

GEOGRAPHICAL DISTRIBUTION, HOST RANGE AND PARASITOIDS OF SERPENTINE LEAF MINER, *Liriomyza trifolii* (Burgess) IN SOUTH INDIA

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ABSTRACT: Survey conducted for assessing the incidence and severity of the serpentine leaf miner, *Liriomyza trifolii* (Burgess) in Andhra Pradesh, Karnataka, Maharashtra and Tamil Nadu during November, 1992 and February, 1993 revealed its occurrence in all these states. Its damage was characterised by sharply curled and contorted leaf mines which had a continuous black trail of frass. It was recorded on 70 host plants covering fibre crops, pulses, vegetables, ornamentals, green manures, fodder, narcotics and weeds belonging to 16 families. The incidence was relatively severe on tomato, okra, field bean, ridge gourd, cucumber, potato, castor and cotton. The severity of damage varied depending on the plant height. Leaves in the top canopy had fewer mines as compared to leaves in the middle and bottom canopy. A few indigenous parasitoids have been recorded on the insect.

Key Words: Host range, *Liriomyza trifolii*, parasitoids

INTRODUCTION

The serpentine leaf miner, *Liriomyza trifolii* (Burgess) (Agromyzidae, Diptera) is a native of Florida in Southern United States and the Caribbean islands (Spencer, 1973). This pest, believed to be an accidental introduction to India, was observed on many vegetable crops, cotton and castor. Its identity was simultaneously established in 1992 by several researchers on a wide variety of crops (Lakshminarayana *et al.*, 1992; Pawar, 1992; Shankar *et al.*, 1992; Srinivasan, 1992). The Indian Council of Agricultural Research

(ICAR) realising the potential seriousness of this pest, constituted a committee to make survey and report the current status of leaf miner in South India in 1992. The objective of the survey was to assess the current status of *L. trifolii*, its parasitoids and host range. Results of the survey are presented in this paper.

MATERIALS AND METHODS

Survey for the leaf miner incidence was carried out in the major cropping areas of

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Karnataka (Bangalore, Belgaum, Chitradurga, Dharwad, Mysore, Raichur, Tumkur districts). Andhra Pradesh (Anantapur, Kurnool districts) and Tamil Nadu (Coimbatore, Dharmapuri, Dindigul, Krishnagiri, Nilgiris, Salem, Trichy districts) in November, 1992. In February, 1993 survey was carried out in Maharashtra (Ahmednagar, Akola, Amravati, Dhule, Jalgaon, Nagpur, Nasik, Pune, Solapur districts) and Andhra Pradesh (East Godavari).

Leaf samples with contorted mines having continuous black trail of frass were collected along with larvae in polyethylene bags. The larvae were allowed to pupate and emerge as adults in the laboratory. Adults which conformed to the following description, namely, greyish black body having an yellow spot on scutellum and most of frons and with plum red eyes were alone taken as *L. trifolii*. Parasitoids were identified by the International Institute of Entomology, London, U.K.

The number of mines per leaf in the top, middle and bottom of the canopy of each crop was recorded. Additional data on the locality, host plant and the number of fields and plants observed are presented in Tables 1a and b.

RESULTS AND DISCUSSION

A. Host plants

In the Survey, *L. trifolii* was recorded on 79 species of plants belonging to the families Amaranthaceae (4 spp.), Asteraceae (14 spp.), Capparaceae (1 sp.), Chariophyllaceae (1 sp.), Chenopodiaceae (3 spp.), Commelinaceae (1 sp.), Convolvulaceae (1 sp.), Cucurbitaceae (11 spp.), Euphorbiaceae (1 sp.), Labiatae (1 sp.), Leguminosae (17 spp.), Malvaceae (6 spp.), Polygalaceae (1 sp.), Sapindaceae (1 sp.), Solanaceae (14 spp.) and Tiliaceae (1 sp.). The host plants include fibre crops (3 spp.), pulses (4 spp.), oilseeds (3 spp.), vegetables (27 spp.), ornamentals (10 spp.),

green manures (3 spp.), fodder crops (1 sp.), wild tobacco (6 spp.) and weeds (22 spp.) (Table 2a, b, c).

B. Severity of attack

The attack of leaf miner was severe warranting detailed observations to be taken on ridge gourd and tomato in Andhra Pradesh; hybrid seed and Jayadhar cotton, brinjal, ridge gourd, cucumber, safflower, tomato, castor and okra in Karnataka; okra, smooth gourd, field bean, potato and tomato in Maharashtra and Okra, hybrid cotton and castor in Tamil Nadu. The mean number of mines and standard deviation observed for each one of the leaf sampled in the top, middle and bottom canopy are provided in Tables 1a and b.

