

## Short communication

### Ascomycetes and their anamorphs associated with shoots of silver birch (*Betula pendula*) growing in the urban greenery of Nitra in Slovak Republic

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#### Abstract

HEČKOVÁ, Z., ADAMČÍKOVÁ, K., STRELKOVÁ, M., RÓZOVÁ, Z. 2013. Ascomycetes and their anamorphs associated with shoots of silver birch (*Betula pendula*) growing in the urban greenery of Nitra in Slovak Republic. *Folia oecol.*, 40: 137–140.

Microfungi of silver birch (*Betula pendula*) were studied in urban greenery of Nitra. Samples were collected in November 2011 and April 2012. In this investigation were used incubations of fresh material in moist chambers and the conventional photomicroscopy for morphological descriptions. During the study of the mycoflora of birch shoots seven anamorph species of Ascomycetes were recorded on the collected samples. Fungus found on shoots was *Disculina betulina*. *Discula betulae*, *Alternaria alternata* and *Fusarium* sp. were the other fungi recorded on leaves. *Prosthemium betulinum*, *Myxocyclus polycystis* and *Phoma* sp. were found on wood and bark. Disease symptoms and some distinctive morphological features are described in this work.

#### Key words

*Betula pendula*, *Discula betulae*, *Disculina betulina*, *Prosthemium betulinum*

#### Introduction

*Betula pendula* Roth is autochthonous species in Slovakia. This Euro-Siberian species has a very wide climatic tolerance. *B. pendula* is a frequently planted tree in parks and other urban areas in Slovakia. Among broad-leaved trees, birch is regarded as tolerant to effects of industrial pollution (ERNST et al., 1998). It is highly adaptable to degraded environment but is commonly infested by microfungi and thus, is frequently the object of mycological studies. Recent studies have demonstrated damage caused by fungi to *Betula* spp.

in Slovakia (JUHÁSOVÁ et al., 2003; BERNADOVIČOVÁ, 2008; PASTIRČÁKOVÁ and PASTIRČÁK, 2010). A number of fungal species associated with *Betula pendula* has also been recorded in other countries including woodlands in Scotland (GREEN and MACASKILL, 2007; DE SILVA et al., 2008), Estonia (HANSO and DRENKHAN, 2010), urban greenery and woodlands in Czech Republic (GREGOROVÁ et al., 2006). The objective of this study was to identify the microscopic fungi associated with the shoots of *B. pendula* in different types of urban greenery in Nitra town.

## Materials and methods

Once in November 2011 and once in April 2012, dead and also live shoots and leaves were collected from 30 individuals of *Betula pendula* at 4 sites (Klokočina, Chrenová, city Park and city Centre) in Nitra.

All fungi were determined from fresh plant material. Samples were placed in Petri dishes containing filter-paper moistened in distilled water and incubated at room temperature for 24 hours before being examined. Microscopic fungi were identified to the genus level, and the species level where possible, based on morphological characteristics under an Olympus BX 51 light microscope. Measurements were made through the medium of QuickPhotomicro 2.2 programme, and the morphometric values were compared with previously published data for the taxa (HANSO and DRENKHAN, 2010; GREEN and CASTLEBURY, 2007; PASTIRČÁKOVÁ and PASTIRČÁK, 2010; HANTULA et al., 1998; ELLIS and ELLIS, 1997).

## Results and discussion

Anamorph: *Disculina betulina* (Sacc.) Höhn. The teleomorph state is *Ophiovalsa betulae* (Tul. & C. Tul.) Petrak. It is pathogenic fungus on wood and bark. *D. betulina* was recorded at each site. Conidia were aseptate, hyaline, long and curved (falcate). Values of characters measured on spores of *D. betulina* on *Betula* reported on examined material are  $41\text{--}64 \times 6\text{--}3 \mu\text{m}$  (mean  $53 \times 4 \mu\text{m}$ ). Characters measured on spores from Estonia are  $29.4\text{--}58.6 \times 5.6\text{--}2.7 \mu\text{m}$  (HANSO and DRENKHAN, 2010).

