

Occurrence of fungi of the genus *Nectria* s.l. (Ascomycota, Hypocreales, Bionectriaceae, Nectriaceae) in Slovakia

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Abstract

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In this work we present the recent data on occurrence of 22 fungal species belonging to the *Nectria* genus s.l. – of families Bionectriaceae and Nectriaceae, the occurrence of which in Slovakia was recorded in our survey and/or which were already recorded and published by other authors in the past. For each individual species, we describe its ecological features and its significance in terms of phytopathology. Sporadic occurrence has been found for the species *Cosmospora coccinea*, *C. purtonii*, *Hydropisphaeria peziza*, *Nectria berolinensis*, *Nectriopsis violacea*, *Neonectria ditissima*, *N. fuckeliana*, *N. punicea*. The first records in Slovakia hold for the species *Nectria coryli*, *Neonectria radicola*, *Monographella nivalis*, *Paranectria oropensis*, *Pronectria pertusariicola*, *Pseudonectria rousseliana* and *Sphaerostibella aureonitens*. *Nectria tuberculariformis*, *Nectriopsis indigena* and *Pronectria tinctoria* can also be considered as very rare and, related to the record date, also threatened of even extinct from the Slovak mycoflora.

Key words

Ascomycota, Bionectriaceae, Nectriaceae, *Nectria* s.l., Slovakia

Introduction

The fungi belonging to the genus *Nectria* s.l., belong by taxonomy to the families Bionectriaceae Samuels & Rossman and Nectriaceae Tul. & C. Tul., order Hypocreales and class Ascomycota. BOOTH (1959), ROSSMAN (1996) and ROSSMAN et al. (1999) report more than 200 fungal species belonging to the genus *Nectria* s.l. recorded up to now. These taxa are typical pyrenomycetous fungi associated with herbs and woody plants as saprophytes, saproparasites and parasites. The genus *Nectria* also involves important vascular parasites – primarily on forest woody plants. These parasites damage bark of their hosts with necrosis of tracheomycotic type. The occurrence of species of the *Nectria* genus in Slovakia, their trophic demands and role related to the plant pathology have been described e.g. by MIHÁL (2002a), MIHÁL et al. (2000, 2007, 2009a, b), SUROVEC (1990), ZÚBRIK et al. (1999).

In this contribution we present data on the current occurrence and distribution of fungi belonging to the

genus *Nectria* s.l. across Slovakia. Paralelly we describe certain ecological features of these species and inform about their importance for plant pathology related to necrosis on forest woody plants. From Slovakia, there have been published occurrence records for fungi of the genus *Nectria* by e.g. CÍČÁK and MIHÁL (2002), KUNCA (1996), KUTHAN et al. (1999), LIZOŇ (1977), MIHÁL (2002a), MIHÁL et al. (2000, 2007, 2009a, b), MORAVEC (1960), SVRČEK (1959, 1987).

Material and methods

Our records were made in surveys running during 1990–2010 in localities selected in several geomorphological units in Slovakia. Each survey took several years. The occurrence identified in Slovakia by other authors in the past have been obtained from the literature and other databases.

The material was acquired in the field by the method *in vivo* in form of fruiting bodies (sporocarps)

in the sexual stage (teleomorphs) sampled from wood substrate (bark of living and dead broadleaved and coniferous trees, denuded and rotting wood, stump cut surface), as well as from other substrates (plant leaves, fungi belonging to Aphyllophorales s.l., Pyrenomycetes, Lichenes). Several species were identified *in vitro* in the laboratory – by cultivation on substrates as well as by analysing sequences obtained from clones cultivated from nrDNA templates. DNA templates were extracted from soil samples. From the templates, there were amplified fragments of nuclear ribosomal acid – with using polymerase chain reaction – PCR at presence of primers specific for fungi (GRYNDLER et al., 2004). More details about the method can be found in BUČINOVÁ (2008).

