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Data Sheets on Quarantine Pests

Liriomyza bryoniae

IDENTITY

Name: *Liriomyza bryoniae* (Kaltenbach)
Synonyms: *Agromyza bryoniae* Kaltenbach
Liriomyza solani Hering
Liriomyza citrulla Rohdendorf
Taxonomic position: Insecta: Diptera: Agromyzidae
Common names: Tomato leaf miner (English)
Tomatenminierfliege (German)
Notes on taxonomy and nomenclature: *Liriomyza huidobrensis* (Blanchard) is not a synonym (Spencer, 1973).
Bayer computer code: LIRIBO
EU Annex designation: I/A2

HOSTS

L. bryoniae is a highly polyphagous species and important primary hosts of economic importance include: cabbages (*Brassica oleracea* var. *capitata*), cucumbers (*Cucumis sativus*), lettuces (*Lactuca sativa*), courgettes (*Cucurbita pepo*), melons (*Cucumis melo*), tomatoes (*Lycopersicon esculentum*) and watermelons (*Citrullus lanatus*) (Abul-Nasr & Assem, 1961; Spencer, 1973; Lee *et al*., 1990b). In the pan-temperate region, *L. bryoniae* has been reported to complete its life cycle on plants from 16 families (Spencer, 1990).

In the EPPO region, *L. bryoniae* is common in the wild in southern Europe, although the insect is now common under glass in many other parts of the region. This pest has the potential to spread to any areas where Asteraceae, Brassicaceae, Cucurbitaceae or Solanaceae are grown under glass.

GEOGRAPHICAL DISTRIBUTION

L. bryoniae probably originates from southern Europe but has now spread to many parts of the EPPO region where crops are grown under glass. The insect is also present in the Far East and the USA.
EPPO region: Albania, Belgium, Bulgaria, Czech Republic, Denmark, Egypt, France, Germany, Greece (Crete), Hungary, Israel, Italy (Sicily), Moldova, Morocco, Netherlands, Romania, Russia, Spain (including Canary Islands), Sweden, UK (England, Guernsey), Ukraine.
Asia: Israel, Japan, Taiwan.
Africa: Egypt, Morocco.
North America: USA (Massachusetts).
EU: Present.

BIOLOGY

Details about the life history of this leafminer are summarized from Spencer (1973), Nedstam (1985), Minkenberg & Lenteren (1986) and Lee *et al.* (1990a).

Approximately 30% of males emerge 1 day before females and copulation takes place immediately females have emerged; non-fertilized females are not able to oviposit. Female flies puncture the cotyledons or the young leaves of the host plants with their ovipositor causing wounds which serve as sites for feeding or oviposition. Females can live for a week or more but males only up to 3 days. Eggs are mostly inserted in the upper surface of leaves but also occasionally in the lower surfaces. Each egg puncture contains a single egg and the duration of this stage varies from 4 to 8 days at a mean temperature of 20.6°C. Females lay an average of seven eggs per day but totals of 104 eggs per female have been observed. Under glass in Europe, the leafminer breeds continuously throughout the spring, summer and autumn months.

There are three larval instars which, in total, last 7-13 days, depending on the temperature. The larva feeds rapidly and forms an irregular linear mine. If a leaf is not sufficient for full development, then the larva can move up in the stem into a second leaf; larvae are unable to penetrate leaves from the outside. Just before pupation, the mature larvae cut semi-circular exit slits in the upper surface of the leaves. After a short period the larvae drop to the ground and then burrow just below the surface of the soil before pupating. Very occasionally, larvae pupate on the upper or lower surfaces of the leaves. The duration of the pupal stages depends on the temperature but under glass in the spring and summer months in England, it averages 3 weeks. During winter, the pupae go into diapause or retarded development until the following spring.

DETECTION AND IDENTIFICATION

Symptoms

Leaves of host plants have small feeding/oviposition punctures and/or irregular linear mines.

Morphology

Eggs

Oval and white, 0.25 mm long.

Larva

Headless maggot. Instars can be distinguished by the size of the sclerotized mouth hooks. First instar, approximately 0.57 mm, length of mouth hooks 95 µm; 2nd instar, approximately 1.55 mm, length of mouth hooks 188 µm; 3rd instar, approximately 2.50 mm, length of mouth hooks 323 µm. The posterior spiracles each have an ellipse of 7-12 pores, which makes the larva in practice indistinguishable from that of *L. huidobrensis* with 6-9 (EPPO/CABI, 1996). Older larvae are yellow at the front and white at the rear.

