Leafminer Fly:

Liriomyza huidobrensis

Technical Bulletin

By: Ann R. Braun and Merle Shepard

The International Potato Center
and
The Clemson University Palawija IPM Project

By: Ann R. Braun, CIP and Merle Shepard,
Clemson University Palawija IPM Project

Photographs by: Merle Shepard

Table of Contents:

Liriomyza huidobrensis, the leafminer fly

Area of Origin

The Americas; originally described from Argentina

Principal hosts

potato, beans, snapbeans, alfalfa, spinach, artichoke, lettuce, watermelon, pumpkin, melon, crucifers, peas, tomatoes, tomato, celery, onions, carrots, chilis, ornamentals, many common weeds;

Most susceptible hosts

potato, celery, beet, lettuce

Damage

- mines formed by larvae tunneling through leaves
- feeding punctures made by adult females
- oviposition punctures made by adult females, these represent 10-15% of the punctures made by the female

Description

head of the adult is yellow with reddish eyes. The thorax and abdomen are black and yellow

Life stages

egg laid in leaf tissue, 3 larval instars completed within leaf tissue, pupa (in the ground), adult fly

Life cycle

depends on temperature
Table 1: Life cycle data

Duration (days)		14.6 °C 88.4 %RH	17.3 °C 88.0 %RH	20.3 °C 82.1 %RH	27 °C 74 %RH
egg stage		6.0	2.9	3.2	3.1
larval stage		13.0	10.7	9.1	6.0
pupal stage		21.1	11.6	7.4	8.2
male longevity	no food	2.1	3.3	3.4	4.2
	honey/water	13.6	15.1	13.4	
	potato/water	4.1	7.1	4.8	
female longevity	no food	5	4.1	3.5	5.9
	honey/water	32.6	31.4	18.8	
	potato/water	18.0	23.7	19.4	
preoviposition		3.9	2.2	4.5.	1
oviposition		11.3	19.9	10.9	3.3

Total eggs/female	45	252	42	21
No. feeding punctures/female	1875	3055	3473	--
peak oviposition (days after adult emergence)	8	5	14	

Activity

diurnal, most active between 7-11 a.m.

Feeding

The adult female fly feeds by perforating the plant tissue with her ovipositor and feeding on the plant sap that oozes out. Feeding punctures are circular and have diameter of about 1 mm. They are usually made on the upper surface of leaves.

Egg laying

Mating occurs 6-7 hrs after the adults emerge from their puparia. Females prefer to lay eggs in the intermediate and lower leaves of most hosts and prefer the undersurface of the leaves although eggs are laid on both surfaces. Virus T and Y may be transmitted by LMF.

Why LMF has become a pest

This insect is a recent immigrant to several countries and regions including Indonesia, Malaysia and Sri Lanka, Israel and Europe. The community of natural enemies of LMF in newly colonized areas may be limited. In Indonesia, for example, a survey of parasitoid species associated with LMF in Indonesia has identified only one species, *Hemiptarsenus varicornis* (Hymenoptera: Eulophidae). *Liriomyza* species tend to be resistant to commonly used pesticides. Pesticide applications may not control LMF adequately, and will lead to heavier infestations in subsequent seasons as the small complex of natural enemies is decimated.

Natural enemies

40 species of larval and pupal parasites have been reported from *Liriomyza* species. This diverse complex of natural enemies explains why leafminers are usually At least 11 species of parasites are known from *L. huidobrensis*. Under natural conditions parasitism is low in the early stages of crop development and increases gradually during the course of the season. Applications of insecticides, often made to control other species such as thrips, aphids or mites eliminate beneficial insects and contribute to outbreaks of LMF.

Parasites may be endoparasites or ectoparasites. Ectoparasites lay their eggs on the bodies of the larvae, feed by puncturing the larval epidermis and abandon the host larva (which then dies) to pupate within the mines. Endoparasites lay eggs within the larvae and their adults emerge from the puparium of the host.

Weeds play an essential role in the biology of some parasites because their flowers provide the nectar necessary for adult fertility and longevity.

Parasites can be detected by collecting 100 leaves with mines from a field. The leaves must be held in paper bags or envelopes made of newspaper for the formation of pupae. Since no soil is available the miners will pupate on the surface of the leaves. The leaves should not be packed tightly otherwise they will rot. To determine the % parasitism, the number of pupal cases should be counted. Then the number of parasites and adult leaf miner flies

should be tabulated. If the number of parasite adults plus the number of LMF adults exceeds the total number of pupae in the sample, this indicates the presence of ectoparasites that kill the larval stage and pupate within the mines.

Dragonflies, Chrysopids, spiders, ants, true bugs are predators of LMF.

Cultural Control

Potato can withstand significant defoliation, especially if it occurs after the crop establishment stage (planting through hilling up: 1-45 Days After Planting). In an artificial defoliation experiment the following results were obtained:

% Defoliation	Yield (t/ha)
0	55
33	51
66	46
100	34

Leafminer in potato produces little damage on the young leaves because of the high density of glandular trichomes present on the surface of these. Leaf miner populations are highest in the lower and intermediate leaves and build up over the season reaching a peak at around 60-70 DAP (under Peruvian conditions). If pesticide use, particularly of broad spectrum products, can be avoided during this early period, and cultural practices can be used instead (trapping with yellow sticky traps; dusting with plant ash) natural enemies can have a chance to build up. We should also work to introduce additional species since results in Hawaii indicate that multiple species of parasites are more effective against LMF than single species.

