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Integrated Pest Management of Black Thrips, *Thrips parvispinus* (Karny) in Chilli

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Introduction

Chilli, a plant scientifically known as *Capsicum annum* L., is cultivated for its use as a vegetable, spice, and condiment. Chilies are grown in all states of India. Around 26% of the total cultivated area for chillies comes from the state of Andhra Pradesh, with Maharashtra, Karnataka, and Orissa following at 15%, 11%, and 11% respectively, as the remaining areas with other states contribute around 22% in total.Several problems have been associated with its decreased output. Among the various biotic pressures, the most severe are the crop losses and harm caused by insect pests. The leaves and fruit of chilli plants in India are subject to damage from approximately 25 different insect pests, such as thrips, mites, aphids, whiteflies, fruit borers, and cutworms. During November 2021, a new invasive thrips,*Thripsparvispinus* and a member of "*Thrips orientalis* group" (Mound, 2005) was recorded in chilli growing areas of Telangana state (Anithakumari*et al*., 2021). Records show that this has been recorded in places such as Indonesia, India, Thailand, Malaysia, Singapore, Taiwan, China, the Philippines, Australia, and the Solomon Islands. The Asian tropics are the native habitat of this pest. It was first discovered In India, on papaya (*Carica papaya* L.) in Bengaluru(Tyagi*et al*., 2015). As per the reports, the pest is polyphagous and attack various crops including strawberries, shallots, papayas, peppers, and beans. The larvae and adults harm the plants completely by consuming the leaves and developing buds directly. In addition, it causes harm to ornamental plants such as Ficus, Anthurium, Chrysanthemum, Dahlia, Dipladenia, and Gardenia.

Nature of Damage and Symptoms

T. parvispinus adults prefer areas adjacent to veins for colonizing and feeding. They puncture deeply and scratch on the dorsal surface of leaves. The yellowish and blotchy

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appearance on the ventral side of the leaves is caused by the chlorophyll scrapping from the underside of the leaves and the extraction of corresponding cell sap. The leaves have a reddish brown colouration on the lower surface. Leaf lamina becomes deformed and has necrotic spots, as well as yellow streaks. In cases of severe infestation, the new leaves either dry completely or damage.On floral parts, they cause brownish streaks on the petals due to scraping. Feeding on pollen can lead to an impact on pollination. The flowers become dry and wilted. All of these affect setting of fruit.

Integrated Pest Management approaches for Black thrips (*Thrips parvispinus*)

The following Integrated Pest Management practices are suggested for management of thrips complex on chilli. In order to achieve more effective outcomes, it is necessary to adopt a community-based approach over a large area.

Cultural Methods

1. In order to destroy the pupae of black thrips as well as their other residual stages, deep summer ploughing should be done.
2. Well decomposed farm yard manure (FYM) or compost application @ 2.5 t/ha, or application of enriched with *Metarhizium anisopliae* or *Pseudomonas fluorescens* @ 2 kg/t alongwith recommended doses of farm yard manure (25-30t/ha).
3. Application of 500 kg of Neem Cake and 1.5-2 t/ha of vermicompost in soil in order to develop resistance against thrips.
4. Seed treatment with Imidachloprid 70WS @10g/kg seed or Seedling root dip for 30 minutes with Imidachloprid 17.8% SL @ 0.5ml/L.
5. Maintain spacing (60 x 30 cm or 45 x 45 cm) and avoid close spacing. Pest incidence are favoured by high density planting.
6. Border cropping with 2-3 rows of tall growing crops like sorghum / maize / bajra / fodder grasses etc. sown thickly as a barrier for thrips movement.
7. Growing resistant or early/short duration varieties if available in order to escape the peak incidence of thrips.
8. Use silver coloured polythene sheets of 25-30 micron thickness as mulch to reduce pupation of thrips in the soil.
9. Clean cultivation and maintaining weed free bunds are crucial for the management of pests. Uprooting and destruction of weeds such as *Parthenium hysterophorus*, *Cleome*

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viscosa, *Prosopis* sp., *Lantana camara*, *Calotropis* sp., *Tecoma* sp., *Abutilon* sp., wild *Solanum* sp., etc. present in the vicinity of field bunds which act as off season and alternate host for thrips.

