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INCREASE OF PLANT THREAT BY *PHYTOPHTHORA* SPECIES IN POLAND

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Abstract

Phytophthora palmivora was the most often isolated species from diseased *Phalaenopsis* whereas *P. tropicalis* from wilted shoots of *Hedera*. In hardy ornamental nursery stock *P. citricola* was for the first time isolated from diseased shoots of *Buxus sempervirens*. The isolated species colonized leaves and roots of several plant species, including their host plants, causing necrosis. The fastest spread of necrosis was observed on plant parts inoculated with *P. tropicalis* and *P. palmivora* whereas the slowest – on leaf blades and roots of boxwood.

Key words: *Phytophthora citricola, P. palmivora, P. tropicalis*, isolation, colonization, host plants

Introduction

The last decade was very progressive in the study of *Phytophthora* species (Basiewicz et al. 2007). Till the end of 1990ies 60 *Phytophthora* species were known and during the next 10 years at least 40 new ones were detected and identified. The main reason of these studies is the increase of plant threat by that group of pathogens, especially in forest and horticulture cultures (Jung et al. 2007). Very fast development of international trade, including plant materials, caused the spread of some new pathogens and among them *Phytophthora* species (Brasier 2008, Oszako et al. 2007). In the 1960ies *P. cryptogea* was the most important threat to Polish production of gerbera and some pot plants under cover. The opening of Polish borders to EU countries in 1990 resulted in extreme increase of young plant material import to Polish hardy ornamental nursery stocks. For the first time mass occurrence of stem base and root rot symptoms and plant mortality was already observed in 1993 and *P. cinnamomi* and *P. citricola* were isolated from diseased plant tissues (Orlikowski et al. 1995). During the next decade the number of identified

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species of *Phytophthora* increased to 13 and some isolates are still not identified (Orlikowski unpublished).

The purpose of these studies was estimation of *Phytophthora* spp. influence on the healthiness of *Phalaenopsis lueddemanniana* and *Hedera helix* under cover and on *Buxus sempervirens* in hardy ornamental nursery stocks.

Materials and methods

Observations were performed in two greenhouses and two hardy nursery stocks of ornamental plants. In the first greenhouse *Phalaenopsis lueddemanniana* is being grown for seven years already, from young propagative materials imported from The Netherlands, but during the last three years also from China. In the second greenhouse farm six–eight-week-old *Hedera helix* cuttings are being produced, mainly for export, and shoots of new cultivars are imported from abroad. In hardy ornamental nursery stocks with *Buxus sempervirens,* as the object of this study, plants are being produced from cuttings from local mother plants. In all farms the decaying of plants was observed during the past three years.

Different symptoms were observed on diseased plants. Leaf blades of *Phalaenopsis,* usually from the base to their top, changed colour to pale green and yellow. On some plants water soaked spots near the plant bases extended even to 1/3 of leaf length or sometimes occurred on different parts of leaf blades. On *Hedera* pale-green leaves and shoot wilting appeared. On shoot bases brown and dark brown necroses, up to 5 cm, were noticed. On *Buxus*, in the first stage of the disease development, yellowing of individual stems spreading slowly to other shoots was observed. Strongly invaded stems were straw coloured. The bark separated from the wood which turned bluish. For mycological analysis 38 *Phalaenopsis*, 95 *Hedera* and 29 *Buxus* plants with the first disease symptoms were chosen. Isolation of *Phytophthora* spp. from diseased tissues was performed according to procedure described by Orlikowski and Szkuta (2003). Isolates were identified to species on the base of their morphological features and with molecular methods (Wiejacha et al. 2002).

Pathogenicity of chosen isolates toward host and non-host plants was evaluated using the procedure of Orlikowski and Szkuta (2003).

Results

12 genera and species of fungi and *Algae*-like *Oomycetes* were isolated from 163 diseased plants (Table 1). Three species of *Phytophthora* (220 isolates) obtained from 132 plants, dominated among all cultures. *Phytophthora palmivora* was isolated from diseased bases and leaf blades of *Phalaenopsis* whereas *P. tropicalis* from *Hedera*. *Phytophthora citricola* was obtained from diseased shoots of *Buxus,* taken from hardy ornamental nursery stocks (Table 1). Cultures of *Fusarium,* often isolated from diseased tissues, were specific of plant species: *F. oxysporum* was isolated mainly from

Table 1

Fungi and *Algae*-like *Oomycetes* isolated from diseased *Phalaenopsis lueddemanniana*, *Hedera helix* and *Buxus sempervirens*

Genera/species	*Phalaenopsis lueddemanniana* (39 plants)		*Hedera helix* (95 plants)		*Buxus sempervirens* (29 plants)	
	a	b	a	b	a	b
Alternaria alternata	–	–	22	17	7	4
Botrytis cinerea	15	7	32	21	28	14
Cladosporium herbarum	–	–	17	9	–	–
Fusarium avenaceum	3	1	48	18	11	6
Fusarium culmorum	–	–	–	–	8	5
Fusarium oxysporum	44	14	–	–	–	–
Mucor spp.	8	4	19	11	24	16
Penicillium spp.	3	2	14	8	17	9
Phytophthora citricola	–	–	–	–	49	26
Phytophthora palmivora	63	32	–	–	–	–
Phytophthora tropicalis	–	–	108	74	–	–
Trichoderma spp.	9	4	23	14	–	–

a – number of isolates obtained, b – number of settled plants.

