

Data Sheets on Quarantine Pests

*Erwinia chrysanthemi***IDENTITY**

Name: *Erwinia chrysanthemi* Burkholder *et al.*

Synonyms: *Erwinia carotovora* (Jones) Bergey *et al.* f.sp. *parthenii* Starr
Erwinia carotovora (Jones) Bergey *et al.* f.sp. *dianthicola* (Hellmers) Bakker
Pectobacterium parthenii (Starr) Hellmers
Erwinia carotovora (Jones) Bergey *et al.* var. *chrysanthemi* (Burkholder *et al.*) Dye

Taxonomic position: Bacteria: Gracilicutes

Notes on taxonomy and nomenclature: Six pathovars of *E. chrysanthemi* are mentioned in the Bergey's *Manual of Systematic Bacteriology* (pv. *chrysanthemi*, pv. *dianthicola*, pv. *dieffenbachiae*, pv. *paradisiaca*, pv. *parthenii* and pv. *zuae*) on the basis of their host plants (Lelliott & Dickey, 1984). The pathovars are more or less related to six biochemical subdivisions (I-VI, Dickey & Victoria, 1980). Nine biovars (1-9; Ngwira & Samson, 1990) have been proposed for non-ambiguous biochemical typing. Some of the biochemical variants may be elevated to subspecies level or to another species name in the near future.

Bayer computer code: ERWICH (also ERWIZE)

EPPO A2 list: No. 53

EU Annex designation: II/A2 - pv. *dianthicola* only

HOSTS

Diseases have most often been reported on bananas, carnations, chrysanthemums, *Dahlia*, *Dieffenbachia* spp., *Euphorbia pulcherrima*, *Kalanchoe blossfeldiana*, maize, *Philodendron* spp., potatoes, *Saintpaulia ionantha*, *Syngonium podophyllum*.

E. chrysanthemi has also been naturally found to attack *Allium fistulosum*, *Brassica chinensis*, *Capsicum*, cardamoms, carrots, celery, chicory, *Colocasia esculenta*, Poaceae such as *Brachiaria mutica*, *B. ruziziensis*, *Panicum maximum* and *Pennisetum purpureum*, *Hyacinthus* sp., *Leucanthemum maximum*, lucerne, onions, pineapples, radishes, rice, *Sedum spectabile*, sugarcane, sorghum, sweet potatoes, tobacco, tomatoes, tulips and glasshouse ornamentals such as *Aechmea fasciata*, *Aglaonema pictum*, *Anemone* spp., *Begonia intermedia* cv. Bertinii, *Cyclamen* sp., *Dracaena marginata*, *Opuntia* sp., *Parthenium argentatum*, *Pelargonium capitatum*, *Phalaenopsis* sp., *Polyscias filicifolia*, *Rhynchosyilis gigantea*. *Primula obconica* has been erroneously mentioned as a host.

For further details, see Bradbury (1986) and other publications.

In the EPPO region, there has been most concern with carnations, chrysanthemums, and, more recently, potatoes as hosts. Ornamental house plants are also important.

GEOGRAPHICAL DISTRIBUTION

E. chrysanthemi has a world-wide distribution. Any kind of strain may occur in temperate countries, where outdoor and glasshouse plants are produced.

EPPO region: Algeria, Austria, Belarus, Belgium, Denmark, Egypt, Finland (found in the past but not established), France, Germany, Greece, Hungary, Israel, Italy, Netherlands, Norway, Poland, Portugal, Romania, Russia (European), Spain, Sweden, Switzerland, UK, Yugoslavia.

Asia: Bangladesh, China (Fujian, Hunan, Jiangsu, Jiangxi, Zhejiang), India (Bihar, Delhi, Karnataka, Uttar Pradesh, West Bengal), Iran, Israel, Japan (Hokkaido), Korea Democratic People's Republic, Korea Republic, Malaysia (Peninsular), Nepal, Philippines, Sri Lanka, Taiwan.

Africa: Algeria, Comoros, Côte d'Ivoire, Congo, Egypt, Réunion, Sudan, South Africa, Zimbabwe.

North America: USA (California, Colorado, Connecticut, Florida, Georgia, Massachusetts, North Carolina, North Dakota, Nebraska, New York, Ohio, Pennsylvania, Texas, Virginia, Wisconsin).

Central America and Caribbean: Aruba, Costa Rica, Cuba, Guadeloupe, Guatemala, Haiti, Honduras, Jamaica, Martinique, Panama, Puerto Rico, St. Lucia.

South America: Brazil (widespread), Colombia, Ecuador, French Guiana, Guyana, Peru, Venezuela.

Oceania: Australia (New South Wales, Queensland, Victoria, Western Australia), Cook Islands, New Zealand, Papua New Guinea, Solomon Islands.

EU: Present.

Distribution map: See CMI (1967, No. 425 - pv. *dianthicola*; 1987, No. 576 - pv. *dieffenbachia*).

This distribution is based on published reports and on the contents of international bacterial culture collections. The bacterium probably occurs in many other countries.

BIOLOGY

E. chrysanthemi is a soft rot pathogen degrading succulent fleshy plant organs such as roots, tubers, stem cuttings and thick leaves. It is also a vascular wilt pathogen, colonizing the xylem and becoming systemic within the plant. This latter aspect is the most alarming when vegetative propagation is involved. The pathogen can remain latent in stock plants (ornamentals, bananas) and can thus be spread in cuttings from them. Tubers are an important source of the disease for potatoes.

The bacterium is able to survive in the soil (on plant debris), so that infestation remains between two crops.

High humidity and free water favour spread and penetration of the bacteria. Disease development is dependent on high temperatures, generally 25-30°C.