Puparium

Oval, gold-yellow to dark brown-black.

Adult

Females 2.0-2.3 mm in length, males 1.5 mm. A small greyish fly with a shining black mesonotum; predominantly yellow femora but tibiae and tarsi more brownish; abdomen with tergites yellow laterally; squamae yellowish with dark margins and fringes ochrous to brown; both vertical setae standing on yellow ground, but black at hind-margin of eye sometimes reaching base of outer vertical setum; third antennal segment small, round, normally bright-yellow and arista gradually tapering (Spencer, 1973).

Detection and inspection methods

Menken & Ulenberg (1986) have described a method to distinguish between four species of *Liriomyza* (*L. bryoniae*, *L. huidobrensis*, *L. sativae*, *L. trifolii*), using starch gel electrophoresis and enzyme staining (see also OEPP/EPPO, 1992). This method can be used on single individuals.

MEANS OF MOVEMENT AND DISPERSAL

Adults are capable of limited flight, but, within the EPPO region, the most probable means of movement is on plants or cuttings intended for propagation.

PEST SIGNIFICANCE

Economic impact

The principal impact of the fly is through the larvae mining into leaves and petioles; the photosynthetic ability of the plant is reduced and growth is retarded. Young host plants are particularly susceptible to attack and frequently die (Spencer, 1973). Larvae feeding on tomato cotyledons prevent normal development of the plants and can cause them to collapse (Speyer & Parr, 1940 in Spencer, 1973).

In Egypt cucurbit plants were frequently attacked in the seedling stage; during heavy attacks, leaves appeared dwarfed and droopy and fruit production was reduced (Abul-Nasr & Assem, 1961). *L. bryoniae* is a major problem on crucifers, cucurbits, lettuces and tomatoes grown under glass in all areas where the pest is present or in the open field in southern Europe and in Taiwan.

Control

In European glasshouses, before 1980, chemical insecticides were recommended (e.g. dioxathion and dimethoate; Hussey *et al.*, 1976) but these were incompatible with the increasing trend of biological control against other glasshouse pests. Since that time, parasitoids have been used with increasing success. Trials with the North American species *Chrysocharis oscinidis* and *Opius dimidiatus* have not proved entirely successful (Linden, 1986); however, very good results have been achieved in The Netherlands (Hendrikse *et al.*, 1980), England (Wardlow, 1984), Sweden (Nedstam, 1987) and Belgium (Veire, 1991a) on tomatoes and other crops with the native species *Diglyphus isaea*, *Dacnusa sibirica* and *Opius pallipes*. More recently, work in Belgium has shown that the insect growth regulator cyromazine is effective and compatible with native parasitoids (Veire, 1991b). Parasitoids have also been recorded from field crops in Taiwan (Lee *et al.*, 1990b).

Phytosanitary risk

L. bryoniae has not been listed as a quarantine pest by EPPO or any other regional plant protection organization. In the western part of the EPPO region, *L. bryoniae* is a major pest of crops within the Asteraceae, Brassicaceae, Cucurbitaceae and Solanaceae grown under glass or in the warmer parts of the region in the field. Until the introduction of *L. trifolii* and *L. huidobrensis* from North America, it was never considered a quarantine pest and no regulatory measures were taken to control it. In view of its great similarity to *L. huidobrensis*, *L. bryoniae* has been conveniently included in the regulatory package which includes the recently introduced alien species (EPPO/CABI, 1996). However, this is not a good reason for EPPO to consider it as an A2 quarantine pest.

PHYTOSANITARY MEASURES

To avoid the introduction and spread of other *Liriomyza* spp., EPPO (OEPP/EPPO, 1990) recommends that propagating material (except seeds) of host plants 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 vegetables with leaves. In practice, these measures will also control the spread of *L. bryoniae*.

Studies on a similar agromyzid, *L. trifolii*, have shown that newly laid eggs in chryanthemums can survive cold storage at 0°C for up to 3 weeks but larvae were killed in 1-2 weeks under the same conditions (Webb & Smith, 1970). Thus plant material infested with *L. trifolii* could be maintained under normal glasshouse conditions for at least 4 days and then stored at 0°C for a minimum of 2 weeks. Specific studies have not been conducted to confirm whether this procedure is also effective against *L. bryoniae*.

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