Phytophthora species, new pathogens in landscape and gardens

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Annotation

The open of Polish borders on Western Europe in 1990 caused the very fast increase of ornamental plants import, especially seedlings or young cuttings. During the twenty years Phytophthora alni, P. cambivora, P. cinnamomi, P. citricola, P. citrophthora, P. nicotianae var. nicotianae and P. ramorum were found on diseased plants in hardy ornamental nursery stocks. Among them ericaceous and coniferous plants were attacked the most often. Since 2005 Phytophthora root and stem rot was also observed on deciduous plants including, Cotoneaster spp., Forsythia intermedia, Ligustrum vulgare, Ribes aureum, Syringa vulgaris and perennial plants. Phytophthora cactorum, P. citrophthora and P. cryptogea were the most often isolated species. Some of these species were also detected in nursery water containers. It indicates that Phytophthora spp. may be also spread with water used for plant sprinkling.

Key words: Phytophthora, host plants, sources, water

INTRODUCTION

Phytophthora species are one of the most dangerous plant pathogens causing root, stem base rot and often leaf and young stem spots. On some plants losses caused by Phytophthora varied from a few to even 50 % (Orlikowski, 2006). Till 1990 about 60 species of Phytophthora were known. The occurrence of P. ramorum as the causal agent of sudden oak death and ericaceous plants resulted in the fast increased of research on that genera (Orlikowski, Wiejacha, 2005). Actually about 160 Phytophthora species are known. Among them P. cinnamomi is
known pathogen of at least 3000 plant species growing in tropical, subtropical and temperate zones. The pathogen was detected first time in Poland in the end of XX century as causal agent of *Chamaecyparis lawsoniana*, *Pinus mugho* var. *pumilo* and *Rhododendron* spp. (Orlikowski et al., 1995). During the next few years it was detected from other coniferous, ericaceous, deciduous and perennial plants (Orlikowski, Szkuta, 2002a, 2002b, Orlikowski et al., 1995). The purpose of that study was detection and identification of *Phytophthora* occurring on ornamental plants growing on a large scale in landscape and gardens.

**MATERIALS AND METHODS**

**Isolation and identification of *Phytophthora* spp.** Plants (*Thuja occidentalis* ‘Smaragd’, *Ligustrum vulgare*, *Syringa vulgaris* and *Viola x wittockiana*) with discoloration of leaves or shoot parts and with symptoms of stem base and root rot were collected in years 2007-2009. They were packed in plastic bags and transport to laboratory. The diseased parts of roots, stem parts were separated, washed under tap and distilled water, blotting dried and after sterilization over a burner flame about 3-5 mm diameter pieces of tissue were transferred into PDA medium in 90 mm Petri dishes. After 1-3 days incubation at 24 °C in the dark colonies growing around inocula were transferred into PDA slants. After segregation representative isolates were chosen for identification on the base of morphological features and using molecular methods.

**Colonisation of plant parts by *Phytophthora* isolates.** The chosen isolates of *Phytophthora* spp. obtained from diseased plants and water were used for pathogenicity test. Stock cultures were grown on PDA in 24 °C in the dark. Photographic trays covered with moist, sterile blotting paper and plastic net were used in all trials. Stem parts and leaves of *Thuja occidentalis*, *Ligustrum vulgare*, *Syringa vulgaris* and *Viola x wittockiana* were transferred into trays and 3 mm diam inocula, taken from the edge of 7-day-old *Phytophthora* cultures were put on the base or in the middle of leaf blades. Trays were covered with folia and during 6 days incubation at 22-24 °C length and diam of necroses was
measured. Experimental designs were completely randomized with 4 replication and 5 plant parts in each rep. Trials were repeated twice.