All the sampled species were identified in the laboratory, with the aid of identification keys assembled by BRAYFORD et al. (2004), BREITENBACH and KRÄNZLIN (1986), BUTIN (1995), ČERVENKA et al. (1972), MOSER (1963), ROSSMAN et al. (1999), SAMUELS (1976), as well as by comparing with the reference collection of the author. As far as not specified otherwise, all the identifications (data not published) have been made by the author of this paper.

The herbarium items for most species have been deposited by the author in the Institute of Forest Ecology SAS in Zvolen, except the species *Monographella nivalis*, *Nectria tuberculariformis*, *Nectriopsis indigena*, *N. violacea*, *Neonectria radicolica* and *Pronectria tinctoria*. The scientific names and author's abbreviations for the individual taxa were received from ROSSMAN et al. (1999), ŠKUBLA (2003), or from the database CABI BIOSCIENCE (2010).

Results and discussion

The following list contains 22 species belonging to the *Nectria* species s.l., from the families Bionectriaceae – genera: *Hydropisphaeria* Dumort., *Nectriopsis* Maire, *Paranectria* Sacc., *Pronectria* Clem., *Sphaerostibella* (Henn.) Saac. & D. Sacc. and Nectriaceae – genera: *Cosmospora* Rabenh., *Monographella* Petr., *Nectria* (Fr.) Fr., *Neonectria* Wollenw., *Pseudonectria* Seaver, the occurrence of which was recorded during our study of Slovak mycoflora or recorded and published formerly by other authors. Parallel, each taxon has been labelled with the hitherto recognised synonyms for the reproductive phase (teleomorphs) as well as growth phase (anamorphs) – according to ROSSMAN et al. (1999) and according to the database CABI BIOSCIENCE (2010).

In case of certain generally distributed species with abundant published and unpublished records, these data are given in a short form (numbers of the records in individual localities and geomorphological units – to save the place).

Bionectriaceae

Hydropisphaeria peziza (Tode: Fr.) Dumort.

[syn.: teleomorpha – *Sphaeria peziza* Tode, *Dialonectria peziza* (Tode) Cooke, *Nectria peziza* (Tode) Fr., *Neuronectria peziza* (Tode) Munk, *Nectria aurea* (Grev.) Cooke, anamorph – *Acremonium* sp.]

Published data: the Záhorská nížina lowland – Kopčany, Sirková voda (Zadný diel), September 1975 (LIZOŇ, 1977 in ŠKUBLA, 2003).

Unpublished data: the Chvojnická pahorkatina hills – Zámčisko, 25 June 2008, the Javorie hills – Michalková, 27 July 2008, the Kremnické vrchy Mts – Kováčovská dolina, 8 July 2008, the Muránska planina mountain plateau – Šarkanica, 20 October 2001, the Revúcka vrchovina hills – Lubeník, 28 October 2005, Revúca – (extra) and intravilan, 1 December 2001.

A rare species, growing in decaying wood of broadleaved and coniferous woody plants. Apart from beech bark and wood, we recorded the species also on bark of *Sambucus nigra* L. KEIZER (1998) reports the occurrence of *H. peziza* also in decaying fruiting bodies of the fungus *Polyporus squamosus* (Huds.) Fr.

Nectriopsis indigena (Arnold) Diederich et Schroers

[syn.: teleomorpha – *Secoliga indigena* Arnold, *Nectria indigena* (Arnold) Rehm, *Gyalecta indigena* (Arnold) H. Olivier, anamorph – *Acremonium* sp., *Gliocladium* sp., *Verticillium* sp.]

Published data: the Západné Tatry Mts, Vrch Baranec hill, September 1966 (VĚZDA, 1970 in ŠKUBLA, 2003).

In Slovakia an isolated, old record – suggesting that *N. indigena* is either a very rare or omitted in surveys. The literature classifies the species of the genus *Nectriopsis* into the group of mycotrophic and lichenicolous parasitic fungi (ČERVENKA et al., 1972; VĚZDA, 1970).

