

SURVEY OF THRIPS (THYSANOPTERA) AND THEIR NATURAL ENEMIES IN VEGETABLES FROM MID HILLS OF HIMACHAL PRADESH

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INTRODUCTION

Different vegetable crops of mid hills of Himachal Pradesh are adversely affected by the different pest species, of which thrips are one of the important insect pests. They are tiny insects which belong to order Thysanoptera in two suborders *i.e.* Terebrantia and Tubulifera. About 7400 species of thrips has been reported worldwide (Mound, 2012), out of which five hundred species of thrips are known to infest different vegetables (Mound and Kou, 1996). They cause economic damage in different crops by feeding and virus transmission (Lewis, 1973 and Parrella *et al.*, 2003). Yield losses in certain vegetable crops like cucumber, cardamom, onion, garlic and tomato due to thrips were estimated up to 50-100 per cent in various regions (Cooper, 1990; Krishna Kumar *et al.*, 2001; Dharmadasa *et al.*, 2008, Diaz *et al.*, 2011 and Kunkaliker, 2011). They increase their population gradually in early season (Meena *et al.*, 2013) and multiply rapidly, because of which they are not feasible to control easily. Thrips are the major threat for the crops and various species of thrips has been reported to develop resistance to different group of insecticides (Kalyan *et al.*, 2012). Insecticide resistance has continued to be a widespread problem with the thrips, as populations have continued to evolve resistance to all manner of new insecticides (Gao *et al.*, 2012). Therefore, to combat insecticide resistance in the thrips non-insecticidal tactics, such as biological control is required. Various species have been reported to feed on thrips. The most abundant group of natural enemies of thrips are eulophids, anthocorid bugs, predatory mites, coccinellids, neuropterans, cecidomyiid and spiders (Yee *et al.*, 2000). But from Himachal Pradesh no earlier reports are present on this aspect. In view of this, the present investigation was carried out to study the diversity of the thrips fauna and its associated natural enemies in different vegetable crops in the mid hill conditions of Himachal Pradesh.

MATERIALS AND METHODS

Mid hills of Himachal Pradesh are located between 30°85' N-32°29' N latitude and 75°10' E-77°16' E longitude at an altitude of 935-1525 meters above mean sea level and are suitable for growing different types of economically important vegetable crops. The study was carried out at Nauni, (1275 meters above mean sea level) and surrounding areas (near University campus of UHF, Nauni) in Solan district of Himachal Pradesh. Thrips and their natural enemies were collected from different vegetables (Table 1) in both seasons (summer and winter) of the year during 2013 and 2014. At each collection site, five plants were randomly selected for sampling. From each plant five leaves or flowers were selected randomly for collection and were beaten on white tray with a stick. The fallen thrips were collected in the collecting fluid containing 60 % alcohol and glacial acetic acid (9:1) with Triton-X (1 mL/1000mL) and were mounted as prescribed

ABSTRACT

A survey study was conducted under mid hills of Himachal Pradesh to assess the diversity of thrips species and their natural enemies on fifteen vegetable crops in summer as well as winter season. The results of the study revealed that thirteen species of thrips and four species of natural enemies were associated with different vegetables. Thrips species were *Thrips tabaci*, *T. flavus*, *T. palmi*, *T. carthami*, *T. alatus*, *Ayyaria chaetophora*, *Anaphothrips sudanensis*, *Scirtothrips dorsalis*, *Megalurothrips peculiaris*, *Neohydatothrips samayankur*, *Aeolothrips sp.*, *Haplothrips tenuipennis* and *Haplothrips ? tenuipennis*. Natural enemies which were found associated with thrips were *Coccinella septempunctata*, *Orius sp.*, *Amblyseius sp.* and spider (unidentified). This study has helped to update the list of vegetable thrips species from the state and has provided the list of natural enemies associated with thrips of vegetables.

KEY WORDS

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by Bhatti (1999). The natural enemies were also collected and preserved by carding or pinning. The slides with mounted specimens were observed under phase contrast microscope. Thrips were identified using taxonomic keys, digital images and descriptions of Palmer (1992), Bhatti (1980),

Ananthkrishnan and Sen (1980) and Masumoto(2010). Some of the specimens were sent to Dr J S Bhatti (Retired Prof, Hans Raj college, Delhi), Dr Vikas Kumar(Scientist C,CDT, ZSI, Kolkata) and Dr Koumud Tyagi (PDF, CDT, ZSI, Kolkata) for identification or confirmation of identity. Natural enemies were identified with the identified reference specimens present in the laboratory.

RESULTS AND DISCUSSION

The study revealed that all sampled vegetable crops were infested with one or more species of thrips. A total of thirteen species of thrips belonging to two suborders i.e. Terebrantia and Tubulifera in three families viz Thripidae, Aeolothripidae and Phlaeothripidae were recorded from different vegetable

crops surveyed (Table 2). Predatory species, *Aeolothrips* sp.was recorded on carrot, onion and cucumber from Nauni, which is a new record on vegetables from this region. In the present study, among all thrips, *Thrips tabaci*, *T. flavus* and *T. palmi* were recorded as polyphagous. All the three species were recorded on onion, capsicum, coriander, broccoli, pea, tomato, radish, fenugreek, brinjal, cucumber, bean, kale and mustard. Sharma and Bhalla (1964) and Bhalla and Thakur (1974) recorded *T. tabaci* on onion from Himachal Pradesh, whereas *T. palmi* is the new record on vegetables from this region. During present investigation, *T. carthami* was found on fenugreek and radish, which is also a new record on vegetables from Nauni. *Megalurothrips peculiaris* was identified on beans and cucumber from Nauni and Rajgarh, which had been recorded on cauliflower from Solan by Bhalla and Thakur (1974). Species like *T. alatus*, *Ayyaria chaetophora*, *Neohydatothrips samayankur* and *Anaphothrips sudanensis* are new records on vegetables from this region and were collected from individual hosts viz. fenugreek, cucumber, asparagus and carrot, respectively. During present study,

