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Data Sheets on Quarantine Pests

Cowpea mild mottle 'carlavirus'

IDENTITY

Name: Cowpea mild mottle 'carlavirus'
Taxonomic position: Viruses: Possible *Carlavirus*
Common names: CPMMV (acronym)
Angular mosaic (of beans), pale chlorosis (of tomato) (English)
Notes on taxonomy and nomenclature: CPMMV is serologically closely related to groundnut crinkle, psophocarpus necrotic mosaic, voandzeia mosaic and tomato pale chlorosis viruses and is probably synonymous with them (Jeyanandarajah & Brunt, 1993). It is not serologically related to known carlaviruses, and should possibly be placed in a new sub-group of the carlaviruses.
EPPO computer code: CPMMOX
EU Annex designation: I/A1

HOSTS

Natural hosts include *Canavalia ensiformis*, groundnuts (*Arachis hypogaea*), *Phaseolus lunatus*, *P. vulgaris*, *Psophocarpus tetragonolobus*, soyabeans (*Glycine max*), tomatoes (*Lycopersicon esculentum*), *Vigna mungo*, probably aubergines (*Solanum melongena*), cowpeas cv. Blackeye (*Vigna unguiculata*), *Vicia faba* and *Vigna subterranea*. The virus also occurs in various weeds (Fabaceae), including *Stylosanthes* and *Tephrosia* spp. Many more hosts can be artificially inoculated.

GEOGRAPHICAL DISTRIBUTION

EPPO region: Egypt, Israel.
Asia: India (Karnataka, Maharashtra and probably elsewhere), Indonesia, Israel, Malaysia, Thailand, Yemen.
Africa: Côte d'Ivoire, Egypt, Ghana, Kenya, Malawi, Mozambique, Nigeria, Sudan, Tanzania, Togo, Uganda, Zambia.
South America: Brazil.
Oceania: Fiji, Papua New Guinea, Solomon Islands.
EU: Absent.

BIOLOGY

Unlike carlaviruses in general, CPMMV is transmitted in a non-persistent manner (Jeyanandarajah & Brunt, 1993). The ability to transmit CPMMV is usually retained for a maximum of 20-60 min (Muniyappa & Reddy, 1983). Non-vector transmission is by mechanical inoculation. Seed transmission has been demonstrated in a number of hosts in different countries, but there are also negative reports. In practice it appears to be the main source of virus inoculum on the relatively short-lived hosts of this virus in tropical countries, though weeds may also act as reservoirs.

In Israel, a distinct isolate (CPMMV/I) has been described on tomato, causing pale chlorosis disease (Antignus & Cohen, 1987). Differences in host range between isolates are not yet sufficiently well investigated for distinct strains to be recognized (Jeyanandarajah & Brunt, 1993).

DETECTION AND IDENTIFICATION

Symptoms

Symptoms vary on different hosts and in different seasons. On *Vigna unguiculata*, CPMMV causes diffuse chlorotic blotches on the primary leaves, systemic mottling and leaf distortion. On groundnuts, it causes necrotic lesions, chlorotic rings or line patterns followed by systemic leaf chlorosis, rolling and veinal necrosis. On soyabeans and on *Phaseolus* it causes vein mosaic and general leaf chlorosis, followed by apical necrosis, distortion and stunting. However, the first report of CPMMV in Tanzania (Mink & Keswani, 1987) was of mild symptoms on *Vigna mungo* and symptomless infection of *Phaseolus vulgaris*. On tomatoes, CPMMV causes mottling and inconspicuous banding of minor veins ("fuzzy vein"; Brunt & Phillips, 1981).

Morphology

CPMMV consists of usually straight filaments 650 nm long and 13 nm wide. In leaf cells of the host, filamentous particles aggregate to form sheets, bundles or brush-like inclusions (Brunt *et al*., 1983).

Detection and inspection methods

Preparations of CPMMV are strongly immunogenic. The virus is detectable by ELISA and ISEM, but not by standard gel diffusion tests. Indicator plants include *Arachis hypogaea*, *Cajanus cajan*, *Canavalia ensiformis*, *Glycine max*, *Vigna unguiculata*, *Nicotiana clevelandii* (systemic mottle); *Beta vulgaris*, *Chenopodium murale*, *C. quinoa* (chlorotic local lesions).

MEANS OF MOVEMENT AND DISPERSAL

CPMMV moves only in its vector *Bemisia tabaci*, which can spread it between fields in infested areas. It is very unlikely to be carried by plants of its hosts in international trade, since these are field crops not normally moved (a possible exception is tomato, which is however a very minor host). The virus is seed-transmitted in some host species but, apparently, not in others (Jeyanandarajah & Brunt, 1993). There may be some risk of movement in *B. tabaci* on other host plants (e.g. ornamentals), given the fact that the vector moves readily from one host to another. However, CPMMV is not persistent in the vector.

PEST SIGNIFICANCE

Economic impact

CPMMV was first described as widespread in eastern Ghana on cowpeas (Brunt & Kenten, 1973). It causes a disease of soyabeans and groundnuts in Kenya (Bock *et al*., 1976), of soyabeans in Côte d'Ivoire (Thouvenel *et al*., 1982) and of groundnuts in India (Iizuka *et al*., 1984). It occurs on soyabean and groundnut in many southeast Asian countries (Iwaki *et al*., 1982, 1986). However, neither Demski & Kuhn (1989) nor Reddy & Rajeshwari (1984), in their accounts of the viruses of soyabean and groundnut respectively, consider CPMMV to be of any very great importance economically. The strain on tomato in Israel seems to be only a curiosity, found on a few plants (Cohen & Antignus, 1982). In Brazil, CPMMV has been recorded on *Phaseolus vulgaris*, on which it causes angular mosaic (Costa *et al*. 1983), but losses are small. In Nigeria, an 'extra mild' isolate of CPMMV has

been recorded on soyabeans (Anno Nyako, 1986). Hall (1991) who covers viruses of *Phaseolus vulgaris*, does not consider CPMMV important enough to be mentioned.

Control

For soyabean, healthy seeds should be used. As far as possible, situations of heavy whitefly infestation should be avoided. Reddy (1991), noting that the disease is rarely of any importance in groundnuts unless these are grown alongside susceptible crops of soyabean or cowpea, simply suggests that this should be avoided. In India, resistance to CPMMV has been sought in soyabean (Suryawanshi *et al*., 1989).

Phytosanitary risk

CPMMV has been evaluated as a quarantine pest by EPPO but not accepted. It has not been considered a quarantine pest by any other regional plant protection organization. Although it falls in the EU Annex category of a "non-European virus transmitted by *Bemisia tabaci*", the case for considering it as a quarantine pest is much weaker than for the New World geminiviruses, such as bean golden mosaic bigeminivirus (EPPO/CABI, 1996). Its economic importance is at most moderate, and has not shown any sudden increase. Nor has *B. tabaci* been noted to rise in importance on CPMMV hosts in the Old World. CPMMV is transmitted non-persistently by *B. tabaci*, so the possibility of entry in the vector is very small. CPMMV principally attacks tropical field crops, rather than glasshouse or vegetable crops. It is very doubtful whether it rates as having quarantine significance for EPPO in relation to soyabean or groundnut, and its importance on *Phaseolus vulgaris* and tomato (which are very important for EPPO) is so small that it can be ignored.

PHYTOSANITARY MEASURES

Because CPMMV is not transmitted in the persistent manner, the risk of introduction in the vector on other hosts is negligible. The only relevant measures would be directed at the possibility of seed transmission.

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