Nectriopsis violacea (Fr.) Maire

[syn.: teleomorpha – *Sphaeria violacea* Fr., *Nectria violacea* (Fr.) Fr., *Hypomyces violaceus* (Fr.) Tul., *Pekiella violacea* (Fr.) Sacc., *Byssonectria violacea* (Fr.) Seaver, *Hyphonectria violacea* (Fr.) Petch, anamorph – *Acremonium fungicola* (Sacc.) Samuels]

Published data: the Šarišská vrchovina hills – Sedlice – Stará smola, 31 October 2004, (lgt. et det. P. KEŠELÁK), the Vysoké Tatry Mts – Podbánske, 12 October 2008, (lgt. et det. P. KEŠELÁK in *Nectriopsis violacea*, (J.C. Schmidt) Maire (1911) rážovka fialová, DATABASE, 2010).

An interesting species with violet-coloured subiculum parasitizing on fruiting bodies of *Fuligo septica* (L.) Wiggers is not possible to confuse with similar fungi. In Slovakia, there exists only one record of this species occurrence – in two localities recorded by P. KEŠELÁK (published on the web). The occurrence of the species *Fuligo septica* in Slovak forests is very frequent, locally

massive, so the scarce occurrence of *Nectriopsis violacea* is surprising.

***Paranectria oropensis* (Ces.) D. Hawksw. & Piroz.**

[syn.: teleomorpha – *Sphaeria oropensis* Ces. in Rabenh., *Ciliomyces oropensis* (Ces.) Höhn., *Nectria lichenicola* P. Crouan & H. Crouan., *Pleonectria lichenicola* (P. Crouan & H. Crouan) Sacc., *Pleonectria appendiculata* Vouaux, anamorpha – unknown]

Unpublished data: the Muránska planina mountain plateau – Poludnica, 15 November 2007 (lgt. D. Blanár).

A very rare and interesting species, whose little fruiting bodies were found growing on thalluses of non-identified lichen (Lichenes). This occurrence can be considered as the first record of *P. oropensis* in Slovakia. In Europe, the species *P. oropensis* has hitherto been recorded in Austria, France, Ireland, Italia and Scotland on thalluses of the lichens *Cladonia* sp., *Lecidea ente-roleuca* Fr. and *Parmeliella atlantica* Degel. (ROSSMAN et al., 1999).

***Pronectria pertusariicola* Lowen**

[syn.: teleomorpha – *Pronectria pertusariicola* Lowen, anamorpha – unknown]

Unpublished data: the Zvolenská kotlina basin – Borová hora, 15 November 1997 (lgt. S. Glejdura).

A very rare species, found growing in remnants of broadleaved wood burnt in the Arboretum Borová hora Zvolen. This is the first record from Slovakia. The species has been given the name according to its host – the lichen *Pertusaria pertusa* (Weigel) Tuck in the type locality for *P. pertusariicola* reported in the literature from Sweden (ROSSMAN et al., 1999). Additional records are from France and Spain. Our record of *P. pertusariicola* from the former burnt space may suggest wider ecological demands of this lichenicolous and probably also carbonicolous fungi.

***Pronectria tinctoria* (Fuckel) Lowen**

[syn.: teleomorpha – *Cryptodiscus tinctorius* Fuckel, *Calonectria tinctoria* (Fuckel) Rehm, *Nectriella tinctoria* (Fuckel) R. Sant., *Nectriella coccinea* Fuckel, *Nectriella fuckelii* Sacc., anamorpha – unknown]

Published data: the Spišská Magura Mts, Vojňany (Spišská Belá), July 1963 (VÉZDA, 1970 in ŠKUBLA, 2003), the record was published as *Nectriella coccinea*.

