



Liriomyza spp

Identity

Economically important species that occur in Kenya are *L. sativae*, *L. trifolii* and *L. huidobrensis*.



Figure 1. *L. trifolii* adult.
Photo: CSL, York (GB) British Crown



Figure 2. *L. huidobrensis* adult
Photo: CSL, York (GB) - British Crown



Figure 3. *L. sativae* adult
Photo Courtesy of OMAFRA

Preferred Scientific Name		Other scientific names (Synonyms)	Common names
1	<i>Liriomyza sativae</i> (Blanchard)	<ul style="list-style-type: none"> • <i>Liriomyza pullata</i> Frick • <i>Liriomyza canomarginis</i> Frick • <i>Liriomyza minutiseta</i> Frick • <i>Liriomyza munda</i> Frick • <i>Liriomyza guytona</i> Freeman • <i>Liriomyza propepusilla</i> Frost 	<ul style="list-style-type: none"> • Vegetable leaf miner • Serpentine vegetable leaf miner • Cabbage leaf miner • Tomato leaf miner
2	<i>Liriomyza huidobrensis</i> (Blanchard)	<ul style="list-style-type: none"> • <i>Agromyza huidobrensis</i> Blanchard • <i>Liriomyza cucumifoliae</i> Blanchard • <i>Liriomyza langei</i> Frick • <i>Liriomyza dianthi</i> Frick 	<ul style="list-style-type: none"> • Serpentine leaf miner • Pea leaf miner • South American leaf miner
3	<i>Liriomyza trifolii</i> (Burgess, 1880)	<ul style="list-style-type: none"> • <i>Liriomyza alliovora</i> (Frick, 1955) • <i>Agromyza phaseolunulata</i> (Frost, 1943) 	<ul style="list-style-type: none"> • American serpentine leaf miner • Chrysanthemum leaf miner
Taxonomic position : Class: Insecta, Order: Diptera, Family: Agromyzidae			

It is difficult to distinguish among *Liriomyza* species but in general, the adult *L. trifolii* is smaller and relatively more yellow in color than *L. huidobrensis* and *L. sativae*. *Liriomyza trifolii* leaf-mines are more commonly found on the upper leaf surface whereas *L. Liriomyza spp*



huidobrensis mines mostly occur on the lower leaf surface. *Liriomyza trifolii* leaf-mines are also narrower and may occur near the leaf margin whereas *L. huidobrensis* mines are more frequently found near the base of the leaf, often along the middle veins (OEPP/EPPO, 1992).

Hosts/species affected

Liriomyza spp attack a variety of plant species including crops and weeds. Some of the most common ornamental hosts include: *Eryngium*, *Solidago*, *Chrysanthemum*, *Dendranthema*, *Gypsophila*, *Dianthus* (carnation); *Petunia*, and *Tagetes* (marigold). The export vegetables most affected are peas in pods (snow peas and sugar snaps) and basil.

Growth stages affected

- Vegetative growing stage
- Flowering stage
- Fruiting stage
- Post-harvest

Biology and Ecology

Adult females feed on leaf tissues by puncturing the leaf surface with their ovipositors and ingesting the liquid cell contents. The Females also puncture leaf tissue to lay eggs and may live for 7 to 10 days. Both feeding and oviposition punctures turn white and damaged foliage looks stippled or speckled. Eggs hatch 2-5 days after oviposition. Each larvae feed on leaf tissue making a winding tunnel (serpentine leaf-mine) or blotch on the leaf. The leaf-mines become increasingly larger in size as the larvae feed and grow through 3 immature stages (instars). Once feeding is completed, mature larvae cut a slit in the leaf surface, exit the leaf and drop to the ground (or potted soil-mix) where they pupate. Many generations can occur each year as long as temperatures are above 10 °C (Infonet Biovision, 2016).

The typical life cycle timing for *liriomyza spp* is as follows: egg stage (3-4 days); first-instar larva (3-4 days); second-instar larva (2-3 days); third instar (3-4 days); pupal stage (12-18 days). Females can live for 3-28 days and males for 2-6 days (CABI, 2016).



