European and Mediterranean Plant Protection Organization
Organisation Européenne et Méditerranéenne pour la Protection des Plantes

Data sheets on quarantine pests
Fiches informatives sur les organismes de quarantaine

Cucumber vein yellowing ipomovirus

Identity

Name: *Cucumber vein yellowing virus*
Taxonomic position: Viruses: *Potyviridae*: *Ipomovirus*
Common names: CVYV (acronym), cucumber vein yellowing (Harpaz & Cohen, 1965) (English), virus de las venas amarillas del pepino (Spanish)
Notes on taxonomy and nomenclature: CVYV is more closely related to *Sweet potato mild mottle ipomovirus* than any other in the family *Potyviridae* (Lecoq *et al*., 2000; Desbiez *et al*., 2001). CVYV-Is and CVYV-Jor are two recognized strains of CVYV from Israel and Jordan, respectively. The two strains induce similar vein-clearing symptoms in cucumber and melon, but CVYV-Jor causes more severe stunting in cucumber (Lecoq *et al*., 2000). The strain recently isolated from cucumber in Spain was 95.6% identical to the sequence published for CVYV-Is. *Squash yellow leaf curl virus* described in the Sultanate of Oman (Zouba *et al*., 1998) may possibly be a form of CVYV (Lecoq *et al*., 2000)
EPPO code: CVYV00
Phytosanitary categorization: EPPO A2 action list no. 316

Hosts

CVYV naturally infects cucumber (Cohen & Nitzany, 1960), melon (Yilmaz *et al*., 1989), watermelon (Janssen & Cuadrado, 2001) and courgette (Anon, 2001). Wild cucurbits are also reported as hosts in Jordan (Mansour & Al-Musa, 1993). Experimental hosts have been studied using mechanical inoculation of cotyledons and inoculation by the whitefly vector *Bemisia tabaci* (Cohen & Nitzany, 1960; Al-Musa *et al*., 1985; Yilmaz *et al*., 1989; Mansour & Al-Musa, 1993). All these experimental hosts are *Cucurbitaceae*. They include *Cucurbita moschata*, *Cucurbita foetidissima*, *Citrullus colocynthis*.

Geographical distribution

EPPO region: Israel (Cohen & Nitzany, 1960), Jordan (Al-Musa *et al*., 1985), Spain (Cuadrado *et al*., 2001a,b), Turkey (Yilmaz *et al*., 1989)
Asia: Israel, Jordan, Turkey
Africa: Sudan (Desbiez *et al*., 2001)
EU: present

Biology

CVYV is transmitted by the whitefly *Bemisia tabaci* (Cohen & Nitzany, 1960) in a semipersistent manner (Harpaz & Cohen, 1965; Mansour & Al-Musa, 1993). *B. tabaci* became viruliferous after an acquisition period of 30 min and transmission reached 51% after a 4-h feeding period. Extending the acquisition time had little effect on the transmission rate. CVYV was retained by its vector for no longer than 4–6 h (Harpaz & Cohen, 1965) and the latent period was at least 75 min. Transmission by viruliferous whiteflies occurred after a 15-min inoculation feeding period. The highest level of transmission (57.5%) was reached after a 4-h inoculation period. Transmission is regarded as inefficient (Mansour & Al-Musa, 1993). The aphids *Aphis gossypii* and *Myzus persicae* are not vectors (Cohen & Nitzany, 1960). No work has been reported to determine whether CVYV is seed-borne. Although *Sweet potato mild mottle virus*, which is the type species of the genus *Ipomovirus* and the only *Ipomovirus* species recognized by van Regenmortel *et al*. (2000), is not seed-borne (Brunt *et al*., 1996), other viruses in the *Potyviridae* can be seed-borne.

CVYV is systemic in its natural hosts. It survives in cucurbit weed hosts (Mansour & Al-Musa, 1993), although these have not been named, and in volunteer plants of crop hosts.

Detection and identification

Symptoms

In cucumber, CVYV causes pronounced vein clearing, chlorosis and finally general necrosis of the affected plant (Cohen & Nitzany, 1960). Light to dark green mosaic is observed on fruit (Anonymous, 2001). Non-parthenocarpic cucumbers have been reported to be symptomless carriers of CVYV while parthenocarpic cucumbers develop severe symptoms. Symptoms in both cucumber and melon have been described as vein yellowing, vein clearing and stunting with a corresponding yield reduction (Yilmaz *et al*., 1989). Sudden death was observed on melon in Spain (Janssen & Cuadrado, 2001). In watermelon, symptoms are often inconspicuous or not expressed (Anon, 2001). Occasional splitting of fruits has been observed (Janssen & Cuadrado, 2001). In courgette, there is a wide range of symptoms, from chlorotic mottling to vein yellowing, or no symptoms (Anon, 2001). In Spain, symptoms are considered to

be increased by synergistic reactions between different viruses. Pinwheel-shaped cytoplasmic inclusions (typical of the *Potyviridae*) have been seen in electron microscopic studies of cells from CVYV-infected plants (Lecoq *et al*., 2000).

