Prepared by CABI and EPPO for the EU under Contract 90/399003

Data Sheets on Quarantine Pests

Burkholderia caryophylli

IDENTITY

Name:*Burkholderia caryophylli* (Burkholder) Yabuuchi *et al.*
Synonyms: *Pseudomonas caryophylli* (Burkholder) Starr & Burkholder
Phytomonas caryophylli Burkholder
Taxonomic position: Bacteria: Gracilicutes
Common names: Bacterial wilt, bacterial stem crack (English)
Chancre bactérien de l'oeillet (French)
Welkekrankheit, Wurzelfäule der Nelken (German)
Chancro bacteriano del clavel (Spanish)
Notes on taxonomy and nomenclature: The combination *Burkholderia caryophylli* was proposed without examination of the type strain of *Pseudomonas caryophylli* and therefore was not valid when first published. This defect can be taken to have been corrected in subsequent studies (Urakami *et al.*, 1994; Gillis *et al.*, 1995).
Bayer computer code: PSDMCA
EPPO A2 list: No. 55
EU Annex designation: II/A2

HOSTS

Carnations are the main host and are widely grown in the EPPO region. However, *Dianthus barbatus* and *D. allwoodii* can be infected through artificial inoculation. In Florida (USA) and Japan, *Limonium sinuatum* is also reported to be infected (Jones & Engelhard, 1984; Nishiyama *et al.*, 1988).

GEOGRAPHICAL DISTRIBUTION

EPPO region: Hungary (unconfirmed), Israel, Italy, Norway (unconfirmed), Poland (unconfirmed), Slovakia (unconfirmed), Sweden (unconfirmed), Yugoslavia. Found in the past but not established in Denmark, France, Germany, Ireland, Netherlands and the UK.
Asia: China (Jilin; unconfirmed), India, Israel, Japan (Shikoku), Taiwan.
North America: USA (Florida, Illinois, Indiana, Iowa, Massachusetts, Minnesota, New York, Pennsylvania, Washington).
South America: Argentina, Brazil, Uruguay.
EU: Present.
Distribution map: See IMI (1995, No. 411) for many doubtful records.

BIOLOGY

The bacterium can only enter plants through wounds, and subsequently colonizes the vascular system of the stem and roots. The primary infection source is infected cuttings taken from mother plants with a latent infection. Bacteria can pass from one cutting to another in the water of the propagating bed or, if the cuttings are held in water, before

planting out. The observed slow, scattered spread of the disease indicates that spread occurs only from one root system to another. Bacterial slime is exposed when stems crack and this inoculum may be transferred from one plant to another. Temperatures over 20°C accelerate bacterial growth and therefore symptom expression, while at low temperatures infected plants may show no symptoms. For more information, see Dowson (1929), Burkholder (1942), Dimock (1950), Hellmers (1958), Garibaldi (1967).

DETECTION AND IDENTIFICATION

Symptoms

Symptoms may take 2-3 years to manifest themselves, particularly when cuttings are mildly infected and maintained at relatively low temperatures. Foliage becomes greyish-green, later yellowing and wilting and then death may occur.

In stems, at soil temperatures below about 17°C, a rapid multiplication of cells leads to tension around the vessels and longitudinal, internodal stem cracks appear, usually at the base of the plant, and later develop into deep cankers. Initially, this cracking is very similar to the physiological cracking observed in certain cultivars. However, in pathogen-induced cracks, a brownish-yellow bacterial slime is visible, often overgrown with saprophytic fungi such as *Cladosporium herbarum*. In some cases, the extrusions from the cankers leave the stems hollow. At 20-25°C, cankers are more rare and wilting is the common symptom. Visual observation of peeled stems reveals sticky, brownish-yellow, narrow or broad, longitudinal stripes in the vascular tissue; in cross section, these appear as irregular brownish spots with a water-soaked margin.

Roots of infected plants, once wilting occurs, are more or less rotten, the plants being easily pulled out of the soil and, on cutting, roots show discontinuous brown spots which distinguish the disease from that caused by *Phialophora cinerescens* which leaves the roots apparently symptomless (EPPO/CABI, 1996a).

Plants may survive about 1-2 months, but secondary invasion by fungi, such as *Fusarium* spp., accelerates death. Heavily infected cuttings wilt and die before roots are formed. For more information, see Dimock (1950), Hellmers (1958), Lemattre *et al.* (1964), Garibaldi (1967), Lemattre (1969), Saddler (1994).

Morphology

B. caryophylli is a straight or slightly curved rod with rounded ends, occurring singly or in pairs; it is aerobic, non-sporing, motile with one or several polar flagella, Gram-negative, sudanophilic, 0.35-0.95 x 1.05-3.18 µm.

In PDA culture, colonies are round, smooth and shining with regular margins: while cream-coloured at first, colonies darken with age. On nutrient agar, growth is slow and cells die rapidly; subculturing is not possible after about a week.

The carnation strain of *Erwinia chrysanthemi* (EPPO/CABI, 1996b), which causes a similar disease, is readily distinguishable in nutrient agar culture by its rapid growth of greyish-white, lobate colonies. In addition, internal symptoms of the two diseases are different.

Detection and inspection methods

To make a reliable diagnosis, many old and young stems should be examined and isolations made from diseased tissue. Microscopic observation of stem sections shows neoformations around infected vessels, plugging of vessels, hyperlignification of their walls and necrosis. Since latent infections on cuttings cannot be readily detected, cuttings should be kept at a relatively high temperature to ensure maximum symptom expression.

The bacterium can be reliably detected by immunofluorescence staining (IFAS) and direct isolation even in material with latent infection (Muratore *et al.*, 1986).

MEANS OF MOVEMENT AND DISPERSAL

The natural spread of the pathogen is very slow and over extremely short distances. The main path of distribution is by means of infected cuttings which may be obtained from infected but symptomless mother plants.

PEST SIGNIFICANCE

Economic impact

B. caryophylli has caused serious damage in the USA since its first report in 1940. Only minor losses occur in the EPPO region at present.

Control

A testing method developed and in use in Denmark, "KPV-Metoden", enables diseased cuttings to be detected and destroyed at an early stage, so preventing further dissemination of the disease, and thus making it possible to eradicate the bacterium in 6-18 months. There are no direct control measures. Disease-free mother plants should be used and rooting beds and soil should be fumigated.

Phytosanitary risk

B. caryophylli is an EPPO A2 quarantine pest (OEPP/EPPO, 1978), in view of the limited number of EPPO countries in which it has been reported, and the fact that it is readily carried on cuttings in international trade. However, the lack of recent publications on this organism and the disease it causes indicate that its importance is now very minor. It is also of quarantine significance for JUNAC.

PHYTOSANITARY MEASURES

In countries where the disease occurs, cuttings should be taken from separately grown mother plants derived from biologically tested, healthy cuttings. EPPO accordingly recommends that consignments should come from a place of production found free from *B. caryophylli* during the last growing season (OEPP/EPPO, 1990). However, the introduction of an EPPO-recommended certification scheme for carnation (OEPP/EPPO, 1991) provides a satisfactory alternative to such plant quarantine requirements.

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