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Effective strategies for managing the invasive pest *Thrips parvispinus* (Karny)

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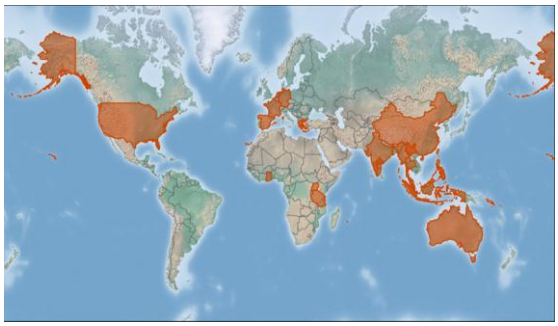
Introduction:

The genus Thrips (Linnaeus), a member of the subfamily Thripinae, is notably extensive, comprising 301 identified species worldwide. A total of 44 species with newly documented distributional records have been reported from various geographical regions of India. (Rachana and Varatharajan, 2017). In India, 44 species from this genus have been recorded (Rachana *et al*., 2022). They constitute a critical group of sap-sucking pests that cause substantial financial damage by both directly infesting crops and indirectly transmitting severe plant viruses, resulting in significant economic losses. Recent observations indicate a surge in thrips populations across various regions, attributed to changes in agricultural practices, pesticide use, and fluctuations in climate. Notably, outbreaks of *Thrips parvispinus* have been reported in numerous areas.

Thrips parvispinus (Karny) is a widely distributed pest species found from Thailand to Australia. In recent years, there has been a significant expansion in its geographic range.

This species has been observed infesting papaya in Hawaii, Gardenia sp. in Greece, and various vegetable crops in different countries. Its presence in India was initially noted on papaya in Bengaluru (Tyagi *et al.,* 2015) and later on trumpet tree, *Dahlia rosea* (Rachana *et al.,* 2018), chilli, bell pepper, brinjal, okra, bittergourd, potato, shallot (onion), pigeon pea, green gram, beans, sorghum, maize, gingelly, cotton, strawberry and marigold (Nagaraju *et al*., 2021 and Roselin *et al.,* 2021). Due to its potential to become a pest, continuous monitoring of this species has been established in various parts of India following its initial detection.



Geographical distribution of *Thrips parvispinus*

The recent outbreak of *Thrips parvispinus* in chilli cultivation areas of

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Andhra Pradesh, Telangana, and Karnataka during the 2021-22 Rabi season has raised concerns among farmers and scientists.

Biology and life cycle

Egg

Female thrips utilize a saw-like ovipositor to lay their eggs, depositing them in diverse plant parts including leaves, petioles, bracts, petals, and developing fruits. These eggs are kidney-shaped, smooth, and opaque white in appearance, and are typically embedded within the leaf tissue. They can be observed using illuminating light.

Larvae

Thrips larvae are slender and range in color from creamy-white to yellow. They undergo two developmental stages. These larvae display thigmotactic behavior, preferring to seek sheltered areas within plants to avoid predators while actively feeding on leaves and flowers.

Pupa

Pupal stages of thrips are identified by their white to cream coloration. They are non-feeding and typically reside in soil or growing substrates. These pupae remain inactive unless disturbed. The first stage is marked by shorter wings and forward-projecting antennae, while the second stage exhibits longer wing pads and antennae folded back over the head. These pupal stages are usually located in moist environments like soil and intricate floral structures.

Adults

Female thrips are approximately 1 mm in length, characterized by a brown head and prothorax, yellowish-brown meso- and metathorax, and a black abdomen. They have dark forewings and light-colored antenna segments. In contrast, adult males are noticeably smaller at 0.6 mm, winged, and uniformly yellow in color. The total life cycle is about 15 to 18 days.

Identification of *Thrips parvispinus* and *Scirtothrips dorsalis*

Thrips parvispinus is characterized by antennae with seven segments, a forewing second vein containing a row of complete setae, and a lateral third tergite devoid of microtrichia. In contrast, *Scirtothrips dorsalis* possesses eight-segmented antennae, with the forewing second vein bearing two distal setae, and the lateral third tergite displaying rows of closely spaced microtrichia.

Nature and symptoms of damage

On leaves

- Pest starts to colonize on under surface of leaves and suck the sap causing deep punctures as well as scratches.
- Reddish brown discolouration occurs on under surface and also leaves

become wrapped with necrotic spots and yellow strips.

Floral parts

- Colonize the flower followed by brown streaks appear on flower
- It feeds on pollen resulting in flower drop and affects the fruit production and overall yield **(Thorat *et al.*, 2022).**

Black thrips colonized the flower

Integrated pest management:

- Regular monitoring of field to check infestation of thrips
- Identification and destruction of severely infected plant parts and weeds in the vicinity which act as alternate and collateral hosts.
- Deep summer ploughing to remove pupa as well as dormant stages of pest.
- Prior to the application of farm manure (FYM) or compost, it is essential that the material undergoes thorough decomposition.
- Implementing balanced fertilization practices that involve elevated potash application alongside nitrogen and phosphorus fertilizers to stimulate crop resilience against pests.
- Planting three rows of tall crops such as sorghum, corn, bajra, or forage grasses closely together serves as a barrier to impede the movement of thrips.
- Combining chilli with sorghum, corn and cowpea in a ratio of 3:10:1 functions as both a barrier and a reservoir to promote the reproduction of natural predators, thereby facilitating biological control of thrips.
- Consider transitioning to a sprinkler irrigation system instead of flood irrigation, as the water spray produced by sprinklers disrupts the growth and reproduction of thrips.
- Applying botanical pesticides such as Neem Seed Kernel Extract (NSKE) 5% or Neem oil 3% (@ 2 ml per litre), Pongamia oil @ 3 ml per litre, and Vitex negundo extract at a range of 50-80 ml per litre. Alternatively, microbial-based insecticides like *Beauveria bassiana* at 4.00 g or ml per litre (with a spore load of $1x10^8$cfu/ml), *Pseudomonas fluorescence* @ 20g per litre, or *Bacillus albus* – NBAIR-BATP @ 20 g per litre, should be uniformly applied to cover the entire plant.

- Deploy blue sticky traps at a density of 25-30 traps per acre to mass capture thrips in fields affected by infestations.
- Utilize insecticides as needed based on specific requirements.

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