10. Plant 2-3 rows of tall growing crops like sorghum / maize / bajra / fodder grasses etc. as border crops which act as barrier in movement of thrips.
11. Intercrop chilli with maize or sorghum and cowpea at 10:3:1 as barrier and reservoir crops which acts as a reservoir crop for multiplication of natural enemy which will lead to biological control of thrips.Crop rotation with crops belonging to the family Poaceae or Gramineae (cereals).
12. For pest management maintain weed free bunds and clean cultivation. Uproot and destroy weeds like*Parthenium hysterophorus*, *Cleome viscosa*, *Prosopis* sp., *Lantana camara*, wild Solanum sp., etc. which are in the vicinity of field bunds which act as off season and alternate host for thrips.

Mechanical Methods

1. Nipping and destruction of severely infested apical shoots at vegetative stage for destruction of thrips residing over apical parts.
2. Mechanical destruction of severely infested plants by uprooting and burying or incineration.
3. For mass trapping purpose, install blue or yellow/white sticky traps at65-75 traps/ha at crop canopy height and for monitoring purpose install 20-25 traps/ ha.
4. Instead of flood irrigation adopt sprinkler irrigation system instead of, since the jet of water spray from sprinklers disrupts the growth and multiplication of thrips.

Biological Methods

1. Conservation of native natural enemies by avoiding spraying of chemical pesticides to the extent possible.
2. Spraying of microbial based insecticides like *Beauveria bassiana* or *Lecaniciliumlecanii* at 4g/L or 4ml/L (spore load - 1x108cfu/g or ml), Pseudomonas fluorescence – NBAIRPFDWD @20g/L or *Bacillus albus* – NBAIR-BATP @20 g/L uniformly covering whole plant.
3. Foliar spray of Entomo-Pathogenic Nematode (EPN), *Steinernemacarpocapsae* formulation @10g/L + 1 g wetting agent.

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4. Soil application of EPNs, *Steinernemacarpocapsae*or *Heterorhabditis indica*@7.50-12.50 kg/ha. It can be applied as soil drenching after mixing in 500 -750 litres of water. It is recommended to use EPNs early in the morning or during late evening hours as they are sensitive to UV and high temperature. Spraying of EPNs in peak sunshine hours be avoided.

Botanical Methods

1. Spraying % Neem Seed Kernel Extract (NSKE) or 5% Neem Seed Powder Extract or 0.50% Neem oil (5 ml/L), 0.50% Pongamia oil (5 ml/L), and 5% Vitex negundoextract (50 ml/L).
2. Spraying of commercial formulation of neem based insecticide (Azadirachtin3000PPM) @2 ml/L.
3. Spraying of 2% Fish Oil Rosin Soap (FORS) (20 ml/L) solely or in combination with Neem Seed Kernel Extract.
4. Spraying of sea weed (*Kappaphycusalvarezii*) extract @ 2 ml/L for inducing resistance in plant to withstand the severe incidence of thrips.

Chemical Methods

1. Spraying should be carried out uniformly to ensure that the entire plant is covered.
2. The insecticide solutions to be added with appropriate stickers and spreaders while spraying.
3. Strictly avoid spraying of unregistered agro-chemicals such as pesticides, plant growth regulators, nutrient mixtures, etc.
4. Avoid repeated spraying of chemical insecticides with same mode of action and spraying of sub-lethal doses to overcome thrips resurgence.

Legal control/ Export

During Phytosanitary inspections of the export shipments, through inspection of petiole region of the chilli has to be done. For the purpose of red chilli export, fully ripen and partially withered pods are harvested. Sun drying of harvested pods decrease the moisture to 10%. All insect pests get eliminated by the process of harvesting and sun drying, if they are associated. Therefore, *T. parvispinus* or any other species of thrips for that matter are not an impediment in export of red chilli. However, pesticide residues should be monitored by following waiting period. So, the presence of *T. parvispinus* or any other thrips species does

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not pose a hindrance to the exportation of red chili. It is important to monitor pesticide residues by abiding by the specified waiting period.

Conclusion

There is potential for progress in biological control methods for *Thrips parvispinus* both now and in the coming future with approaches that do not involve the use of chemicals. There is ongoing research aiming to identify and implement the most effective eco-friendly management practices that can be successfully applied in real-world situations. It can effectively solve several pest issues in both vegetable and ornamentalcropping systems.

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