EPPO Datasheet: *Crinivirus lactucaflavi*

Last updated: 2023-05-15

IDENTITY

[more photos...]

Preferred name: *Crinivirus lactucaflavi*
Taxonomic position: Viruses and viroids: Riboviria: Orthornavirae: Kitrinoviricota: Alsuviricetes: Martellivirales: Closteroviridae
Other scientific names: *LIYV*, *Lettuce infectious yellows crinivirus*, *Lettuce infectious yellows virus*
Common names: infectious yellows of lettuce
[view more common names online...]
EPPO Categorization: A1 list
[view more categorizations online...]
EU Categorization: A1 Quarantine pest (Annex II A)
EPPO Code: LIYV00

Notes on taxonomy and nomenclature

Lettuce infectious yellows virus (LIYV) is the type member of the genus *Crinivirus* in the family *Closteroviridae*. Viruses in this genus are transmitted by specific whitefly vectors, have filamentous, rod-shaped virions and two positive-sense genomic RNAs (Klaassen *et al.*, 1995).

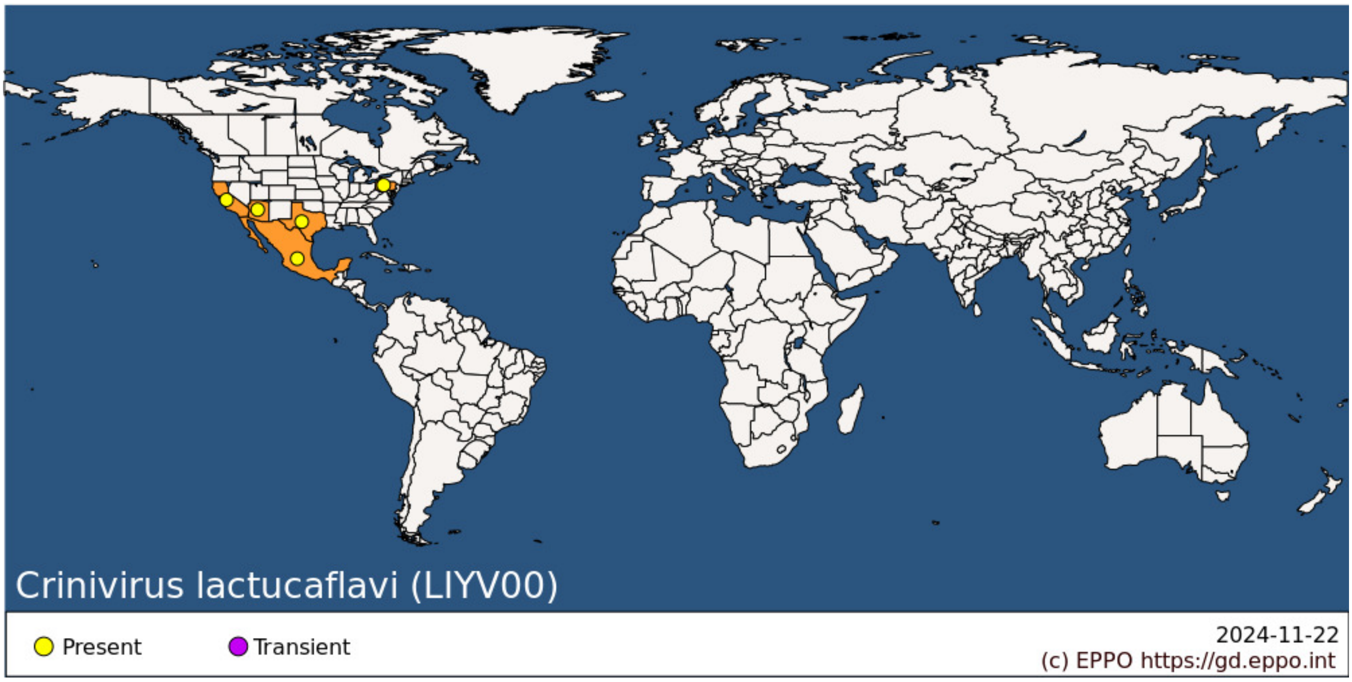
HOSTS

LIYV has a wide host range (at least 45 species in 15 families). The most economically significant hosts in North America are sugarbeets (*Beta vulgaris*), lettuces (*Lactuca sativa*), marrows (*Cucurbita pepo*) and melons (*Cucumis melo*). Other natural hosts include carrots (*Daucus carota*) and the cucurbits *Cucurbita foetidissima*, *C. maxima*, *C. moschata* and watermelons (*Citrullus lanatus*) (Duffus *et al*., 1986; Halliwell and Johnson, 1992). LIYV also infects various weeds, including *Ipomoea* spp., *Lactuca canadensis*, and *Malva parviflora*. In addition, *Chenopodium capitatum* and *Nicotiana benthamiana* are excellent experimental hosts.

Host list: *Beta vulgaris*, *Chenopodiastrum murale*, *Chenopodium album*, *Citrullus lanatus*, *Cucumis melo*, *Cucurbita foetidissima*, *Cucurbita maxima*, *Cucurbita moschata*, *Cucurbita pepo*, *Daucus carota*, *Ipomoea purpurea*, *Lactuca canadensis*, *Lactuca sativa*, *Lactuca serriola*, *Malva parviflora*, *Portulaca oleracea*, *Rumex crispus*, *Sonchus oleraceus*, *Taraxacum officinale*

GEOGRAPHICAL DISTRIBUTION

