AgriScope
Monthly e-Magazine on Agriculture and Interdisciplinary Sciences
Visit at us: www.agriscope.in
Email at us: agri4scope@gmail.com
ISSN: 3139-6488

Thrips as a Challenge in Vegetable Production: Biology, Damage and Integrated Management

Geeta Songer[1]*, Akanand[1], Manish Kumar[1], Vinita Darro[1] and Hem Prakash Verma[2]

[1]Department of Entomology, College of Agriculture, Raipur

[2]SRF, ICAR-National Institute of Biotic Stress Management, Raipur

*Corresponding author: geetasonger1@gmail.com

Article ID: 29002

Introduction

Vegetables are an important component of the human diet and play a vital role in nutrition, food security and economic development. They are major sources of vitamins, minerals, dietary fibre, antioxidants and other bioactive compounds. Vegetable crops also provide farmers with higher economic returns within a short duration and contribute to the development of agriculture-based industries. India is the second-largest vegetable-producing country in the world after China and contributes approximately 15% of global vegetable production. The country produces more than 219 million metric tonnes of vegetables annually; however, productivity is adversely affected by insect pests and diseases (Kumar and Pal, 2020).

Thrips (Order: Thysanoptera) are minute and economically important insect pests that cause damage to vegetables, fruits, oilseeds, pulses and ornamental plants worldwide. They cause direct damage by sucking sap from leaves, buds, flowers and fruits, resulting in leaf curling, deformation, flower and fruit shedding, and reduced plant growth. In addition, several thrips species act as vectors of plant viruses, further increasing their economic importance (Mound and Kibby, 1998; Rao *et al*., 2018).

In India, the incidence of thrips is increasing rapidly in major vegetable crops such as chilli, tomato, brinjal, onion, garlic, okra, cucumber, bitter gourd, bottle gourd, pumpkin, watermelon, muskmelon and beans. Among these, *Scirtothrips dorsalis*, *Thrips palmi*, *Thrips tabaci*, *Frankliniella occidentalis* and the recently emerging species *Thrips parvispinus* are important damaging species. *Thrips parvispinus* has emerged as a highly destructive pest of chilli and other crops, and under favourable conditions, yield losses may reach 80-100% (Sridhar *et al*., 2021; Prasannakumar *et al*., 2021).

Climate change, crop diversification, expansion of protected cultivation and indiscriminate use of insecticides are making the thrips problem increasingly serious. Thrips infestation may cause 30-100% yield loss in different vegetable crops, thereby affecting production, quality and farmers' income. Therefore, knowledge of thrips identification, biology, host plants, damage symptoms and integrated pest management strategies is essential (Mouden *et al*., 2017; Jensen, 2000; Bielza, 2008).). Such information can contribute significantly to increasing vegetable production and quality while promoting environmentally safe, sustainable and profitable agricultural systems.

Major Identification Characteristics of Thrips

Thrips are very small, slender and elongated insects, generally measuring 1-2 mm in length. Their body colour may vary from yellow and light to dark brown or black. They possess piercing and sucking-type mouthparts, and their antennae generally consist of 6-9 segments. Adults have two pairs of narrow, membranous wings fringed with long hairs along the margins, which constitute one of their characteristic identification features. Nymphs are wingless and generally light yellow or cream in colour. Adult thrips move rapidly and often remain hidden in leaves, buds and flowers. The presence of a silvery or silvery-white sheen and minute black fecal spots on affected plant parts are also characteristic signs of thrips infestation.

Life Cycle

The life cycle of thrips generally consists of the egg, two nymphal stages, prepupal, pupal and adult stages. Female thrips lay their eggs within tender leaves, buds, flowers or other soft plant tissues. Nymphs hatch from eggs within 2-7 days and feed on plant sap as they grow. The nymphal stages are followed by the prepupal and pupal stages, which are generally completed in the soil, dried leaves or protected portions of plants. Adults subsequently emerge from the pupal stage. Under favourable temperature and humidity conditions, the complete life cycle of thrips may be completed within approximately 12-20 days, allowing their populations to increase rapidly (Mouden *et al*., 2017).

Damage Symptoms

Thrips damage plants by sucking sap from tender leaves, buds, flowers and fruits. Both nymphs and adults are damaging stages. Their feeding causes a silvery appearance on affected leaves, along with upward curling, crinkling and deformation of the leaves. Under severe infestation, plant

growth becomes stunted, and plants appear weak. Infestation of flowers may result in flower shedding and adversely affect fruit formation. Rough, brown or cork-like lesions may develop on mature fruits, reducing their quality and market value. Consequently, considerable yield losses may occur. In addition, some thrips species act as vectors of plant viruses, causing both direct and indirect damage to crops (Rao *et al*., 2018).

(a) Thrips on flower (b) Adult thrips (c) Symptoms of thrips damage on chilli

Integrated Pest Management of Thrips in Vegetable Crops

Considering the polyphagous nature, high reproductive potential, short life cycle and developing insecticide resistance in thrips, effective management cannot rely solely on chemical control. Therefore, the following integrated pest management (IPM) strategies can be adopted for successful and long-term management of thrips.

