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## FUNGI OCCURRING ON GARDEN POND PLANTS

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### Abstract

The studies were carried out on plants in garden ponds: white water lily (*Nymphaea alba*), yellow iris (*Iris pseudoacorus*), common cattail (*Typha latifolia*), soft rush (*Juncus effusus*) and calamus (*Acorus calamus*). Following fungi species: *Alternaria alternata*, *Aspergillus versicolor*, *Sordaria fimicola*, *Penicillium expansum*, *Epicoccum purpurascens*, *Phialophora cyclaminis*, *Mortierella isabellina*, *Botrytis cinerea*, *Chaetomium elatum*, *Phialophora richardsiae*, and *Penicillium verrucosum* v. *corymbiferum* were most frequently isolated from the affected tissues of the water plants. White water lily was the most affected plant. The fact that a lot of fungi species inhabited the plants did not influence significantly their state of health.

**Key words:** water lily, yellow iris, common cattail, soft rush, calamus, fungi

### Introduction

The growing popularity of water garden and ponds in house gardens will probably result in increased interest in water plant health status, as pathogenic microorganisms may decrease the ornamental value of the plants. In the literature only major pests occurring on water plants under differentiated climate conditions are noted (Pirone et al. 1960, Westcott 1971, Verger and Van der Velde 1977, Van der Aa 1978, Polskie nazwy... 1996, Fox 2000, Soares et al. 2006, Suarabh et al. 2006).

The aim of the study was identification of fungi occurring on water plants in ponds.

### Materials and methods

Plants in five ponds were observed in house gardens in Cracow, from May to October 2006 (six observations at four-week-long intervals). Following plant spe-

cies were taken into consideration: white water lily (*Nymphaea alba*), yellow iris (*Iris pseudoacorus*), common cattail (*Typha latifolia*), soft rush (*Juncus effusus*) and calamus (*Acorus calamus*). From affected plant parts (leaves and stems) five tissue fragment, ca 9–16 mm<sup>2</sup>, were taken for mycological analysis. After disinfection with 70% ethanol, the plant material was put onto 1% potato dextrose agar (PDA). In total 580 fragments were analysed. The fungi were identified according to Batko (1975), Booth (1966), Domsch et al. (1980), Ellis and Ellis (1985), Ramirez (1982) and Sivenesan (1984).

## Results and discussion

From the five plant species investigated (*N. alba*, *I. pseudoacorus*, *T. latifolia*, *J. effusus* and *A. calamus*), 428 fungi colonie, representing 57 species, were isolated (Table 1).

The dominating group (most frequent in the community) consisted of *Alternaria alternata*, *Aspergillus versicolor*, *Sordaria fimicola* and *Penicillium expansum* (constituting 50.46% of the entire fungal community). They were isolated from affected tissues of the five plant species. The influents (medium frequent in the community) were 13 species: *Epicoccum purpurascens*, *Phialophora cyclaminis*, *Mortierella isabellina*, *Botrytis cinerea*, *Chaetomium elatum*, *Phialophora richardsiae*, *Penicillium verrucosum* v. *corymbiferum*, *Paecilomyces farinosus*, *Penicillium steckii*, *P. verrucosum* v. *verrucosum*, *Chaetomium globosum*, *Emericella nidulans*, *Phoma hedericola* and *Arthrinium urticae*. The influents constituted 31.31% of all fungi. The accessoric fungi (occurring one–four times) were 40 species, amounting 18.23% of all fungi.

The greatest number of colonies was isolated from white water lily tissues, much less from soft rush and calamus (Table 1).

On *N. alba* the most frequent species were *A. versicolor* (isolated in May and October) and *A. alternata* (isolated from June to October), and also *S. fimicola* and *P. expansum* (isolated most of ten in August and June, respectively). From *I. pseudoacorus* tissues the most of ten isolated species was *A. alternata* (from June to October), *P. verrucosum* v. *corymbiferum* (August), *A. versicolor* (May), *Ch. elatum* and *P. cyclaminis* (October). The most frequent species in *T. latifolia* tissues were *A. alternata*, *E. purpurascens* and *S. fimicola* (October) and *P. expansum* (May and August). Directly from leaves in September and October *Leptosphaeria typharum*, *L. typhae*, *Periconia typhicola* and *Trichothecium roseum* were obtained. From *J. effusus* tissues *A. versicolor* was most often isolated in May, and in October – *A. alternata* and *S. fimicola*. In October *Arthrinium curvatum* v. *minus*, *Leptosphaeria juncina*, *Morenoina paludosa* and *Paraphaeosphaeria michotii* were isolated from leaves. *Alternaria alternata* was isolated most often from *A. calamus* leaves.

