced from the 2nd week after sowing (31st SMW) with 2.12 jassid/3 leaves. The population shows an increasing trend from the 3rd WAS (32nd SMW) and achieved its peak during 6th WAS (35th SMW) with 8.72 jassid/3 leaves. Thereafter, the population declined from the 7th to 12th week after sowing (36th to 41st SMW) in the range from 0.52 to 5.36 jassid/3 leaves.

Patel et al. (2021) reported jassid population started during 31st SMW and peak population found during 36th SMW in green gram. Thus, present findings are more or less in confirmation with earlier findings.

**Correlation:** The data presented in Table 2 indicated that jassid population had positive significant correlation with morning relative humidity (r = 0.589). Minimum temperature (r = 0.142), evening relative humidity (r = 0.050), bright sunshine hours (r = 0.204), wind speed (r= 0.142) and evaporation (r= 0.150) had positive non-significant correlation with the jassid population. However, maximum temperature (r = -0.172), rainfall (r = -0.353) and rainy days (r = -0.242) had negative non-significant correlation with the jassid population.

**Table 1. Incidence of sucking pests and their natural enemies in moth bean**

| WAS | SMW | Mean population per three leaves | | | Mean no. of predators per plant | |
|---|---|---|---|---|---|---|
| | | Jassid | Whitefly | Thrips | Ladybird beetle | *Chrysoperla* |
| **1** | **30** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **2** | **31** | 2.12 | 2.48 | 2.40 | 0.00 | 0.00 |
| **3** | **32** | 2.52 | 4.88 | 3.16 | 0.56 | 2.04 |
| **4** | **33** | 3.36 | 5.48 | 5.56 | 1.20 | 2.36 |
| **5** | **34** | 4.44 | 6.28 | 6.40 | 1.32 | 3.56 |
| **6** | **35** | 8.72 | 7.84 | 6.04 | 1.60 | 4.00 |
| **7** | **36** | 5.36 | 9.04 | 8.48 | 2.40 | 4.76 |
| **8** | **37** | 3.52 | 5.64 | 4.24 | 2.08 | 3.28 |
| **9** | **38** | 2.28 | 3.52 | 3.24 | 1.44 | 2.00 |
| **10** | **39** | 1.52 | 2.56 | 3.04 | 1.16 | 1.24 |
| **11** | **40** | 0.64 | 1.72 | 1.52 | 0.76 | 0.92 |
| **12** | **41** | 0.52 | 1.24 | 1.16 | 0.52 | 0.68 |

*SMW: Standard Meteorological Week, WAS: Weeks After Sowing*

**Table 2. Correlation (r) between weather parameters and sucking pests as well as natural enemies in moth bean**

| Weather parameters | Jassid | Whitefly | Thrips | Ladybird beetle | *Chrysoperla* |
|---|---|---|---|---|---|
| Maximum temperature ($^0$C) | -0.172 | 0.582* | 0.007 | -0.003 | 0.046 |
| Minimum temperature ($^0$C) | 0.543 | 0.567 | 0.551 | 0.110 | 0.428 |
| Morning relative humidity (%) | 0.589* | 0.642* | 0.281 | 0.415 | 0.201 |
| Evening relative humidity (%) | 0.050 | 0.042 | 0.038 | -0.110 | -0.018 |
| Bright Sunshine hours (h/day) | 0.204 | 0.620* | 0.636* | 0.334 | 0.247 |
| Rainfall (mm) | -0.353 | -0.363 | -0.286 | -0.148 | -0.277 |
| Rainy days | -0.242 | -0.146 | -0.155 | 0.019 | -0.128 |
| Wind speed (km/hr) | 0.142 | 0.101 | 0.049 | -0.296 | -0.090 |
| Evaporation mm/day) | 0.150 | 0.084 | 0.058 | 0.005 | 0.092 |

*Note: *Significant at 0.05 level*

Vikrant and Bajapai (2013) reported that jassid population had positive significant correlation with morning relative humidity. Bhathesar et al. (2021) found that jassid population non significantly and negatively correlated with maximum temperature. Thus, present findings are in confirmation with earlier work.

**Whitefly, *B. tabaci*:** The data represented in the Table 1 shows that the whitefly population commenced from the 2nd week after sowing (31st SMW) with 2.48 whitefly/3 leaves. The population shows an increasing trend from the 3rd WAS (32nd SMW) and achieved its peak during 7th WAS (36th SMW) with 9.04 whitefly/3 leaves. Thereafter, the population declined from the 8th to 12th week after sowing (37th to 41st SMW) in the range from 1.24 to 5.64 whitefly/3 leaves.

Bhathesar et al. (2021) also recorded highest population of whitefly at 36th SMW after sowing in moth bean which is in complete agreement with present findings.

**Correlation:** The data presented in Table 2 indicated that the whitefly population had a positive significant correlation with maximum temperature (r = 0.582), morning relative humidity (r = 0.642) and bright sunshine hours (r = 0.620). Minimum temperature (r = 0.567), evening relative humidity (r = 0.042), wind speed (r = 0.101) and evaporation (r = 0.084) had positive non-significant correlation with the whitefly population. However, evening rainfall (r = - 0.363) and wind rainy days (r = -0.146) had negative non-significant correlation with the whitefly population.