The literature (ROSSMAN et al., 1999) provides the records of this species also from Switzerland, Finland and Russia – on thalluses of the lichens *Anaptychia ciliaris* (L.) Körb. ex A. Massal, *Evernia prunastri* (L.) Ach. and *Physcia stellaris* (L.) Nyl. The dating of this only record in Slovakia allows us to judge about its very rare occurrence or omitting in inventories. It is also possible that in Slovakia is the species extinct.

***Sphaerostibella aureonitens* (Tul. & C. Tul.) Seifert, Samuels & W. Gams**

[syn.: teleomorpha – *Hypomyces aureonitens* Tul. & C. Tul., *Nectriopsis aureonitens* (Tul. & C. Tul.) O. Kuntze, *Hyphonectria aureonitens* (Tul. & C. Tul.) Petch, *Nectria mycetophila* Peck, *Dialonectria sulphurea* Ellis & Calk., *Cucurbitaria sulphurea* (Ellis & Calk.) O. Kuntze, anamorpha – *Gliocladium penicillioides* Corda]

Published data: the Kremnické vrchy Mts – Kováčovská dolina valley, September 1990, 1992, 2001, (MIHÁL, 2002b in ŠKUBLA, 2003).

From the past more frequently reported as *Nectriopsis aureonitens* (genus *Nectriopsis*, family Bionectriaceae). At present, recognised by ROSSMAN et al. (1999) as *Sphaerostibella aureonitens* (family Hypocreaceae). This rare species can be identified based on small, gold-coloured fruiting bodies growing as saproparasites on fruiting bodies of fungi from the order Polyporales s.l. Hitherto, there has been published one single record of *S. aureonitens* from Slovakia – on fruiting bodies of *Stereum rugosum* (Pers.) Fr. in a fir-beech forest in Central Slovakia.

Nectriaceae

***Cosmospora coccinea* Rabenh.**

[syn.: teleomorpha – *Nectria cosmariospora* Ces. et De Not., *Dialonectria cosmariospora* (Ces. et De Not.) Z. Moravec, anamorpha – *Verticillium olivaceum* W. Gams]

Published data: In total 10 localities in 9 geomorphological units across Slovakia (ŠKUBLA, 2003).

Unpublished data: the Kremnické vrchy Mts – Badínsky prales, 24 September 2008, the Muránska planina mountain plateau – Malá Stožka, 19 September 1999, Poludnica, 30 April 2009, the Poľana Mts – Kozí chrbát, 1 July 2009, the Štiavnické vrchy Mts – Jalná, 22 April 2004.

An interesting species, rather frequent as mycotrophic saproparasite on older fruiting bodies of the lignicolous *Inonotus nodulosus* (Fr.) P. Karst. in beech forest stands.

***Cosmospora episphaeria* (Tode: Fr.) Rossman et Samuels**

[syn.: teleomorpha – *Sphaeria episphaeria* Tode, *Dialonectria episphaeria* (Tode) Cooke, *Nectria episphaeria* (Tode) Fr., *Nectria sanguinea* (Sibth.) ss. auct. brit., anamorpha – *Fusarium aquaeductuum* (Radlk. et Rabenh.) Lagerh. var. *medium* Wollenw.]

Published data: In total 19 localities in 13 geomorphological units in Slovakia (ŠKUBLA, 2003).

Unpublished data: the Kremnické vrchy Mts – Kováčovská dolina valley, 4 May 2007, Štagiar, 16 September 2005, the Muránska planina mountain plateau – Javorníková dolina valley, 28 April 2009, Muráň, 11 May 2009, Poludnica, 30 April 2009, Závadka nad Hronom,

22 April 2009, the Revúcka vrchovina hills – Jelšavská Teplica, 6 May 2009, Licince, 29 February 2008, Revúca, 28 February 2008, the Slovenský kras Karst – Hucín, 20 March 2009, the Stolické vrchy Mts – Muránska Zdychava, 17 January 2009.