LIYV emerged in the South-West USA and nearby regions of Mexico in the early 1980s coinciding with the introduction and massive proliferation of very large populations of *B. tabaci* (Duffus *et al.*, 1996). The original *B. tabaci*, present at that time, was referred to as biotype A, now called the New World cryptic species, and is a very efficient vector of LIYV. *B. tabaci* New World populations and LIYV remained limited to the South-West USA for a few years. Subsequent build up of large populations of other *B. tabaci* cryptic species, MEAM-1 (biotype B) and Med (biotype Q), which are inefficient vectors of LIYV, led to displacement of the *B. tabaci* New World vector and disappearance of LIYV. The map below shows the LIYV distribution in the mid 1980s and early 1990s, however LIYV has not been reported from North America since about the mid 1990s.



North America: Mexico, United States of America (Arizona, California, Pennsylvania, Texas)

BIOLOGY

LIYV is transmitted in a semi-persistent manner by *Bemisia tabaci* New World. *B. tabaci* is recognized as one of the worlds' worst invasive species (Global Invasive Species Database, http://www.issg.org/database) and is composed of many cryptic species, formerly called biotypes (Dinsdale *et al.*, 2010). *B. tabaci* New World (biotype A), is the efficient whitefly vector associated with LIYV (Duffus *et al.*, 1986). Detailed studies have shown that other *B. tabaci* cryptic species do not efficiently transmit LIYV (Chen *et al.,* 2021). LIYV is retained by viruliferous whiteflies for several days (Duffus *et al.*, 1986). Susceptible vegetable crops normally become infected by the migration of high numbers of viruliferous *B. tabaci* from other cultivated hosts. LIYV is not transmitted to plants by mechanical inoculation.

DETECTION AND IDENTIFICATION

Symptoms

Infected plants show severe yellowing and/or reddening of the leaves, together with stunting, rolling, vein clearing and brittleness (Brown & Nelson, 1986). Older leaves show distinct interveinal yellowing while veins remain green.

Morphology

Virions are flexuous filaments, ~ 800-900 nm long and ~13-15 nm wide (Tian *et al.*, 1999). Hoefert *et al.* (1988) and Pinto *et al.* (1988) describe the ultrastructural effects in LIYV-infected lettuce, especially the unique formation of conical deposits on the plasmalemma of phloem parenchyma cells. These structures are composed of a LIYV-encoded protein and are involved in LIYV spread within infected plants (Qiao *et al.*, 2018).

