



### Research Note

## Studies on the parasitoids of the serpentine leaf miner, *Liriomyza trifolii* (Burgess) in tomato ecosystem under mid hill condition of Himachal Pradesh

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**ABSTRACT:** The species diversity of parasitoids of the serpentine leaf miner, *Liriomyza trifolii* (Burgess) in tomato ecosystem was conducted under mid hill conditions of Himachal Pradesh during 2008-2010. The tomato leaves were collected periodically from June to September from three strata i.e. bottom, middle and top portion of the plants at random. During the course of study four species of larval parasitoids viz., *Neochrysocharis formosa* (Westwood), *Diglyphus* sp., *Asecodes* sp. and *Chrysocharis* sp. belonging to the family Eulophidae and one species of larval-pupal parasitoid, *Opius* sp. belonging to the family Braconidae were identified. These parasitoids were active throughout the cropping season and the parasitization ranged from 6.0 – 21.1, 19.4 – 28.6 and 13.6 – 23.1 per cent during 2008, 2009 and 2010, respectively. It was maximum (20.1 – 28.6%) during the month of August. Marginally higher parasitization (14.3 – 26.7%) was observed in the middle stratum of the foliage than in top (11.1 – 24.0%) or bottom (6.7 – 20.0%) stratum during all the three years of study. Among the larval parasitoids, *N. formosa* was the predominant species (81.5%), whereas, other parasitoids such as *Diglyphus* sp., *Chrysocharis* sp. and *Asecodes* sp. comprised of 7.4, 7.4 and 3.7 per cent of the total population of the larval parasitoids.

**KEY WORDS:** *Liriomyza trifolii*, parasitoids, serpentine leaf miner, tomato

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The serpentine leaf miner, *Liriomyza trifolii* (Burgess) is an important polyphagous pest infesting over 70 host plants representing vegetables, ornamentals, field crops and weeds (Kapadia, 1994). Damage is mainly caused by the maggots which feed by mining into the leaves and affect the photosynthesis of the plant drastically. Besides, feeding punctures and egg laying wounds made by insertion of ovipositor by the females also cause minor injury (Parrella *et al.*, 1985) and serve as entry points for different pathogens (Kapadia, 1995; Durairaj *et al.*, 2010). In Himachal Pradesh, the pest has been reported to cause considerable damage to tomato (Kaushik, 1999). In nature leaf miners are attacked by a large number of larval and larval-pupal parasitoids belonging to the families Eulophidae, Pteromalidae and Braconidae (Hansson and Lasalle, 1996; Gencer, 2002, 2005; Chen *et al.*, 2003; Bhat *et al.*, 2009). Such information, nevertheless, is lacking from Himachal Pradesh. Thus, the present study was carried out to study the parasitoids associated with *L. trifolii* and their role in suppressing this pest.

The study was conducted at the experimental farm of Dr Y S Parmar University of Horticulture and Forestry, Nauni, Solan, Himachal Pradesh situated in the mid hills (major tomato growing area) of the state at 1270 msl (latitude 30° 50' North, longitude 77° 6' East) during 2008, 2009 and 2010. Serpentine leaf miner infested leaves of tomato were collected at fortnightly intervals between June and September from top, middle and bottom strata of the plants at random. In total 20 infested leaves were collected from each stratum. These leaves were brought to the laboratory and examined under microscope for empty mines, dead mines, live mines and parasitized mines. The mines showing emergence hole (C shaped cut at the terminal end) were treated as empty mines terminated in between (died due to unknown reasons) without developing into miner or parasitoid as the dead mines while, the mines which contained live larva or dead larva with parasitoid larva/pupa as the live or parasitized. These leaves were then kept in plastic jars in the laboratory at temperature ranging from 23 to 36°C and RH from 40 to 95 per cent for the emergence of either miner flies or the parasitoid adults. While calculating per cent parasitization, the data

on the dead mines were ignored and the data pertaining to empty mines, miner flies emerged and parasitoids emerged were pooled to have total mines and the number of parasitoids emerged. The parasitoids collected during the study were preserved in 70 per cent alcohol before mounting on slides to have temporary as well as permanent mounts. The specimens were identified as per the identification guide given by Fisher *et al.* (2008). Relative proportion of different species was also worked out.

