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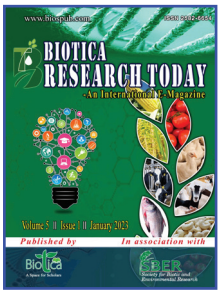

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Integrative Management Strategies of Chilli Thrips (*Scirtothrips dorsalis* Hood) in Chilli Crop

Ashutosh Singh Aman[1*], Pramod Kumar Mishra[1], Pawan Kumar[2], Arun Kumar[1] and Madan Mohan Bajpeyi[1]

[1]Dept. of Entomology, Chandra Shekhar Azad University of Agriculture & Technology, Kanpur, Uttar Pradesh (208 002), India

[2]Dept. of Entomology, Deen Dayal Upadhyaya Gorakhpur University, Gorakhpur, Uttar Pradesh (273 009), India

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Corresponding Author

Ashutosh Singh Aman

e-mail: ashutoshsinghaman@gmail.com

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Abstract

The chilli thrips, *Scirtothrips dorsalis* Hood, is the most important and devastating sucking pest of several vegetable, ornamental and fruit crops. It is considered as one of the major and most destructive pest of chilli crop. Chilli thrips is also called yellow tea thrips and strawberry thrips, originated from South-East Asia. Economic Threshold Level (ETL) of the notorious chilli pest considered is 2 thrips leaf^{-1}. Both nymph and adult of chilli thrips cause damage in chilli crop which is mainly responsible for upward curling of leaves and scaring on chilli fruits. This literature aims to promote bio-friendly approaches and make the farmers to follow safe management tactics. Various integrative management strategies to control chilli thrips has been discussed in this following literature.

Introduction

Chilli (*Capsicum annuum* L.) is a species of plant originated from Southern North America, Caribbean and Northern South America. It belongs to the family of Solanaceae is one of the most beneficial and important commercial spice and vegetable crop grown all over India as well as other different region of the world. Chilli is grown in both *Kharif* and *Rabi* season, In *Kharif* it is sown in between the month of July-August and in *Rabi* season it is sown in October-November. Chilli thrips cause significant yield loss ranging from 11.8-90%. Green Pods/ fruits are good source of vitamin C and vitamin A also rich in magnesium, iron and vitamin B_6. Chilli is used as a principal ingredient of various vegetables, spices, curries, chutneys, condiments, pickles and sauces. The Pungency nature of chilli is due to the active constituent "Capsaicin". It is an alkaloid which is extracted from chillies and used in medicines (Das, 2001). India is the world leader in the production of chilli. Chilli is a vastly cultivated commercial crop in India in an estimated area of 411 thousand hectare with production 4363 thousand metric tonnes during 2020-21. Chilli thrips (*Scirtothrips dorsalis* Hood) belongs to the family of Thripidae in the Thysanoptera order (Tirkey and Kumar, 2017). It is considered as one of the major and most destructive pest of chilli crop (Figure 1). Chilli thrips is also called yellow tea thrips and strawberry thrips; it is originated from Southeast Asia and other subcontinent of India. Both nymph and adult of chilli thrips cause damage in chilli crop which is mainly responsible for upward curling of leaves and scaring on chilli fruits. ETL for Chilli thrips is considered when thrips population appears in field is 2 thrips per leaf. As we have several options to control thrips then why not to promote bio-friendly approaches and make the peasants to follow safe management tactics? Various integrative management strategies to control chilli thrips has been discussed in this following literature which is cost effective to be adopted by farmers and environmentally safe.

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E-mail: *bioticapublications@gmail.com*

Figure 1: Adult of chilli thrips (*Scirtothrips dorsalis* Hood)

Alternate Host Plant and Distribution

Scirtothrips dorsalis is highly polyphagous pest attack over 150 host plants including banana, beans, chrysanthemum, citrus, mango, onion, peach, peanut, pepper, rose, soybean, strawberry, tea, tobacco, corn, cotton, cocoa, eggplant, sweet potato, yams, grape, jasmine, kiwi, litchi, tomato, cashew and castor *etc.* It is widely distributed Japan, Pakistan, Israel, South Africa, the Caribbean and Florida.

Morphological Identification

Most commonly chilli thrips are pale coloured and the lengths of their first and second instar nymph is ranges 0.37-0.39 and 0.68-0.71 mm respectively. The length of pupae are ranges to 0.78-0.80 mm. The length of Adults are about 1.2 mm long which also has dark wings and dark spots which leads to form incomplete stripes which appear on dorsal part of the abdomen (Seal *et al.*, 2009). The pronotum surface covers with the number of transverse striae which are spaced closely. Abdominal tergites consist of number of parallel rows of tiny microtrichia (hairs of cuticle on the surface of the wing membrane). Sternites possess marginal setae which arise at the posterior margins. Metanotum has median pair of setae which emerges close to the anterior margin.

Nature of Damage and Damaging Symptoms

Nymphs and adults of chilli thrips sucks the sap of soft foliage and lacerate or scrap the leaf tissues, flowers, shoots and fruits resulting in curling of leaves in upward direction. The infested leaves also develop crinkles (Figure 2). Elongation of petioles takes place fruit shows scars on it. If infestation occurs before flowering the plant growth get stunted and flowering fruiting gets arrested. Drooping of buds and flowers occurs and flowers fall off in premature stage itself (Mishra *et al.*, 2022).

