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Data Sheets on Quarantine Pests

Peach rosette mosaic nepovirus

IDENTITY

Name: Peach rosette mosaic nepovirus
Taxonomic position: Viruses: Comoviridae: *Nepovirus*
Common names: PRMV (acronym)
Notes on taxonomy and nomenclature: Apart from that caused by PRMV, there are a number of diseases of peach that include the name "peach rosette". In Europe, the disease "peach rosette" is caused by strawberry latent ringspot nepovirus; in Australia, "peach rosette and decline" is due to a combined infection with prune dwarf and prunus necrotic ringspot ilarviruses; in parts of the USA, peach rosette phytoplasma causes the "peach rosette" symptom.
EPPO computer code: PCRMXX
EPPO A1 list: No. 219
EU Annex designation: IA/1

HOSTS

The principal host is the American grape species *Vitis labrusca*. Some cultivars of *V. vinifera*, and French-American *Vitis* spp. hybrids are also susceptible. Peach rosette mosaic nepovirus (PRMV) is also an important pathogen of peaches (*Prunus persica*) and has experimentally caused disease in *Vaccinium corymbosum*. In addition, several weed species have been shown to be hosts for the virus: Rumex crispus, *Solanum carolinense* and *Taraxacum officinale*. The experimental herbaceous host range is rather narrow. Some species of Chenopodiaceae, Cucurbitaceae, Fabaceae and Solanaceae are infected by mechanical inoculation with sap from infected grapes or peaches.

GEOGRAPHICAL DISTRIBUTION

PRMV is one of the North American nepoviruses of fruit trees, and has not extended its range to any other continent. No basis has been found for the possible presence of the virus in India or Italy, as mentioned by Németh (1986).
EPPO region: Absent.
North America: Canada (indigenous in Western Ontario, near Lake Erie); USA (indigenous in Michigan, found once in New York).
EU: Absent.

BIOLOGY

Several nematode species have been recorded as vectors. *Xiphinema americanum* (*sensu lato*) has been known for several years to be a vector in Michigan, USA (Klos *et al*., 1966) and Ontario, Canada (Dias, 1975). From the geographic distribution of the virus and species of the *X. americanum* group in North America, it is probable that the species involved is *X. americanum sensu stricto* (EPPO/CABI, 1996).

A species of *Criconemoides* was reported to be a vector in Michigan (Klos *et al*., 1966); this may have been *C.* (= *Macroposthonia*) *xenoplax*, as later referred to by Ramsdell & Myers (1974) from the same area. *Longidorus diadecturus*, which occurs in many parts of eastern North America, has been reported as a vecor of PRMV, but only in a few peach orchards of Essex County, Ontario (Allen *et al.*, 1982; Driel *et al.*, 1990). Two other species of *Longidorus*, *L. breviannulatus* and *L. elongatus* were tested in laboratory experiments and demonstrated to transmit PRMV on rare occasions (Allen, 1986; Allen & Ebsary, 1988).

The records of these non-*Xiphinema* vectors of PRMV are surprising since, in general, the nepoviruses are divided into those transmitted by *Longidorus* spp. and those by *Xiphinema* spp. Not only is this the only case in which the same virus is transmitted by both genera, but it would also be the only transmission of a nepovirus by a nematode (*Criconemoides/Macroposthonia*) not belonging to the Longidoridae. Halbrendt (1993) has suggested that *X. americanum* may lack the high degree of specificity noted in other nematode/virus associations, which could partly explain the situation. It may, however, be noted that the unexpected vectors were present in mixed populations with *Xiphinema americanum* at both places in North America where their supposed transmission of PRMV was demonstrated. The results may therefore be dubious.

PRMV was shown to be seed-borne in grapevine cv. Concord at a level of 9.5% from an average of two experiments. It was also shown to be seed-borne in *Taraxacum officinale* (Ramsdell & Myers, 1978). PRMV is also transmitted through seed of *Chenopodium quinoa*.

DETECTION AND IDENTIFICATION

Symptoms

The virus causes leaf malformation, shortening of cane internodes and crooked cane growth in grapevines. In peaches, shortened internodes, rosetting and mosaic of leaves result from infection.