Biswas and Banerjee (2019) reported that the whitefly population had positive significant correlation with maximum temperature and positive non-significant correlation with wind speed. Ojha et al. (2022) found that whitefly population significantly and positively correlated with maximum temperature. Thus, present findings are more or less similar to the earlier findings.

**Thrips, *C. indicus*:** The data represented in the Table 1 shows that the thrips population commenced from the 2nd week after sowing (31st SMW) with 2.40 thrips/3 leaves. The population shows an increasing trend from the 3rd WAS (32nd SMW) and achieved its peak during 7th WAS (36th SMW) with 8.48 thrips/3 leaves. Thereafter, the population declined from the 8th to 12th week after sowing (37th to 41st SMW) in the range from 1.16 to 4.24 thrips/3 leaves.

Ojha et al. (2022) reported the highest population of thrips at 35th SMW in green gram which is more or less in agreement with present findings.

**Correlation:** The data presented in Table 2 indicated that the thrips population had a positive significant correlation with bright sunshine hours (r = 0.636). Maximum temperature (r = 0.007), minimum temperature (r = 0.551), morning relative humidity (r = 0.281), evening relative humidity (r = 0.038), wind speed (r = 0.049) and evaporation (r = 0.005) had positive non-significant correlation with the thrips population. However, rainfall (r = - 0.286) and rainy days (r = -0.155) had negative non-significant correlation with the thrips population.

Soratur et al. (2017) reported that among various weather parameters morning relative humidity and evening relative humidity had a positive non-significant correlation with the thrips population. Ojha et al. (2022) found that thrips population had negative non-significant correlation with rainfall. So the above report is more or less confirmative with result of present findings.

**Ladybird beetle:** The data presented in Table 1 showed ladybird beetle was appeared from 3rd WAS (32th SMW) and persisted till the 12th WAS (41st SMW) in the range between 0.52 to 0.56 ladybird beetle/plant. The ladybird beetle population achieved peak during 7th WAS (36th SMW) with 2.40 ladybird beetle/plant.

The present finding is in agreement with Singh et al. (2019) who reported peak population of ladybird beetle during 37th SMW while, Choudhary et al. (2023) reported maximum population of ladybird beetles in 36th SMW. The variation in present finding may be due to different date of sowing and prevailing weather parameters.

**Correlation:** The data presented in Table 2 indicated that the ladybird beetle population had positive non-significant correlation with minimum temperature (r = 0.110), morning relative humidity (r = 0.415), bright sunshine hours (r = 0.334), rainy days (r = 0.019) and evaporation (r = 0.005). Whereas, maximum temperature (r = -0.003), evening relative humidity (r = -0.110), rainfall (r = - 0.148) and wind speed (r = -0.296) had negative non-significant correlation with ladybird beetle population.

Choudhary et al. (2023) reported that among various weather parameters minimum temperature, morning relative humidity and bright sunshine hours had positive non-significant correlation with the ladybird beetle population which is in agreement with present findings.

***Chrysoperla*:** The data represented in Table 1 showed that *Chrysoperla* was appeared from 3rd WAS (32nd SMW) and persisted till the 12th WAS (41st SMW) in the range between 0.68 to 2.04 *Chrysoperla*/plant. The *Chrysoperla* population achieved peak during 7th (36th SMW) with 4.76 *Chrysoperla*/plant.

The present finding is in complete agreement with Choudhary et al. (2023) who also reported peak population of *Chrysoperla* during 36th SMW.

**Correlation:** The data presented in Table 2 indicated that *Chrysoperla* population had a positive non-significant correlation with maximum temperature (r = 0.046), minimum temperature (r = 0.428), morning relative humidity (r = 0.201), bright sunshine hours (r = 0.247) and evaporation (r = 0.092). However, evening relative humidity (r = -0.018), rainfall (r = - 0.277), rainy days (r = -0.128) and wind speed (r = -0.090) had a negative non-significant correlation with the *Chrysoperla* population.

Choudhary et al. (2023) reported that among various weather parameters maximum temperature, minimum temperature and morning relative humidity had positive non significant correlation with the *Chrysoperla* population which is more or less similar to present findings.

## 4. CONCLUSION

Jassid population commenced from 1st week of August (31st SMW) and achieved its peak during 1st week of September (35th SMW). Whitefly infestation commenced from 1st week of August (31st SMW) achieved its peak during 2nd week of September (36th SMW). The population of thrips commenced from 1st week of August (31st SMW) achieved its peak during 2nd week of September (36th SMW). The population of ladybird beetle appeared from 2nd week of August (32nd SMW) and achieved its peak during 2nd week of September (36th SMW). The population of *Chrysoperla* appeared from 2nd week of August (32nd SMW) and achieved peak population during 2nd week of September (36th SMW). Among the different environmental factors, morning relative humidity showed significant positive influence on jassid and whitefly population. Bright sunshine hours showed positive significant influence on thrips and whitefly population. However no significant correlation was found between natural enemies and weather parameters.

## 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.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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