Diseases Caused by Oomycetes

First Report of Root Rot Caused by *Phytophthora acerina* on *Metasequoia glyptostroboides* in China

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Metasequoia glyptostroboides Hu & W. C. Cheng (Taxodiaceae), commonly called the Chinese redwood or dawn redwood, is a well-known “living fossil” and rare relict plant species endemic to China that has been successfully cultivated around the world (Ma 2007). In July to September 2020, trees of Chinese redwood that were >30 years old showed symptoms of decline and death associated with branch dieback and root and collar rot in Yangtze River shelter-forests of Jiangling County, Hubei Province, China (112°15'19"E, 30°11'56"N; 40 m above sea level). Diseased roots and rhizosphere soils were collected in September 2020 and April 2021. Using the baiting method, a homothallic *Phytophthora* sp. was recovered consistently from diseased roots and soil samples of Chinese redwood. All the isolates formed similar colonies on V8 agar and corn meal agar. Three representative isolates (L4-5-4, L4-5-5, and L4-5-6) were randomly selected for morphological and molecular identification. In distilled water, semipapillate persistent sporangia were borne in simple sympodial branched sporangiophores. Sporangia were predominantly ovoid, but other shapes were observed including subglobose, limoniform, or distorted shapes, averaging $44.1 \pm 7.7 \times 32.8 \pm 5.2 \mu\text{m}$ ($n = 102$), with narrow exit pores of $8.0 \pm 1.4 \mu\text{m}$ ($n = 93$) and a length/breadth ratio of 1.3 ± 0.10 ($n = 102$). Chlamydospores were not observed. Oogonia were globose or subglobose, 20.51 to 40.15 μm (av. $33.1 \pm 3.9 \mu\text{m}$) ($n = 119$) in diameter, with

smooth walls and paragynous antheridium. Oospores were globose or subglobose in elongated oogonia with medium wall thickness of $1.9 \pm 0.5 \mu\text{m}$ ($n = 36$), applerotic or plerotic and 16.9 to 32.6 μm in diameter (av. $26.6 \pm 3.8 \mu\text{m}$) ($n = 40$). According to the above morphological characteristics, this *Phytophthora* sp. was placed in Waterhouse's (1963) group III. The sequences of the internal transcribed spacers (ITS) region of nuclear ribosomal DNA of each isolate (GenBank accession nos. OK087320, OK087321, and OK087322) were 760 bp and had 99.84% identity with three *P. acerina* isolates (JX951285, JX951291, and JX951296), while the 800 bp β -tubulin (*BTUB*) sequences (OK140540, OK140541, and OK140542) showed 99.97% homology to the sequence of *P. acerina* (KC201283) (Ginetti et al. 2014). Maximum likelihood phylogenetic trees were established by comparing ITS and *BTUB* sequences of L4-5-4, L4-5-5, and L4-5-6 with reference sequences of ITS and *BTUB* of isolates of *Phytophthora* in GenBank. Based on the morphological and molecular characteristics, the strains were identified as *P. acerina*. In addition, pathogenicity assays were performed with the strain L4-5-4 on *M. glyptostroboides* using both one-year-old and three-year-old seedlings. Inoculum was prepared by subculturing agar plugs from edges of CMA cultures into V8 medium plates and incubating at 20°C in darkness for 10 days. Six seedlings planted in pots with sterilized soil were inoculated by a mycelium plug at the root collar and stem wounded by a 8 mm diameter puncher. Six control seedlings were inoculated in the same manner as above, with sterile agar plugs. After 35 days, inoculated seedlings all had necrotic lesions at the inoculation sites, and some seedlings had symptoms of foliage blight and dieback, whereas control seedlings remained healthy. The number of fibrous roots after inoculation was significantly less than in controls, and the roots of inoculated seedlings blackened or even rotted, while there were no obvious symptoms in controls. *Phytophthora* isolates recovered from the symptomatic tissues of artificially inoculated plants were identical to L4-5-4 in morphological characters and ITS sequencing. This is the first report of *P. acerina* causing root rot on Chinese redwood in China. As only the seedlings were inoculated, further research is needed to address the epidemiology and pathogenicity of *P. acerina* to adult trees of Chinese redwood.

References:

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