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CANCER DISEASES ON BIRCH (*BETULA* L.) IN VILNIUS CITY GREEN PLANTATIONS

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The phytosanitary state of green plantations was estimated in Vilnius city in 2005–2007. Twenty fungi taxa were identified on birch. Dangerous and frequent fungi infecting the bark, trunk, twigs of birch in green plantations of cities were: *Nectria cinnabarina, N. galligena* (*Neonectria galligena*). *N. galligena* on *Betula pubescens* is reported for the first time in Lithuania.

Key words: *Betula, Nectria galligena* (*Neonectria galligena*), Vilnius city

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Introduction

Thirteen naturally growing taxa of birches are found in Lithuania (Navasaitis, 2004). In urban green plantations, common birch (*Betula pendula* Roth) and hairy-twigged silver birch (*B. pubescens* Ehrh.) are most frequent. Birches grow in the squares, parks and courtyards of the city. Birches dislike blacktop and sidewalks, which are injury networks for roots and trunks. Injured plants lose resistance to pathogenic fungi.

Data on fungal diversity on birches are scarce in Lithuania; only a few mycological publications are available (Ignatavičiūtė, Treigienė, 1998). In 2004–2007, the diversity of various microscopic fungal groups was investigated on *Betula* in different terrestrial habitats. In total 148 species of anamorphic and ascomycetous fungi were listed (Treigienė et al., 2007).

In urban areas birches are infected with different disease agents. The most widespread fungi are: *Chondrostereum purpureum, Stereum hirsutum, Phellinus igniarius, Schizophyllum commune*, *Nectria cinnabarina* (Grigaliūnaitė et al., 2005). In green plantations the distribution of fungal disease agents on plants mostly depends on meteorological conditions and anthropogenic activity.

Nectria cinnabarina is common on woody plants. Pathogenic fungi *N. galligena* in Lithuania are known on fruit-trees, mostly apple trees.

The purpose of the present study was to collect and analyze the *Nectria* genus fungi, the cause of cancer diseases of birches in urban green plantations.

Material and methods

Material was collected in July-October of 2005-2007 during field trips in Vilnius city and district. Samples were collected from dead and living twigs, branches and trunks. Specimens were analyzed in the laboratory.

A nutrient medium – malt extract agar (MEA) with pH 6.8 in Petri dishes - was used for the isolation of fungi. The dishes were incubated in a thermostat at a temperature of 22°C, until the appearance of fungal mycelium spores (about 30 days). Fungal species were identified using routine mycological methods. In order to identify specimens, microslices of the collected material were observed in distilled water. Fungal species were identified according to Ellis, 1997; Watanabe, 2002; Eriksson, 2006 a; Eriksson 2006 b; Farr, 2007; Index fungorum.

Isolation of bacteria. Universal accumulative and selective media were used for the isolation of bacteria from diseased birches: self-made potato dextrose agar (PDA), growth factor (GF) malt extract agar (MEA), nutrient dextrose agar (NDA) and yeast glucose mineral agar (YGMA) (Lelliot, Stead, 1987; Klement et al., 1990; Schaad et al., 2001).

Pathogenicity tests. The hypersensitivity reaction (HR) tests were done on fully expanded tobacco leaves (*Nicotiana tabacum* L. cv. 'Samsun'), when suspension (10^8 cfu/ml) of each (10^8 cfu/ml) isolate was inoculated with the needle directly into tissue of leave and reaction was recorded after 24 h (Klement et al., 1990).

Results and discussion

In different terrestrial and aquatic habitats only two species of *Nectria* fungus were detected in Lithuania on birch (*Betula*): *Nectria cinnabarina, N. leptosphaeriae* (Treigienė et al., 2007). In urban green plantations *N. cinnabarina* on *Betula pendula, B. pubescens* (Fig. 1) dominate. *N. galligena* was collected for the first time by the authors from a single locality in Vilnius city.

Position in classification of *Nectria* genus fungi
Nectriaceae, Hypocreales, Sordariomycetidae, Sordariomycetes, Ascomycota, Fungi

Nectria cinnabarina (Tode) Fr. (anamorph ***Tubercularia vulgaris*** Tode)

Fig. 1. *Nectria cinnabarina* on dead branches of *Betula pendula*

Fig. 2. *Nectria cinnabarina* on live trunk of *Aesculus hippocastanum*

The canker *Nectria cinnabarina* with the new common name "coral spot" appears on twigs and branches and develops on trunks to such an extent as to cause the death of the birch. Reddish fungus fruit-bodies develop in large numbers. In Vilnius city the fungus is most common on twigs of oneseed hawthorn (*Crataegus monogyna* L.), small-leaved linden (*Tilia cordata* Mill.), Norway maple *(A. platanoides* L.*),* silky willow (*Salix viminalis* L.), European aspen (*Populus tremula* L.), trunk ashleaved maple (*Acer negundo* L.), red maple (*A. rubrum* L.), on twigs and trunk horse-chestnut (*Aesculus hippocastanum* L.) (Fig. 2), on stem white cornel (*Cornus alba* L.), wall cotoneaster (*Cotoneaster horizontalis* Decne).

Teleomorph and anamorph of *Nectria cinnabarina* were found together on withered or dead twigs of *Betula pendula*, *B. pubescens* in three localities in Vilnius district.