The species occurs, likewise the species *Cosmospora coccinea*, as a mycotrophic saproparasite on vital as well as dead fungal fruiting bodies, especially pyrenomycetous fungi: *Diatrype disciformis* (Hoffm.) Fr., *D. stigma* (Hoffm.) Fr., *Eutypella quaternata* (Pers.) Rappaz, *Hypoxyton fragiforme* (Pers.) J. Kickx f., *H. multi-forme* (Fr.) Fr. or *Valsa ambiens* (Pers.) Fr. This species is the most frequent among the mycotrophic species belonging to the genus *Nectria* s.l.

***Cosmospora purtonii* (Grev.) Rossman & Samuels**

[syn.: teleomorpha – *Sphaeria purtonii* Grev., *Nectria purtonii* (Grev.) Berk., *Nectria appianata* Fuckel, anamorpha – *Fusarium aquaeductuum* (Radlk. et Rabenh.) Lagerh.p.p.]

Published data: the Kremnické vrchy Mts – Kováčovská dolina valley, September 1990, June 1998, the Malé Karpaty Mts – Smolenice, July 1998, Havrania skala, November 1998, the Poľana Mts – Kozi chrbát, June 1998 (ŠKUBLA, 2003).

Unpublished data: the Muránska planina mountain plateau – Cigánka, 15 June 2007, the Revúcka vrchovina hills – Mokrú Lúka, 11 March 2009, the Slovenský kras Karst – Hucín, 20 March 2009, the Stolické vrchy Mts – Stolica, 13 August 2009.

An interesting fungus, growing as a mycotrophic saproparasite – likewise the two preceding species. We have recorded from the species *Diatrype disciformis*, *Eutypella quaternata* and *Hypoxyton fragiforme*. The occurrence of *C. purtonii* from fruiting bodies of the species *Diatrype stigma* has been reported by ROSSMAN et al. (1999). This species is less frequent than the two species discussed above.

***Monographella nivalis* (Schaffnit.) E. Müll.**

[syn.: teleomorpha – *Calonectria nivalis* Schaffnit., *Micronectriella nivalis* (Schaffnit.) C. Booth., *Calonectria graminicola* F. Stevens non (Berk. et Broome) Wollenw., *Melioliphila graminicola* (F. Stevens) Speg., anamorpha – *Fusarium nivale* (Fr.) Sorauer, *Fusarium nivale* f. *graminicola* W. C. Snyder et H. N. Hansen, *Gerlachia nivalis* (Ces. ex Sacc.) W. Gams et E. Müll.]

Published data: The only one record in Slovakia (lgt. Adamčík et al., in 1998) published in ŠKUBLA (2003), details on the site are lacking.

In the literature, the species is known mostly as *Calonectria graminicola* or *Melioliphila graminicola*. ROSSMAN et al. (1999) report this species according to MÜLLER (1977) under the name *Monographella nivalis*. The *Melioliphila* and *Calonectria* were described by SPEGAZZINI (1924 in ROSSMAN et al., 1999) as fungi parasitizing on plant-associated fungi.

***Nectria berolinensis* (Sacc.) Cooke**

[syn.: teleomorpha – *Pleonectria berolinensis* Sacc., *Thyronectria berolinensis* (Sacc.) Seaver, *Nectria ribis* Niessl., *Thyronectria ribis* (Rabenh.) Z. Moravec, *Nectria fenestrata* Berk. et M. A. Curtis, *Pleonectria fenestrata* (Berk. et M. A. Curtis) Berl. et Voglino, anamorpha – *Tubercularia berolinensis* (Wollenw.) Rossman]

Unpublished data: the Revúcka vrchovina hills – Revúca (intravilan), 6 April 2008, Sirk (intravilan), 2 November 2004, the Zvolenská kotlina basin – Zvolen (extravilan), 8 November 2002.