Morphology

PRMV is a multicomponent, isometric (28 nm) single-stranded, positive-sense RNA virus. The genome consists of two RNA species of MW 2.2 x 10^6 and 2.5 x 10^6 d. The protein subunit MW is 57 x 10^4 d. The three components have sedimentation coefficients of 52 s (top), 115 s (middle), and 134 s (bottom). In infected sap of *Chenopodium quinoa*, the thermal inactivation point; (10 min) is 58-68°C, the dilution end point is 10^3-10^5 and the virus retains infectivity for about 15-25 days at room temperature (20°C). For more information on the characterization of PRMV, see also Dias (1975) and Dias & Cation (1976).

Detection and inspection methods

PRMV is serologically unrelated to any other nepovirus. It is moderately immunogenic. Titres of 1/512 to 1/1024 can be obtained by intramuscular injection of purified virus and Freund's complete adjuvant for the first injection, followed by virus in Freund's incomplete adjuvant for two additional injections. The virus forms a single precipitin line in gel-diffusion serological tests, when infected sap of *Chenopodium quinoa* is used as the antigen source. ELISA works very well in directly detecting PRMV in infected grapevines, peaches and *Vaccinium*. Alternatively, PRMV-infected, young leaves of grapevines, peaches or *Vaccinium* can be triturated in 2 ml of 0.05 M potassium phosphate buffer, pH 7.0, containing 1% (v/v) nicotine alkaloid (2 ml/g of tissue) and rub-inoculated to *C. quinoa* plants. Chlorotic and necrotic local lesions will form on inoculated leaves in 7-10

days. Expressed sap can be tested against PRMV antiserum in gel diffusion for confirmation of identity.

MEANS OF MOVEMENT AND DISPERSAL

The nematode vector *X. americanum* transmits the virus from infected vines, infected grape seedlings and certain weed hosts, such as *Taraxacum officinale*, to healthy grapevines or peach trees. However, spread from infection foci (usually circular in shape) is only at the rate of about 1 m per year radially. Diseased grape seed may be present in pomace that growers sometimes spread in the vineyard. In international trade, PRMV is only liable to be carried in infected propagating material; accompanying soil may harbour infective seeds and the nematode vector.

PEST SIGNIFICANCE

Economic impact

A 50-fold yield reduction has been measured in grapevine cv. Concord infected for several years. In 1980, at the annual meeting of the International Council for the Study of Viruses of the Grapevine, held in Canada, New York and Michigan, the group as a whole unanimously agreed, upon seeing PRMV-diseased vines, that PRMV causes the worst symptoms in grapevine of any virus disease in the world.

Control

It is not possible to cure plants once infected with PRMV and, therefore, prevention is the only alternative. The use of virus-free plants emanating from a certification scheme is recommended. The soil in which the material is to be planted should be free from viruliferous nematodes. If nematodes are present, the soil can be tested for the simultaneous presence of PRMV by planting bait plants or by direct extraction of virus from nematodes ("slash test"). Soil-applied nematicides can be used to reduce the number of nematodes in the soil. This can have the effect of slowing infection and spread but will not prevent virus transmission, since a certain number of nematodes always remains after such treatment.

Phytosanitary risk

PRMV has recently been added to the EPPO A1 list, but has not been considered as a quarantine pest by any other regional plant protection organization Its present distribution in North America indicates that it could well establish and produce symptoms in most of central Europe. The crops at risk would be peach and grapevine.

However, in order for it to become a serious problem it would need to establish a relationship with an efficient vector. Because of the doubts (expressed above) about the information on transmission, it is difficult to provide a realistic assessment of the risk of such a relationship being established. Two of the nematodes mentioned as vectors (*Macroposthonia xenoplax* and *Longidorus elongatus*) are already present and quite widely distributed in the EPPO region, but these are of dubious status and in any case not considered to be capable of a high rate of transmission. On the other hand, the major vector in North America, *X. americanum*, is not present in the EPPO region, and has already been considered as an A1 quarantine pest by EPPO (EPPO/CABI, 1996) on the basis of its vector potential for tomato ringspot nepovirus. The other reported non-European vector, *L. diadecturus* is of rather doubtful status (see above). It does not seem of sufficient importance for the EPPO region to be considered as a quarantine pest.

PHYTOSANITARY MEASURES

Plants for planting of *Vitis labrusca*, *V. vinifera* and French-American grapevine cultivars and all cultivars of *Prunus persica* from North America should come from areas free from PRMV. Such material may be tested for the presence of PRMV by ELISA. All plants for planting from North America should be free from soil.

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