During 2008, two species of larval parasitoids belonging to the family Eulophidae and one larval-pupal parasitoid belonging to the family Braconidae were collected. The number of larval parasitoids (Eulophid) recorded during 2009 and 2010 were increased to three and four, respectively. The larval-pupal parasitoid recorded during the study was identified as *Opius* sp. (Braconidae: Hymenoptera), whereas, the identity of the Eulophid larval parasitoids collected during the first two years could not be established. Nevertheless, the larval parasitoids collected during 2010 were identified as *Neochrysocharis formosa* (Westwood), *Diglyphus* sp., *Chrysocharis* sp. and *Asecodes* sp. Total parasitization ranged from 0 to 25, 16.6 to 33.3 and 10 to 23.5 per cent during 2008, 2009 and 2010, respectively. After pooling the data for the three strata of the plant, it was observed that the parasitization varied from 6 to 21.1,

19.4 to 28.6 and 13.6 to 23.1 per cent during the respective years of study. The parasitoids were more active during the month of August and maximum mean parasitization of 21.1, 28.6, and 23.1 per cent was recorded in the first fortnight of August, second fortnight of August and second fortnight of August during 2008, 2009 and 2010, respectively. The parasitoid activity was marginally higher in the middle stratum (14.3, 26.7 and 20.9%) than in the top (11.1, 24.0, 18.5%) or the bottom stratum (6.7, 20.0 and 18.8%) of the plant during respective years. Among larval parasitoids collected during 2010, *N. formosa* was the dominant species contributing 81.5 per cent of the total parasitization. Other parasitoids like *Diglyphus* sp., *Chrysocharis* sp. and *Asecodes* sp. comprised of 7.4, 7.4 and 3.7 per cent of the total larval parasitoids. The results obtained during the present study are in agreement with the findings of Bhat *et al.* (2009) who also reported eulophid parasitoids like *Asecodes* sp., *Chrysonotomyia* sp., *Closterocerus indica* Khan, Agnihotri & Sushil, *Hemiptarsinus varicornis* (Girault), *Diglyphus* sp. and *Quadrastichus* sp.; and Braconid parasitoids such as *Opius* sp. and *Dacnusa* sp. attacking *L. trifolii* in different cropping systems in Kashmir valley of India. Further studies are necessary for the conservation of these natural enemies through suitable habitat management techniques and reduction in pesticide use.

**Table 1. Per cent parasitization in serpentine leaf miner, *Liriomyza trifolii* during 2008-10**

Year	Leaf position	June II	July I	July II	August I	August II	September I	Seasonal mean*
2008	Top	0.0	15.4	14.3	16.7	–	–	11.1
	Middle	7.7	8.3	25.0	23.1	–	–	14.3
	Bottom	12.5	0.0	16.7	–	–	–	6.7
	Mean*	6.5	6.0	17.4	21.1	–	–	10.6
2009	Top	–	16.6	20.0	18.2	25.0	–	24.0
	Middle	–	18.2	25.0	27.3	33.3	–	26.7
	Bottom	–	21.4	16.6	20.0	–	–	20.0
	Mean*	–	19.4	21.1	22.2	28.6	–	24.0
2010	Top	–	18.4	16.0	21.4	21.1	18.2	18.5
	Middle	–	22.2	18.4	21.6	23.4	10.0	20.9
	Bottom	–	16.7	17.9	19.4	23.5	–	18.8
	Mean*	–	18.7	17.4	20.1	23.1	13.6	19.5

I – First fortnight, II – Second fortnight

\* Based on parasitized larvae among total larvae counted during the period of observation.

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