Morphology

Studies of the virus have revealed rod-shaped particles 740–800 nm long and 15–18 nm wide. The virus is estimated to have a sedimentation coefficient of about 220 S (Sela *et al*., 1980). Lecoq *et al*. (2000) reported that it was likely that the viral nucleic acid of CVYV is double-stranded RNA rather than a double-stranded DNA as proposed earlier (Sela *et al*., 1980). The work of Cuadrado *et al*. (2001b) supported the suggestion of Lecoq *et al*. (2000).

Detection and inspection methods

Vein clearing or vein yellowing of cucumber and melon is considered to be a distinctive symptom of CVYV. Molecular assays have been used to detect CVYV (Martínez-García *et al*., 2004).

Pathways for movement

In international trade, CVYV is most likely to be carried by infected vegetative host material, such as seedlings. *B. tabaci* will spread CVYV locally. Internationally, CVYV is semipersistent in its whitefly host and is retained for less than 6 h, so *B. tabaci* is only likely to introduce CVYV if it is carried on infected host material. *B. tabaci* carried on non-host plants may not remain viruliferous long enough to transmit the virus. CVYV is not known to be seed-borne.

Pest significance

Economic impact

The cucumber disease caused by CVYV was first observed in the late 1950s in the Jordan valley area of Israel during the warm autumn growing season where it was reported to be severe and damaging. At that time, it had not been recorded in the cooler regions of Israel or during other seasons in the Jordan Valley (Cohen & Nitzany, 1960). In 1985, CVYV was recorded as present in the Jordan Valley in Jordan, but no indication of damage in this country has been given except that the virus stunted parthenocarpic cucumbers grown under plastic and that it was the most frequent viral disease of that crop (Al-Musa *et al*., 1985; Mansour & Al-Musa, 1993). Mansour (1994) reported that, in 1992, CVYV was detected in 43% of tested samples collected from cucumber crops grown under plastic. Similarly, the presence of CVYV on cucumber and melon in Turkey was not accompanied by information on crop damage other than a description of symptoms (Yilmaz *et al*., 1989). However, CVYV has been described as a widespread and severe disease of cucurbits in the eastern Mediterranean basin (Lecoq *et al*., 2000) and considerable losses were reported from Spain during the first outbreak (Cuadrado *et al*., 2001b). In autumn 2000, CVYV was considered important enough for the Spanish authorities to destroy affected plants covering 70 ha of glasshouses in an attempt to suppress further spread (Cuadrado *et al*., 2001a). In 2001, occasional splitting of watermelon fruits has been observed in Spain (Janssen & Cuadrado, 2001).

Control

There is no information on resistant cultivars of cucumber or melon. No data is available on trials that may have been undertaken to reveal yield losses in the non-parthenocarpic (symptomless) and parthenocarpic cucumbers. Care should be taken to protect cucumber or melon seedlings from infection before transplanting in the field or under plastic. This would require raising the seedlings in a whitefly free environment.

In protected crops in Spain, control relies on preventive and cultural practices (use of pest-free seedlings, adequate glasshouse-window screens, double doors, treatment of infected vegetable residues and the introduction of a rest period of at least one month between two cucurbit crops campaigns, monitoring of *B. tabaci* populations).

When preventive and cultural methods are not sufficient, control of CVYV centres on the control of its whitefly vector *B. tabaci*. Regarding chemical control, *B. tabaci* appears to develop resistance to all groups of plant protection products that have been developed for its control. A rotation of insecticides that offer no cross resistance should therefore be used to control *B. tabaci* infestations. The parasite *Encarsia formosa* is used as a biological control agent to control *T. vaporariorum*, but it is less efficient against *B. tabaci*. Repeated introductions of larger numbers of *E. formosa* than *B. tabaci* are necessary if eradication is required. The predatory beetle *Delphastus pusillus* is very effective against *B. tabaci* (Anonymous, 2000).

Phytosanitary risk

CVYV is present in countries of the eastern Mediterranean area and, with the report from Spain, one country in the western Mediterranean area. It is likely to become established in areas where *B. tabaci*, its whitefly vector, is established. *B. tabaci* is present outdoors in many southern European countries and is a glasshouse pest in some northern European countries. Therefore, CVYV has the potential to become a serious disease of cucurbits in the EPPO region. Cucumber is grown throughout the EPPO region, while melons and watermelons are most commonly grown in Mediterranean countries.

Phytosanitary measures

CVYV was added in 2003 to the EPPO A2 action list, and is thus recommended for regulation as a quarantine pest by EPPO member countries. International trade in young cucurbit plants for planting seems the main pathway, but little information has been found on movements into or within the EPPO region. It is

not clear how likely it is that seedlings would become infected, but they should presumably be protected from infection before entering trade. Visual inspections of export material may not detect the virus since it is latent in some hosts and may take some time to express symptoms in others. Suitable measures would ensure, for plants for planting of cucurbits from areas where CVYV occurs, crop or place of production freedom from the virus and exclusion of the vector *B. tabaci*.

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