*Plant Archives* Vol. 26, Supplement 1, 2026 pp. 1709-1712 e-ISSN:2581-6063 (online), ISSN:0972-5210

Plant Archives

Journal homepage: http://www.plantarchives.org
DOI Url : https://doi.org/10.51470/PLANTARCHIVES.2026.v26.supplement-1.230

# POPULATION DYNAMICS OF MAJOR SUCKING INSECT PESTS INFESTING CUMIN AND ITS CORRELATION WITH WEATHER PARAMETERS

**Ramki B.[1] and Kalasariya R.L.[2]***
[1]Department of Agricultural Entomology, Anand Agricultural University, Anand-388 110, Gujarat, India
[2]All India Network Project on Pesticide Residues, Contaminants, ICAR Unit – 9,
Anand Agricultural University, Anand-388 110, Gujarat, India
*Corresponding author E-mail: dr.ravi@aau.in
(Date of Receiving : 22-08-2025; Date of Acceptance : 09-12-2025)

**ABSTRACT**

A field experiment was conducted at Plant Pathology Farm, BACA, AAU, Anand during *rabi*, 2024–25. The present study highlighted the population dynamics of major sucking insect pests in cumin, namely aphids (*Aphis gossypii*), thrips (*Thrips tabaci*) and their natural predator, coccinellids. The maximum incidence of aphids, thrips and coccinellids was recorded during the $4^{th}$, $5^{th}$ and $4^{th}$ standard meteorological weeks, with 48.36 aphids per 5 cm shoot/plant, 5.87 thrips/plant and 6.17 coccinellids/plant, respectively. Correlation analysis revealed mostly non-significant associations between weather parameters and pest populations. However, coccinellids had a highly significant positive correlation with the aphid population (r = 0.980**) and a non-significant correlation with thrips (r = 0.504), indicating their strong predatory association with aphids.
***Keywords*** **:** *Aphis gossypii*, *Thrips tabaci*, Coccinellids, Population dynamics, Peak incidence, Standard Meteorological Week (SMW), Correlation coefficient.

## Introduction

Cumin (*Cuminum cyminum*) is important seed spice crop commonly known as Jeera belongs to family *Apiaceae*. In India, cumin is sown from October until the beginning of December and harvesting starts in February. It is an ingredient of most curry powders and many savory spice mixtures (Nadeem and Riaz, 2012). Gujarat contributed approximately 62.01% to India's total cumin production (Anonymous, 2024). Cumin plants are severely affected by diseases and insect pests which are highly detrimental to their growth and yield. Among the insect pests, aphids [*Myzus persicae* (Sulzer), *Hyadaphis coriandri* (Das) and *Aphis gossypii* Glover], thrips [*Thrips tabaci* (Lindeman) and *Scirtothrips dorsalis* (Hood)]; jassids, Empoasca sp. and whitefly, *Bemisia tabaci* (Gennadius) are considered major pests (Meena *et al.*, 2018). The occurrence and intensity of sucking pests in cumin are influenced by both biotic and abiotic factors. Climatic conditions significantly affect their seasonal population trends. Gaining insight into their population dynamics is essential for the formulation of efficient pest control strategies. This study investigates the seasonal fluctuations of major sucking pests in cumin to support the development of effective and timely integrated pest management (IPM) approaches for its cultivation (Yadav *et al*., 2018a).

## Materials and Methods

A field experiment was conducted at the Plant Pathology Farm of B. A. College of Agriculture (BACA), Anand Agricultural University, Anand, Gujarat, India (22.57° N, 72.95° E longitude) during *rabi*, 2024-25. Cumin variety Gujarat Cumin 4 (GC-4) was broadcasted in a main plot measuring 10 × 10 m, following all the recommended agronomic practices. Six quadrates (1.0 × 1.0 m each) were randomly selected from the main plot and observations on major sucking insect pests were recorded from five randomly selected plants within each quadrate. The population of natural enemies (coccinellids) was also recorded from the same plants. Observations were taken at weekly intervals, starting one week after germination and continuing up to harvest. The data on weather parameters such as maximum and minimum temperature (°C), morning and evening relative humidity (%), morning and evening vapour pressure (mm of Hg), bright sunshine (hrs/day) and wind speed (km/hr), recorded at the Agricultural Meteorological Observatory, AAU, Anand, were correlated with incidence.

