

Data Sheets on Quarantine Pests

Tomato black ring nepovirus

IDENTITY

Name: Tomato black ring nepovirus

Taxonomic position: Viruses: Comoviridae: *Nepovirus*

Common names: TBRV (acronym)

Bean ringspot, beet ringspot, celery yellow vein, lettuce ringspot, potato bouquet, potato pseudo-*aucuba*, tomato black ring (English)

Buschbohnenringflecken, Kartoffelbukett (German)

Notes on taxonomy and nomenclature: Distantly related to cacao necrosis (Kenten, 1977) and grapevine chrome mosaic nepoviruses and very distantly serologically related to artichoke (Italian) latent nepovirus.

EPPO computer code: TMBRXX

EU Annex designation: II/A2

HOSTS

TBRV infects a wide range of herbaceous and woody monocotyledonous and dicotyledonous species including many that are important crop plants such as *Vitis vinifera*, tree fruit and small fruit species, sugarbeet, potatoes and many vegetables (e.g. species of *Allium*, *Beta*, *Brassica*, *Lactuca*, *Lycopersicon*, *Phaseolus*) and ornamentals; it has also been found infecting some forest tree and shrub species.

All these crop hosts of TBRV and many wild plants hosts occur widely throughout the EPPO region. In practice, the only important hosts are *Rubus*, *Ribes*, *Fragaria* and some *Prunus* spp. (especially peaches).

GEOGRAPHICAL DISTRIBUTION

EPPO region: Widespread in France. Also reported from Denmark (unconfirmed), Finland, Germany, Greece, Hungary, Ireland, Italy (unconfirmed), Netherlands, Moldova, Norway, Poland, Romania, Russia (European), Sweden, Turkey, UK (England, Scotland) and Yugoslavia.

Asia: India (Andhra Pradesh, Karnataka, Tamil Nadu), Japan (both probably infected imported material), Turkey.

Africa: Kenya (intercepted only).

North America: Canada (Ontario; probably infected imported material), USA (intercepted only).

South America: Brazil (intercepted only).

EU: Present.

BIOLOGY

The two types of RNA present in TBRV are both genomic RNA species and are necessary for infectivity (Randles *et al.*, 1977). Natural transmission between plants is by vector

nematodes of the dorylaimid genus *Longidorus*: *L. attenuatus* and *L. elongatus*. Larvae and adults are able to transmit but the virus is not retained after moulting, nor is it passed to progeny through the egg (Murant, 1970). Nematodes acquire virus from infected plants after feeding for about 1 h and retain the ability to transmit for many weeks in soil without host plants. Different TBRV isolates often have different vector species. Thus, in the UK, isolates of TBRV from Scotland are transmitted most efficiently by *L. elongatus*, whilst those in England (and also on the mainland of Europe) are transmitted largely by *L. attenuatus* (Harrison *et al.*, 1961; Harrison, 1964; Taylor & Murant, 1969). Vector specificity seems to be correlated with the serological properties of the virus coat protein. Transmission by nematodes alone spreads the virus by only a few metres per year.

The virus is also transmitted through seeds of infected plants, often with a high frequency, especially in some crop species and weeds (Lister & Murant, 1967). This enables the virus to be dispersed over a wide area. Additionally, the virus can be dispersed by transport of soil containing TBRV-infected nematodes and/or TBRV-infected seed. In perennial plants, virus may be distributed in material vegetatively propagated from infected plants.

Many strains of TBRV have been described, including bean ringspot, beet ringspot, celery yellow vein, lettuce ringspot, potato bouquet and potato pseudo-aucuba.

DETECTION AND IDENTIFICATION

Symptoms

Most naturally infected weed and crop plants may show few or no symptoms especially in the year of infection or when infection occurs through the seed. Nevertheless, plant growth and vigour in such plants may be impaired. Where infection occurs through nematode transmission, this often appears as patches of poor growth which slowly extend in size each year. Depending on the cultivar, natural infection in *Rubus* and *Fragaria* may induce chlorotic mottling and/or ringspots in leaves (Murant, 1987; Murant & Lister, 1987); in potato, leaves may develop black necrotic spots (Harrison, 1957). In celery, *Sambucus nigra* and some other shrubs, leaves may show bright-yellow vein-clearing (Schmelzer, 1966; Hollings *et al.*, 1969). Symptoms are generally most obvious in plants in early spring growth and are less noticeable during more rapid growth in summer.