Lowest counts of leaf mines were observed in the top leaves in all the crops surveyed. Higher counts of leaf mines were observed in the middle and bottom canopy. Details of cropwise severity of attack are presented.

Tomato

It was most susceptible to the leaf miner as revealed by the survey. In general, F₁ hybrids were the most susceptible. At Rahod (Pune district) 30 - 40 day old tomato seedlings were severely affected (4.3, 5.0 and 2.6 mines/leaf in the top, middle and bottom canopy). In rest of the fields surveyed, mostly the older plants (70 - 90 days after planting) supported mined leaves at the middle and bottom canopy.

Cucurbits

Among the cucurbits, watermelon, ridge-gourd and cucumber were highly susceptible. At growers field in Madiki, East Godavari districts (Andhra Pradesh), severe incidence of leaf miner was observed in ridge-gourd. On an average, 22.3 mines were observed in 25 leaves sampled from the bottom canopy (Table 1b). The farmer obtained only four pickings as against the normal 6 - 7.

Serpentine leaf miner, *L. trifolii* in South IndiaTable 1a. Details of crops surveyed for *L. trifolii* and its damage

Locality	Crop	No. of fields examined	No. of plants observed	Mines/leaf		
				Top	Middle	Bottom
KARNATAKA						
Manvi, Sindhur (Raichur)	Hybrid cotton	3	150	0.0	4.1 (0.7)	10.8 (1.0)
Karalawad, Hanchinal, Belavatagi (Dharwad)	Hybrid cotton	3	75	0.1 (0.1)	1.1 (0.3)	1.8 (0.3)
Manangi (Tumkur)	Seed cotton	1	25	0.0	1.1 (0.4)	25.9 (1.9)
Gadag (Dharwad)	Jayadhar cotton	1	25	0.0	0.0	1.4 (0.2)
Sindhur (Raichur)	Brinjal	1	25	0.0	0.9 (0.3)	1.8 (0.3)
Basapur (Raichur)	Ridge gourd	1	25	0.1 (0.1)	1.4 (0.2)	3.3 (0.4)
Somapur (Dharwad)	Cucumber	1	25	0.2 (0.1)	1.5 (0.3)	3.2 (0.4)
Shivalli (Dharwad)	Safflower	1	25	0.0	0.4 (0.1)	1.0 (0.2)
Byadgi (Dharwad)	Tomato	5	200	0.1 (0.1)	1.5 (0.2)	5.2 (0.5)
Devanahalli (Bangalore)	Tomato	1	25	0.0	0.2 (0.1)	0.6 (0.2)
University of Agril. Sciences, Dharwad	Castor	1	25	0.0	12.4 (2.7)	20.0 (2.5)
Surdenapura (Bangalore)	Okra	1	25	0.0	0.0	1.6 (0.6)
Gundlupet (Mysore)	Okra	1	25	0.0	3.4 (0.6)	6.0 (0.2)

Figures in parenthesis denote values for standard deviation

Table 1b. Details of crops surveyed for *L. trifolii* and its damage

Locality	Crop	No. of fields examined	No. of plants observed	Mines/leaf		
				Top	Middle	Bottom
ANDHRA PRADESH						
Madiki (East Godavari)	Ridge gourd	1	25	0.0	9.8 (2.2)	22.3 (1.8)
Madiki (East Godavari)	Tomato	1	25	0.0	4.8 (0.6)	6.2 (0.5)
MAHARASHTRA						
Gulanchwadi (Pune)	Okra	1	25	0.1 (0.1)	3.8 (1.1)	6.5 (1.3)
Dehere (Ahmed Nagar)	Smooth gourd	1	25	0.5 (0.2)	6.5 (0.9)	11.7 (0.9)
Mahatma Phule Krishi Vidya Peeth Campus (Rahuri)	Field bean	1	25	4.7 (0.7)	6.6 (0.7)	5.0 (0.7)
Rajuri (Pune)	Potato	1	50	1.2 (0.6)	4.0 (0.4)	4.2 (0.3)
Rahod (Pune)	Tomato	1	25	4.3 (0.6)	5.0 (0.4)	2.6 (0.3)
TAMIL NADU						
Devasaynampatti (Dindigul)	Okra	1	25	0.0	1.3 (0.4)	2.4 (0.4)
Kanakampatti (Dindigul)	Hybrid cotton	1	50	0.1 (0.1)	1.7 (0.3)	5.2 (0.5)
Kanakampatti (Dindigul)	Castor	1	25	0.0	59.9 (7.3)	96.0 (2.7)

Figures in parenthesis denote values for standard deviation

Incidentally, the larvae within the leaf mines of cucurbits were found to be heavily parasitised.