Anamorph: *Discula betulae* (Westend.) Menyncook, commonly known by the illegitimate name *Discula betulina* (J. Kickx f.) ARX. – syn. *Gloeosporidium betulinum* J. Kickx f.. *D. betulae* is common foliar pathogen of birch in Europe (GREEN and CASTLEBURY, 2007; ADAMSKA, 2005; BOJARCZUK and PRZYBYL, 2005). Currently, little is known about the life cycle of *D. betulae* (SINCLAIR and LYON, 2005). GREEN and CASTLEBURY (2007) in their research tested the hypothesis that *D. betulae* is the anamorph of *Gnomonia intermedia*, which was confirmed by the results from the ITS sequencing. *D. betulae* is regarded as a leaf disease causing leaf spots that can lead to premature defoliation (SINCLAIR and LYON, 2005). *D. betulae* was found on three sites (Chrenová, city Centre and city Park). *D. betulae* forms dark lesions with dark margins on leaves. Conidia were aseptate, hyaline and ovoid. Values of characters measured on spores of *D. betulae* on *Betula* reported from examined material are  $5\text{--}9 \times 3\text{--}2 \mu\text{m}$  (mean  $7 \times 2 \mu\text{m}$ ). Characters measured on spores from woodlands in Scotland are  $4\text{--}8 \times 1.5\text{--}2.5 \mu\text{m}$  (mean  $6 \times 2 \mu\text{m}$ ) (GREEN and CASTLEBURY, 2007).

Anamorph: *Prosthemia betulinum* Kunze. Species in this family (Pleomassariaceae) are saprotrophs on woody substrate, but generally their hosts are restricted (PASTIRČÁKOVÁ and PASTIRČÁK, 2010). The teleomorph state *Pleomassaria siparia* was not recorded on detached samples. Conidiomata of *P. betulinum*, immersed in the bark tissue, were found on detached birch twigs. Conidiophores were filiform, unbranched, hyaline, septate. Conidia brown, staurosporous, branched, with 2–3 main arms and 1–3 smaller arms. Main arms brown, with 3–5 transverse septa, with hyaline to pale brown apical cell. Smaller arms hyaline to pale brown, continuous or 1–3 septate (Fig. 1). This fungus was determined only at city Centre site. Values of characters measured on spores of *P. betulinum* on *Betula* reported from examined material are  $33\text{--}49 \times 19\text{--}13 \mu\text{m}$  (mean  $40.5 \times 15.5 \mu\text{m}$ ). Characters measured on spores from other parts of Slovakia (e.g. Hlohovec, Šurany) are  $37\text{--}47.5 \times 15\text{--}11.5 \mu\text{m}$  (mean  $41.5 \times 14 \mu\text{m}$ ) (PASTIRČÁKOVÁ and PASTIRČÁK, 2010), values recorded in Finland are  $37\text{--}54 \times 20\text{--}14 \mu\text{m}$  (HANTULA et al., 1998) and in Estonia are  $20\text{--}48.2 \times 20.1\text{--}10.2 \mu\text{m}$  (mean  $37.5 \times 15.5 \mu\text{m}$ ) (HANSO and DRENKHAN, 2010).



Fig. 1. *Prosthemia betulinum* conidia.

Anamorph: *Myxocyclus polycystis* (Berk. & Broome) Sacc. This species was found on dead twigs. Pustules are depressed, elevating the cuticles slightly. Conidiophores are very pale brown to hyaline, septate, with slime coating. Conidia are large, smoky brown, clavate, oblong-elliptic, multilocular, with 7–8 transverse septa, at first taken with peduncles oozing out and forming black mass, clothed with gelatinous sheath (Fig. 2). This fungus was reported only at city Centre site. Values of characters measured on spores of *M. polycystis* on *Betula* reported from examined material are  $59\text{--}69 \times 25\text{--}18 \mu\text{m}$  (mean  $63 \times 22.5 \mu\text{m}$ ). Characters measured on spores from other parts of Slovakia are  $40\text{--}75 \times 18.5\text{--}14.5 \mu\text{m}$  (mean  $59.5 \times 17$ ) (PASTIRČÁKOVÁ and PASTIRČÁK, 2010), following ELLIS and ELLIS (1997) the values of conidia are  $45\text{--}65 \times 25\text{--}20 \mu\text{m}$ .



Fig. 2. *Myxocyclus polycystis* conidia.

