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Changing Dynamics of Thrips Infestation - A Threat to Cotton in the North Zone

EXPERT'S Column



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Cotton was cultivated in 16.39 during 2022 and approximately in 17.65 lakh ha area during 2023 in the North Zone. The overall productivity of the North zone is declining over the years due to many biotic and abiotic factors. Zonal productivity has fallen from 638 kg lint in 2019 to 439 kg lint in 2022 (<https://cotcorp.org.in/statistics.aspx>). Whitefly and Pink Bollworm marked their regular presence leading to escalating damage and cost of cultivation. During recent past thrips incidence has been noticed beyond its functional window in North zone, usually thrips thrive more during hot and arid weather but its endurance for non favorable climate is becoming an issue of concern. Estimated yield losses reported due to major sucking pest is 33.02 percent and 30-50 percent lint losses due to thrips.

Thrips is a tiny insect having slim, cylindrical body, small wing and size is less than 1.0 mm (Plate 1). The nymphs are wingless, whitish in color and fast moving on leaves (Plate 2 & 3).





Plate 1



Plate 2



Plate 3



Plate 4



Plate 5



Plate 6



Plate 7



Plate 8

Plate 1: Thrips: the insect, Plate 2 & 3: Nymphs; Plate 4 & 5: Damage symptoms: silvery patches on the leaves; Plate 6: Upward curling of leaves from edges; Plate 7: Hardiness at Lower surface of leaves; Plate 8: Distortion of leaves.

The prevalence of thrips species complex in cotton, dominated by *Thrips palmi* with the coexistence of other thrips species including *Thrips tabaci*, is pervasive pest in North Cotton growing Zone of India. Generally cotton is sown between 15th April to 15th May in the Zone and thrips incidence primarily observed at 30 day after sowing (DAS). As per the earlier reports the appearance of thrips in north zone has been noted from seedling stage to mid-crop with non significant presence till crop maturity. Under dry and warm climatic circumstances, the thrips population proliferates rapidly, escalating damage to the cotton crop. In terms of feeding behavior initially, the insects feed on leaves, subsequently moving on to feed on flowers, squares, and bolls. Thrips possess piercing and sucking mouthparts, enabling them to attack and extract sap from various parts of the plant such as leaves, flowers, squares, and bolls.

Thrips life cycle, off season survival and alternate hosts

Thrips generally passes through four main stages in their life cycle: egg, nymph, pupa, and adult, with each stage having specific characteristics and behaviors. Adult females lay 50-65 elongated, cylindrical to kidney-shaped eggs in the soft tissue or veins of leaves. They

use their sharp ovipositors to insert the eggs into the leaf tissue. The eggs hatch after an incubation period of 4-9 days. The newly emerged nymphs feed on tender, lush green leaves. They are highly active and move around on the lower surface of leaves. After completing nymphal stage turns to pupa, when they stop feeding and pupate approximately 20-25 mm below the soil, in plant debris, or in mulch. The pupal period lasts about 2-4 days, after which adult thrips emerge. Adult thrips emerge from the pupal stage and engage in mating. Adult's main purpose is reproduction. After mating female lays eggs in the soft tissue of leaves. Females typically live for 2-4 weeks, while males have a shorter lifespan.

Thrips is active throughout the year on cotton and other alternate hosts (eggplant, pepper, onion, potato, garlic, cabbage, beans, papaya, chilli, shallot and cauliflower). It attacks the cotton crop during June to September in North zone. Generally cotton harvesting takes place in October and November and by the end of September-October, thrips populations migrates towards early-sown cabbage and cauliflower, where they begin feeding and reproducing. By November, they switch hosts once more, moving to onion and garlic plants, where they continue to survive, reproduce, and complete their life cycle until April-May.

Nature of Damage and Symptoms:

The damage starts from the cotyledon stage and then progresses to mature leaves, resulting in wrinkled or depressed leaves because of the removal of the cellular contents; later on, affected leaves turn silvery and the leaf margin curls upward. This feeding behavior often results in the creation of cut marks on leaves alongside sap extraction site. Due to sap sucking and cut by piercing type mouth parts the leaf is often ripped off, being distorted and hardy. As the population crossed Economic Threshold Level (ETL); the symptom starts appearing on old leaf, square, flower and boll also.

