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Host Plants and Impact of Thrips (Thysanoptera)

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Thrips (*Thysanoptera*) are minute, fringed-wing insects that have emerged as pests of global agricultural importance. Their damage arises not only from direct feeding but also from their efficiency as vectors of plant-infecting tospoviruses. Thrips infest a vast range of host plants, spanning vegetables, fruits, ornamentals, field crops, and weeds, thereby complicating management. Their cryptic habits, high reproductive rate, and ability to develop resistance to insecticides make them especially problematic. This article reviews the host associations of economically important thrips species, their direct and indirect impacts on crop productivity and quality, and the broader ecological and economic implications of their pest status.

Thrips are among the smallest phytophagous insects but exert disproportionately large economic impacts. Belonging to the order *Thysanoptera*, they include more than 6,000 species, of which approximately 1% are considered crop pests (Mound, 2005). Thrips possess asymmetrical piercing–sucking mouthparts, uniquely adapted for scraping epidermal cells and sucking out contents. Their feeding produces characteristic silvering, scarring, and deformation of plant tissues.

Thrips are not only polyphagous feeders but also vectors of tospoviruses, such as *Tomato spotted wilt virus* (TSWV), *Impatiens necrotic spot virus* (INSV), and *Groundnut bud necrosis virus* (GBNV), which can decimate yields. Because tospovirus transmission is persistent and propagative, the virus replicates inside the thrips, making control extremely difficult (Ullman et al., 1997).

Taxonomic Overview of Thrips

Order: Thysanoptera

Families: Phlaeothripidae and Thripidae (the latter includes most crop pests).

Key Pest Genera: *Thrips*, *Frankliniella*, *Scirtothrips*, *Caliothrips*.

Notable Pest Species:

- *Thrips tabaci* (onion thrips)

- *Frankliniella occidentalis* (western flower thrips)
- *Thrips palmi* (melon thrips)
- *Scirtothrips dorsalis* (chilli/mango thrips)
- *Frankliniella schultzei* (common blossom thrips)

Host Plants of Thrips

Vegetables

- *Thrips tabaci*: Onion, garlic, leek, cabbage, tomato, potato.
- *Thrips palmi*: Eggplant, chilli, cucumber, pumpkin, watermelon, gourds.
- *Frankliniella occidentalis*: Tomato, pepper, lettuce, beans, spinach, greenhouse vegetables.

Field Crops

- Cotton: leaf curling, stunting at the seedling stage.
- Groundnut: bud necrosis (via GBNV).
- Soybean: flower abortion, reduced pod set.
- Sunflower, maize, wheat (sporadic infestations).

Fruit Crops

- *Scirtothrips dorsalis*: Mango (inflorescence damage), grapes (bronzing), strawberry (fruit scarring), citrus.
- *F. occidentalis*: Strawberry, grape, kiwi.
- *Caliothrips indicus*: Citrus thrips in India.

Ornamentals

- Roses, chrysanthemum, gerbera, gladiolus, carnation, tulip, orchid.
- Damage: petal streaking, flower deformation, discoloration — major quality loss.

Weeds as Reservoirs

- *Amaranthus*, *Parthenium hysterophorus*, *and Solanum nigrum* serve as virus reservoirs and thrips breeding hosts.
- Presence of weeds correlates with outbreak intensity in nearby crops (Kirk & Terry, 2003).

Impacts of Thrips

Direct Impacts

1. **Feeding Injury**

- Leaves: silvery streaks, necrosis, curling, stunting.
- Flowers: petal distortion, premature senescence, reduced pollination.
- Fruits: bronzing, corky scars, pitting, and downgrading of quality.

2. **Growth Reduction**

- Severe seedling attack leads to poor establishment (onion, cotton, chilli).
- Continuous feeding reduces photosynthesis and vigor.

3. **Marketability Issues**

- Ornamentals: even slight petal damage leads to rejection.
- Fruits/vegetables: scarring reduces grade and export potential.

Indirect Impacts

1. Virus Transmission

- Over 20 tospoviruses are transmitted by thrips.

Examples:

- *Thrips tabaci* → Iris yellow spot virus (IYSV) in onion.
- *F. occidentalis* → TSWV, INSV in vegetables/ornamentals.
- *T. palmi* → Peanut bud necrosis virus (PBNV).
- *S. dorsalis* → Capsicum chlorosis virus (CaCV).
- Viral diseases often result in yield losses exceeding 50–80%.

2. Quarantine Significance

- Infestation leads to export rejection (cut flowers, strawberries, capsicum).
- Western flower thrips is considered a quarantine pest in many countries.

3. Resistance Development

- Thrips rapidly develop resistance to pyrethroids, organophosphates, carbamates, and even some newer chemistries (Reitz, 2009).
- Resistance complicates pest management, escalating costs.

Case Studies of Economic Loss

- **Onion (India):** IYSV transmitted by *T. tabaci* has reduced bulb yields up to 60%.
- **Groundnut (South Asia):** PBNV vectored by *T. palmi* has caused yield losses of 30–70%.
- **Tomato (USA & Europe):** TSWV epidemics in tomatoes and peppers due to *F. occidentalis* infestations, necessitating costly IPM programs.
- **Strawberry (California, Spain):** Fruit bronzing and downgrading caused by *F. occidentalis* infestations.

Ecological and Evolutionary Implications

- Thrips thrive in warm, dry climates, with populations exploding in drought conditions.
- Their polyphagy and short generation time allow adaptation to diverse hosts.
- Virus-vector interactions are evolutionary drivers — tospoviruses enhance thrips survival and reproduction, creating a mutualistic relationship (Ullman et al., 1997).

Conclusion

The impacts of thrips are multifaceted: direct feeding reduces photosynthetic efficiency and aesthetic quality, while virus transmission causes catastrophic yield losses. Their wide host range ensures continuous survival, and resistance evolution challenges conventional control. The persistence of thrips across vegetables, field crops, fruits, and ornamentals underscores the need for holistic management, combining cultural sanitation, biological control (predatory mites, *Orius* spp.), and rational chemical use.

8. Conclusion

Thrips represent a significant constraint to sustainable crop production worldwide. Their ability to colonize multiple host plants, cause direct tissue damage, and transmit devastating viruses makes them one of the most challenging pest groups to manage. Future strategies should prioritize IPM, resistance monitoring, and exploitation of natural enemies, alongside strict quarantine enforcement to prevent global spread.

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