Okra

Leaf miner attack at Gulanchwadi (Pune district) was severe on a month old crop

(Table 1b). This plot, incidentally was situated in a valley surrounded by hillocks.

Castor

Incidence of leaf miner was severe on young and old plants in all the fields observed. A mean of 96 mines could be counted in the

Table 2a. Host plants of *Liriomyza trifolii* (Burgess) in Maharashtra, Andhra Pradesh, Karnataka and Tamil Nadu

Common Name	Scientific Name	Family
FIBRE CROPS		
Cotton	<i>Gossypium hirsutum</i> L.	Malvaceae
Cotton	<i>G. arboreum</i> L.	Malvaceae
Cotton	<i>G. barbadense</i> L.	Malvaceae
PULSES		
Pigeonpea	<i>Cajanus cajan</i> Mill	Leguminosae
Black gram	<i>Vigna mungo</i> (L.)	Leguminosae
Green gram	<i>Vigna radiata</i> (L.)	Leguminosae
Soyabean	<i>Glycine max</i> (L.) Merr.	Leguminosae
OILSEEDS		
Sunflower	<i>Helianthus annuus</i> L.	Compositae
Safflower	<i>Carthamus tinctorius</i> L.	Compositae
Castor	<i>Ricinus communis</i> L.	Euphorbiaceae
VEGETABLES		
Tomato	<i>Lycopersicon esculentum</i> Mill.	Solanaceae
Potato	<i>Solanum tuberosum</i> L.	Solanaceae
Chilli	<i>Capsicum annum</i> L.	Solanaceae
Bell Pepper	<i>Capsicum frutescens</i> L.	Solanaceae
Brinjal	<i>Solanum melongena</i> L.	Solanaceae
Okra	<i>Abelmoschus esculentus</i> L.	Malvaceae
Indian Hemp	<i>Hibiscus subdarifa</i> L.	Malvaceae
Pumpkin	<i>Cucurbita moschata</i> D.	Cucurbitaceae
Ridge-gourd	<i>Luffa aegyptiaca</i> Roem.	Cucurbitaceae
Bittergourd	<i>Momordica charantia</i> L.	Cucurbitaceae
Watermelon	<i>Citrullus vulgaris</i> Schrod	Cucurbitaceae
Cucumber	<i>Cucumis sativus</i> L.	Cucurbitaceae
Snake gourd	<i>Cucumis anguina</i> L.	Cucurbitaceae
Ash gourd	<i>Benincasa hispida</i> (Thunb.)	Cucurbitaceae
Smooth gourd	<i>Trichosanthes dioica</i> Roxb.	Cucurbitaceae
Coccinia	<i>Coccinea indica</i> Wight & Arn.	Cucurbitaceae
Cluster beans	<i>Cyamopsis tetragonolobus</i> (L.)	Leguminosae
Cowpea	<i>Vigna unguiculata</i> (L.)	Leguminosae
French bean	<i>Phaseolus vulgaris</i> L.	Leguminosae
Creep bean	<i>Dolichos lablab</i> L.	Leguminosae
Field bean	<i>Lablab purpureus</i> (L.)	Leguminosae
Peas	<i>Pisum sativum</i> L.	Leguminosae
Sword bean	<i>Canavalia gladiata</i> DC.	Leguminosae
Fenugreek	<i>Trigonella foenum-graecum</i> L.	Leguminosae
Spinach	<i>Spinacia oleracea</i> L.	Chenopodiaceae
Beet root	<i>Beta vulgaris</i> L.	Chenopodiaceae
Amaranthus	<i>Amaranthus gangeticus</i> L.	Amaranthaceae

Table 2b. Host plants of *Liriomyza trifolii* (Burgess) in Maharashtra, Andhra Pradesh, Karnataka and Tamil Nadu