Typical symptoms due to thrips feeding are as under:

- 1. Silvery patches on leaves:** Initially, thrips starts damage on new leaves, resulting in the emergence of silvery patches near the leaf veins. As the incidence of thrips increases, these silvery patches progressively spread to the entire leaf. (Plate 4 & 5).
- 2. Upward curling of leaves from edges:** As a result of sap-sucking the leaves become silvery and exhibit an upward curling. These symptoms may be observed from the boundary of the fields itself. The thrips population naturally decreases on distorted and torn leaves, while it shows higher population on new leaves (Plate 6).
- 3. Hardiness at lower leaf surface:** The drying of silvery patches results in reduced sap

content in leaves causing their hardening, producing a distinct rasping sound when the leaves are gently scraped by hand (Plate 7).

- 4. Distortion or rip off of leaf:** After hardening of leaves, the occurrence of cuts, distortion, and tearing becomes noticeable on the leaf surfaces. Fully damaged leaves exhibit cuts at various angles, coupled with distortion. Eventually, the entire field displays a distorted appearance, and in heavily attacked areas, the damaged leaves resemble like sieves. (Plate 8).
- 5. Defoliation of damaged leaf:** Following distortion, the leaves shows drying and ripping from various locations. Subsequently, a defoliation process begins which significantly hampers the plant's ability to grow, produce branches, bear bolls, and ultimately reduces its potential yield.

General thrips scenario under unprotected conditions:

Over the past decade, generally under unprotected condition thrips have been crossing the ETL during 26th SMW (25th June-1st July) or later and showed a shorter persistence whereas thrips crossed ETL during 25th SMW (18th June-24th June) in 2023, in first fortnight of June (during 23-24 SMW; 04th June-17th June) and attack increases continuously. During 2023, the reported incidence remained above the ETL for duration of 4-6 weeks.

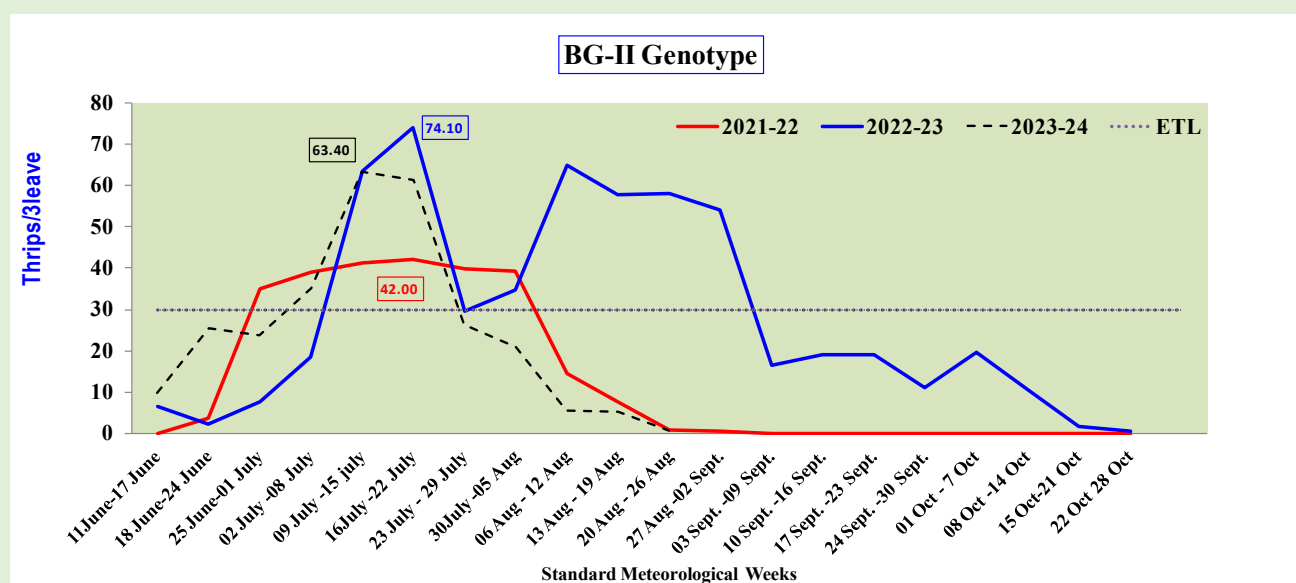


Figure 1. Thrips population recorded on BG-II genotype under unprotected conditions

