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Emerging Threat of Thrips in Chilli Cultivation: Identification, Impact, and Management Strategies

*Bomma Pavan Kumar[1], Telu Hajay[2], Ashfaq Ahmed S[3], Kammari Harsha Vardhan[4] and Kothapalli Sai Lakshmi Samyuktha[5]

[1]B.Sc. (Hons) Agriculture, Jagannath University, Jaipur, India
[2]Research Associate, Research and Development, Urban Kisaan, Hyderabad, India
[3]Biologist, Biosecurity, National Aquaculture Group (NAQUA), Saudi Arabia
[4]Filed Marketing Officer, Marketing, Adama India Pvt Ltd, Sirguppa, Karnataka
[5]M.Sc. Agriculture (Nematology), College of Agriculture, Bhubaneswar, Odisha University of Agriculture & Technology, Bhubaneswar, Odisha, India
*Corresponding Author's email: kbommapavan@gmail.com

Chilli *(Capsicum annuum L.)* is an indispensable cash crop in India, serving both culinary and industrial purposes. India is the world's largest producer, consumer, and exporter of chillies, with major growing states including Andhra Pradesh, Telangana, Karnataka, Tamil Nadu, and Maharashtra. However, the productivity and quality of chilli crops are being severely threatened by the rising incidence of pests, especially thrips. Thrips are minute, slender insects that have become increasingly notorious in chilli-growing regions due to their ability to cause both direct and indirect damage. Their rapid reproductive cycle, ability to transmit viral diseases such as Chilli Leaf Curl Virus (ChiLCV) and Tospoviruses, and growing resistance to insecticides have made them a significant pest. Climate change, unsustainable pesticide use, and monoculture practices have exacerbated their spread, posing a grave challenge to sustainable chilli cultivation.

Field photo of chilli Crop

Thrips Identification and Biology

Species of Concern

The primary thrips species affecting chilli crops is Scirtothrips dorsalis (chilli thrips), although other species like Thrips palmi and Frankliniella schultzei may also occur.

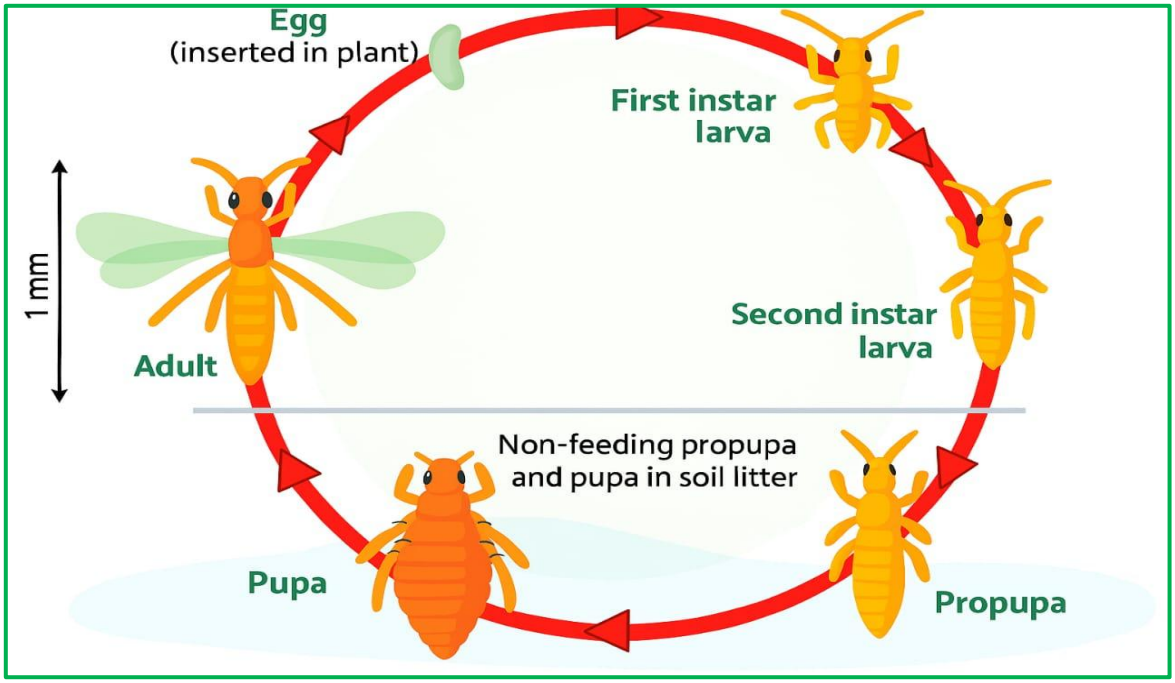
Morphological Features

- Adults: 1–2 mm in length, pale yellow to dark brown, with fringed wings.
- Nymphs (larvae): Wingless, yellowish-white, and usually found on tender plant parts.

Life Cycle

- Eggs are laid inside leaf tissues.

- Two larval stages followed by non-feeding pupal stages (prepupa and pupa).
- Adults emerge within 15–20 days under favorable temperatures (25–30°C).



