Data Sheets on Quarantine Pests

Xanthomonas axonopodis pv. *dieffenbachiae*

IDENTITY

Name: *Xanthomonas axonopodis* pv. *dieffenbachiae* (McCulloch & Pirone) Vauterin *et al.*
Synonyms: *Xanthomonas campestris* pv. *dieffenbachiae* (McCulloch & Pirone) Dye
Xanthomonas dieffenbachiae (McCulloch & Pirone) Dowson
Taxonomic position: Bacteria: Gracilicutes
Common names: Bacterial blight of aroids, anthurium blight, tip burn of *Philodendron oxycardium* (English)
Dépérissement de l'anthurium (French)
Notes on taxonomy and nomenclature: In a comprehensive study using DNA-DNA hybridization 20 DNA homology groups were recognized within the genus *Xanthomonas*. Of these, 16 were within the species *X. campestris*, and are now considered genomic species (Vauterin *et al.*, 1995). The type species of the genus, *X. campestris* is emended to include pathovars only obtained from plants in the Brassicaceae. In this study a high degree of homology was detected between the species *X. axonopodis* pv. *dieffenbachiae* and a wide range of other *X. campestris* pathovars from nonleguminous hosts. The species *X. axonopodis* was emended to include these pathovars.
Bayer computer code: XANTDF
EPPO A1 list: No. 180

HOSTS

Natural hosts are ornamental foliage plants of the family Araceae: *Aglaonema commutatum*, *A. crispum*; *Anthurium andraeanum* (a frequent host in USA - California, Florida, Hawaii - and in the Caribbean; Cooksey, 1985; Chase, 1987), *A. crystallinum*, *A. scherzerianum*; *Caladium hortulanum*, *Dieffenbachia maculata* (originally described on this species, but not apparently a frequent host now; Chase, 1987); *Epipremnum pinnatum*; *Philodendron scandens* subsp. *oxycardium* (the most frequent host in Florida, USA; Chase, 1987), *P. selloum*; *Syngonium podophyllum* (Chase *et al.*, 1988). The tropical aroid food crops *Xanthosoma caracu* (Pohronezny *et al*., 1985) and *X. sagittifolium* (Berniac, 1974) are also recorded as hosts, while *Colocasia esculenta* has been found to be affected by a *Xanthomonas campestris* leaf spot in Papua New Guinea (Tomlinson, 1987), which was not transmissible to *Anthurium* or *Philodendron*. *Aglaonema pictum* (Araceae) and *Dracaena fragrans* (Agavaceae) were infected on artificial inoculation.

GEOGRAPHICAL DISTRIBUTION

EPPO region: Absent (interceptions only, e.g. in the Netherlands).
Asia: Philippines.
Africa: South Africa.

North America: Canada (British Columbia, Ontario), Bermuda, USA (California, Florida, Hawaii, New Jersey).
Central America and Caribbean: Costa Rica, Dominica, Guadeloupe, Jamaica, Martinique, Puerto Rico (Cortes-Monllor, 1992), St. Vincent and Grenadines, Trinidad and Tobago.
South America: Brazil, Venezuela.
Oceania: Australia, French Polynesia (Tahiti), Papua New Guinea (on taro, possibly a different pathovar; Tomlinson, 1987).
Distribution map: See IMI (1996, No. 698).

BIOLOGY

The disease was first described on *Dieffenbachia maculata* by McCulloch & Pirone (1939). Infection and increase of the disease takes place especially under warm (>25°C) and humid conditions. The bacterium can infect through wounds, hydathodes and stomata. *X. axonopodis* pv. *dieffenbachiae* may occur in low numbers on the leaf (epiphytically) or in the vascular system of the plant (latent infection). The bacterium can be spread by (latently) infected plants, splashing water (rain, irrigation), contaminated tools, wet clothes, infested soil and possibly nematodes during planting, leaf pruning and harvesting (Nishijima & Fujiyama, 1985).

