EPPO DATA SHEETS ON QUARANTINE PESTS[1]

Peach mosaic ?closterovirus

IDENTITY

Name: Peach mosaic ?closterovirus
Synonyms: Peach mosaic virus (American)
Taxonomic position: Viruses: *Closteroviridae* : probable *Closterovirus*
Common names: PcMV (acronym)
American peach mosaic (English)
Mosaïque américaine du pêcher (French)
Notes on taxonomy and nomenclature: peach American mosaic disease was listed by EPPO as an A1 quarantine pest in the 1970s, at the time when its aetiology was not known. In the 1980s, peach cultivars imported into Europe from North America under quarantine were found to be affected by a mosaic disease. Peach latent mosaic viroid (PLMVd) was isolated, identified and named by European scientists from this material (Desvignes, 1986; Desvignes *et al*., 1988; Flores & Llácer, 1988; Flores *et al*., 1990). The disease called peach yellow mosaic in Japan was also shown to be caused by PLMVd. Because of the similarities in symptomatology, host range, etc. between the mosaic disease caused by PLMVd and American peach mosaic, it was concluded that PLMVd must be the pathogen causing peach mosaic in North America. The entry in the EPPO list was renamed accordingly (EPPO/CABI, 1997) and, as PLMVd was later found to be present in several European countries, it was transferred to the A2 list. However, it has now been demonstrated clearly that the causal agent of American peach mosaic is not PLMVd (Shamloul *et al*., 1995) but, instead, the probable closterovirus described in this data sheet. PLMVd also occurs in North America and causes a different disease. Peach American mosaic ?closterovirus is accordingly reinstated as an EPPO A1 quarantine pest. In the 1990s, PLMVd was found to be more widely distributed in EPPO countries than previously thought, and was accordingly deleted from the A2 list in 1999. The data sheet on PLMVd (EPPO/CABI, 1997) is not being updated.
EPPO computer code: PCMXXX
EPPO A1 list: No. 27
EU Annex designation: I/A1 - as peach mosaic virus (American)

HOSTS

Peach American mosaic ?closterovirus affects only *Prunus* spp.: peach (*Prunus persica*), nectarine (*P. persica* var *nectarina*), almond (*P. dulcis*), apricot (*P. armeniaca*), *P. besseyi*, *P. serrulata* and several species of plum. Cherries are not hosts of the disease. Peaches and nectarines are the main economically affected hosts, as the disease on susceptible cultivars deforms the fruit so that it becomes unsaleable. Cultivated European and Japanese plums *(P. domestica* and *P. salicina*) are highly susceptible to the disease but express only the leaf symptoms described for peach. In apricot, some susceptible cultivars (e.g. Blenheim) develop leaf discoloration patterns and distortion and stubby twig symptoms. Trees are less vigorous, produce less fruit and have more sunburned fruit than healthy trees. Almond trees generally show mild foliar and fruit symptoms, with a reduction in yield or nut quality.

GEOGRAPHICAL DISTRIBUTION

American peach mosaic was first observed in 1931 in Texas (US) and soon after that in Colorado, and southern California (limited to areas south of the Tehachapi mountains). The disease was then reported throughout the peach-growing states of Arizona, Arkansas, New Mexico, Oklahoma and Utah. It must be stressed that in the USA, because of the implementation of strict quarantine programmes, the disease is now rare. In Mexico, symptoms of peach mosaic were reported in the 1950s in Chihuahua, Baja California and Coahuila. More recently, peach mosaic was detected in Chihuahua and several states of the central highlands (Aguascalientes, Guanajuato, Hidalgo, Michoacan, San Luis Potosi, Sonora, Zacatecas). The disease is considered important in Mexico, where many symptomatic trees are currently being observed (Oldfield *et al*., 1995). Apparently, there are no records outside North America for peach American mosaic ?closterovirus.
EPPO region: Absent.
North America: Mexico (Aguascalientes, Baja California, Coahuila, Guanajuato, Hidalgo, Michoacan, San Luis Potosi, Sonora, Zacatecas), USA (Arizona, Arkansas, California, Colorado, New Mexico, Oklahoma, Texas, Utah).

[1] This data sheet constitutes a revision of earlier EPPO data sheets that appeared in OEPP/EPPO (1978) and, under the wrong name of peach latent mosaic viroid, in EPPO/CABI (1997).