Morphology

Isometric particles *c.* 28 nm in diameter with hexagonal outlines. In purified preparations particles exist as three sedimenting components with sedimentation coefficients ($S_{20,w}$) of *c.* 55S, 97S and 121S, termed T, M and B, respectively. All particles consist of 60 protein subunits each of molecular weight *c.* 57 000 but, whereas T particles are nucleic acid-free protein shells, M and B particles contain linear ssRNA with molecular weight of 1.7×10^6 and 2.7×10^6 , respectively (Murant, 1970; Murant *et al.*, 1973). Some virus isolates contain in addition a satellite RNA of molecular weight *c.* 0.5×10^6 . Several different satellites have been described for different TBRV isolates (Fritsch *et al.*, 1984).

Detection and inspection methods

Infected crop plants do not usually develop diagnostic symptoms. TBRV is readily transmitted by inoculation of sap to many herbaceous test plants but mechanical inoculation of virus from woody plants should be made in 2% (v/v) nicotine sulfate (pH 9.3). In test species such as *Chenopodium quinoa*, *C. amaranticolor* and *Nicotiana clevelandii*, TBRV induces chlorotic or necrotic local lesions and systemic necrosis, depending on the virus isolate. Such symptoms, although indicative of virus infection, are not diagnostic for TBRV, and other tests, such as serology or nucleic acid hybridization, are necessary to establish unequivocally the presence of TBRV. Serological tests are generally the most

convenient and ELISA is probably the most sensitive. However, because of the serological variability of TBRV isolates, antisera to each of the two main serotype groups (Bercks, 1963; Murant, 1970) should be used. ELISA has been successfully used to detect TBRV directly in plants such as grapevine, raspberry and strawberry.

MEANS OF MOVEMENT/DISPERSAL

TBRV is transmitted by its nematode vectors over short distances only. In international trade, only movement of infected planting material would be important. The significant host plants are not moved as seeds.

PEST SIGNIFICANCE

Economic impact

TBRV can cause severe disease in some raspberry, strawberry and peach cultivars in some localities but the incidence of such infections is often small. Yield loss in crops is difficult to quantify but, although significant in some cultivars of some crops, it is probably of only local importance.

Control

Avoidance of infection is by planting healthy material (seed or vegetative material) at sites free from infestation with *Longidorus* vector nematodes carrying the virus. At sites contaminated with such infective nematodes, soil treatment with nematicides prior to planting can be used as a control (Murant & Taylor, 1965; Trudgill & Alpey, 1976). This treatment kills most nematodes and also any infected weed and crop seeds that might act as virus reservoirs for the few nematodes surviving the soil treatment. To minimize the risk of reinfesting such treated sites through the presence of virus-infected weed seedlings, continued weed control is an additional and recommended treatment. The virus was eradicated from infected potato tubers and some fruit tree budwood by thermotherapy (Kaiser, 1980).

Phytosanitary risk

TBRV is a quarantine organism for NAPPO. It is not listed as a quarantine pest by EPPO on the grounds that it is not a virus of great economic importance, is already widely distributed throughout its likely range and that of its vectors, and is more appropriately controlled by certification schemes.

PHYTOSANITARY MEASURES

Vegetative planting material of *Fragaria*, *Ribes*, *Rubus* and peach (*Prunus persica*) should be derived from parent stock tested and found to be free from the virus. Ideally, material should be washed thoroughly to remove adhering soil particles and possible nematodes. EPPO recommends a suitable certification scheme for fruit trees (OEPP/EPPO, 1991/1992) and is developing schemes for *Ribes*, *Rubus* and strawberries.

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