

STUDY ON PHYTOSEIID (ACARI: MESOSTIGMATA) INHABITING BRINJAL (*SOLANUM MELONGENA* L.: SOLANACEAE) FROM HIMACHAL PRADESH, INDIA.

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ABSTRACT

In the present survey nine species of Phytoseiid (Acari: Mesostigmata) belonging to five genera were recorded viz. *Euseius chitradurgae* (Gupta), *Euseius eucalypti* (Ghai and Menon), *Paraphytoseius multidentatus* Swirski and Shechter, *Typhlodromus (Anthoseius) himalayensis* Gupta, *Phytoseius corniger* Wainstein, *Phytoseius crinitus* Swirski and Shechter, *Phytoseius kapuri* Gupta, *Neoseiulus* sp. nr. *neoghani* and *Phytoseius* sp. nr. *maldhaensis*. *Phytoseius* was the dominant genus with four species. *Typhlodromus (Anthoseius) himalayensis* was the most wide spread species. *Euseius eucalypti* were the new report on this vegetable in the state. Survey will be useful in finding the potential one which can be used in IPM programme in future.

INTRODUCTION

Brinjal (*Solanum melongena* L.: Solanaceae) is one of the important vegetable grown in many tropical and subtropical regions of the world. Several pests have been reported on this vegetable from these regions. Major pests include brinjal fruit and shoot borer, leafhopper, whitefly, thrips, aphid, spotted beetles, leaf roller, stem borer, blister beetle and mites. Twenty seven pest species were reported from Himachal Pradesh damaging this vegetable (Patial and Mehta, 2008). Among these, phytophagous mites are one of the important pests which attack this crop at various stage of development. Farmers depend heavily on chemical pesticides to protect this vegetable from these pest which results in the resistance development. World over resistance have been reported by various pests on different cropping systems (Craham and Helle, 1985; Goodwin *et al.*, 1991). In India, resistance against acaricides/pesticides has been reported by phytophagous mites (Sridhar and Jhansi Rani, 2007; 2003; Jhansi Rani and Sridhar, 2002). These tiny creatures are harmful as well as beneficial to the farmers *i.e.* pests and predators. Predatory mites of family Phytoseiidae have received attention worldwide as biological control agent against phytophagous mites and soft bodied insects (Gupta and Karmakar, 2015). These are valued among growers worldwide as natural enemies that provide effective pest control under greenhouses and open field conditions (Bjorson, 2008). There was meager information on Phytoseiid occurrence on vegetable crops from Himachal Pradesh except Singh and Chauhan (2014). So, in the present study an attempt

was made to explore and identify the occurrence of Phytoseiid on brinjal from this region.

MATERIALS AND METHODS

Survey was conducted in six districts of Himachal Pradesh, India during 2013 and 2014 to collect the mites of family Phytoseiidae inhabiting brinjal. Sampling was done as described by Poe (1980). Leaves were examined with 10x hand lens and collected in polyethylene bag tied with rubber band and brought to the laboratory. Samples were placed in refrigerator overnight to immobilize the mites. These were examined under stereo zoom microscope (Olympus SZ70). Observed phytoseiid were picked with the help of dissecting needle and mounted in a drop of Hoyer's medium on microscopic slides (Singh and Raghuraman, 2011; Jeppson *et al.*, 1975). Slides were dried in hot air oven at 35-40°C for 3-4 days. Identification was done by observing the specimens under phase contrast microscope (Olympus CX41) by following the standard keys (Gupta, 2003; Chant and McMurtry, 2007).

Statistical analysis

The diversity indices and relative abundance was calculated by using Shannon diversity index (1948).

$$\text{Shannon diversity index}(H^1) = \sum_{i=1}^s P_i(\ln P_i)$$

$H_{max} = \ln K$

Where, K is the number of species; Species evenness (J) = H/H_{max} ; Species dominance = $1-J$

RESULTS AND DISCUSSION

During the study nine species of family Phytoseiidae were collected and identified on brinjal viz. *Euseius chitradurgae* (Gupta), *Euseius eucalypti* (Ghai and Menon), *Paraphytoseius multidentatus* Swirski and Schechter, *Typhlodromus (Anthoseius) himalayensis* Gupta, *Phytoseius corniger* Wainstein, *Phytoseius crinitus* Swirski and Schechter, *Phytoseius kapuri* Gupta, *Neoseiulus* sp. nr. *neoghani* and *Phytoseius* sp. nr. *maldhaensis*. These species were belonging to three subfamily viz. Amblyseiinae, Typhlodrominae and Phytoseiinae. Their occurrence was observed in different month in association with phytophagous mites of two families (Table 1). Maximum species (Eight) were observed in district Mandi followed by Kullu (Two) whereas one species each was recorded from Shimla, Hamirpur, Bilaspur and Kangra (Table 1).

Various workers reported the occurrence of predatory mites on brinjal from different parts of the country. Maheshwari *et al.* (2015) reported nine species of family Phytoseiidae inhabiting different vegetables from Thrissur district of Kerala. During their study they found the occurrence of all these species on brinjal. Singh and Chauhan (2014) reported seventeen species of predatory mites on vegetables from Himachal Pradesh. Seven species of predatory mite were reported on this vegetable from Kerala by Binisha and Bhaskar (2013) in association with phytophagous mites.

