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Seasonal incidence studies of major sucking pests infesting cherry tomato under protected cultivation in Telangana

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Abstract
Cherry tomato (*Solanum lycopersicum* var. *cerasiforme*) is an economically valuable crop with high nutritional content and global cultivation potential. However, sucking pest infestation significantly constrain crop production, necessitating comprehensive understanding of pest population dynamics. This study investigated the seasonal incidence of major sucking pests infesting cherry tomato under protected cultivation during *rabi* 2024-25 at Professor Jayashankar Telangana Agricultural University, Hyderabad. Weekly monitoring Standard Meteorological Week (SMW) - wise was conducted from November, 2024 to March, 2025 on 50 randomly selected plants to record major sucking pest insect populations and the results revealed distinct seasonal patterns with minimal pest activity during early December (49^{th} SMW), gradually increasing through late December and peaking during February-March, 2025. Whitefly and leafhopper showed peak populations during the 9^{th} SMW with densities of 9.75 and 9.95 individuals per 5 leaves per plant, respectively and then declined later.

Keywords: Cherry tomato, seasonal incidence, major sucking pests, protected cultivation, SMW

1. Introduction
Cherry tomato *Solanum lycopersicum* var. *cerasiforme* is an economically valuable crop cultivated globally for its distinctive flavor, high nutritional value and adaptability to diverse agro-climatic conditions. With origins traced to Peru and Northern Chile, cherry tomato is considered one of the progenitors of cultivated tomatoes (Prema *et al.*, 2011) [8]. These table tomatoes feature small, bright red fruits with a distinctive cherry-like flavor (Charlo *et al.*, 2007) [4]. When compared to conventional tomatoes, cherry varieties demonstrate superior adaptability to diverse climates and good productivity (Anayat *et al.*, 2022) [1]. Nutritionally, cherry tomatoes are exceptional, one cup of cherry tomatoes (149 g) provide 26.8 calories of energy, 1.3 g of protein, 4.5 mg of omega-3 fatty acids, 119 mg of omega-6 fatty acids, 1241 IU of vitamin A, 18.9 mg of vitamin C, 22.3 mcg of folic acid, 353 mg of potassium, 35.8 mg of phosphorus, 14.9 mg of calcium, 0.43 mg of acidity and 10.4 TSS (USDA, 2017) [10].
Despite its commercial potential, cherry tomato production is severely constrained by major sucking pests *viz.*, whitefly (*Bemisia tabaci* Gennadius) and leaf hopper (*Amrasca devastans* Ishida) (Anu *et al.*, 2020) [3]. These sucking pests puncture the fruits through their stylet and introduce secondary infections which destroy the quality of fruit or act as vector of many viruses and mycoplamas that cause growth disorders or death of the plant (Arno *et al.*, 2009) [2]. Their prevalence is influenced by seasonal variations and the microclimatic conditions within protected structures necessitating a detailed understanding of their population dynamics. So, the present study was formulated to know the incidence of whitefly and leafhopper infestation during cropping season of cherry tomato under protected cultivation.

2. Materials and Methods
The field experiment was carried out at Horticulture Garden, College of Agriculture, Professor Jayashankar Telangana Agricultural University, Rajendranagar, Hyderabad at an altitude of 563 m above MSL lying between 17° 19' 14" N latitude and 78° 24' 58" E longitude. The cherry tomato crop was raised on uniform black clay soil in 300 m^2 area during *rabi* 2024-25. The experimental plot was established using RBD and divided into five quadrants for systematic observations for major sucking pests of cherry tomato under protected cultivation.

Nursery plants was raised in pro trays and 20 days old seedlings of cherry tomato red round variety of cherry tomato were transplanted with 60 cm x 60 cm spacing. The crop was allowed for natural infestation of without any plant protection measures. The entire area was divided into five quadrants *i.e.*, four in the corners and one in the middle of the plot to facilitate recording of observations on whitefly and leaf hopper. The field was inspected at weekly intervals *i.e.*, SMW during morning hours between 6 AM to 9 AM to notice the natural infestation of major sucking pests infesting cherry tomato crop. For recording incidence of whitefly (number of whitefly nymphs and adults on five randomly selected leaves per plant) (NICRA, 2012) [5-14] and leaf hopper number of leaf hoppers from five leaves (three from top and two from middle) per plant (Patel *et al.*, 2019) [7] were counted and mean population was calculated.