RESULTS AND DISCUSSION

Discoloration of individual shoots of thuja, dying of them and stem base rot were observed in nursery. *Phytophthora citricola* was isolated from individual, diseased shoots whereas *P. cinnamomi* and *P. cryptogea* were detected from diseased stem base and root zone. The disease symptoms were mainly observed on *Thuja occidentalis* ‘Smaragd’, but also on *Thuja orientalis* ‘Aurea’ Nana and *T. plicata* ‘Zebrina’. Among 14 species and cultivars of thuja all of them were susceptible on 3 *Phytophthoras*. *P. cinnamomi* caused significantly faster development of necroses on stem parts than 2 other species (Fig. 1). The disease spread faster on yellow than on green cultivars of *Thuja* spp. (Fig. 1). Our studies showed that thuja species and cultivars, treated till now as resistant on different pathogens, are susceptible on 3 *Phytophthora* species (Orlikowski, Ptaszek, 2010).

*P. citrophthora* was the causal agent of yellowing and browning of leaf blades and stem base rot of *Ligustrum vulgare* and *S. vulgaris*. On *S. vulgaris* the disease occurred, both, on container and field grown

**Fig. 1.** Colonization of *Thuja* spp. parts of yellow species 9 days after inoculation

*1 pav.* Geltonspyglių *Thuja* spp. dalių apsikrėtimo laipsnis po 9 dienų inokuliacijos

*Note.* Means followed by the same letter do not differ significantly (p=0,05) acc. to Duncan's multiple range test.
plants whereas on *L. vulgare* only in hardy nursery stocks. Inoculation of stem parts of lilac by *P. citrophthora* caused the fast spread of necrosis both on grafting plants and rootstocks (Fig. 2). Isolates of the species obtained from the diseased stem base and substratum were more pathogenic than the culture from necrotic top of shoot (Fig. 2). Isolates of *P. citrophthora* from lilac and privet caused the disease symptoms on both host plants. Our studies showed that among 6 species of *Phytophthora* (*P. cactorum*, *P. citricola*, *P. inflata*, *P. palmivora*, *P. ramorum*, and *P. syringae*), known as lilac pathogens (Schwingle et al., 2007; Vegh, 1987). *P. citrophthora* is the next threat of that plant, detected in Polish nurseries.

![Fig. 2.](image)

**Fig. 2.** Relationship between source of *Phytophthora citrophthora* isolates, plants and development of necrosis on stem parts of *Syringa vulgaris*.

2 pav. **Ryšys tarp Phytophthora citrophthora izoliatų ir nekrozių vystymosi ant Syringa vulgaris stiebo dalių**

*Note.* Means followed by the same letter do not differ significantly (p=0.05) acc. to Duncan’s multiple range test.

In the last 4 years in summer production of *Viola x wittockiana*, among others, stem rot caused by *P. cactorum* was observed. On some nurseries losses caused by that pathogen varied from a few to even 50% (Orlikowski et al., 2010). First symptoms were observed on leaves as yellowing and browning of them. On stem base brown or darkbrown rot spread upwards even to 5 cm. In our trials inoculation of stem parts of 5 pansy cultivars caused the development of necroses but the disease spread significantly faster on Carrera White with Blotch and Colossus...
Yellow Improved (Fig. 3). In further studies among 26 cultivars necroses did not develop only on 3 of them (Orlikowski et al., 2010).

![Graph showing diameter of necrosis in mm for different cultivars.](image)

**Fig. 3.** Colonisation of 4 pansy cultivars by isolate of *Phytophthora cactorum* from substratum

**3 pav.** *Phytophthora cactorum* kolonizacja keturių yrančių izoliatų

*Note.* Means followed by the same letter do not differ significantly (p=0.05) acc. to Duncan’s multiple range test.

**CONCLUSIONS**

1. *Phytophthora* stem or shoot rot is the increasing problem in Polish ornamental nurseries, landscape and gardens.

2. Among known species of that genera *Phytophthora cactorum*, *P. cambivora*, *P. cinnamomi*, *P. citricola* and *P. citrophthora* occur the most often.

3. During the last few years *Phytophtora* stem base and shoot problems were observed on *Thuja* spp., *Ligustrum vulgare*, *Syringa vulgaris* and *Viola x wittockiana*.

**REFERENCES**


**PHYTOPHTHORA GENTIES RŪŠYS – NAUJI LAUKINIŲ IR KULTŪRINIŲ AUGALŲ PATOGENAI**

**Santrauka**


**Reikšminiai žodžiai:** *Phytophthora*, dekoratyvieji augalai, priežastys, vanduo.