Detection and inspection methods

Preparations of LIYV virions are immunogenic and the virus can be detected by ELISA and immunoblot analysis (Duffus *et al.*, 1986; Tian *et al.*, 1999). More recent diagnostic methods are nucleic acid-based, particularly RT-PCR targeting the conserved HSP-70h coding region (Tian *et al.*, 1996). Recommended indicator plants for whitefly transmission of LIYV are: *Beta vulgaris*, *Brassica pekinensis*, *Chenopodium capitatum*, *Citrullus lanatus*, *Cucumis melo*, *Cucumis sativus*, *Lactuca sativa*, *Malva parviflora*, *Nicotiana clevelandii* and *Trifolium subterraneum*, all of which show the symptoms noted above. In addition, cloned infectious cDNAs can be experimentally transmitted by agroinoculation (inoculation of recombinant LIYV plasmids via *Agrobacterium tumefaciens*) to *Nicotiana benthamiana* plants (Wang *et al.*, 2009).

PATHWAYS FOR MOVEMENT

LIYV spreads naturally only by its vector *Bemisia tabaci* New World which can spread it within and between fields (and presumably glasshouses) in infested areas. In international trade, it is very unlikely to be carried by plants of its main cultivated hosts, since these are short-lived vegetable crops not normally moved. Young seedlings for transplanting might constitute a pathway, but would still be unlikely to move in intercontinental trade. Therefore, the main risk of movement is in *B. tabaci* New World on other host plants (e.g. ornamentals), given the fact that the vector moves readily from one host to another, and that the virus can persist in the vector for several weeks after acquisition.

PEST SIGNIFICANCE

Economic impact

LIYV has caused severe losses on marrow, melon and related cucurbit crops in California (USA) (Duffus & Flock, 1982; Nameth *et al.*, 1985). Yield of lettuce may be reduced up to 75% by infection. The disease has also been found causing serious losses in hydroponically grown lettuces in North-Eastern USA (Brown & Stanghellini, 1988). It is one of several criniviruses which have become very important since the spread of *Bemisia tabaci* throughout the world. However, largely due to displacement of *B. tabaci* New World (efficient LIYV vector) by other, non-vector *B. tabaci* cryptic species, LIYV has not caused economic losses in recent years.

Control

Control mainly aims at eliminating or excluding the vector *Bemisia tabaci*, and also weed hosts which may act as reservoirs for both LIYV and *B. tabaci* (Wood, 1988). Protective row covers of spun-bonded polyester over seedlings as a floating cover showed some effectiveness (Natwick & Durazo, 1985). Lettuce cultivars differ in susceptibility to LIYV (McCreight *et al.*, 1986), and resistance or tolerance has also been studied in melons and sugarbeet, but no effective resistance is known.

Phytosanitary risk

LIYV could present a threat to the cultivation of lettuces and cucurbits (especially courgettes and melons), in the open in Southern Europe or under glass in Northern Europe, wherever *B. tabaci* New World occurs. However, its apparent disappearance from agricultural systems in North America due to the displacement of *B. tabaci* New World by non-efficient vectors has lowered the risk for the EPPO region.

PHYTOSANITARY MEASURES

Host plants of *Bemisia tabaci* from areas where LIYV occurs should come from a place of production free from LIYV and *B. tabaci* New World during the last growing season.

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ACKNOWLEDGEMENTS

This datasheet was extensively revised in 2023 by Bryce Falk, University of California, Davis, CA, USA. His valuable contribution is gratefully acknowledged.

How to cite this datasheet?

EPPO (2024) *Crinivirus lactucaflavi*. EPPO datasheets on pests recommended for regulation. Available online. https://gd.eppo.int

Datasheet history

This datasheet was first published in 1997 in the second edition of 'Quarantine Pests for Europe', and revised in 2023. It is now maintained in an electronic format in the EPPO Global Database. The sections on 'Identity', 'Hosts', and 'Geographical distribution' are automatically updated from the database. For other sections, the date of last revision is indicated on the right.

CABI/EPPO (1997) *Quarantine Pests for Europe (2nd edition).* CABI, Wallingford (GB).

Co-funded by the European Union