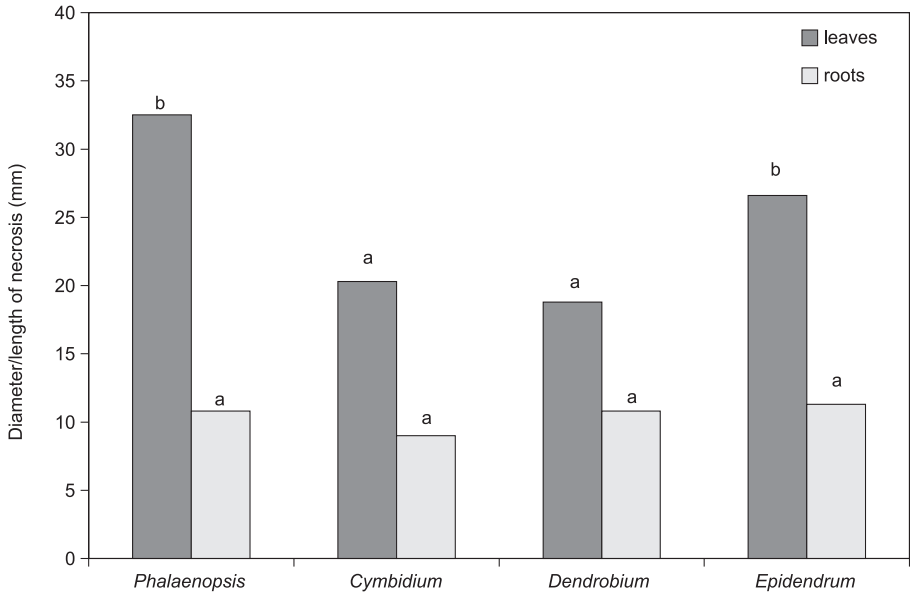

Fig. 1. Colonisation of leaves and roots of orchids by *Phytophthora palmivora* from *Phalaenopsis*

Table 2

Colonisation of leaves of some ornamental plants by *Phytophthora tropicalis* three days after inoculation (diameter/length of necrosis, mm)

Plant species	Leaf blades	Leaf petioles
Cyclamen persicum	17.3 d	5.3 ab
Dieffenbachia maculata	4.5 a	3.8 a
Hedera helix	21.0 e	13.3 c
Pelargonium zonale	30.0 f	15.0 cd

Means in columns followed by the same letter do not differ with 5% of significance (Duncan's multiple range test).

Table 3

Colonisation of leaves and rootsof boxwood by *Phytophthora citricola* after 8 and 16 days of inoculation (diameter/length of necrosis, mm)

Plant parts	8 days	16 days
Leaves	5.6 a	12.8 a
Roots	7.2 b	18.4 b

Means in columns followed by the same letter do not differ with 5% of significance (Duncan's multiple range test).

Phalaenopsis, *F. avenaceum* from *Hedera* and *F. culmorum* from *Buxus*. Additionally, *Botrytis cinerea* was also detected in necrotic parts of plants (Table 1).

The culture of *P. palmivora* from *P. lueddemanniana* colonized leaf blades and roots of that plant, *Cymbidium, Dendrobium* and *Epidendrum*. Leaf and root rot spread about twice faster on leaf blades than on roots (Fig. 1). The analyzed culture colonized leaves of *Phalaenopsis* and *Epidendrum* significantly faster than those of other two plant species (Fig. 1). Isolate of *P. tropicalis* from necrotic stem part of *H. helix* colonized leaf blades and petioles of that species but also cyclamen, dieffenbachia and pelargonium with the significantly fastest spread on *P. zonale* (Table 2). *Phytophthora citricola* isolated from the base of boxwood shoot colonized leaf blades and roots of the host plant but necrosis spread slower than in the case of plant inoculation with *P. palmivora* and *P. tropicalis* (Table 3).

Conclusions

1. *Phytophthora palmivora,* known earlier as the causal agent of stem base rot of some plants growing under cover, proved a severe pathogen of *Phalaenopsis lueddemanniana* and other species of orchids.

2. *Phytophthora tropicalis* was detected for the first time in Poland on *Hedera helix* and the species proved also pathogenic towards cyclamen, dieffenbachia and pelargonium.

3. For the first time in Poland *P. citricola* was detected in diseased shoot base of *Buxus sempervirens* and it is possible that the species will be the new host plant for that pathogen in Polish ornamental nursery stocks.

Streszczenie

WZROST ZAGROŻENIA ROŚLIN GATUNKAMI *PHYTOPHTHORA* W POLSCE

Gatunek *Phytophthora palmivora* izolowano najczęściej z porażonych roślin falenopsis, a *P. tropicalis* – z więdnących pędów bluszczu. W szkółce pojemnikowej roślin ozdobnych po raz pierwszy stwierdzono występowanie *P. citricola* na zamierających pędach bukszpanu. Wyizolowane gatunki kolonizowały liście i korzenie niektórych gatunków roślin, w tym swych gospodarzy, powodując nekrozę. Nekroza rozwijała się najszybciej po inokulacji roślin przez *P. tropicalis* i *P. palmivora*, a najwolniej – na liściach i korzeniach bukszpanu zakażonego przez *P. citricola*.

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