Anamorph: *Alternaria alternata* (Fr.) Keissl., syn. *Alternaria tenuis* Fries. A sexual state has not yet been reported. *A. alternata* produces black lesions on young leaves, twigs and fruits, lesions may expand due to the production of a toxin, often resulting in leaf drop and twig dieback (PERES and TIMMER, 2006). Conidiophores and conidia are brown. Conidia form long, branching chains, ovoid, obclavate, verruculose, with or without apical beak,  $39\text{--}62 \times 19\text{--}11 \mu\text{m}$  large, with three to eight transverse septa, in the lower part each portion has one or two longitudinal septa (Fig. 3). *A. alternata* is cosmopolitan species.

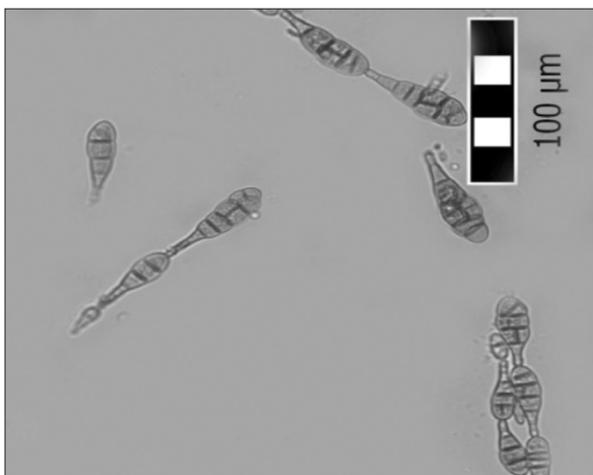


Fig. 3. *Alternaria alternata* conidia.

Anamorph: *Phoma* sp. Sacc. The genus is poorly understood, and generally considered to be a taxonomically difficult group of mitosporic fungi. Species of this genus are mainly known as plant pathogens (CROUS et al., 2009). *Phoma* sp. occurred on leaves. Conidia were hyaline, single-celled, ellipsoid  $11\text{--}6 \times 6\text{--}3 \mu\text{m}$  large (mean  $9 \times 4 \mu\text{m}$ ).

Anamorph: *Fusarium* sp. Link. This genus contains a number of species. Many species of *Fusarium* cause cankers and dieback of trees and shrubs (ADAMČIKOVÁ et al., 2011; SINCLAIR and LYON, 2005). Many fusaria are conidial states of *Nectria* and other hypocreaceous fungi (ELLIS and ELLIS, 1997). Conidia were hyaline, septate, curved and fusiform.

#### Acknowledgement

This study is the result of the project implementation: Environmentálne aspekty urbanizovaného prostredia, ITMS: 26220220110, supported by the Research & Development Operational Programme funded by the ERDF, scientific projects: Slovak Ministry of Education, project VEGA No. 1/0042/12 and Constantine the Philosopher University in Nitra, project UGA No. VII/17/2012.

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## **Askomycéty a ich anamorfne štádiá vyskytujúce sa na výhonkoch brezy previsnutej (*Betula pendula*) rastúcej v urbanizovanom prostredí mesta Nitra na Slovensku**

### **Súhrn**

Práca bola zameraná na štúdium druhovej diverzity mikroskopických húb, ktoré sa vyskytujú na breze previsnutej rastúcej v urbanizovanom prostredí mesta Nitra. Rastlinný materiál bol zbieraný v novembri 2011 a apríli 2012. Príspevok prezentuje askomycéty a ich anamorfne štádiá zistené z rastlinného materiálu po inkubácii vo vlhkých komôrkach. Počas výskumu boli použité konvenčné fotograficko-mikroskopické metódy pre stanovenie morfológických popisov. Zo vzoriek boli mikroskopicky identifikované huby *Disculina betulina* (Sacc.) Höhn, *Discula betulae* (Westend.) Mennycook, *Alternaria alternata* (Fr.) Keissl a *Fusarium* sp. Link na listoch a *Prosthemium betulinum* Kunze, *Myxocyclus polycystis* (Berk. & Broome) Sacc a *Phoma* sp. Sacc. na dreve a na kôre.

*Received December 6, 2012*

*Accepted May 22, 2013*