3. Results and Discussion

Weekly observations of the insect pest incidence were taken from December, 2024 to March, 2025 on 50 randomly selected plants (10 plants per quadrant) and expressed in terms of No. / 5 leaves / plant. The data pertaining to incidence of whitefly and leaf hopper is presented in table 1 and illustrated in figure 1. The whitefly population demonstrated a characteristic seasonal progression throughout the experimental period. During the initial observation (49th and 50th SMW), no whitefly individuals were detected, suggesting their delayed colonization compared to early crop establishment. The first occurrence was recorded during 51st SMW with 1.12 whiteflies / 5 leaves / plant. Population density increased progressively during 52nd SMW, reaching 1.73 whiteflies / 5 leaves / plant. From 1st SMW onwards, a continuous upward trend was observed, with densities of 2.10, 2.90, 3.15, 4.17 and 5.90 whiteflies / 5 leaves / plant recorded during 1st, 2nd, 3rd, 4th and 5th SMW respectively. The population attained its maximum during 6th SMW, recording 6.80 whiteflies / 5 leaves / plant, coinciding with optimal plant growth conditions. High population densities continued during 7th and 8th SMW with 7.77 and 8.43 whiteflies / 5 leaves / plant respectively. Peak infestation was observed during 9th SMW with 9.75 whiteflies / 5 leaves / plant. Subsequently, population levels declined to 6.44, 4.23 and 1.62 whiteflies / 5 leaves / plant during 10th, 11th and 12th SMW respectively.

The leaf hopper population displayed a gradual establishment pattern throughout the growing season. During the first three observation periods (49th and 50th SMW), populations remained negligible, with only 0.20 leaf hoppers / 5 leaves / plant recorded during 51st SMW, followed by increase in population density increased moderately during 52nd SMW, reaching 0.56 leaf hoppers / 5 leaves / plant. Progressive increase continued from 1st SMW onwards, with populations of 1.12, 1.27, 2.73, 3.40 and 5.20 leaf hoppers / 5 leaves / plant recorded during 1st, 2nd, 3rd, 4th and 5th SMW respectively. Peak population was observed during 6th SMW with 6.59 leaf hoppers / 5 leaves / plant, aligning with active vegetative development. High densities were maintained during subsequent weeks, recording 7.99, 8.70 and 9.95 leaf hoppers / 5 leaves / plant during 7th, 8th and 9th SMW respectively. Maximum infestation occurred during 9th SMW. Population levels remained elevated at 8.00 leaf hoppers / 5 leaves / plant during 10th SMW, followed by gradual reduction to 7.02 and 2.06 leaf hoppers / 5 leaves / plant during 11th and 12th SMW, respectively.

Similar findings were observed by Tomar *et al.* (2024) [9] whiteflies reached peak during the 9th SMW (7.90 whiteflies /3 leaves/plant) and Panse *et al.* (2020) [6] who reported that jassids attained its peak during 9th SMW (9.26 Jassids / 6 leaves / plant).

Table 1: Seasonal incidence of whitefly and leaf hopper infesting cherry tomato under protected cultivation during rabi, 2024-25

SMW	Mean insect population	
	Whitefly (no. / 5 leaves / plant)	Leaf hopper (no. / 5 leaves / plant)
49 (03 - 09 Dec)	0.00	0.00
50 (10 - 16 Dec)	0.00	0.00
51 (17 - 23 Dec)	1.12	0.20
52 (24 - 31 Dec)	1.73	0.56
1 (1-7 Jan)	2.10	1.12
2 (8-14 Jan)	2.90	1.27
3 (15-21 Jan)	3.15	2.73
4 (22-28 Jan)	4.17	3.40
5 (29 Jan- 4 Feb)	5.90	5.20
6 (5-11 Feb)	6.80	6.59
7 (12-18 Feb)	7.77	7.99
8 (19-25 Feb)	8.43	8.70
9 (26 Feb-4 Mar)	9.75	9.95
10 (5-11 Mar)	6.44	8.00
11 (12-18 Mar)	4.23	7.02
12 (19-25 Mar)	1.62	2.06