## Results and Discussion

The results revealed that incidence of *A. gossypii* and *T. tabaci* were the major sucking insect pest observed causing major damage to cumin crop. Aphid infestation in cumin began in the 2$^{nd}$ week of December (50$^{th}$ SMW) with an initial population of 0.60 aphid/5 cm shoot/plant and remained active until crop maturity. The population peaked at 48.36 aphids/5 cm shoot during the 4$^{th}$ week of January (4$^{th}$ SMW), followed by a decline toward maturity. These results align with earlier findings by Yadav *et al.* (2018b), who reported a peak of 90 aphids/3 umbels in 4$^{th}$ SMW. Dadhich and Pandey (2023), observed 51.68 aphids/umbel in the 5$^{th}$ SMW. Vadher *et al.* (2023), with 3.40 aphid index/plant in 7$^{th}$ SMW and Yadav *et al.* (2023), noted peak activity in the 8$^{th}$ SMW. This consistent trend highlights January to early February as the critical period for aphid outbreaks, underscoring the need for timely monitoring and control measures. The correlation analysis revealed that the aphid population had a non-significant positive association with bright sunshine hours, wind speed, morning relative humidity and evening relative humidity (r = 0.174, 0.086, 0.146 and 0.129, respectively), while it showed a non-significant negative correlation with maximum temperature, minimum temperature, morning vapour pressure and evening vapour pressure (r = –0.232, –0.261, –0.209 and –0.019, respectively). These findings are consistent with earlier studies by Italiya and Sisodiya (2017), Yadav *et al.* (2018b) and Dadhich and Pandey (2023), which also reported weak or non-significant correlations between aphid incidence and weather parameters in cumin.

The infestation of Thrips (*T. tabaci*) activity in cumin was recorded from the 3$^{rd}$ week of January (3$^{rd}$ SMW) and persisted until harvest. The infestation began with 0.17 thrips/plant and peaked at 5.87 thrips/plant in the 1$^{st}$ week of February (5$^{th}$ SMW), followed by a gradual decline to 0.53 thrips/plant by the 1$^{st}$ week of March (9$^{th}$ SMW). These findings are comparable with those of Meena *et al.* (2017), who reported a peak of 2.8 thrips/plant in the 47$^{th}$ SMW, Shewale and Borad (2020), who observed a peak of 3.2 thrips/3 leaves during the 6$^{th}$ week after germination (48$^{th}$ SMW) and Bindhani *et al.* (2021), who noted a peak population ranging from 3.6 to 12.9 thrips/leaf between early January and early February.

The correlation analysis revealed that thrips population had a non-significant negative correlation with minimum temperature, wind speed, morning relative humidity, morning and evening vapour pressure and evening relative humidity (r = –0.063, –0.351, –0.062, –0.078,–0.431 and –0.493, respectively). In contrast, maximum temperature and bright sunshine hours showed a positive but non-significant correlation (r = 0.334 and 0.481, respectively). These observations are in line with earlier studies by Shewale and Borad (2020) and Bindhani *et al.* (2021), who also reported variable correlations between weather factors and thrips population.

The incidence of Coccinellid activity in cumin was first recorded in the 3$^{rd}$ week of December (51$^{st}$ SMW) with a population of 0.43 per plant and peaked at 6.17 per plant during the 4$^{th}$ week of January (4$^{th}$ SMW), coinciding with the highest aphid density. The population gradually declined thereafter, reaching 0.73 per plant by the 1$^{st}$ week of March (9$^{th}$ SMW). The simultaneous peak of coccinellid and aphid populations suggests a strong numerical response and highlights the potential of coccinellids as a natural biological control agent in cumin. Correlation analysis showed a highly significant positive correlation

between coccinellids and aphids (r = 0.980**), while the correlation with thrips was positive but non-significant (r = 0.504). These results indicate that coccinellid abundance is closely linked with aphid population dynamics in the cumin ecosystem. Similar results were reported by Samota *et al.* (2015), Kanjiya *et al.* (2018) and Regar *et al.* (2022), who observed that coccinellid populations increased in response to rising aphid densities, confirming their role as effective natural predators in cumin.

**Table 1:** Population dynamics of major sucking insect pests and natural enemies in cumin

| Months | Weeks | SMW | WAS | Aphid/5 cm shoot | Thrips/plant | Coccinellids/plant |
|---|---|---|---|---|---|---|
| December, 2024 | I | 49 | 1 | 0.00 | 0.00 | 0.00 |
| | II | 50 | 2 | 0.60 | 0.00 | 0.00 |
| | III | 51 | 3 | 2.93 | 0.00 | 0.43 |
| | IV | 52 | 4 | 5.13 | 0.00 | 1.50 |

| | | | | | | |
|---|---|---|---|---|---|---|
| January, 2025 | I | 1 | 5 | 10.93 | 0.00 | 2.30 |
| | II | 2 | 6 | 23.43 | 0.00 | 3.17 |
| | III | 3 | 7 | 35.43 | 0.17 | 4.53 |
| | IV | 4 | 8 | 48.36 | 2.07 | 6.17 |
| February | I | 5 | 9 | 34.43 | 5.87 | 4.27 |
| | II | 6 | 10 | 25.27 | 4.37 | 3.53 |
| | III | 7 | 11 | 18.26 | 3.27 | 2.63 |
| | IV | 8 | 12 | 10.45 | 2.03 | 1.73 |
| March | I | 9 | 13 | 4.08 | 0.53 | 0.73 |