Table 1: Different vegetable crops surveyed

Season	Vegetable crop
Summer season	Tomato(<i>Solanum lycopersicum</i>), chilli (<i>Capsicum annuum</i>), brinjal (<i>Solanum melongena</i>), beans (<i>Phaseolus vulgaris</i>), cucumber (<i>Cucumis sativa</i>)
Winter season	Pea (<i>Pisum sativum</i>), coriander (<i>Coriandrum sativum</i>), onion (<i>Allium cepa</i>), asparagus (<i>Asparagus officinalis</i>), broccoli (<i>Brassica oleracea</i> var. <i>italica</i>), cauliflower(<i>Brassica oleracea</i> var. <i>botrytis</i>), kale (<i>Brassica oleracea</i> var. <i>acephala</i>), mustard(<i>Brassica juncea</i>), radish(<i>Raphanus sativus</i>), carrot(<i>Daucus carota</i>)

Table 2: Thrips species associated with different vegetables.

Thrips species	Habit and habitat	Location
Suborder: Terebrantia, Family: Aeolothripidae		
1. <i>Aeolothrips</i> sp.	Predator Carrot ,onion, cucumber	Nauni
Suborder: Terebrantia, Family:Thripidae		
2. <i>Thrips tabaci</i> Lindeman	Phytophagous Onion,coriander,broccoli, pea, tomato, radish, bean, fenugreek, brinjal, capsicum	Nauni
3. <i>Thrips flavus</i> Schrank	Phytophagous Broccoli, bean, coriander, fenugreek, pea, kale, mustard, radish, onion,capsicum	Khaltu, Nauni, Pandah, Gaura, Rajgarh
4. <i>Thrips palmi</i> Karny	Phytophagous Brinjal, pea, radish, onion, cucumber,coriander	Nauni, Khaltu
5. <i>Thrips carthami</i> Shumsher Singh	Phytophagous Fenugreek, radish	Nauni
6. <i>Thrips alatus</i> Bhatti	Phytophagous Fenugreek	Nauni
7. <i>Megalurothrips peculiaris</i> Bagnall	Phytophagous Bean, cucumber	Nauni, Rajgarh
8. <i>Ayyaria chaetophora</i> Karny	Phytophagous Cucumber	Nauni
9. <i>Anaphothrips sudanensis</i> Trybom	Phytophagous Carrot	Nauni
10. <i>Scirtothrips dorsalis</i> Hood	Phytophagous Capsicum, carrot	Nauni, Rajgarh
11. <i>Neohydatothrips samayankur</i> Kudo	Phytophagous Asparagus	Nauni
Suborder: Tubulifera, Family: Phlaeothripidae		
12. <i>Haplothrips tenuipennis</i> Bagnall	Phytophagous Cucumber, brinjal, tomato	Nauni
13. <i>Haplothrips ? tenuipennis</i>	Phytophagous Fenugreek	Nauni

Table 3: Natural enemies associated with thrips

Order: Family	Species	Host Plants	Location
Coleoptera: Coccinellidae	<i>Coccinella septempunctata</i>	Mustard, cucumber, brinjal, bean, broccoli, cauliflower, tomato, onion, coriander	Nauni, Khaltu, Pandah
Hemiptera: Anthocoridae	<i>Orius</i> sp.	Onion, bean, coriander	Nauni, Khaltu, Pandah
Mesostigmata Phytoseiidae	<i>Amblyseius</i> sp.	Cucumber	Nauni
Araneae	unidentified spiders	Cucumber	Nauni

Scirtothrips dorsalis was recorded on capsicum and carrot, which has been considered as a serious pest of chilli and recorded on chilli in Himachal Pradesh (CABI/EPPO, 2010). In present investigation, *Haplothrips tenuipennis* was found on cucumber, brinjal and tomato which had been earlier recorded by Thakur *et al.* (1973) on cucumber and pumpkin flowers from Solan. *Haplothrips ? tenuipennis* was recorded on fenugreek which may be a new record from this area.

Four species of natural enemies were also identified which belonged to four orders viz., Coleoptera, Hemiptera, Mesostigmata and Araneae (Table 3). This is the first comprehensive report on the thrips and their natural enemies from this region. As the survey was conducted in mostly in the chemical incorporated fields; the number of natural enemies encountered was less. *Coccinella septempunctata* was the most commonly encountered natural enemy which was collected from mustard, cucumber, brinjal, bean, broccoli, cauliflower, tomato, onion and coriander from Nauni, Khaltu and Pandah. Second most prevalent natural enemy was anthocorid bug, *Orius* sp., which was recorded on onion, bean and coriander. Predatory mite *Amblyseius* sp. and predatory spiders were recorded from cucumber only.

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