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Data Sheets on Quarantine Pests

Liriomyza huidobrensis

IDENTITY

Name: *Liriomyza huidobrensis* (Blanchard)
Synonyms: *Agromyza huidobrensis* Blanchard
Liriomyza cucumifoliae Blanchard
Liriomyza langei Frick
Liriomyza dianthi Frick
Taxonomic position: Insecta: Diptera: Agromyzidae
Common names: Serpentine leaf miner, pea leaf miner, South American leaf miner (English)
Bayer computer code: LIRIHU
EPPO A2 list: No. 152
EU Annex designation: I/A2

HOSTS

Fourteen families of plants have been recorded as hosts, without a clear preference for any particular family. *L. huidobrensis* has been reported from *Amaranthus* spp., *Aster* spp., aubergines (*Solanum melongena*), beets (*Beta vulgaris*), *Capsicum annuum*, celery (*Apium graveolens*), chrysanthemums (*Dendranthema morifolium*), cucumbers (*Cucumis sativus*), *Dahlia* spp., *Dianthus* spp., faba beans (*Vicia faba*), garlic (*Allium sativum*), *Gypsophila* spp., hemp (*Cannabis sativa*), *Lathyrus* spp., lettuces (*Lactuca sativa*), lucerne (*Medicago sativa*), melons (*Cucumis melo*), onions (*Allium cepa*), peas (*Pisum sativum*), *Phaseolus vulgaris*, potatoes (*Solanum tuberosum*), *Primula* spp., radishes (*Raphanus sativus*), spinach (*Spinacia oleracea*), tomatoes (*Lycopersicon esculentum*), *Tropaeolum* spp., *Verbena* spp. and *Zinnia* spp.

GEOGRAPHICAL DISTRIBUTION

L. huidobrensis originates in Central and South America and was absent from other continents until the 1980s. It was first detected in the EPPO region in 1987 in the Netherlands where it was found on glasshouse lettuces; it is presumed to have been imported directly from South America. It has since spread considerably in the EPPO region, but remains absent from a significant number of countries, in particular in central and eastern Europe.
EPPO region: Austria, Belgium, Cyprus, Czech Republic, France (Trouvé *et al.*, 1991), Israel, Italy (Suss, 1991; including Sicily), Malta, Netherlands, Portugal, Spain (including Canary Islands), UK (England, Northern Ireland, Scotland). *L. huidobrensis* has been intercepted, or has occurred and been eradicated, in Denmark, Finland, Germany (Leuprecht, 1991), Ireland and Sweden.
Asia: Cyprus, India (Uttar Pradesh), Israel, Thailand.
Africa: Mauritius, Réunion.

North America: Mexico (unconfirmed), USA (California, Hawaii and in glasshouses in Florida and Virginia).
Central America and Caribbean: Belize, Costa Rica, Dominican Republic, El Salvador, Guadeloupe, Guatemala, Honduras, Nicaragua, Panama.
South America: Argentina, Brazil (Matto Grosso, São Paulo), Chile, Colombia, Peru, Venezuela.
Oceania: Australia (intercepted).
EU: Present.

BIOLOGY

The biology of *L. huidobrensis* is not as well known as that of some other *Liriomyza* spp. This general description, therefore, draws on information from other species. Peak emergence of adults occurs before midday (McGregor, 1914). Males usually emerge before females. Mating takes place from 24 h after emergence and a single mating is sufficient to fertilize all eggs laid. Female flies puncture the leaves of the host plants causing wounds which serve as sites for feeding or oviposition. Feeding punctures cause the destruction of a larger number of cells and are more clearly visible to the naked eye. About 15% of punctures made by *L. trifolii* and *L. sativae* contain viable eggs (Parrella *et al*., 1981). Males are unable to puncture leaves but have been observed feeding at punctures produced by females. Both males and females feed on dilute honey (in the laboratory) and take nectar from flowers.

Eggs are inserted just below the leaf surface. The number of eggs laid varies according to temperature and host plant. Eggs hatch in 2-5 days according to temperature. The duration of larval development also varies with temperature and host plant but is generally 4-7 days at mean temperatures above 24°C (Harris & Tate, 1933). Reductions in population levels of *L. huidobrensis* occurred in California (USA) when the daily maximum temperature rose to 40°C (Lange *et al*., 1957).

L. huidobrensis pupariates within the leaf, whereas other species usually pupariate externally, either on the foliage or in the soil just beneath the surface. Pupariation is adversely affected by high humidity and drought. Adult emergence occurs 7-14 days after pupariation, at temperatures between 20 and 30°C (Leibee, 1982). At low temperatures emergence is delayed.

In the southern USA, the life-cycle is probably continuous throughout the year. There is a noticeable first generation which reaches a peak in April (Spencer, 1973). In California, *L. huidobrensis* completes its life-cycle in 17-30 days during the summer and in 50-65 days during the winter (Lange *et al*., 1957). Adults of *Liriomyza* spp. live, on average, between 15 and 30 days, and females generally live longer than males. In northern Europe, *L. huidobrensis* is mainly a glasshouse pest, but a proportion of puparia can survive outdoors during an average Dutch winter (Van der Linden, 1993).

DETECTION AND IDENTIFICATION

Symptoms

Feeding punctures appear as white speckles between 0.13 and 0.15 mm in diameter. Oviposition punctures are smaller (0.05 mm) and are more uniformly round. Mines are usually white with dampened black and dried brown areas. They are typically serpentine, tightly coiled and of irregular shape, increasing in width as larvae mature; there should be no confusion with the mines of the European chrysanthemum leaf miner *Chromatomyia syngenesiae* which are less contorted and uniformly white.