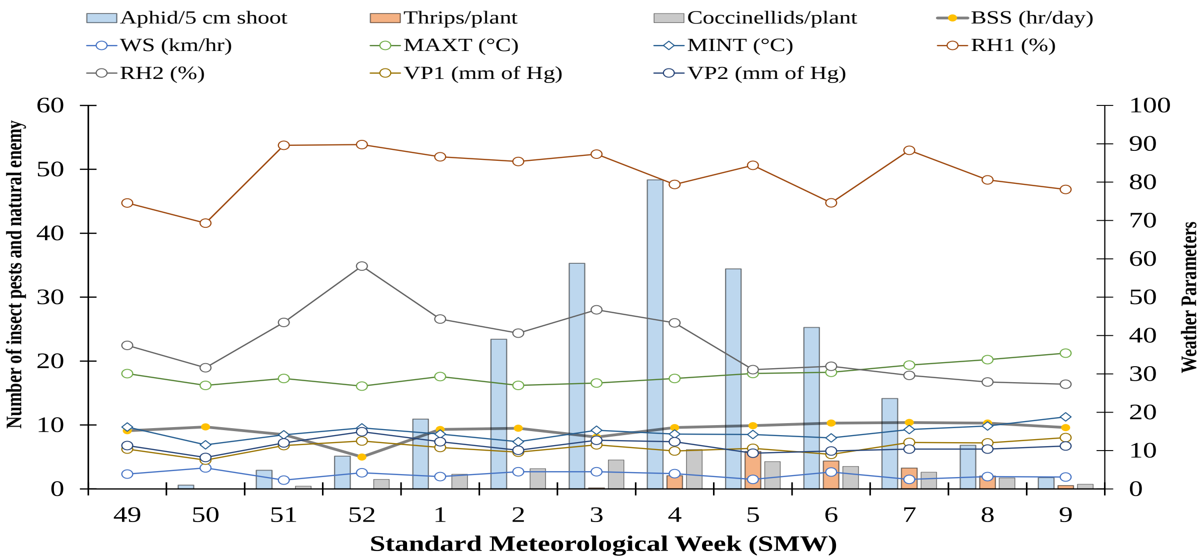


**Fig. 1 :** Population dynamics of major sucking insect pests, natural enemies and weather parameters in cumin

**Table 2:** Correlation co-efficient between weather and population of sucking insect pests.

| Weather parameters | Correlation co-efficient (r) | | |
|---|---|---|---|
| | **Aphids (n=13)** | **Thrips (n=7)** | **Coccinellids (n=11)** |
| Maximum temperature (MaxT), °C | -0.232 | 0.334 | -0.163 |
| Minimum temperature (MinT), °C | -0.261 | -0.063 | -0.185 |
| Morning relative humidity ($RH_1$), % | 0.146 | -0.062 | 0.232 |
| Evening relative humidity ($RH_2$), % | 0.129 | -0.493 | 0.148 |
| Morning vapour pressure ($VP_1$), mm of Hg | -0.209 | -0.078 | -0.101 |
| Evening vapour pressure ($VP_2$), mm of Hg | -0.019 | -0.431 | 0.094 |
| Bright sunshine hours (BSS), h/day | 0.174 | 0.481 | 0.152 |
| Wind speed (WS), km/h | 0.086 | -0.351 | 0.311 |

**Table 3 :** Correlation co-efficient (r) between biotic factors and population of sucking insect pests in cumin

| Biotic factors | Aphid | Thrips |
|---|---|---|
| Coccinellids | 0.980** | 0.504 |

**Note:** ** Correlation is significant at 1% level of significance

## Conclusion

The study on population dynamics of major sucking insect pests in cumin revealed that *A. gossypii* appeared from the 50th SMW (2nd week of December) and peaked during the 4th SMW (4th week of January), while *T. tabaci* infestation was recorded from the 3rd SMW (3rd week of January) with a peak in the 5th SMW (1st week of February). The coccinellid predator population coincided with aphid incidence, showing a highly significant positive correlation, suggesting its potential role in natural regulation of aphid outbreaks. Weather parameters exhibited non-significant correlations with both aphid and thrips populations, indicating that factors other than abiotic conditions may have a greater influence on their fluctuations. Overall, the findings provide useful insights into seasonal occurrence and peak activity of major sucking pests in cumin, which can guide timely monitoring and eco-friendly management strategies.

## Acknowledgements

The authors acknowledge the Plant Pathology Farm of B.A. College of Agriculture, Anand Agricultural University, Anand for providing field facilities and technical support.

## Author Contribution Statement

Ramki conducted the study and prepared the manuscript; Ravi Kalasariya is the advisor for the research work.

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