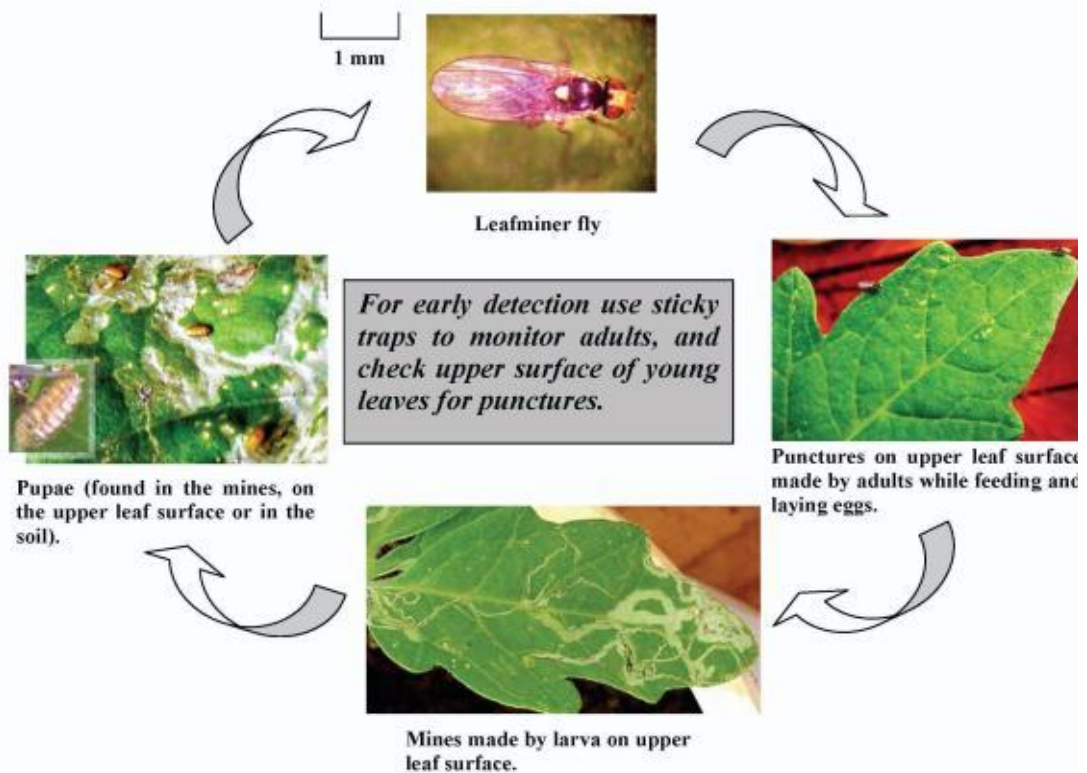


Figure 4: Life cycle for *Liriomyza* spp. Photos courtesy of KEPHIS.

Symptoms

The larvae of *Liriomyza* tunnel in the chloroplast-containing spongy mesophyll layers, disrupting photosynthesis (CABI, 2016). The larvae make winding trails (mines) as they feed inside leaves and pods. The mines are easily visible and when the larvae are in large numbers this feeding damage can cause substantial economic losses (Infonet Biovision, 2016). Mined leaves are unattractive and unmarketable. Heavy damage may slow plant growth and results to defoliation.



Figure 5. Feeding damages (mining tunnels/punctures) caused on various host plants. Photos by KEPHIS.

Means of movement and dispersal

Adults can fly over limited distance. Dispersal over long distances is on planting material of host species. Cut flower and leafy vegetables are also means of dispersal. For example, the vase life of chrysanthemums is sufficient to allow completion of the life-cycle of the pest (CABI, 2016).

Movement in trade

Plant parts liable to carry the pest in trade include: fruits (including pods), leaves, stems (above ground), shoots, trunks and branches. Eggs and larvae borne internally are commonly transported.

Impact

The three species that occur in Kenya are characterized by a high degree of polyphagy, high crop damage and losses. *L. huidobrensis* is mostly causing interceptions of Kenya's fresh produce (vegetables e.g. snow pea, sugar snap and cut flowers) in the European Union market. *Liriomyza spp* causes damage to host plants in several ways:

- (i) Stippling resulting from punctures made by females for feeding on sap and laying eggs
- (ii) Internal mining by the larvae
- (iii) Punctures and tunnels create openings that allow pathogenic fungi to enter the plant
- (iv) Mechanical transmission of plant viruses
- (v) Physical damages result in a depressed level of photosynthesis in the plant.
- (vi) Extensive mining causes premature leaf drop.
- (vii) Punctures on the leaves of ornamental plants reduces the crop value

Phytosanitary significance

The three species are listed in the EU directive 2000/29/EC Annex I part A as harmful organisms whose introduction into, and spread within, all member states shall be banned. *L. sativae* is listed in Section I as harmful organisms not known to occur in any part of the community and relevant for the entire community while *L. huidobrensis* and *L. trifolii* are listed section II as harmful organisms known to occur in the community and relevant for the entire community (EPPO, 2016).

