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Population dynamics of sucking insect pests in greengram [*Vigna radiata* (L.)] and their correlation with abiotic factors

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Abstract
A field investigation was conducted during the *Kharif* season of 2024 at the Pulses Research Unit, Akola, to study the seasonal incidence of sucking pests in greengram. The study examined the population dynamics of thrips, whiteflies, aphids, and jassids in relation to weather parameters. Thrips reached a peak population of 34.50 per 3 leaves during the 38th SMW. Whitefly and aphid populations both reached their pinnacle during the 40th SMW, recording 17.20 whiteflies and 51.32 aphids per 3 leaves, respectively. Statistical analysis revealed varying degrees of correlation with abiotic factors, providing a basis for sustainable crop protection strategies.

Keywords: Greengram, population dynamics, sucking pests, abiotic factors, correlation

1. Introduction
Legumes like mungbean [*Vigna radiata (*L.)] hold significant importance in human nutrition due to their ample protein content. India stands out as the highest producer of mungbean, highlighting its role as a major *kharif* pulse crop. Pulses are commonly known as the "meat of the poor" and contribute to sustainable agriculture by enriching soil fertility through nitrogen fixation (Singh *et al.* 2019) [24]. Green gram plays a pivotal role in diversifying cereal-based farming systems globally. Recognized by various monikers such as moong, mung, and mungo, it serves as a valuable source of fibres, proteins, vitamins, and minerals.
One of the primary factors contributing to the stagnant yields of green gram in India is the extensive damage inflicted by insect pests. While researchers have documented approximately 64 different insect species that inhabit these crops, only a small handful are responsible for widespread economic losses. Of these, sucking pests specifically whiteflies, jassids, and thrips are considered the most destructive, frequently devastating large-scale cultivation areas (Khattak *et al.* 2004) [10]. These pests damage the crop through a triple-threat mechanism: they drain the plant's vitality by feeding on its sap, interfere with essential photosynthesis, and act as vectors for various diseases. Notably, the impact of the whitefly is particularly severe; historical data suggests that if left uncontrolled, whitefly infestations can slash total crop yields by as much as 70% (Biswas *et al.* 2008) [3].
The objective of this investigation was to determine the influence of weather parameters on the population dynamics of sucking insect pests in greengram. The study specifically aimed to identify the correlation between abiotic factors.

2. Material and Methods
The field study was conducted at the Pulses Research Unit, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, during the *Kharif* season of 2024. The experiment was laid out in a Randomized Block Design (RBD) with seven treatments and three replications. The variety 'Kopargaon' was sown on 11th July 2024. The row-to-row spacing was 30 cm and plant-to-plant spacing was 10 cm. Within each plot, five plants were randomly selected and labeled for consistent monitoring. Observations were taken every week. Populations of aphids, leafhoppers, thrips, and whiteflies were recorded from 3 leaves (top, middle, and bottom canopy).

The data tabulated on population were subjected to appropriate transformation and analysed using OPSTAT software.

3. Results and Discussion

3.1 Seasonal incidence of sucking pests

Thrips: Populations were first noticed during the 34th SMW. The peak population of 34.50 thrips per 3 leaves was observed in the 38th SMW. These findings are in conformity with Kumawat *et al.* (2019) and Mahipal *et al.* (2017) [14, 16].

Whiteflies: Incidence commenced from the 32nd SMW. The peak population of 17.20 whitefly was recorded in the 40th SMW. This aligns with previous research by Kumar *et al.* (2004) and Mehendra *et al.* (2019) [11].

Aphids: Populations were first noticed during the 34th SMW. The peak population of 51.32 aphids per 3 leaves was observed in the 40th SMW. These results are in conformity with Sharma *et al.* (1994) and Salunkhe *et al.* (2003) [21].

Jassids: Incidence was noticed from the 33rd SMW. The highest population of 14.8 jassid per 3 leaves was recorded during the 37th SMW. Findings corroborate those of Charjan *et al.* (2017) and Bhavasar and Kumar (2019) [2, 5].

Table 1: Correlation between population of sucking pests and abiotic factors.

SMW	Sucking pests				Weather parameters				
	thrips/ 3 leaves	Whitefly/3 leaves	Aphid/ 3 leaves	Jassids/ 3 leaves	Temperature (°C) Max.	Temperature (°C) Min.	Rainfall (mm)	R.H (%) Morn.	R.H (%) Even.
30	0	0	0	0	26.7	20.4	85.2	89	84
31	0	0	0	0	29.5	19.8	57.1	87	74
32	0	2.3	0	0	29.3	19.8	33.3	87	72
33	0	2.85	0	4	31.5	20.4	1.4	84	61
34	29.87	2.15	19.27	8.4	31.4	19.6	120.2	85	69
35	16.2	4.15	11.86	12.2	31.1	19.8	30.1	85	67
36	18.84	9.13	30.92	13.8	29.6	19.4	59.5	88	71
37	17.65	9.81	41.22	14.8	30.2	19.9	5.5	85	63
38	34.5	15.78	43.35	4.8	32.4	19.6	2.4	84	56
39	21.45	12.22	21.46	3.6	31.5	22.2	30.9	84	65
40	0	17.2	51.32	0	33.9	19.6	0	85	50

3.2 Correlation with Abiotic Factors

Thrips: Exhibited a negative non-significant correlation with maximum temperature (), minimum temperature (), and rainfall (). This is supported by Vijayalakshmi *et al.* (2017) [27].

Whiteflies: Showed a positive correlation with maximum temperature () and a highly significant negative correlation with evening relative humidity (). Similar correlations were reported by Sharma *et al.* (2019) [23].

Aphids

Demonstrated a significant negative correlation with evening relative humidity (). This confirms earlier work by Sharma *et al.* (2019) [23] and Kumar *et al.* (2018) [13].

Jassids

The correlation with all abiotic weather factors was found to be non-significant. Chaudhary *et al.* (2018) [6] reported similar findings.

Table 2: Correlation coefficient between Thrips, Whitefly, Aphids and Jassids of green gram with weather parameters.

Name of pests	Temperature		Rainfall	Relative humidity	
	Max T	Min T		RHM	RHE
Thrips	-0.324^{NS}	-0.176^{NS}	-0.392^{NS}	-0.418^{NS}	-0.123^{NS}
Whiteflies	0.685^{*}	-0.272^{NS}	-0.545^{NS}	0.467^{NS}	-0.740^{**}
Aphids	-0.560^{NS}	-0.085^{NS}	0.478^{NS}	0.404^{NS}	-0.634^{*}
Leafhopper	0.106^{NS}	-0.457^{NS}	-0.204^{NS}	-0.135^{NS}	-0.135^{NS}
LBB	0.619^{*}	-0.025^{NS}	0.427^{NS}	-0.281^{NS}	-0.651^{*}

Conclusion

The results revealed that sucking pests in greengram peak during September, with thrips in the 38th SMW and others between the 37th and 40th SMW. Correlation analysis revealed that while evening relative humidity significantly suppresses whiteflies and aphids, rainfall and temperature fluctuations primarily drive thrips and jassid dynamics. These findings emphasize that monitoring abiotic weather parameters is essential for predicting pest surges and implementing timely management strategies.

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