The most specific chemical product effective against LMF is Trigard (Cyromazine), an insect growth regulator that disrupts the life cycle by interfering with the larval stage. The dose used in Panama is 100 cc/ha applied every 20-25 days. NOTE: this product can be toxic to potato foliage if applied too frequently.

Some specific cultural practices:

Destruction of plant residues from previous crops that were attacked. These can be burned or turned under the soil.

Flowering weeds around the borders of the fields act as a reservoir for parasites, providing them with nectar needed for oviposition and longevity. These weeds should not be eliminated.

Some host crops such as carrots and beets which are only slightly affected by LMF tend to harbour more parasites than other crops, probably because they are sprayed less frequently. These can be used in rotations or intercropped with susceptible crops such as potato.

Use of sticky traps:

Management of LMF flies with traps has given results comparable to those obtained with pesticides. Yellow plastic gallon containers mounted upside down on stakes should be coated with transparent automobile grease (eg. Penzoil 7070L) or used motor oil. About 2/3 more flies are captured if automobile grease is used. They should be placed in and around

the borders of the fields at about 10 cm above the foliage. More traps shouldbe introduced in areas where the highest numbers of flies are being captured. Traps should be cleaned and regreased when they become covered with flies. White or green containers also attract flies but are less attractive than yellow traps. Traps capture more males than females.

Yellow Plastic trapping sheets: a 2 m long x 75 cm wide yellow plastic sheet coated with used motor oil and attached at each end to a pair of wooden poles is carried through the field to mass capture flies. The sheet is held b y two workers walking on either side of potato rows

Plant Ash:
Ashes prepared from dried plants of *Lantana camara* or from wood shavings may be applied as dusts from plastic talcum powder bottles. In Peru good results were obtained by making the first a pplication immediately after transplanting of TPS or when plants grown from tubers reached the 2-3 leaf stage. Eight applications were made on TPS and six on crops grown from tubers. Hymenopterous parasites were more common on dusted plants compared to the non-dusted control plants.

On the plants grown from tubers, wood ash significantly reduced the number of feeding punctures. On plants grown from TPS, wood and *Lantana camara* ash significantly reduced the number of feeding punctures.

References

Bonilla, Y.G. and C.L. Rodriguez V. 1994. Captura de adultos de Liriomyza huidobrensis (Blanchard) mediante trampas amarillas y su relacion con el daño producido en plantas de papa (Solanum tuberosum). Manejo Integrado de Plagas (Costa Rica) 33:19-22.

Chavez , G.L. and K.V. Raman. 1987. Evaluation of trapping and trap types to reduce damage to potatoes by the leafminer, Liriomyza huidobrensis (Diptera: Agromyzidae). Insect Sci. Application 8(3); 369-372.

Jaminson, E.H. 1990. Influencia de las malezas sobre los insectos controladores de Liriomyza sp. (Diptera: Agromyzidae). Thesis. University of Costa Rica. Turrialba, Costa Rica.

Johnson, M.W. 1993. Biological control of Liriomyza leafminers in the pacific basin. Micronesica Suppl 4:81-92.

Minckenberg. O.P.J.M and J. C. van Lenteren. 1986. The leafminers Liriomyza bryoniae and L. trifolii (Diptera: Agromyzidae), their parasities and host plants: a review. Agricultural University Wageningen Papers 86-2.

Morales, R.A., F. A. Atenco, J. A. Lara and J.A.Muñoz. 1994. La mosquita minadora (Liriomyza spp.) en Panama. Programa Regional Cooperativo de Papa, Instituto de Investigacion Agropecuaria de Panama. Monograph No. 1.

Raymundo, S.A. and J. Alcazar. 1983. Dusting with ashes to reduce leafminer fly damage on potatoes.. Appropriate Technology 10(3):17.

Rodriguez, C.L. and R. Cespedes. 1991. Efecto del Daño de Liriomyza huidobrensis Blanchard con relacion a la fenologia del cultivo de papa. Investigacion Agricola (Costa Rica) 5(1-2):55-59.

Shepard, M, Samsudin and Ann R. Braun. (in press). Seasonal incidence of Liriomyza huidobrensis and its parasites on vegetables, weeds and ornamental crops in Indonesia. Intl. J. Pest Mgmt.

Spencer, Kenneth A. and George C. Steyskai. 1986. Manual of the Agromyzidae (Diptera) of the United States.USDA Agricultural Handbook No. 638,

Travaglini, A.L. 1989. Biologia de "mosca minadora" Liriomyza huidobrensis Blanchard (Diptera: Agromyzidae). Thesis; B.S. in Biology. Universidad Ricardo Palma, Facultad de Ciencias Biologicas, Lima, Peru.

Weintraub, Phyllis G. and A. Rami Horowitz. 1996. Spatial and diel activity of the pea leafminer (Diptera: Agromyzidae) in potatoes, Solanum tuberosum. Environ. Entomol. 25(4):722-726.

Yabar, E. 1988. La mosca minadora de la papa en Peru. Boletin. Instituto Nacional de Investigacion Agraria y Agroindustrial. Programa Nacional de Papa. Lima, Peru.