During the survey, distribution of *T. (A.) himalayensis* was found in four districts in association with *T. urticae* and Eriophyied sp. (Table 1). Earlier, this species was reported on different fruit plants in association with phytophagous mites (Kumari, 2009; Gupta, 2003). *E. eucalypti* and *P. crinitus* were recorded from Mandi & Kullu and Mandi & Shimla associated with *T. urticae* and Eriophyied sp. (Table 1). Kumari (2009) reported *E. eucalypti* on apple whereas *P. crinitus* was collected on *Citrus* sp. in association with false spider mites (Thakur and Dinabandhoo, 2005). In the present study, *E. chitradurgae* was found associated with *T. urticae* and eriophyid mites (Table 1). Sanjta and Chauhan (2015) reported *Amblyseius* sp. in association with thrips on cucumber. Haneef and Sadanandan (2013) reported *Amblyseius herbicolus* on brinjal from Northern Kerala. Rachana *et al.* (2009) reported the occurrence of *Amblyseius longispinosus* and *Phytoseiulus persimilis* on Okra associated with red spider mite. *P. multidentatus* was reported on brinjal from gangetic plains by Karmakar and Gupta (2011) in association with *Polyphagotarsonemus latus* (Banks). In the present study this species was found associated with two spotted spider mite. During the present study two species viz. *P. kapuri* and *P. corniger* were associated with *T. urticae* and eriophyid mites (Table 1). Dhooria (1990) reported *P. kapuri* on brinjal from Punjab feeding on eggs and larvae of *T. urticae*.

Neoseiulus sp. nr. *neoghani* was associated with *T. ludeni* in Seobag area of district Kullu (Table 1). Infestation of *T. ludeni* was a new report from this state. *Phytoseius* sp. nr. *maldhaensis* was associated with *T. urticae* and Eriophyied mites. *Phytoseius* sp. nr. *maldhaensis* & *Neoseiulus* sp. nr. *neoghani* were identified up to near species level due to difference in

Table 1: Phytoseiidae fauna inhabiting brinjal (*Solanum melongena*) in Himachal Pradesh

Species	Associated phytophagous mite	Name of District/Locality	Period of Collection
<i>Euseius chitradurgae</i>	<i>T. urticae</i> and Eriophyid sp.	Mandi (Sarkaghat, Dhanrashi)	March to May
<i>Euseius eucalypti</i>	<i>T. urticae</i>	Mandi (Sundernagar), Kullu (Bajoura)	March to June
<i>Paraphytoseius multidentatus</i>	<i>T. urticae</i>	Mandi (Sundernagar, Harabag)	September to November
<i>Neoseiulus</i> sp. nr. <i>neoghani</i>	<i>T. ludeni</i>	Kullu (Seobag, Bajoura)	May to August
<i>Typhlodromus (Anthoseius) himalayensis</i>	<i>T. urticae</i> , Eriophyid sp.	Mandi (Sarkaghat, Dhanrashi), Hamirpur, Bilaspur (Ghumarwin) and Kangra (Jach)	February to June
<i>Phytoseius corniger</i>	<i>T. urticae</i> and Eriophyid sp.	Mandi (Sarkaghat, Dhanrashi)	March to June
<i>Phytoseius crinitus</i>	<i>T. urticae</i> and Eriophyid sp.	Mandi (Sarkaghat, Dhanrashi), and Shimla (Hadsu)	March to June
<i>Phytoseius kapuri</i>	<i>T. urticae</i> and Eriophyid sp.	Mandi (Sarkaghat, Dhanrashi)	March to June
<i>Phytoseius</i> sp. nr. <i>maldhaensis</i>	<i>T. urticae</i> and Eriophyid sp.	Mandi (Sarkaghat, Dhanrashi)	March to June

Table 2: Relative abundance and diversity indices of phytoseiid inhabiting brinjal (*Solanum melongena*) in Himachal Pradesh, India

Species	Relative abundance	Relative proportion
<i>Euseius chitradurgae</i>	3	8.57
<i>Euseius eucalypti</i>	5	14.28
<i>Paraphytoseius multidentatus</i>	2	5.71
<i>Neoseiulus</i> sp. nr. <i>neoghani</i>	2	5.71
<i>Typhlodromus (Anthoseius) himalayensis</i>	8	22.85
<i>Phytoseius corniger</i>	4	11.43
<i>Phytoseius crinitus</i>	3	8.57
<i>Phytoseius kapuri</i>	4	11.43
<i>Phytoseius</i> sp. nr. <i>maldhaensis</i>	4	11.43
Total	35	100

H = 2.11; H_{max} = 2.19; Species evenness (J) = 0.96; Species dominance (D) = 0.04

spermatheca and dorsal body setae which are different with their near species and require further study.

Results of diversity indices showed that *T. (A.) himalayensis* was the dominant species followed by *E. eucalypti*. Among all species 4% were found dominant and 96% were evenly distributed on this crop in the state. Species richness (Hmax) was 2.19 and Shannon index (H) calculated was 2.11 (Table 2).

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