Figure 2: Damaging symptoms of chilli thrips

Biological Life Cycle

In the life cycle of chilli thrips *Scirtothrips dorsalis* stages include egg, first and second instar nymph, pre-pupa, pupa and adult (Figure 3). Gravid or pregnant female thrips insert eggs inside the plant tissues. These eggs are in microscopic size ranging 0.075 mm long and 0.070 mm wide and it is creamy white in colour and kidney-shaped. The hatching of egg takes place between 2-7 days, depending upon temperature and different weather condition. The two larval stages are completed in 8-10 days and the pupal stage lasts about 2.6-3.3 days. Adult takes 11.0 days for a first instar larva to the adult stage on pepper plants (Seal *et al.*, 2009). The length of time chilli thrips takes to complete its life cycle varies depending on temperature and host plants too that may range 14-20 days.

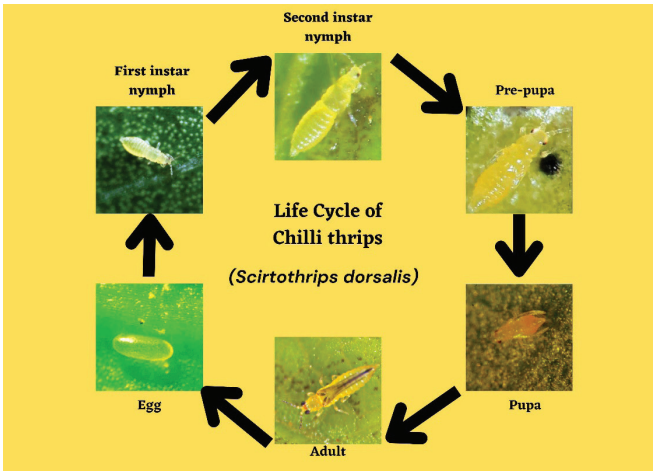

Figure 3: Life cycle of chilli thrips

Integrative Management Strategies for Chilli Thrips in Chilli Crop

• Infestation of chilli thrips in chilli as well as other host plants monitoring should be done regularly.

• To induce resistance against thrips soil application of 200 Kg of neem cake and 500 Kg of vermicompost acre^{-1} are applied.

• Severely infested plants should be collected and destroyed and uprooting or removal of weeds like *Parthenium hysterophorus*, *Lantana camara*, *Cleome viscosa*, *Abutilon species*, wild *Solanum* species *etc.* from the field or field bunds which act as alternate host for thrips in off season too. Avoid further spread of the population by uprooting plant debris and they either buried or burnt.

• Growing resistant or early/ short duration varieties like Bhanger, Bullet and Jhumko *etc.*

• Crop rotation followed after uprooting the severely infested chilli crop, farmers may take crops like maize/ any millets or pulses. Type of crop should be decided according to suitability to the locality.

• Chilli should not be grown after sorghum.

• Mixed crop like chilli and onion should not be followed.

• Agathi (*Sesbania grandiflora*) should be intercropped to provide shade and regulate the thrips population.

• Mulching of chilli crop is with silver coloured polythene sheets of thickness 25-30 micron so that pupation of thrips in the soil should be reduced.

• In thrips infested fields erection of blue sticky traps @ 25-30 acre^{-1} for mass trapping should be done (Figure 4).

• Spray botanical based pesticides like Neem oil 3% @ 2 ml L^{-1} or Neem Seed Kernel Extract (NSKE) 5%, *Vitex negundo* extract @ 50-80 ml L^{-1}, *etc.* or microbial based insecticides like *Beauveria bassiana* @ 4.00 g or ml L^{-1} spore load - 1×10^{8} cfu (colony forming unit) g^{-1} or ml, *Bacillus albus* strain NBAIR-BATP @ 20 g L^{-1} or *Pseudomonas fluorescence* strain NBAIRPFDWD @ 20 g L^{-1} covering whole plant uniformly.

• To check the multiplication of thrips water should be sprinkled over the seedlings.

• To treat the seeds against thrips, application of imidacloprid 70% WS @ 12 g kg^{-1} of seed is followed.

• To make the conditions unfavourable for growth and multiplication of thrips in field crop spraying should be done with strong jet of water.

• Conserve predators such as insidious flower bugs *Orius insidiosus* and predatory mite *Amblyseius swirskii etc.*

• Following insecticides are applied or sprayed are Thiamethoxam 25% WP @ 0.2 ml L^{-1}, Spinosad 45% SC @ 3.2 ml 10 L^{-1}, Fipronil 5% SC @ 1.5 ml L^{-1}, Emamectin benzoate 5% SG @ 4 g 10 L^{-1} and Imidacloprid 17.8% SL @ 3.0 ml 10 L^{-1} of water and also combined insecticide also sprayed for effective management like Emamectin benzoate 1.50% + Fipronil 3.50% SC @ 500-750 g in 500 litre of water or spray solution.

Figure 4: Integrative management strategies like blue sticky trap, marigold inter cropping and mulching with silver polythene

Conclusion

Chilli belongs to the family of Solanaceae is one of the most beneficial spice and vegetable crop grown all over India. Cultivation of chilli crop takes place over large commercial scale in India in an estimated area of 4 lakh ha^{-1} with production 4221 thousand metric tonnes. Chilli thrips cause significant yield loss ranging from 11.8-90%. Due to it is most detrimental pest causes heavy loss in chilli crop in order to combat this pest we need to adopt and promote among peasants of the nation. Various integrated management strategies are discussed in this particular literature.

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