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Data Sheets on Quarantine Pests

Lettuce infectious yellows 'closterovirus'

IDENTITY

Name: Lettuce infectious yellows 'closterovirus'
Taxonomic position: Viruses: Possible *Closterovirus*
Common names: LIYV (acronym)
EPPO computer code: LEIYXX
EPPO A1 list: No. 212
EU Annex designation: I/A1

HOSTS

LIYV has a wide host range (45 species in 15 families). The most significant economic hosts in North America are beetroots (*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*). LIYV also infects various weeds, including *Helianthus* spp., *Ipomoea* spp., *Lactuca canadensis*, *Malva parviflora* and *Physalis heterophylla*.

GEOGRAPHICAL DISTRIBUTION

EPPO region: Absent.
North America: Mexico (Halliwell & Johnson, 1992), USA (Arizona, California, Pennsylvania in hydroponic culture, Texas).
EU: Absent.

BIOLOGY

LIYV is transmitted in a semi-persistent manner by *Bemisia tabaci*. Biotype B has been particularly implicated in California (Cohen *et al*., 1992). The virus is not transmitted by mechanical inoculation. It is retained by viruliferous whiteflies for several days in serial transfers on susceptible hosts (Duffus *et al*., 1986). Susceptible vegetable crops normally become infected by the migration of high numbers of *B. tabaci* from other cultivated hosts.

DETECTION AND IDENTIFICATION

Symptoms

Severe yellowing and/or reddening of the leaves, together with stunting, rolling, vein clearing and brittleness (Brown & Nelson, 1986).

Morphology

Filaments, usually flexuous, 1800-2000 nm long and 13-14 nm long. Hoefert *et al*. (1988) and Pinto *et al*. (1988) describe the ultrastructural effects in lettuce, especially the unique formation of conical deposits on the plasmalemmae of phloem parenchyma cells.

Detection and inspection methods

Preparations of LIYV are immunogenic and the virus can be detected by ELISA (Duffus *et al*., 1986), but not readily in crude sap from infected plants. The virus is not transmitted mechanically. Recommended indicator plants are: *Beta vulgaris*, *Brassica pekinensis*, *Chenopodium quinoa*, *Citrullus lanatus*, *Cucumis melo*, *Cucumis sativus*, *Lactuca sativa*, *Malva parviflora*, *Nicotiana clevelandii* and *Trifolium subterraneum*, all of which show the symptoms noted above.

MEANS OF MOVEMENT AND DISPERSAL

LIYV moves only in its vector *Bemisia tabaci*, which can spread it 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. Nor at present is there intercontinental trade in the vegetables as such, of which the leafy crops like lettuces would be most likely to carry *B. tabaci*. So the main risk of movement is in *B. tabaci* 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 causes severe losses of marrows, melons and related cucurbits 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 northern USA (Brown & Stanghellini, 1988). It is one of a group of viruses which have become very important since the spread of biotype B of *Bemisia tabaci*.

Control

Control mainly aims at eliminating or excluding the vector *Bemisia tabaci*, and also weed hosts which may act as reservoirs (Wood, 1988). Endosulfan and other insecticides have been used in an attempt to reduce whitefly density. It was found more effective to protect rows of seedlings with spun-bonded polyester as a floating cover (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.

Phytosanitary risk

LIYV has recently been added to the EPPO A1 list, but has not been classified as a quarantine pest by any other regional plant protection organization. This is no doubt partly due to the fact that its appearance as a significant pest is very recent. It presents a severe 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* and especially its biotype B occur. It may be stressed that LIYV, like squash leaf curl bigeminivirus (EPPO/CABI, 1996), has only been recorded in North America and that no other *B. tabaci*-transmitted virus is known to attack cucurbits or lettuces in other parts of the world, except the insignificant cucumber vein yellowing virus in the Middle East (Yilmaz *et al*., 1989; Mansour & Al Musa, 1993).

PHYTOSANITARY MEASURES

Host plants of *Bemisia tabaci* from areas where LIYV occurs should come from a place of production free from LIYV and *Bemisia tabaci* (or treated against *B. tabaci*) during the last growing season. This applies especially to the ornamental *Euphorbia pulcherrima* (poinsettia), which is notorious for carrying *B. tabaci* inconspicuously.

BIBLIOGRAPHY

Brown, J.K.; Nelson, M.R. (1986) Whitefly-borne viruses of melons and lettuce in Arizona. *Phytopathology* **76**, 236-239.

Brown, J.K.; Stanghellini, M.E. (1988) Lettuce infectious yellows virus in hydroponically grown lettuce in Pennsylvania. *Plant Disease* **72**, 453.

Cohen, S.; Duffus, J.E.; Liu, H.Y. (1992) A new *Bemisia tabaci* biotype in the southwestern United States and its role in silverleaf of squash and transmission of lettuce infectious yellows virus. *Phytopathology* **82**, 86-90.

Duffus, J.E.; Flock, R.A. (1982) Whitefly-transmitted disease complex of the desert southwest. *California Agriculture* **36**, 4-6.

Duffus, J.E.; Larsen, R.C.; Liu, H.Y. (1986) Lettuce infectious yellows virus - a new type of whitefly-transmitted virus. *Phytopathology* **76**, 97-100.

EPPO/CABI (1996) Squash leaf curl bigeminivirus. In: *Quarantine pests for Europe*. 2nd edition (Ed. by Smith, I.M.; McNamara, D.G.; Scott, P.R.; Holderness, M.). CAB INTERNATIONAL, Wallingford, UK.

Halliwell, R.S.; Johnson, J.D. (1992) Lettuce infectious yellows virus infecting watermelon, cantaloupe, honey dew melon, squash, and cushaw in Texas. *Plant Disease* **76**, 643.

Hoefert, L.L.; Pinto, R.L.; Fail, G.L. (1988) Ultrastructural effects of lettuce infectious yellows virus in *Lactuca sativa*. *Journal of Ultrastructure and Molecular Structure Research* **98**, 243-253.

Mansour, A.; Al Musa, A. (1993) Cucumber vein yellowing virus: host range and virus vector relationships. *Journal of Phytopathology* **137**, 73-78.

McCreight, J.D.; Kishaba, A.N.; Mayberry, K.S. (1986) Lettuce infectious yellows tolerance in lettuce. *Journal of the American Society for Horticultural Science* **111**, 788-792.

Nameth, S.T.; Laemmlen, F.F.; Dodds, J.A. (1985) Viruses cause heavy melon losses in desert valleys. *California Agriculture* **39**, 28-29.

Natwick, E.T.; Durazo, A. (1985) Polyester covers protect vegetables from whiteflies and virus diseases. *California Agriculture* **39**, 21-22.

Pinto, R.L.; Hoefert, L.L.; Fail, G.L. (1988) Plasmalemma deposits in tissues infected with lettuce infectious yellows virus. *Journal of Ultrastructure and Molecular Structure Research* **100**, 245-254.

Wood, M. (1988) Scientists take aim on lettuce menaces. *Agricultural Research, USA* **36**, 10-12.

Yilmaz, M.A.; Ozaslan, M.; Ozaslan, D. (1989) Cucumber vein yellowing virus in Cucurbitaceae in Turkey. *Plant Disease* **73**, 610.