Host specialization has not definitely been proved in *E. chrysanthemi*, except in pv. *paradisiaca* (Dickey & Victoria, 1980; Dickey, 1981). The pathogen is ubiquitous and isolates from maize and potato seem to be rather polyphagous, while *Philodendron* and *Kalanchoe* do appear to be differential hosts for temperate isolates (Janse & Ruissen, 1988).

DETECTION AND IDENTIFICATION

Symptoms

E. chrysanthemi causes soft rots and wilts, in particular stem rot of chrysanthemums, maize, *Dieffenbachia*, *Euphorbia pulcherrima*, bananas; leaf rot of *Philodendron*,

Saintpaulia ionantha, *Aglaonema*; wilting, dwarfing and tuber rot of potatoes and *Dahlia*; slow wilting, stunting and dwarfing of carnations.

For more information, see Burkholder *et al.* (1953), Lelliott (1956), Bortels & Sauthoff (1965), Fernandez-Borrero & Lopez-Duque (1970).

Morphology

E. chrysanthemi is a motile, Gram-negative, non-sporing, straight rod with rounded ends, and occurs singly or in pairs: it varies from 0.8-3.2 x 0.5-0.8 µm (average 1.8 x 0.6 µm). There are 3-14, but more usually 8-11, peritrichous flagellae.

On PDA, young colonies are either circular, convex, smooth and entire, or sculptured with irregular margins, depending on the moisture content of the growth medium. After 4-5 days, both colony types resemble a fried egg, with a pinkish, round, raised centre and lobed periphery, which later becomes feathery or almost coralloid.

Detection and inspection methods

Since soft rots and particularly wilts are not symptoms specific to *E. chrysanthemi*, the identity of the causal bacterium must be checked. Latent infections can be detected in cuttings or tubers. Selective pectate media have been devised for specific isolation of pectolytic erwinias (Van Vuurde & Roozen, 1990). Further characterization is needed to reach the species level. Tolerance to temperature and erythromycin may be used for direct differential isolation (Pérombelon & Hyman, 1986) but with precautions (Janse & Spit, 1989).

Antisera and ELISA kits are commercially available to detect *E. chrysanthemi*. The antibodies are generally directed against O-serogroup 1, recognizing only 68% of the strains (Samson *et al.*, 1990).

Inoculated artificially into aubergines, *E. chrysanthemi* from potatoes can cause symptoms resembling those caused by *Clavibacter michiganensis* subsp. *sepedonicus* (Persson & Janse, 1988).

MEANS OF MOVEMENT AND DISPERSAL

The bacterium is transmitted in soil and growing medium, and can, for example, survive up to 10 weeks in cattle manure (Lohuis, 1990). Over long distances, and especially across national borders, it is mainly spread by infected vegetative propagating material.

PEST SIGNIFICANCE

Economic impact

The disease causes destruction of many flower and ornamental crops, particularly carnation and chrysanthemum in rooting beds. Losses are also recorded on different glasshouse ornamentals (*Saintpaulia ionantha*, *Kalanchoe*), as well as in potato and *Dahlia* tuber production. On potatoes, it causes soft rot and blackleg like *E. carotovora* (Pérombelon & Kelman, 1987), but the symptoms tend to be expressed at higher temperatures. Seed potato certification schemes producing material for warmer countries should take account of *E. chrysanthemi* (Pérombelon *et al.*, 1987). The banana pseudostem rot is rather destructive.

Control

Control varies with the crop attacked. It entails strict attention to sanitation and plant hygiene in the nursery or glasshouse, and usually a rigidly controlled propagation programme to produce disease-free plants.

Phytosanitary risk

E. chrysanthemi is listed as an A2 quarantine pest by EPPO (OEPP/EPPO, 1982). This arose historically from the earlier listing of the carnation pathogen and it does not appear that plant quarantine authorities had other hosts in mind. When bacterial nomenclature was revised in 1980, EPPO specified that the quarantine pests concerned were pathovars *dianthicola* and *chrysanthemi* (OEPP/EPPO, 1988). It was accepted that the major means of infection of these crops, at least in some countries, was the use of infected planting material which according to current trade practice was mostly imported. Thus the local presence of *E. chrysanthemi* was irrelevant (since it could be excluded by very simple precautions), and protection against this pest was perceived as a plant quarantine problem. Since then, argument has continued on the infraspecific forms of *E. chrysanthemi* which are supposed to be covered by the quarantine pest classification. This debate has been further complicated in two ways: (1) many authorities consider that *E. chrysanthemi* is so widely distributed in the EPPO region that it cannot classify as a quarantine pest; (2) the existence of host-specific pathovars is queried (Samson *et al.*, 1987), at least with respect to carnation and chrysanthemum, which increases yet further the possibility that these crops might be infected from sources other than imported planting material. It is now accepted within EPPO that the risk from *E. chrysanthemi* can be adequately covered by national nuclear-stock certification schemes for the crops concerned (see Phytosanitary measures) and that *E. chrysanthemi* will be deleted from the EPPO A2 list as soon as such schemes have been agreed for carnations (OEPP/EPPO, 1991) and chrysanthemums. No other regional plant protection organization considers *E. chrysanthemi* to be a quarantine pest.

PHYTOSANITARY MEASURES

EPPO recommends (OEPP/EPPO, 1990) that plants for planting of carnations or chrysanthemums should come from mother plants found free from *E. chrysanthemi* (by testing in the case of carnations). However, now that nuclear-stock certification schemes are recommended for carnations (OEPP/EPPO, 1991) and chrysanthemums (in preparation), it is simpler to recommend that planting material of these crops should originate from such schemes. No particular recommendations are needed for other crops.

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