ABSTRACT OF HABILITATION THESIS

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MORPHOLOGY AND SOME PHYSIOLOGICAL CHARACTERISTICS OF *PHYTOPHTHORA CACTORUM* (LEBERT ET COHN) SCHRÖTER AND *PHYTOPHTHORA CITRICOLA* SAWADA OCCURRING IN FOREST NURSERIES IN SOUTHERN POLAND

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Key words: tree seedlings, damping-off, growth temperature, pathogenicity, sensitivity to hymexazol

Phytophthora cactorum and *P. citricola* are common pathogens of woody plants occurring worldwide, especially in temperate regions. Their host ranges are very wide. In forest nurseries, both pathogens are causal agents of damping-off, seedling blights, root and collar rots. The aim of the work was assessment diversity of *P. cactorum* and *P. citricola* isolates obtained from the seedlings of different tree species in Polish forest nurseries. Characterization and description of vegetative growth and reproduction features was performed. Some physiological parameters of isolates were determined under laboratory conditions.

The studies covered 13 isolates of *P. cactorum* from seedlings of *Abies alba* Mill., *Acer pseudoplatanus* L., *Alnus glutinosa* (L.) Gaertn., *A. incana* (L.) Moench., *Betula pendula* Roth., *Fagus sylvatica* L., *Pinus nigra* J.F. Arnold and *P. sylvestris* L., and four isolates of *P. citricola* from seedlings of *F. sylvatica*, *Picea abies* (L.) H. Karst. and *P. sylvestris*. The seedlings with damping-off symptoms were collected during 2000–2003 in eight forest nurseries located in the south of Poland.

The following characteristics of the isolates were determined: colony morphology (growth pattern) on potato dextrose agar (PDA), corn meal agar (CMA) and V8-juice agar (V-8); dimensions and types of reproduction structures (oogonia, antheridia, oospores and sporangia); optimum, minimum and maximum temperature of growth on PDA; sensitivity to hymexazol, a component of selective media for isolation of *Phytophthora* spp. from plant tissues and from soil; pathogenicity to *Alnus glutinosa*, *Betula pendula*, *Fagus sylvatica*, *Picea abies*, *Pinus nigra* and *P. sylvestris* seedlings in the seedling inoculation test.

Phytopathol. Pol. 48: 59–61

ISSN 1230-0462

The isolates of *P. cactorum* differed in the diameter of oogonia (26.4 to 35.0 μm), and oospores (23.0 to 30.9 μm), most numerous on V-8 medium, as well as in the dimensions (28.8 to 36.5 μm × 22.7 to 30.2 μm, with L/B ratio 1.2 to 1.4) and morphology (ellipsoidal, ovoid, obpyriform or almost spherical) of sporangia, numerous on PDA and/or CMA media. Such differences were also found in the isolates of *P. citricola*: diameter of oogonia 26.4 to 28.2 μm, diameter of oospores 24.0 to 26.1 μm, most numerous on V-8 medium, dimensions of sporangia 32.9 to 43.6 μm × 21.7 to 29.4 μm, with L/B ratio 1.4 to 1.7. Sporangia, variable in shape (obpyriform, ovoid, flattened on one side, often distorted in shape, occasionally bilobed), were formed in cultures flooded with water, except for one isolate which formed sporangia on PDA and CMA media. No connection was observed between the features of *P. cactorum* and *P. citricola* isolates and their host plant or a nursery.

The colony morphology of *P. cactorum* isolates grown on PDA, CMA and V-8 media was similar. The isolates produced uniform to less defined petaloid colonies on PDA, uniform on CMA, and uniform or slightly radiate on V-8 medium. A greater morphological diversity was found in the isolates of *P. citricola*. They formed uniform colonies on CMA, radiate or rosette on PDA, and uniform or chrysanthemum on V-8 medium.

Both species showed slight variation in the optimum (27.5°C for 10 isolates and 22.5°C or 25.0°C for three isolates of *P. cactorum*, 25.0 or 27.5°C for *P. citricola*), minimum (about 5°C for both species), and maximum (about 30°C for *P. cactorum*, 27.5°C to 30°C for *P. citricola*) temperatures of growth between isolates.

The isolates of *P. cactorum* distinctly differed in the sensitivity to hymexazol, while those of *P. citricola* displayed an inconsiderable variation. Hymexazol more strongly reduced the growth rate of colonies in *P. cactorum* (79.4% to 3.7%) than in *P. citricola* (14.3% to 7.1%). The greater sensitivity of *P. cactorum* may limit the efficiency of its isolation from plants and soil on hymexazol-containing media.

In the seedling inoculation test, beech (*Fagus sylvatica*) seedlings appeared particularly susceptible to infection with *P. cactorum* and *P. citricola*. The least susceptible tree species to the infection with the former was Norway spruce (*Picea abies*), and with the latter – common alder (*Alnus glutinosa*). *Phytophthora citricola* was more aggressive than *P. cactorum* towards seedlings of Austrian pine (*Pinus nigra*), Scots pine (*Pinus sylvestris*) and Norway spruce, whereas both pathogens showed a similar aggressiveness towards seedlings of beech, common alder and silver birch (*Betula pendula*). The isolates of *P. cactorum* and *P. citricola* obtained from various host plants differed in pathogenicity to the seedlings of beech, silver birch, common alder, Norway spruce, Austrian pine, and Scots pine, but they did not show host specificity. This indicates that the occurrence of both pathogens in the soils of forest nurseries may pose a threat to various plants introduced there in successive stages of crop rotation.

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The habilitation colloquium took place with the Scientific Council of the Faculty of Forestry, University of Agriculture in Cracow, on January 31, 2007. The degree of *doctor habilitatus* was confirmed on the same day.

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