There are at least three groups of *X. axonopodis* pv. *dieffenbachiae* affecting Araceae: 1) strains from *Anthurium*, which are more virulent on *Anthurium* than other strains and have a broader host range; 2) certain strains from *Syngonium*, serologically closely related to *Anthurium* strains, also virulent on *Anthurium*, with a narrow host range; 3) strains from other Araceae, including strains from *Syngonium* other than those mentioned above, which are weakly virulent on *Anthurium* and have a narrower host range. Strains from *Syngonium*, first attributed to *X. vitians*, were described as *X. campestris* pv. *syngonii* by Dickey & Zumoff in 1987, but work of Chase *et al.* (1992) and Lipp *et al.* (1992) on a large number of *X. campestris* strains from aroids showed that there is little basis for a separate pathovar *syngonii*. The disease on *Anthurium* appears most damaging and is described here in more detail.

DETECTION AND IDENTIFICATION

Symptoms

On *Aglaeonema* and *Anthurium*, the disease has two stages (leaf infection and systemic infection), while other hosts only show leaf infection. The foliar symptoms are found on the leaves and spathe. They start close to the leaf margin on the underside of the leaf as small watersoaked spots, eventually with some yellowing around the spots. Under dry conditions the small, early spots may appear dry dark-brown. In later stages, the leaf spots become brown and necrotic, and coalesce, resulting in large, irregular necrotic areas with a bright-yellow border. Symptoms of systemic invasion of the pathogen start with yellowing of older leaves and petioles. Systemically infected leaves or flowers easily break off and may show dark-brown streaks at their base, which gradually enlarge. When petioles are cut, yellow-brown vascular bundles are visible. Eventually the entire plant is killed. Sometimes systemic infection also produces watersoaked leaf spots, when bacteria invade the leaf parenchyma from the infected vascular bundles. These watersoaked spots are mainly found near the main veins.

Morphology
The pathogen is an aerobic, motile, Gram-negative rod, 0.3-0.4 x 1.0-1.5 nm, with a single polar flagellum (McCulloch & Pirone, 1939; Bradbury, 1986).

Detection and inspection methods
Symptoms of blight can be easily confused with those of other diseases, making a laboratory confirmation obligatory. The presence of the bacterium can be checked by isolation on a selective medium, serological tests using monoclonal antibodies and a host test (Alvarez *et al.*,1988; Norman & Alvarez, 1989; Lipp *et al.*, 1992; Norman & Alvarez, 1994a).

MEANS OF MOVEMENT AND DISPERSAL

Natural dispersal of the bacterium is only on a very local scale. The most likely pathway for international movement is planting or breeding material of ornamental Araceae, which may be latently infected. This also applies to material in tissue culture; Norman & Alvarez (1994b) found that the bacterium could survive on apparently healthy material of *A. andraeanum* in tissue culture for over a year.

PEST SIGNIFICANCE

Economic impact
In production areas of *Anthurium* in North and South America, the disease is already a limiting factor. In Hawaii (USA) where the disease was first described by Hayward (1972), total loss for the *Anthurium* industry in 1989 was 15 782 USD per ha, i.e. a total loss of 2.74 million USD. Small farms have tended to reduce the area planted with this crop or to give up its cultivation (Shehata & Nishijima, 1989).

Control
Sanitation and exclusion are the main cultural measures (Lipp *et al*., 1992). In particular, overhead irrigation and overcrowding must be avoided and infected leaves removed. Different products have been used for chemical control, such as streptomycin or oxytetracycline (Sato, 1983). Since such antibiotics are not generally registered for horticultural use in Europe, it may be noted that cupric hydroxide and mancozeb can also be used (Knauss *et al.*, 1971). Breeding for resistance is under way for *A. andraeanum* (Kamemoto *et al.*, 1990).

Phytosanitary risk
X. axonopodis pv. *dieffenbachiae* is an A1 quarantine organism for EPPO, and an A2 quarantine organism for CPPC. If it was introduced, bacterial blight would seriously threaten ornamental flower and foliage production of *Anthurium* and other Araceae in glasshouses in the EPPO region.

PHYTOSANITARY MEASURES

Imported consignments should come from a place of production which was inspected during the growing season and found free from *X. axonopodis* pv. *dieffenbachiae*. In addition, planting and breeding material should ideally be laboratory tested for latent infection before export.

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