A rare species, in Slovakia growing as a saproparasite on *Ribes* sp. (ČERVENKA et al., 1972). The summarised work of ŠKUBLA (2003) do not contain a record on *N. berolinensis* occurrence in Slovakia, in spite of the fact that this saproparasite on stems and branches of currants in our gardens is much more distributed but escaping our observations.

***Nectria cinnabarina* (Tode: Fr.) Fr.**

[syn.: teleomorpha – *Sphaeria cinnabarina* Tode, *Nectria cinnabarina* (Tode) Fr., anamorpha – *Tubercularia vulgaris* Tode: Fr.]

Published data: In total 71 localities in 30 geomorphological units in Slovakia (ŠKUBLA, 2003).

Unpublished data: the Revúcka vrchovina hills – Licince, 20 March 2009, Revúca (intravilan), 9 April 2009, Revúcka Lehota, 3 September 2009, the Slánske vrchy Mts – Dargov, 28 April 2003, the Stolické vrchy Mts – Muránska Zdychava, 28 October 2009, the Štiavnické vrchy Mts – Jalná, 12 November 2003, Žiar nad Hronom, 31 March 2004, the Veporské vrchy Mts – Fabova hoľa, 24 April 2009, the Zvolenská kotlina basin – Zvolen (intravilan), 7 October 2008.

A generally known and distributed species growing as a saproparasite and saprophyte on a variety of wooden and herbal substrates. We have recorded the species *N. cinnabarina* on *Abies alba* Mill., *Acer platanoides* L., *A. pseudoplatanus* L., *Aesculus hippocastanum* L., *Armeniaca vulgaris* Lam., *Betula pendula* Roth, *Carpinus betulus* L., *Cerasus avium* (L.) Moench, *Clematis vitalba* L., *Corylus avellana* L., *Daphne arbuscula* Čelak., *Fagus sylvatica* L., *Frangula alnus* Mill., *Fraxinus excelsior* L., *Grossularia* sp., *Juglans regia* L., *Laburnum anagyroides* Medik., *Malus domestica* Borkh., *Picea abies* (L.) P. Karst., *Pinus sylvestris* L., *Quercus* sp., *Rhamnus* sp., *Ribes alpinum* L., *Robinia pseudoacacia* L., *Rubus* sp., *Salix fragilis* L., *Sambucus nigra* L., *Sorbus aucuparia* L., *Swida sanguinea* (L.) Opiz, *Tilia* sp., *Vitis vinifera* L., *Wisteria* sp. and even on rotting leaves from a rosette of an ananas – *Ananas comosus* (L.) Merr. (Zvolen – intravilan, 7 October 2008, lgt. et det. I. Mihál).

***Nectria coryli* Fuckel**

[syn.: teleomorpha – *Chilonectria coryli* (Fuckel)

Ellis & Everh., *Creonectria coryli* (Fuckel) Seaver, *Colosphaeria acervata* P. Karst., *Nectria coryli* f. *salicis* Rehm, anamorph – *Tubercularia* sp.?)

Published data: the Starohorské vrchy Mts – Zamrlô valley, May 1998 (MIHÁL, 2002a in ŠKUBLA, 2003).

The species was hitherto recorded only in one locality, and there are also lacking data on its bionomy. We identified fruiting bodies of this rare species on bark of a cut beech stem in a fir-beech stand on an exposed slope in the mountain valley Zamrlô in the Starohorské vrchy Mts. BREITENBACH and KRÄNZLIN (1986) and MOSER (1963) describe this species as rarely occurring in spring on bark of broadleaved woody plants as e.g. *Corylus* sp., *Populus* sp., *Salix* sp.

***Nectria tuberculariformis* (Rehm ex Sacc.)**

G. Winter

[syn.: teleomorpha – *Hypocrea tuberculariformis* Rehm, *Hypocreopsis tuberculariformis* Rehm ex Sacc., *Creonectria tuberculariformis* (Rehm ex Sacc.) Seaver, *Nectria carneorosea* Rehm, anamorph – unknown]

Published data: the Belianske Tatry Mts – Tatranská Kotlina, a slope of the Bujačí vrch Mt., August 1956 (SVRČEK, 1959; KUBIČKA, 1964 in ŠKUBLA, 2003).