EU: Absent.
Distribution map: See CABI/EPPO (1998, no. 316)

BIOLOGY

Peach American mosaic ?closterovirus is easily graft-transmissible to healthy peach using fruit, leaf, root, or bud tissues and a contact period as short as two days. Attempts to transmit the agent through dodder have failed. The vector of the disease is the peach bud mite *Eriophyes insidiosus*. This mite feeds and reproduces on developing leaf primordia within the bud. In areas of the USA where it infests freestone peaches, it is usually limited to adventitious buds on the trunk or on the lower scaffold branches. Infested buds are swollen and reddened, growth remains retarded, and buds may eventually die. A single infectious mite can transmit the disease to a healthy tree. *E. insidiosus* has been found on peach and on several American species of plum in south-western USA. In Mexico, *E. insidiosus* was observed in buds of wild *Prunus munsoniana* in Chihuahua and in buds of criollo peaches (clingstone peaches with various colours of flesh grown in Mexico for hundreds of years) in the central highland areas where peach is grown. On criollo peaches, the mites were seen in unopened buds along small branches distributed throughout the canopy of the trees (Oldfield *et al*., 1995).
Peach American mosaic ?closterovirus reacts with monoclonal antibodies produced for cherry mottle leaf closterovirus (James & Howell, 1993). However, the latter differs in that it infects cherry and has *E. inaequalis* as its mite vector (Oldfield *et al*., 1995).

DETECTION AND IDENTIFICATION

Symptoms
The first signs of disorder become apparent on the trees during the second year after planting and include: delays of 4-6 days in leaf emergence, flowering and maturity; pink broken lines on the white petals in warm temperatures; irregularly shaped, flattened, colourless fruit, with cracked sutures and enlarged pits; open habit; bud necrosis. Some isolates cause mosaic, blotch, calico and necrosis of the leaves, whereas others induce stem pitting and leaf twisting. For further descriptions of the disease see Hutchins (1932), Hutchins *et al.* (1937), Larsen & Oldfield (1995), Pine (1976).

Morphology
A flexuous clostero-like virus is associated with peach mosaic disease and has been isolated from an affected peach tree cv. Elberta. It was mechanically transmitted from symptomatic leaves to *Chenopodium quinoa* and has an estimated size of 752 nm in length and 9.25 nm in width, with striations 3.47 nm in pitch. This virus could then be transmitted to Elberta peach, by budding, and induced typical symptoms of peach mosaic. In serological assays, this virus reacted with monoclonal antibodies prepared for cherry mottle leaf closterovirus (James & Howell, 1993, 1997).

Detection and inspection methods
Peach American mosaic ?closterovirus can be detected in the glasshouse on indicator plants (peach seedlings, e.g. cvs. Elberta, GF305, Rio Oso Gem) by grafting (Desvignes, 1976). Indirect enzyme-linked immunosorbent assay (ELISA) using the monoclonal antibody prepared for cherry mottle leaf closterovirus can also be used as a useful interim detection tool for peach American mosaic.

MEANS OF MOVEMENT AND DISPERSAL

Natural transmission is ensured by the mite vector (see Biology). The main means of movement is in infected propagation material.

PEST SIGNIFICANCE

Economic impact
In the USA, the economic consequences in affected peach orchards have been considerable in the past. It is estimated that the total tree losses in California and Colorado before 1955 were more than 390,000 (Larsen, 1997). However, the disease is currently of very minor importance in USA, but much more important in Mexico. Fruits from affected trees, especially peaches and nectarines, are generally unmarketable.

Control
Control measures should be based on the use of healthy propagation material. Control of the mite vector can also help to reduce the spread of peach American mosaic. In the USA, the rapid spread of the disease during 1932/1935, especially in California and Colorado, led to the establishment of eradication programmes. Spread of peach mosaic to peach production regions situated at the east of the Mississippi river was prevented. It is now felt that the results of the eradication campaigns were successful in containing spread and reducing the incidence of the disease to a low level in infested areas. For example, in Colorado the annual tree losses dropped below 1,000 in 1960, below 100 in 1969, below 10 in 1982, below one in 1983 and finally to zero in 1987. The only documented incidence in Colorado since 1987

occurred in 1991 (Thresh, 1988; Larsen, 1997). In Mexico, where no such measures were taken, the disease incidence has remained rather high.

Phytosanitary risk

EPPO originally considered peach American mosaic as an A1 quarantine pest (OEPP/EPPO, 1978). After a period of confusion on the identity of the pathogen (see Notes on taxonomy and nomenclature), it is again now clear that there is a North American probable closterovirus which causes a mite-transmitted mosaic disease of peach, which is unknown in the EPPO region. Although the virus can readily be excluded from commercial plantations using healthy planting material, and the vector *E. insidiosus* is not known to occur in Europe, the introduction of this virus into the EPPO region would create a significant additional constraint for peach production, justifying its retention on the A1 list. Other eriophyid mites existing relatively harmlessly on *Prunus* in Europe could possibly act as alternative vectors.

PHYTOSANITARY MEASURES

Virus-free propagation material should be used. EPPO recommends in particular (OEPP/EPPO, 1990) that plants for planting of peach from all origins should have been found free from symptoms by a growing-season inspection and, for material from infested countries, that material should derive from a certification scheme in which mother plants are tested for the pathogen; for example, see OEPP/EPPO (1991; 1991/1992).

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