Life cycle of Thripidae (e.g. Thrips palmi)

Damage Caused by Thrips

Direct Feeding Damage

Thrips feed by piercing plant cells and sucking the sap, resulting in:

- Silvery sheen on leaves due to cell collapse
- Curling and distortion of young leaves
- Wilting and drying of terminal buds
- Poor fruit set due to flower drop

Indirect Damage: Virus Transmission

Thrips are vectors of devastating viruses:

- **Chilli Leaf Curl Virus (ChiLCV):** Characterized by upward leaf curling, mosaic patches, and plant stunting.
- **Tospoviruses** such as **Groundnut Bud Necrosis Virus (GBNV)** and **Tomato Spotted Wilt Virus (TSWV):** Cause necrotic rings, chlorotic spots, and heavy fruit loss.

	
Healthy Chilli Plant	Chilli Plants damaged by Thrips

Economic Impact on Chilli Farmers

- Thrips can reduce chilli yields by **30–60%** depending on the infestation stage and viral spread.
- Quality deterioration affects marketability shriveled, malformed, or discolored fruits fetch lower prices.
- Increased input costs due to repeated chemical sprays and virus-infected crop failures.

A single severe infestation can push marginal chilli growers into debt due to high dependency on credit for inputs.

Favorable Conditions for Outbreaks

Several agronomic and climatic factors contribute to thrips population explosions:

1. Monoculture and Continuous Cropping

Chilli being grown year-round without rotation enables pest carryover between seasons.

2. Unsustainable Chemical Use

Over-reliance on broad-spectrum insecticides leads to:

- Resistance development in thrips
- Destruction of natural enemies (predators and parasitoids)

3. Climate Change

- Prolonged dry spells and increased temperature favor rapid thrips multiplication.
- Rainfall suppression reduces natural pest control mechanisms.

4. Lack of Resistant Varieties

Most commercial hybrids are susceptible to both thrips and virus infections, lacking genetic resistance.

Monitoring and Threshold-Based Control

Scouting Techniques

- Regular field inspections (2–3 times per week) for leaf curling, silvering, and bud drying.
- Checking the underside of tender leaves and flower buds.

Use of Traps

- Blue sticky traps placed at crop height attract and trap adult thrips.

Economic Threshold Level (ETL)

- 10–15 thrips per flower or 3–5 per leaf warrants immediate action.

Integrated Pest Management (IPM) Strategies

Thrips management must be **multi-pronged** to be effective and sustainable:

1. Cultural Control

- **Crop rotation** with non-host crops like legumes.
- **Intercropping** with marigold or sesame to reduce thrips attraction.
- **Sanitation**: Removal of crop residues and alternate host plants.
- **Proper irrigation and spacing**: Reduce stress and ensure better aeration.

2. Use of Resistant/Tolerant Varieties

- Varieties under testing from ICRISAT, IIHR, and private seed firms show promise but are not widely available yet.

3. Biological Control

- Predators: Chrysoperla carnea, Orius spp., ladybird beetles
- Parasitoids: Thripobius semiluteus
- Fungal Biopesticides: Beauveria bassiana, Metarhizium anisopliae, Verticillium lecanii

4. Botanical Extracts

- Neem oil or Azadirachtin-based products (1500 ppm @ 2–3 ml/l) applied in early stages.
- Garlic-chilli extract or pongamia oil-based sprays.

5. Judicious Chemical Use

- Rotate insecticides with different modes of action:

✓ Spinosad 45 SC @ 0.3 ml/l
✓ Fipronil 5 SC @ 1 ml/l
✓ Imidacloprid 17.8 SL @ 0.5 ml/l
✓ Lambda-cyhalothrin 5 EC @ 1 ml/l

- Avoid tank-mixes of multiple chemicals.
- Never spray during flowering to protect pollinators.

Case Study: 2020–21 Thrips Epidemic in Andhra Pradesh

The Guntur and Kurnool districts witnessed a massive outbreak in late 2020:

- Over 50,000 hectares affected
- Crop loss worth ₹500+ crore
- Panic-driven pesticide use worsened resistance
- Suspected new biotype of thrips with higher virulence

Lessons learned:

- Monitoring must be community-based
- IPM is more reliable than chemicals alone
- Extension agencies must strengthen grassroots response systems

Future Trends and Innovations

RNAi and CRISPR-based Solutions

- Gene silencing to inhibit thrips reproduction and virus replication.
- Early trials show promise for next-generation biopesticides.

Digital Pest Surveillance

- Use of drones, remote sensing, and AI to monitor pest hotspots.
- Mobile apps that notify farmers of ETLs and treatment windows.

Drone spraying in a chilli field or farmer using a mobile advisory app

Climate-Smart IPM

- Integration of weather forecasting and pest dynamics for region-specific advisories.

Conclusion

Thrips have emerged as one of the most destructive pests of chilli, causing significant direct and indirect losses. Their ability to transmit viruses, adapt rapidly, and resist common insecticides has made them difficult to control through conventional methods. However, a balanced approach using IPM combining cultural, biological, and chemical strategies can offer long-term sustainability. Enhancing farmer awareness, investing in pest surveillance systems, and encouraging research on resistant varieties are vital steps towards securing the future of chilli cultivation in India.

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