SMW-Standard Meteorological Week, * Mean of fifty plants

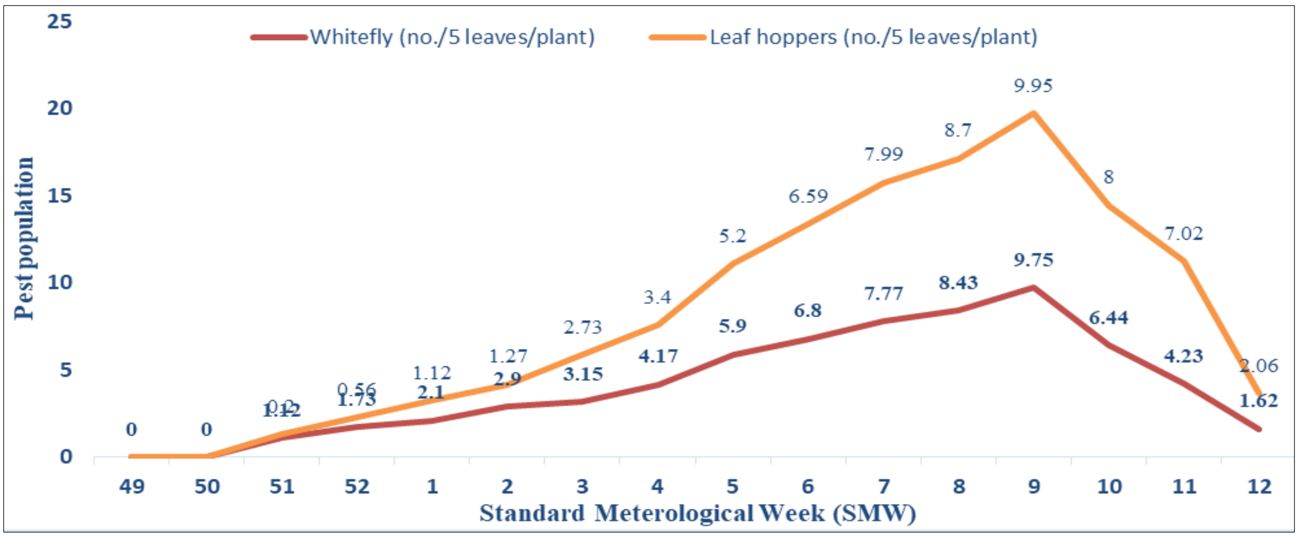

Fig 1: Seasonal incidence of whitefly and leaf hopper infesting cherry tomato under protected cultivation during *rabi* 2024-25

4. Conclusion

Based on the comprehensive seasonal monitoring data, both whitefly and leaf hopper populations demonstrated synchronized delayed colonization patterns with negligible presence during initial crop establishment (49th - 50th SMW), followed by first detection during 51st SMW with whiteflies at 1.12 and leafhoppers at 0.20 individuals per 5 leaves per plant respectively. Both species showed progressive population increases through 52nd SMW (whiteflies: 1.73, leafhoppers: 0.56), continuing upward trends from 1st through 5th SMW with whiteflies recording 2.10, 2.90, 3.15, 4.17 and 5.90 individuals per 5 leaves per plant while leafhoppers showed 1.12, 1.27, 2.73, 3.40, and 5.20 individuals per 5 leaves per plant during the same periods. Peak population densities occurred synchronously during 9th SMW, with whiteflies reaching maximum infestation at 9.75 and leafhoppers at 9.95 individuals per 5 leaves per plant, following sustained high densities during 6th-8th SMW (whiteflies: 6.80, 7.77, 8.43; leafhoppers: 6.59, 7.99, 8.70 respectively). Subsequently, both species exhibited rapid population decline with whiteflies dropping to 6.44, 4.23, and 1.62 individuals per 5 leaves per plant during 10th, 11th and 12th SMW respectively, while leaf hoppers declined to 8.00, 7.02 and 2.06 individuals per 5 leaves per plant during the corresponding periods. This synchronized population dynamic pattern indicates shared ecological requirements and optimal environmental conditions during the 6th - 9th SMW period, providing critical information for implementing targeted integrated pest management strategies with intensive monitoring from 3rd - 4th SMW and peak intervention during the identified high-risk period when both species reach maximum density and potential crop damage.

5. Disclaimer (Artificial Intelligence)

Author(s) hereby declares that NO generative AI technologies such as Large Language Models (Chat GPT, COPILOT, etc) and text-to-image generators have been used during writing or editing manuscripts.

6. Acknowledgements

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7. Competing Interests

Authors have declared that no competing interests exist.

8. References

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