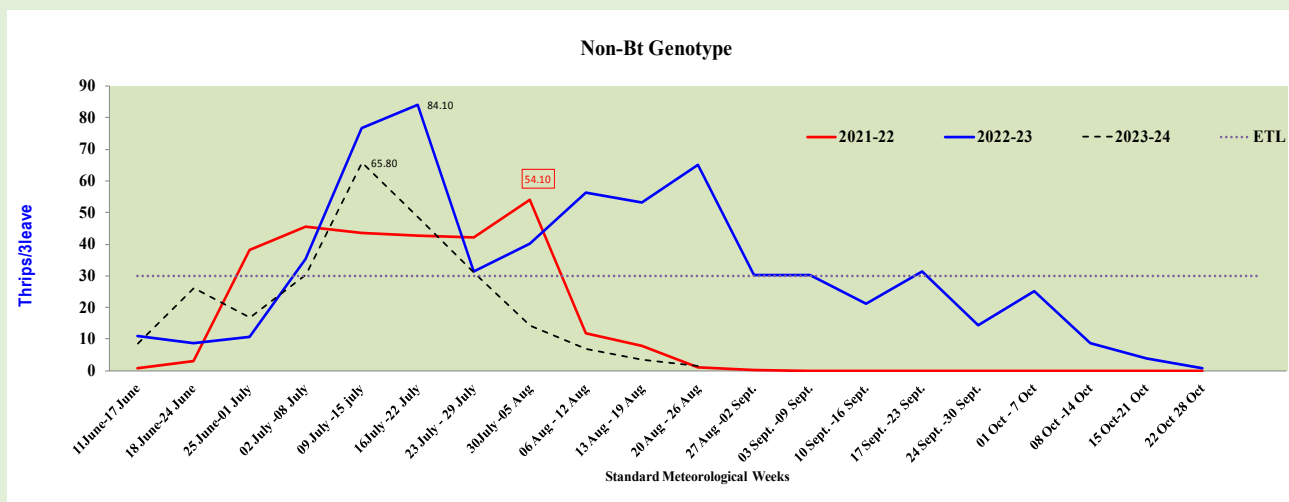


Figure 2. Thrips population recorded on Non Bt genotype under unprotected conditions

Farmer field surveys:

This season (2023-24) the sowing window was very wide and cotton at farmer’s field was sown from 1st April to 10th June. The early sown cotton along with the congenial conditions supported the earlier incidence of thrips and it was further perpetuated for the late sown cotton crop. The results from the farmers’ field survey revealed variations in thrips population and number of locations crossed ETL (Economic Threshold Level). Thrips populations ranged from 1 to 52, 2 to 55 and 2 to 67 /3 leaves during 2021, 2022 and 2023 cotton season, respectively. Notably, there was a prominent increase in thrips populations in the 2023 season compared to earlier years. Total locations surveyed were 98, 97 and 133 (22-33 SMW; 28th May-19th Aug), respectively during 2021, 2022 & 2023. Out of total locations surveyed, the percentage of locations crossed ETL increased significantly over the years, from 6.12 (%) in 2021, 8.24 in 2022 and 37.59 (%) in 2023. It was also recorded that at farmers field locations the ETL crossed during 28th SMW (09th July-15th July), 29th SMW (16th July-22nd July)

and 25th SMW (18th June-24th June) in 2021, 2022 and 2023, respectively, which clearly confirmed the advancement of the thrips incidence over the years in North Zone.

Monitoring and Management

To monitor the thrips incidence it is advised to survey the crop regularly starting from seedling to 120 DAS old crop. The ETL of thrips is average thirty (30) nymphs or adults per 3 leaves based the counts recorded on twenty (20) tagged plants. The monitoring procedure involves early morning visits to the field, where a random selection of 20 plants per acre is required avoiding plants from boarder row and shade. From each selected plant, one fully formed leaf to be observed from each of the upper, middle and lower stratum (total 3 leaves per plant) and the number of thrips present will be counted. If the survey reveals that thrips populations have crossed the established ETL, the application of recommended interventions (botanicals/biopesticides/insecticides) may ensure effective pest management vis. a vis. higher yield.

Table 1. Number of farmer’s field location surveyed during 2021-2023 from 22-33 SMW (28th May-19th Aug)

Year	No. of location surveyed*	No. of ETL crossed locations & (population range)	ETL crossed (%)	ETL crossed (SMW)
2021	98	06(1-52)	6.12	28th SMW (09th July-15th July)
2022	97	08(2-55)	8.24	29th SMW (16th July-22nd July)
2023	133	50(2-67)	37.59	25th SMW (18th June-24th June)

*Survey report from Sirsa District (Haryana) having highest area under cotton.

(To be continued...)

(The views expressed in this column are of the authors and not that of Cotton Association of India)