The fungi caused disease symptoms in leaves and stems of water plants, mostly discolourations with a halo, with sunken necrotic tissue, resulting in deterioration of ornamental value of plants.

Table 1

## Fungi isolated from affected tissues of water plants

Species of fungi	Species of plants					
	<i>Nymphaea alba</i>	<i>Iris pseudoacorus</i>	<i>Typha latifolia</i>	<i>Juncus effusus</i>	<i>Acorus calamus</i>	total
1	2	3	4	5	6	7
<i>Alternaria alternata</i>	20	27	17	14	22	100
<i>Aspergillus versicolor</i>	21	7	2	9	3	42
<i>Sordaria fimicola</i>	17	2	6	10	4	39
<i>Penicillium expansum</i>	15	1	16	2	1	35
<i>Epicoccum purpurascens</i>	2	2	7	–	7	18
<i>Phialophora cyclaminis</i>	8	7	–	1	–	16
<i>Mortierella isabellina</i>	8	1	1	5	–	15
<i>Botrytis cinerea</i>	7	1	–	5	1	14
<i>Chaetomium elatum</i>	–	7	1	5	1	14
<i>Phialophora richardsiae</i>	2	5	1	4	–	12
<i>Penicillium verrucosum</i> v. <i>corymbiferum</i>	–	10	–	–	–	10
<i>Paecilomyces farinosus</i>	–	–	–	3	5	8
<i>Penicillium steckii</i>	1	–	5	–	–	6
<i>Penicillium verrucosum</i> v. <i>verrucosum</i>	2	1	–	1	2	6
<i>Chaetomium globosum</i>	5	–	–	–	–	5
<i>Emericella nidulans</i>	–	5	–	–	–	5
<i>Phoma hedericola</i>	–	–	5	–	–	5
<i>Arthrimum urticae</i>	–	–	–	–	4	4
<i>Fusarium poae</i>	–	–	–	4	–	4
<i>Fusarium sporotrichoides</i>	3	–	–	1	–	4
<i>Cladosporium cladosporioides</i>	2	–	1	–	–	3
<i>Cladosporium macrocarpum</i>	–	–	3	–	–	3
<i>Fusarium tricinctum</i>	–	3	–	–	–	3
<i>Hemicola fuscoatra</i> v. <i>fuscoatra</i>	–	–	3	–	–	3
<i>Mammaria echinobotryoides</i>	–	2	1	–	–	3
<i>Mortierella parvispora</i>	2	–	–	–	1	3
<i>Mucor hiemalis</i> f. <i>hiemalis</i>	2	–	1	–	–	3
<i>Penicillium waksmanii</i>	3	–	–	–	–	3
<i>Phoma exigua</i>	–	–	–	3	–	3
<i>Aspergillus clavatus</i>	–	–	–	2	–	2
<i>Coleophoma empetrii</i>	2	–	–	–	–	2
<i>Leptosphaeria maculans</i>	2	–	–	–	–	2
<i>Nigrospora sphaerica</i>	–	2	–	–	–	2
<i>Phialophora cinerescens</i>	–	2	–	–	–	2
<i>Ulocladium botrytis</i>	–	–	2	–	–	2

Table 1 – cont.

1	2	3	4	5	6	7
<i>Arthroderma insignularae</i>	–	–	–	1	–	1
<i>Aspergillus meleus</i>	1	–	–	–	–	1
<i>Cladosporium herbarum</i>	–	–	–	1	–	1
<i>Cladosporium sphaerospermum</i>	–	–	1	–	–	1
<i>Cylindrocarpon destructans</i>	1	–	–	–	–	1
<i>Cylindrocarpon didymum</i>	1	–	–	–	–	1
<i>Fusarium oxysporum</i>	1	–	–	–	–	1
<i>Mortierella alpina</i>	–	–	1	–	–	1
<i>Myrothecium cinctum</i>	–	–	–	1	–	1
<i>Nowakowskiella elegans</i>	–	–	–	–	1	1
<i>Penicillium verrucosum</i> v. <i>cyclopium</i>	–	–	–	1	–	1
<i>Phialophora americana</i>	–	1	–	–	–	1
<i>Phoma medicaginis</i> v. <i>pinodella</i>	1	–	–	–	–	1
<i>Scopulariopsis koningii</i>	–	–	1	–	–	1
<i>Leptosphaeria typharum</i>	–	–	4	–	–	4
<i>Trichothecium roseum</i>	–	–	3	–	–	3
<i>Arthrimum curvatum</i> v. <i>minus</i>	–	–	–	1	–	1
<i>Leptosphaeria juncina</i>	–	–	–	1	–	1
<i>Leptosphaeria typhae</i>	–	–	1	–	–	1
<i>Morenoina paludosa</i>	–	–	–	1	–	1
<i>Paraphaeosphaeria michotii</i>	–	–	–	1	–	1
<i>Periconia typhicola</i>	–	–	1	–	–	1
Total	129	86	84	77	52	428