Detection and inspection

Scouting

Field scouting involves regular examination of fields in a prescribed fashion to measure pest levels.

Use of Yellow sticky traps

Yellow sticky traps are very useful monitoring tools for early detection of presence of leaf miner and also for monitoring the progress of control programs. Adults are attracted to the

yellow colour of sticky traps and the traps are also used to indicate leaf miner population levels.

Leaf miner activity signs

Monitoring can also be done by looking for feeding and oviposition damage and for the presence of small mines on plants. Leaf surfaces should be examined for punctures and the obvious greenish-white mines and frass along their length. The larvae will be found feeding at the end of the mine, or the mine will end with a small slit in the epidermis where the larva has left the mine to pupate on the ground. Sometimes the pupa may be found attached to the leaf surface.

Visual Detection for adults

The small black and yellow flies may be detected around host plants or resting on the leaf surfaces. Sweep nets can be used to collect adults for closer examination.

Management

Sanitation

- Removal and management of alternate hosts such as weeds in and around the fields and greenhouse.
- Picking and destruction of leaves showing signs of oviposition and mines
- Collection and destruction of plant clippings and debris
- Destruction of new seedling which show signs of leaf miners

Exclusion

Exclusion is the use of measures to prevent the entry of leaf miners into the production site. Measures that can be used are:

- Ensuring that only leaf miner free seedlings are planted
- Installation of greenhouse screens with a pore size of 600 microns or smaller
- Installing double door system at the entrance of greenhouses and ensuring at least one door is closed when entering and exiting the greenhouse.
- Having dedicated protective clothing for each greenhouse such as coats
- Setting up of nets around the production area and/or susceptible hosts in the fields
- Planting trees around the farm or production area to break entry of leaf miner blown in by the wind
- Having a buffer zone around the production area and clearing all weeds and other hosts
- Setting up yellow sticky traps in the buffer zone to trap leaf miner before they come into the production site
- Drenching the production site with an appropriate control product to control the pupae stage before planting.

Biological control



Biological control may be effective in certain situations, especially for high valued crops in greenhouses. *Diglyphus isaea* is the most commonly used bio-control agent against leaf miner in greenhouses.

Crop Rotation

Planting of susceptible hosts of leaf miner continuously leads to pest build up. Rotation with non-hosts will reduce pest levels and the risk of infestation.

Chemical Control

Some of the registered products in Kenya for the management of *Liriomyza spp* include:

Product Name (Active Ingredient)	Purpose for registration
Acetamiprid 200g/L	Control of leafminer on French beans and Roses
Abamectin 18% w/w (18g/L)	Control of leafminer on Roses, French beans, tomatoes, ornamentals/flowers
Diazinon 600g/L	Control of leafminer on tomatoes
Imidacloprid 200g/L	Control of leafminers in Citrus
Azadirachtin 0.03%	Control of leafminer on tomatoes
Acetamiprid 25g/L	Control of leafminer on French beans & Tomatoes.

N.B. Frequent and long term use of insecticides with the same mode of action should be avoided because this may lead to development of resistant populations.

References

Infonet Biovision (2016). Aphids. Retrieved from [https://www.infonetbiovision.org/ Plant Health /Pests/Leafminers](https://www.infonetbiovision.org/PlantHealth/Pests/Leafminers)

CABI. (2016). Crop Protection Compendium, 2016 Edition. © CAB International Publishing. Wallingford, UK. www.cabi.org. Retrieved on 23th April 2016

EU Directive 2000/29/EC. <http://eur-lex.europa.eu>. Accessed on 23th April 2014

List of Registered Pest Control Products (10Th Edition). www.pcpb.or.ke

EPPO (2016). EPPO Global database. Retrieved from <https://gd.eppo.int/>.