Morphology

Eggs

Size 0.2-0.3 mm x 0.10-0.15 mm, off-white and slightly translucent.

Larva

A headless maggot up to 3.25 mm in length. First-instar larvae are colourless on hatching, turning pale yellow-orange. Later instars are yellow-orange. The posterior spiracle forms a crescent with six to nine mounted pores.

Puparium

The puparium is oval, slightly flattened ventrally, 1.3-2.3 x 0.5-0.75 mm, with variable colour.

Adult

Small, greyish-black, compact-bodied, 1.3-2.3 mm in body length, 1.3-2.3 mm in wing length. Females are slightly larger than males.

To distinguish adults of *L. huidobrensis* from other leaf miners of quarantine concern, the following simplified key can be used for initial identification (accurate identification requires dissection of male terminalia and all identifications made with this key should be confirmed by a specialist):

1. Scutellum bright-yellow 2
   Scutellum black ..... *Amauromyza maculosa*

2. Inner setae usually standing on yellow ground; prescutum and scutum black with grey bloom ..... *Liriomyza trifolii*
   Outer vertical setae standing on black; prescutum and scutum shining black 3

3. Inner vertical setae usually standing on dark ground (yellow mixed with black) ..... *Liriomyza huidobrensis*
   Inner vertical setae usually standing on yellow ground ..... *Liriomyza sativae*

Other morphological differences are described in Spencer (1973) and Knodel-Montz & Poe (1982). Menken & Ulenberg (1986) have described a method to distinguish between four species of *Liriomyza* (*L. bryoniae* and the three species in the above key), using starch gel electrophoresis and enzyme staining (see also OEPP/EPPO, 1992). This method can be used on single individuals. An improved version has recently been published by Oudman *et al.* (1995).

MEANS OF MOVEMENT AND DISPERSAL

Adult flies are capable of limited flight. Dispersal over long distances is on planting material of host species. Cut flowers can also present a danger as a means of dispersal; it should be noted, for example, that the vase life of chrysanthemums is sufficient to allow completion of the life-cycle of the pest.

PEST SIGNIFICANCE

Economic impact

This species damages a range of glasshouse ornamentals and also attacks vegetable crops (Lange *et al.*, 1957). In South America, it is a key pest of potato. In the EPPO region, *L. huidobrensis* is already a major pest of chrysanthemums, *Primula*, *Verbena*, lettuces (OEPP/EPPO, 1994), *Phaseolus*, cucumbers, celery and *Cucurbita pepo* (ADAS, 1991). Treatments for chrysanthemums are recommended if 50 larvae are found in a random sample of the upper two-thirds of ten stems (Spencer, 1982). Since it has spread to Mediterranean countries, it has appeared on outdoor crops (e.g. lettuce and beet; Echevarria *et al.*, 1994). It has proved a much more serious pest than *L. trifolii* (Weintraub & Horowitz, 1995).

Damage is caused by larvae mining into leaves and petioles. The photosynthetic ability of the plants is often greatly reduced as the chlorophyll-containing cells are destroyed. Severely infested leaves may fall, exposing plant stems to wind action, and flower buds and developing fruit to scald (Musgrave *et al.*, 1975). The presence of unsightly larval mines and adult punctures in the leaf palisade of ornamental plants can further reduce crop value (Smith *et al.*, 1962; Musgrave *et al.*, 1975). In young plants and seedlings, mining may cause considerable delay in plant development leading to plant loss.

Control

Some insecticides, particularly pyrethroids (abamectin) and also cyromazine (Van der Staay, 1992; Leuprecht, 1993), are effective, but leaf miner resistance can sometimes make control difficult (Parrella *et al.*, 1984; Macdonald, 1991). Natural enemies periodically suppress leaf miner populations (Spencer, 1973). *Dacnusa sibirica* (Van de Veire, 1991; Leuprecht, 1992), *Opius pallipes* and *Diglyphus isaea* (Van der Linden, 1991; Benuzzi & Raboni, 1992) are under consideration for use as natural enemies of the pest in European glasshouses.

Phytosanitary risk

L. huidobrensis is an A2 quarantine pest for EPPO (OEPP/EPPO, 1984); it was originally listed as an A1 pest, being at that time absent from the EPPO region, but since its recent introduction into several northern European countries it has been transferred to the A2 list. *L. huidobrensis* has the potential to become a major pest of a wide variety of ornamental or vegetable crops grown under glass and as protected crops in the EPPO region. This species could also cause damage to these crops grown in the open in the warmer parts of the region.

PHYTOSANITARY MEASURES

All stages are killed within a few weeks by cold storage at 0°C. Newly laid eggs are, however, the most resistant stage and it is recommended that cuttings of infested ornamental plants be maintained under normal glasshouse conditions for 3-4 days after lifting, to allow eggs to hatch. Subsequent storage of the plants at 0°C for 1-2 weeks should then kill off the larvae of leaf miner species (Webb & Smith, 1970).

To avoid the introduction of *L. huidobrensis* (and the other leaf miner species, including *L. sativae* and *Amauromyza maculosa*; EPPO/CABI, 1996), EPPO (OEPP/EPPO, 1990) recommends that propagating material (except seeds) of *Capsicum*, carnations, celery, chrysanthemums, *Cucumis*, *Gerbera*, *Gypsophila*, lettuces, *Senecio hybridus* and tomatoes from countries where the pests occur must have been inspected at least every month during the previous 3 months and found free from the pests. A phytosanitary certificate should be required for cut flowers and for vegetables with leaves.

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