

Data Sheets on Quarantine Pests

Clavibacter michiganensis subsp. *insidiosus***IDENTITY**

Name: *Clavibacter michiganensis* subsp. *insidiosus* (McCulloch) Davis *et al.*

Synonyms: *Corynebacterium insidiosum* (McCulloch) Jensen

Corynebacterium michiganense pv. *insidiosum* (McCulloch) Dye & Kemp

Taxonomic position: Bacteria: Firmicutes

Common names: Bacterial wilt, blight, root rot (English)

Jaunissement (flétrissement) bactérien (French)

Bakterielle Luzernewelke (German)

Podredumbre de la alfalfa (Spanish)

Bayer computer code: CORBIN

EPPO A2 list: No. 49

EU Annex designation: II/A2

HOSTS

The main host is lucerne, but *Medicago falcata*, *Melilotus alba* and other *Medicago* spp. can also be infected. For more information, see Close & Mulcock (1972) and Hayward & Waterston (1973). Lucerne is the crop principally concerned in the EPPO region.

GEOGRAPHICAL DISTRIBUTION

The pathogen is of North American origin and has spread to many other continents.

EPPO region: Czech Republic, Greece (widespread), Ireland, Italy, Poland (unconfirmed), Romania, Russia (European), Tunisia, UK, Yugoslavia.

Asia: Saudi Arabia, Turkmenistan.

Africa: South Africa, Tunisia.

North America: Canada (British Columbia to Quebec), Mexico (unconfirmed), USA (Alaska, California, Maryland, Minnesota, Oklahoma, Oregon).

South America: Brazil (Ceara; found on experimental crops grown from infected seeds; did not persist), Chile (unconfirmed).

Oceania: Australia (New South Wales, South Australia, Tasmania, Victoria, Western Australia), New Zealand.

EU: Present.

Distribution map: See CMI (1987, No. 67).

BIOLOGY

The bacterium is primarily a wilt pathogen and, following entry through wounds, is found in the vascular tissues of the stems and pods, where it produces an extracellular polysaccharide gum, the substance responsible for the wilting. *C. michiganensis* subsp. *insidiosus* is also found in the intercellular spaces of the seed parenchyma.

Although seed transmission only occurs from severely infected plants, the bacterium can remain infective for at least 3 years and laboratory experiments showed that it can survive in dried tissue or seed for 10 years (Erwin, 1990). Nematode transmission by *Ditylenchus dipsaci* has been shown and the incidence of infection is increased in the presence of *Meloidogyne hapla* (Hunt *et al.*, 1971). In the Czech Republic, *Sitona lineatus* (Coleoptera: Curculionidae) a common pest of Fabaceae, had been reported as a vector of the bacterium (Kudela *et al.*, 1984), but this report has never been verified.

Overwintering generally occurs in the roots and crowns of diseased plants; bacteria remain viable for 10 years in lucerne stems stored at 20-25°C, but they survive only poorly in non-sterile soils (Carroll & Lukezic, 1971).

Differences in disease severity in Australia are thought to be due to climatic factors, although no work has been done to verify this. In Victoria, at present, the disease occurs in wetter, colder areas. Different strains of the pathogen may occur. For more information, see Dickson (1956), Ribaldi (1958), Fahy (1974), Lelliott (1988).

DETECTION AND IDENTIFICATION

Symptoms

Disease development is affected by host nutrition, wilt being most severe at high N and P, and low K levels. Scattered plants or groups in the lower part of a field are usually affected first. Symptoms are often inconspicuous in the first year and affect the lucerne crop rather uniformly, hence the “insidious” subspecies name.

Mild symptoms include leaf-mottling and upward curling of leaf margins, with some reduction in plant height. Moderate infection leads, in addition, to a proliferation of the stems, giving a witches' broom effect. In severe infections, plants are only a few centimetres high, stems thin and spindly, leaflets small and thicker, often distorted and with marginal or entire bleaching. Plants usually die.

In the absence of or in addition to aerial symptoms, there is a yellow to pale-brown discoloration of the young woody root tissue at the junction of the cortex and vascular cylinder. This is visible on peeling off the cortex. For more information, see Dickson (1956), Close & Mulcock (1972), Hayward & Waterston (1973), Fahy (1974), Miller & Pollard (1976).

Morphology

C. michiganensis subsp. *insidiosus* is an aerobic, Gram-positive, capsulated, non-motile rod, 0.4-0.5 x 0.7-1.0 µm, which does not produce chains. Agar colonies are generally pale-yellow, round or amorphous, smooth, glistening, flat or slightly raised. Characteristic blue pigment granules occur irregularly in cultures on media high in available sugars after 7-14 days (Close & Mulcock, 1972; Hayward & Waterston, 1973).

Detection and inspection methods

A rapid serological identification method developed in New Zealand may be used (Hale, 1972). This is the tube agglutination method, whereby antiserum is added to the bacterial suspension and subsequent flocculation observed. A simple rapid fluorescent technique has also been developed (Eng & Cole, 1976). An EPPO quarantine procedure based on immunofluorescence is in preparation.

Modified Burkholder's agar (Straley *et al.*, 1974), containing 250 p.p.m. actidione, is recommended for primary isolation and development of pigment (Close & Mulcock, 1972). Isolations should be incubated at 20°C and take 5-7 days to develop. Colonies are frequently swamped by faster growing contaminants, and so isolation from fresh, actively developing disease tissue is essential.

MEANS OF MOVEMENT AND DISPERSAL

Natural spread can occur through wind dispersion of soil and the dispersion of contaminated drainage water. Spread by vectors can be neglected in relation to international movement. The bacterium is easily spread by contaminated farm machinery, especially mowing equipment. International spread is most likely to occur through shipping of infected lucerne seed or hay.

PEST SIGNIFICANCE

Economic impact

In the USA, bacterial wilt may be considered the most important disease of lucerne, reducing hay yields and killing plants very rapidly, so that fields become unprofitable after 3-4 years, particularly in well irrigated areas. In Australia, the disease is a serious problem only in the Gippsland region of south-eastern Victoria, although it is now present throughout Victoria and southern New South Wales. In the EPPO region, the disease causes losses, particularly in Poland and Russia.

Control

Lucerne wilt is readily controlled by growing resistant cultivars. These can be assessed by root and crown inoculation, or by testing with a phytotoxic glycopeptide from *C. michiganensis* subsp. *insidiosus* (Straley *et al.*, 1974). However, resistant cultivars are used only to a limited extent in Europe and those of North American origin are not suitable for European conditions.

Phytosanitary risk

C. michiganensis subsp. *insidiosus* is an EPPO A2 quarantine pest (OEPP/EPPO, 1982) and of quarantine significance for IAPSC. It is a serious disease, not reported from many EPPO countries where lucerne is grown. For more information, see Close & Mulcock (1972).

PHYTOSANITARY MEASURES

Seeds of lucerne from countries where *C. michiganensis* subsp. *insidiosus* occurs should come from a field which, as well as any adjacent fields, was found free from *C. michiganensis* subsp. *insidiosus* during the last growing season, and where no lucerne was grown during the last 3 years. As an additional security, countries may require that at the place of production *C. michiganensis* subsp. *insidiosus* has not occurred during the last ten years and/or that the seeds have been harvested at the first or second complete vegetation cycle (OEPP/EPPO, 1990).

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