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Data Sheets on Quarantine Pests

Citrus ringspot virus

IDENTITY

Name: Citrus ringspot virus
Taxonomic position: Viruses (ungrouped)
Common names: CRSV (acronym)
Psorosis B, citrus necrotic ringspot, naturally spread psorosis (English)
Notes on taxonomy and nomenclature: EU Directive 77/93 lists "naturally spreading psorosis" as of quarantine concern for the EU. Though no clearly characterized agent has yet been identified, it is nevertheless clear that at least two virus-like agents are independently involved in causing two distinct diseases which have been called psorosis (Frison & Taher, 1991). The first is psorosis A, true psorosis or classical psorosis, identified by leaf flecking symptoms when grafted onto suitable citrus indicators and by the fact that it is not mechanically transmitted (in the majority of isolates). The second is psorosis B, also called citrus ringspot, which is associated with distinctive virus particles, and is mechanically transmitted and can therefore be identified by its reactions on herbaceous indicators. The disease which spreads naturally in South America is the latter, so this data sheet concerns citrus ringspot 'virus' and the quarantine significance of its natural transmission under certain circumstances.
EPPO computer code: CSRSXX
EU Annex designation: IIA/1 (as naturally spreading psorosis)

HOSTS

Most *Citrus* spp. and their hybrids, especially grapefruits (*C. paradisi*) and oranges (*C. sinensis*). Timmer *et al.* (1978) reported that some isolates do not infect tangelos (*Citrus paradisi* x *C. reticulata*) or *Poncirus trifoliata*.

GEOGRAPHICAL DISTRIBUTION

The distribution is given for CRSV in general. The true distribution may be wider, since a proportion of the reports of psorosis (found in all citrus-growing areas) may well refer to citrus ringspot as well as to psorosis A. The countries where natural spread has been reported are also indicated.
EPPO region: Algeria, France, Greece, Italy (including Sicily), Spain, Turkey.
Asia: India, Iran, Turkey.
Africa: Algeria, South Africa.
North America: USA (California, Florida; Texas, natural spread in some cases)
South America: Argentina (natural spread), Uruguay (natural spread).
EU: Present (but no natural spread).

BIOLOGY

Citrus psorosis, including psorosis A and citrus ringspot, has mainly been spread through propagating material, and in most citrus-growing areas has largely been eliminated as a

commercial problem by budwood certification programmes. In most countries, outbreaks are so unusual that they are especially noted when they occur, for example by Marais *et al.* (1992) in South Africa. CRSV has recently attracted attention particularly because it has spread extensively by natural means in a few countries (Argentina, Uruguay). It is not known whether this spread is due to the presence of a unique vector, occurring only in those areas, or to a unique isolate of the virus, transmitted by vectors which occur elsewhere. No species has been suggested as a unique vector, but some aphid species (*Toxoptera citricidus, T. aurantii* and *Aphis spiraecola*; Portillo & Benatena, 1986) have been suggested as suspect vectors of a putative aphid-transmitted strain.

In Texas (USA), a necrotic strain of CRSV has been identified, from rampant, psorosis-like bark lesions found on trees from nucellar, virus-free sources. Graft inoculation of citrus from these sources produced chlorotic spots and blotches on leaves and fruit, and necrosis of shoots. This strain is consistently associated with bark lesions. Natural spread has apparently occurred in Texas, but only a low percentage of trees is affected.

Many other isolates of CRSV have been characterized, in Florida and Texas (USA), Spain (Navas-Castillo & Moreno, 1993; Navas-Castillo *et al.*, 1993), South Africa (Graca *et al.*, 1991).

DETECTION AND IDENTIFICATION

Symptoms

Citrus ringspot appears (Frison & Taher, 1991) as large, irregular blotches, or ringspots, on mature leaves, which are frequently gum-impregnated. Some cultivars show shoot necrosis and bark scaling (the classical psorosis symptom). Fruits may also show ringspot symptoms.

Morphology

Apparently filamentous with long and short particles (300-500 and 1500-2500 nm), single-stranded RNA; two components are needed for infectivity (Derrick *et al.*, 1988; García *et al.*, 1991). A characteristic 48 kDa protein is possibly the capsid protein.

Detection and inspection methods

Citrus ringspot gives shock symptoms when material is grafted on grapefruit or orange (this may also occur with psorosis A). Reactions of different citrus species to ringspot have been described in Argentina by Danos (1989). Leaf symptoms are variable, rather than the characteristic leaf flecking seen for psorosis A. Local lesions are obtained on mechanically inoculated *Chenopodium quinoa*. Antisera to the 48 kDa protein which is presumed to be the capsid protein of the virus have been obtained (Graca *et al.*, 1991), but no serological test seems yet to have been developed.

MEANS OF MOVEMENT AND DISPERSAL

The question of the natural transmission of CRSV is discussed under Biology. In international trade, CRSV is most likely to move in infected planting material. Such material could have been certified virus-free, but could have been reinfected subsequently. Since nothing is known of the mode of transmission or persistence in the vector, it is impossible to judge whether the vector itself could carry the virus in international trade.

PEST SIGNIFICANCE

Economic impact

Citrus ringspot is the most important cause of citrus tree loss in many areas of Argentina. In contrast to experience in other countries, the budwood certification programme established

in Argentina failed to control the disease. Healthy mother trees propagated from tested local and imported sources became naturally infected with CRSV. After 15 years in the scion mother block, 35% of the originally healthy sources of orange had foliar symptoms and 16% had bark lesions, while 49% of the grapefruit sources had symptoms and 21% had bark lesions.

Control

The normal method for controlling graft-transmissible viruses of citrus (sanitation and certification) has partly failed in areas where CRSV is naturally transmitted. There is no information on vector control.

Phytosanitary risk

Citrus ringspot 'virus' has not been considered as a quarantine pest by any regional plant protection organization. It is already quite widely distributed, and can be controlled by routine certification programmes. It appears to be less common or important than psorosis A in most countries. However, it would become a much more serious problem if it started to spread naturally in new areas. The difficulty is to identify the quarantine pest which presents the risk: is it a strain of CRSV or a vector? Until these questions have been answered, the risk presented cannot be analysed, nor can pathways for spread be evaluated. In any case, citrus planting material from the areas where CRSV is naturally transmitted is already prohibited for import into the EPPO region, because of other quarantine pests.

PHYTOSANITARY MEASURES

If the quarantine pest presenting the risk is a strain of CRSV, then prohibition of citrus planting material from countries where the virus is naturally transmitted would be the normal measure. If the quarantine pest is the vector, then an analysis of possible pathways is essential before any measures can be suggested. To a certain extent, prohibition of citrus planting material may be effective. However, most of the Homoptera (for example) which feed on citrus feed on other hosts as well.

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