Nectria galligena Bres. (= ***Neonectria galligena*** (Bres.) Rossman & Samuels)

Fig. 3. *Nectria galligena* on twigs of *Betula pendula*

Fig. 4. *Nectria galligena* on twigs of *Betula pendula*

The fungus attacks the branches near the forks. As the pathogen spreads, a thick callus develops at the border of the canker (Fig. 3, 4). The fungus causes irregular swellings which crack open and expose areas of the wood. The rolls of the callus indicate that the birch is overcoming the infection. Cankers on trunks have similar symptoms to such vulnerable spot on branches. When trunks are girdled, the tree is death (Fig. 5, 6).

In spring bright red perithecia 0.25(0.24)–0.35(0.36) mm appear in canker injured places of birch, and become darker with age. Ascospores hyaline, 1-septate mouth to minutely verruculose, mostly 15–20(21) x 6–8.5 µm.

Nectria galligena found on twigs of *Betula pubescens* and *B. pendula* in two localities in Vilnius district in November 2007 and June 2008.

Saprotrophic and pathogenic fungi have been isolated *in vitro* from cankered, ulcerous places of birch (*Betula*): *Alternaria alternata* (Fr.) Keissl., *Gonatobotrys* sp., *Fusarium culmorum* (W.G. Sm.) Sacc., *Penicillium* sp., *Phomopsis* sp., *Sclerotium* spp., *Stemphylium botryosum* Sacc., *Sordaria fimicola* (Roberge ex Desm.) Ces. & De

Fig. 5. *Nectria galligena* on trunk and twigs of *Betula pubescens*

Fig.6. *Nectria galligena* on trunk of *Betula pubescens*

Not., *Trichoderma viride* Pers., *Trichothecium roseum* (Pers.) Link, etc. (Fig. 7, 8, 9, 10, 11).

Preliminary tests (colony morphology, Gram-staining, pathogenicity) showed that isolated bacteria were non-pathogenic.

The most efficient control is pruning of infected birch tissue.

References

Ellis M. B., Ellis J. P., 1997. Microfungi on Land Plants. – Slough.

Eriksson O. E., 2006 a. Fungi of Sweden. *Ascomycota*.– http://www.umu.se/myconet/asco/indexASCO.html.–Umea.

Eriksson O. E. (ed.), 2006 b. Outline of *Ascomycota* – 2006. – http://www.fieldmuseum.org/myconet/outline.asp – Myconet, 12: 1–82.

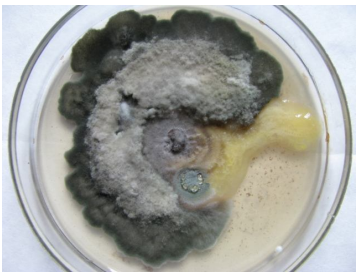

Fig.7. *Alternaria alternata, Stemphylium botryosum, Penicillium* sp. and non-pathogenic bacteria from *Betula pendula in vitro*

Fig.8. *Phomopsis* sp. from *Betula pendula in vitro*

Fig.9.*Gonatobotrys* sp. from *Betula pubescens in vitro*

Farr D. F., Rossman A. Y., Palm., M. E, & McCray, E. B. (n. d.) 2007. Fungal Databases, Systematic Botany & Mycology Laboratory, ARS, USDA,
http://nt.ars-grin.gov/fungaldatabases/.

Grigaliūnaitė B., Matelis A., Stakvilevičienė S. 2005. Sumedėjusių lapuočių augalų būklė miestų želdiniuose. Želdiniai ir jų dizainas. Vilnius, 51–62.

Ignatavičiūtė M., Treigienė A. 1998. Lietuvos grybai. 9. Acervuliečiai (*Melanconiales*). – Vilnius.

Klement Z., Rudolph K., Sands D. C. 1990. Methods in Phytobacteriology. – Akadémiai Kiadó, Budapest, Hungary.

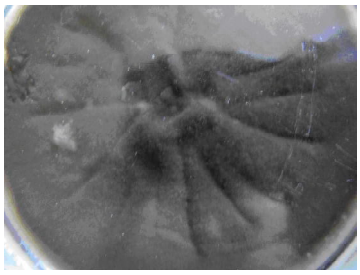

Fig. 10. *Sclerotium* spp. from *Betula pendula in vitro*

Fig. 11. *Fusarium culmorum* from *Betula pendula in vitro*

Lelliott R. A., Stead D. E. 1987. Methods for the diagnosis of bacterial diseases of plants. **2**. Blackwell Scientific Publications, Oxford, Great Britain.

Navasaitis M. 2004. Dendrologija. Vilnius.

Schaad N. W., Jones J. B., Chun W, 2001: Laboratory Guide for Identification of Plant Pathogenic Bacteria. – 3rd edition, American Phytopathological Society, Saint Paul, Minnesota, USA.

Treigienė A., Markovskaja S., Bagdžiūnaitė A. 2007. Micromycetes associated with *Betula* in Lithuania. Botanica Lithuanica, 13 (3): 181–196.

Watanable, T. 2002. Pictorial Atlas of Soil and Seed Fungi. CRC Press.

http://www.indexfungorum.org/Names/names.asp

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