Common Name	Scientific Name	Family
ORNAMENTALS		
Marigold	<i>Tagetes erecta</i> L.	Compositae
Calendula	<i>Calendula officinalis</i> L.	Compositae
Aster	<i>Callistephus chinensis</i> Nees	Compositae
Gerbera	<i>Gerbera jamesonii</i> Bolus	Compositae
Dahlia	<i>Dahlia variabilis</i> (Cav.)	Compositae
Gaillardia	<i>Gaillardia amblyodon</i> J. Gay	Compositae
Indian pink	<i>Dianthus chinensis</i> L.	Chariophyllaceae
Cock's Comb	<i>Celosia argentea</i> L.	Amaranthaceae
Petunia	<i>Petunia axillaris</i> Lam.	Solanaceae
Salvia	<i>Salvia azurea</i> Lam.	Labiatae
GREEN MANURE		
Sesbania	<i>Sesbania grandiflora</i> (L.) Poiret	Leguminosae
Pongamia	<i>Pongamia pinnata</i> (L.) Pierre	Leguminosae
Sunnhemp	<i>Crotalaria juncea</i> L.	Leguminosae
FODDER		
Berseem	<i>Trifolium alexandrinum</i> L.	Leguminosae
NARCOTICS		
Tobacco	<i>Nicotiana glauca</i> L.	Solanaceae
(Wild species)	<i>Nicotiana paniculata</i>	Solanaceae
	<i>Nicotiana velutina</i>	Solanaceae
	<i>Nicotiana acuminata</i>	Solanaceae
	<i>Nicotiana simuslands</i>	Solanaceae

bottom leaf canopy at Kanakampatti (Dindigul district), Tamil Nadu. Most of the pupation took place on the leaves and they got collected in the leaf axils.

Cotton

Infestation appeared to be severe in hybrid and seed cotton in Karnataka and Tamil Nadu. However, the plants overcame the attack, 40-45 days after sowing.

Potato

At Rajuri, Pune district, relatively heavy incidence (4.0 and 4.2 mines in the middle and bottom canopy, respectively) was observed.

Field bean

At Mahatma Phule Krishi Vidyapeeth campus, Rahuri, Maharashtra, field bean supported damage (4.7, 6.6 and 5.0 mines/leaf in the bottom, middle and top canopy, respectively), which resulted in drying up of leaves.

Sunflower/Safflower

In crops like sunflower and safflower the attack of the leaf miner was confined to only cotyledonary leaves.

C. Natural enemies

Two native hymenopteran parasitoids namely, *Hemiptarsenus varicornis* (Girault)

Table 2c. Host plants of *Liriomyza trifolii* (Burgess) in Maharashtra, Andhra Pradesh, Karnataka and Tamil Nadu

Scientific Name	Family
WEEDS	
<i>Flavaria</i> sp. nr. <i>controverba</i>	Compositae
<i>Sonchus arvensis</i> L.	Compositae
<i>Sonchus oleraceus</i> L.	Compositae
<i>Parthenium hysterophorus</i> L.	Compositae
<i>Bidens pilosa</i> L.	Compositae
<i>Synedrella nodiflora</i> (L.) Gaertn	Compositae
<i>Cleome gynandra</i> L.	Capparidaceae
<i>Cassia biflora</i>	Leguminosae
<i>Phaseolus tribulus</i> Ait	Leguminosae
<i>Solanum nigrum</i> L.	Solanaceae
<i>Datura</i> spp.	Solanaceae
<i>Cardiospermum helicacabum</i> L.	Sapindaceae
<i>Hibiscus panduraeformis</i> Burm.	Malvaceae
<i>Corchorus olitorius</i> L.	Tiliaceae
<i>Convolvulus arvensis</i> L.	Convolvulaceae
<i>Polygala persicariifolia</i> W & A.	Polygalaceae
<i>Alternanthera ficoidea</i>	Amaranthaceae
<i>Amaranthus spinosus</i> L.	Amaranthaceae
<i>Momordica tuberosa</i> Cogn.	Cucurbitaceae
<i>Blastania garcini</i> Cogn.	Cucurbitaceae
<i>Commelina bengalensis</i> L.	Commelinaceae
<i>Chenopodium quinoa</i> Willd.	Chenopodiaceae

(Eulophidae) and an eucoilid parasite of the genus near *Gonotoma* were found parasitising the leaf miner on vegetable crops (tomato, watermelon, cucumber) at Indian Institute of Horticultural Research, Bangalore. *Chrysothomyia* sp. was recorded to parasitise the fly maggots on cotton in Karnataka (Shankar *et al.*, 1992). Unidentified braconid parasitoids have been reared from the fly maggots at University of Agricultural Sciences, Bangalore. The parasitism was as high as 24.78% in cucurbits.

An overall analysis of results obtained in the survey indicated that serpentine leaf miner is widely distributed in the Southern states of Andhra Pradesh, Karnataka, Maharashtra and

Tamil Nadu. It infests a large number of hosts including vegetables, ornamentals, fibre crops, pulses, oilseeds, green manures, fodder, narcotics and weeds belonging to 16 plant families. The leaf miner is fast spreading and is likely to be a major pest in India within a short time.

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