New Disease Reports

First report of *Pythium aphanidermatum* causing root rot on common ice plant (*Mesembryanthemum crystallinum*)

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Common ice plant (*Mesembryanthemum crystallinum*) is a facultative halophyte, originating in South African deserts (Huxley *et al*., 1992), which has recently been cultivated for edible use in Japan. In June 2012, a severe root rot was found on commercially grown ice plants in a greenhouse in Osaka, Japan. Root rot appeared suddenly on five- to six-week-old plants (Fig. 1a), and approximately 300 plants in the greenhouse (i.e. a quarter of all the ice plants grown) were found to be affected by the disease. The plants were grown in a conventional hydroponic system that used 'Otsuka A' nutrient solution (OAT Agrio Co., Ltd. Tokyo, Japan), amended with 0.1% sea salt. The greenhouse had a controlled temperature regime (23/18°C, day/night), and 16 hours of artificial light per day. The affected tissues were soft and discoloured, and wilting of the plants was observed (Fig. 1b). Abundant aplerotic oospores were found in diseased roots (Fig. 1c). A *Pythium*-like organism was isolated and identified as *P. aphanidermatum* based on morphological characters and hyphal growth rate at different temperatures. The observed morphological characters were as follows: main hyphae up to 10 µm wide; sporangia mostly terminal, sometimes intercalary and consisting of inflated structures (Fig. 1d); oogonia terminal, globose, smooth, 21.0–26.9 µm in diameter; antheridia intercalary, sometimes terminal, 10.4–15.5 µm long and 8.1–11.5 µm wide, one per oogonium; oospores aplerotic, 14.2–22.8 µm in diameter, oospore wall 1.0–2.0 µm thick (Fig. 1e); and zoospores formed at 25-30°C. Cardinal temperatures for growth on potato carrot agar were 10°C minimum, 37°C optimum, and 40°C maximum, with a daily radial growth rate of 30.8 mm at 25°C. The ITS region of the representative isolate OPU852 was amplified and sequenced with primers ITS4 and ITS5 (White *et al*., 1990). Sequence analysis determined 100% identity to *P. aphanidermatum* isolate CBS118.80 (GenBank Accession No. HQ665084; Robideau *et al*., 2011). The sequence generated in this study was deposited in GenBank (KT336808) and isolate OPU852 was deposited in the NIAS Genebank, Ibaraki Prefecture, Japan as isolate no. MAFF245234.

A pathogenicity test was conducted using isolate OPU852 in a small-scale hydroponic system that had the same nutrient solution, and temperature and light conditions as described above. A total of 30 thirty-day-old ice plants were transplanted into the system. *Pythium aphanidematum* zoospores were released and prepared as described by Raftoyannis & Dick (2002), and 90 ml of pond water containing approximately 10^4 zoospores/ml was poured into the hydroponic system. After seven days incubation, wilting symptoms were observed on 50% of the inoculated plants, whereas no evidence of disease was observed in a non-infected hydroponic system. The pathogen was re-isolated from diseased plant roots and confirmed as *P. aphanidermatum*.

In Japan, *Pythium aphanidermatum* is a devastating pathogen on many plants, especially on common bean and sugar beet, and has been reported since 1935 (van der Plaats-Niterink, 1981). However, it has never been reported on common ice plant. To our knowledge, this is the first report of *P. aphanidermatum* causing root rot on common ice plant worldwide. Moreover, no *Pythium* spp. have been recorded previously from this plant. Hydroponic systems might favour the development of this disease due to the environmental conditions that promote the growth of the pathogen (Stanghellini & Rasmussen, 1994).

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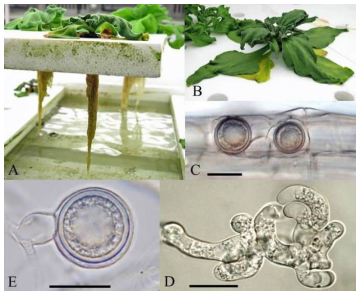

Figure 1

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