On *N. alba* leaves in all the ponds investigated leaf spots were found. The symptoms were tiny chlorotic spots at first, and at end of growing season – brown spots with a reddish halo. The tissue was necrotic and crumbled in the spots. From the spots *A. versicolor*, *B. cinerea*, *C. cladosporioides*, *C. destructans*, *C. didymum*, *F. oxysporum*, *F. sporotrichoides*, *M. isabellina*, *A. alternata* and *S. fimicola* were isolated. Pirone et al. (1960), Westcott (1971) and Van der Aa (1978) claim that *A. alternata* and *C. cladosporioides* are the causing agents of rot and leaf spot of water lilies.

In *I. pseudoacorus* *P. verrucosum* v. *corymbiferum* was found – a species mentioned by Borecki (Polskie nazwy... 1996) as the cause of iris penicilliosis. From oval spots with reddish-brown margins and grey centres *A. alternaria*, *B. cinerea*, *Ch. elatum* and four species of *Phialophora* were isolated. The causing agents of grey mould and alternariosis, according to Pirone et al. (1960) and Fox (2000), often occur on different iris species, while *Phialophora* spp. are known to cause phialophorosis of many plants (Domsch et al. 1980).

It seems that the discolouration of *T. latifolia* leaves was caused by *Leptosphaeria typharum*, *L. typhae* and *Periconia typhicola*, isolated from depressed, red-rusty spots,

mentioned by Ellis and Ellis (1985). Westcott (1971) claims that *Cladosporium* spp. causes spots and retting of common cattail *T. latifolia*.

From affected tissues of *J. effusus*, *A. alternata*, *S. fimicola*, *A. versicolor*, *B. cinerea*, *Ch. elatum*, *P. michotii*, *M. paludosa*, *L. juncina* and *A. curvatum* v. *minus* were obtained. According to Ellis and Ellis (1985) the four latter species often inhabit *J. effusus* and *J. conglomeratus*.

From spots in upper parts of *A. calamus* leaves *E. purpurascens*, *A. alternata* and *Nowakowskiella elegans* were isolated; only *N. elegans* was found in the literature (Batko 1975).

Brickell (1999), and Verger and Van der Velde (1977) claim that the majority of water plants, including water lilies, calamus, cattails, rushes, are considerably resistant to pathogens and good culture conditions and proper care additionally limit the occurrence of diseases.

## Conclusions

1. Fungi occurring on white water lily (*Nymphaea alba*), yellow iris (*Iris pseudoacorus*), common cattail (*Typha latifolia*), soft rush (*Juncus effusus*) and calamus (*Acorus calamus*) in water gardens, caused various discolourations, spots and necroses which resulted in diminishing ornamental value of plants.

2. From the affected plants following species of fungi were isolated most often: *Alternaria alternata*, *Aspergillus versicolor*, *Sordaria fimicola*, *Penicillium expansum*, *Epicoccum purpurascens*, *Phialophora cyclaminis*, *Mortierella isabellina*, *Botrytis cinerea*, *Chaetomium elatum*, *Phialophora richardsiae* and *Penicillium verrucosum* v. *corymbiferum*.

3. The most infested plant species was during the entire vegetation season white water lily (*N. alba*), with leaf discolouration.

4. The health status of water plants was not really deteriorated despite their infestation with a wide range of fungi.

## Streszczenie

### GRZYBY WYSTĘPUJĄCE NA ROŚLINACH OCZEK WODNYCH

Celem badań była identyfikacja grzybów występujących na roślinach oczek wodnych. Obserwacje prowadzono na grzybieniu białym (*Nymphaea alba*), irysie żółtym (*Iris pseudoacorus*), pałce szerokolistnej (*Typha latifolia*), sicie rozpierschłym (*Juncus effusus*) oraz tataraku zwyczajnym (*Acorus calamus*). Z porażonego materiału roślinnego najczęściej izolowano grzyby: *Alternaria alternata*, *Aspergillus versicolor*, *Sordaria fimicola*, *Penicillium expansum*, *Epicoccum purpurascens*, *Phialophora cyclaminis*, *Mortierella isabellina*, *Botrytis cinerea*, *Chaetomium elatum*, *Phialophora richardsiae* oraz *Penicillium verrucosum* v. *corymbiferum*. Spośród badanych roślin najbardziej porażany

był grzybień biały. Zasiedlenie roślin przez wiele gatunków grzybów nie wpłynęło znacząco na ich zdrowotność.

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