Cultural Measures

- Use healthy and pest-free planting material.
- Keep fields free from weeds and crop residues, as several weeds may serve as alternative hosts for thrips.
- Adopt balanced fertilizer management and avoid excessive application of nitrogenous fertilizers.
- Follow crop rotation to disrupt the life cycle of the pest.

Mechanical and Physical Measures

- Install blue or yellow sticky traps at 20-25 traps per hectare for monitoring and partial suppression of thrips populations.
- Remove and destroy infested leaves, buds and other affected plant parts.
- In protected cultivation, insect-proof nets can be used to prevent the entry of thrips.

Biological Control

- Conserve natural enemies such as ladybird beetles, *Chrysoperla* and predatory mites.
- Entomopathogenic biopesticides such as *Beauveria bassiana*, *Metarhizium anisopliae* and *Verticillium lecanii* may be applied at 4.0 g or 1 ml per litre of water.
- Neem-based products at 1500-10,000 ppm may be effective when applied during the early stages of infestation.

Chemical Control

- Before sowing, seeds may be treated with imidacloprid 70 WS @ 12 g per kg seed, and at the time of transplanting, carbofuran 3G @ 33 kg per hectare or phorate 10G @ 10 kg per hectare may be applied to the soil.
- Continuous use of insecticides belonging to the same chemical group should be avoided to prevent the development of insecticide resistance. Therefore, insecticides such as spinosad, spinetoram, fipronil or other locally recommended insecticides should be rotated appropriately.
- During spraying, the lower surface of leaves and flowers should be thoroughly covered because thrips often hide in these locations.
- Once the economic threshold level is exceeded, one of the following insecticides may be applied at the recommended dose.

Insecticide	**Dose**
Imidacloprid 17.8% SL	3.0 ml/10 L water
Dimethoate 30% EC	1.0 ml/L water
Fipronil 5% SC	1.5 ml/L water
Emamectin benzoate 5% SG	4 g/10 L water

Insecticide	Dose
Spinosad 45% SC	3.2 ml/10 L water
Thiacloprid 21.7% SC	6.0 ml/10 L water
Abamectin 1.9% EC	5.0 ml/10 L water
Spinetoram 11.7% SC	5.0 ml/10 L water
Cyantraniliprole 10.26% OD	6.0 ml/10 L water
Spirotetramat 15.31% OD	5.0 ml/10 L water
Oxydemeton-methyl 25% EC	1.0 ml/L water
Phosalone 35% EC	2.0 ml/L water

Monitoring and decision-based management

- Regularly inspect the crop and initiate management measures as soon as the initial occurrence of thrips is detected.
- Monitor thrips populations using sticky traps and plant samples.
- Chemical control should be undertaken only when the pest population reaches or exceeds the economic threshold level and based on the severity of infestation.

References

Bielza, P. (2008). Insecticide resistance management strategies against the western flower thrips, *Frankliniella occidentalis*. *Pest Management Science, 64*(11), 1139–1144. https://doi.org/10.1002/ps.1610

Jensen, S. E. (2000). Insecticide resistance in the western flower thrips, *Frankliniella occidentalis*: Research and management. *Integrated Pest Management Reviews, 5*, 131–146.

Kumar, A., & Pal, R. (2020). Sustainable integrated pest management of vegetable crops. *Indian Horticulture, 65*(1).

Mouden, S., Sarmiento, K. F., Klinkhamer, P. G. L., & Leiss, K. A. (2017). Integrated pest management in western flower thrips: Past, present and future. *Pest Management Science, 73*(5), 813–822.

Mound, L. A., & Kibby, G. (1998). *Thysanoptera: An identification guide* (2nd ed.). CAB International.

Prasannakumar, N. R., Venkataravanappa, V., Rachana, R. R., Sridhar, V., Govindappa, M. R., Basavarajappa, M. P., Hemalatha, K. J., Aswathnarayana, D. S., Reddy, M. K., & Samuel, D. K. (2021). Status of the outbreak of *Thrips parvispinus* (Karny) on chilli in Karnataka. *Pest Management in Horticultural Ecosystems, 27*(2), 286–289.

Rao, S., Tjallingii, W. F., Dicke, M., Smith, C. M., & Weintraub, P. G. (2018). Thrips advisor: Exploiting thrips-induced defences to combat pests on crops. *Journal of Experimental Botany, 69*(8), 1837–1850. https://doi.org/10.1093/jxb/ery040

Sridhar, V., Rachana, R. R., Prasannakumar, N. R., Venkataravanappa, V., Sireesha, K., Anitha Kumari, D., Reddy, K. M., Naik, O. S., Chandana, P. S., & Reddy, M. K. (2021). Dominance of invasive species, *Thrips parvispinus* (Karny) over the existing chilli thrips, *Scirtothrips dorsalis* Hood on chilli in the southern states of India with a note on its host range: A likely case of species displacement. *Pest Management in Horticultural Ecosystems, 27*(2), 132–136.