In Slovakia, there was recorded only one locality with this species, moreover, long ago. We can suppose either its extinction or extremely rare occurrence – escaping identification.

***Neonectria coccinea* (Pers.: Fr.)**

Rossmann et Samuels

[syn.: teleomorpha – *Sphaeria coccinea* Pers., *Nectria coccinea* (Pers.) Fr., anamorph – *Cylindrocarpon candidum* (Link.) Wollenw.]

Published data: In total 24 localities in 12 geomorphological units in Slovakia (ŠKUBLA, 2003).

Unpublished data: the Bukovské vrchy Mts Havešová, 16 September 2005, the Cerová vrchovina hills – Tachty, 25 July 2006, the Kremnické vrchy Mts – Badínsky prales, 15 October 2008, the Muránska planina mountain plateau – Poludnica, 26 October 2001, the Poľana Mts – Kozí chrbát, 1 July 2009, the Nitrianska pahorkatina hills – Chynoranský luh, 20 September 1998 (lgt. G. Juhásová), the Revúcka vrchovina Mts. – Lubeník, 7 June 1995, the Slánske vrchy Mts – Dargov, 28 April 2003, the Stolické vrchy Mts – Kohút, 9 October 2009, the Štiavnické vrchy Mts – Žiar nad Hronom, 26 June 2003, the Veľká Fatra Mts – Dedošova dolina valley, 18 August 2008, the Veporské vrchy Mts – Vrch Dobroč hill, 3 October 2002.

A common species, in Slovakia growing on broadleaved woody plants as a saproparasite or parasite. In broadleaved forest stands, the fungus is a frequent causal agent of necrotic bark disease of tracheomycotic type. Apart from beech bark, we observed this species on *Acer pseudoplatanus* L., *Fraxinus excelsior* L. and *Sambucus nigra* L.

***Neonectria ditissima* (Tul. & C. Tul.)**

Samuels & Rossman

[syn.: teleomorpha – *Nectria ditissima* var. *arctica* Wollenw., *Nectria ditissima* var. *major* Wollenw., *Nectria major* (Wollenw.) J. Moravec, anamorph – *Fusarium willkommii* Lindau, *Cylindrocarpon willkommii* (Lindau) Wollenw.]

Published data: the Cerová vrchovina hills – Fenek, June 1995, the Kremnické vrchy Mts – Kováčovská dolina valley, September 1990, June 1997 (det. G. Juhásová), the Malé Karpaty Mts – Bratislava, Rača, September 1977 (LIZOŇ, 1977 in ŠKUBLA, 2003), the Veporské vrchy Mts – Dobročský prales, September 1998 (det. G. Juhásová), (according to LIZOŇ, 1977; MIHÁL, 1997, 2002a in ŠKUBLA, 2003).

Unpublished data: the Nitrianska pahorkatina hills – Chynoranský luh, 20 September 1998 (lgt. et det. G. Juhásová), the Revúcka vrchovina Mts – Revúca (intravilan), 2 January 2009.

A species relative to and difficult to distinguish from *Neonectria galligena*, therefore, we can hypothesize about its much more frequent occurrence. It grows as a saproparasite or parasite on broadleaved woody plants. In broadleaved forest stands, the fungus is a frequent cause of necrotic beech bark disease of tracheomycotic type. Apart from beech, the species was also observed growing on *Malus domestica* Borkh. and *Quercus* sp.

***Neonectria fuckeliana* (C. Booth) Castl. & Rossman**

[syn.: teleomorpha – *Sphaeria cucurbitula* Tode, *Nectria cucurbitula* (Tode) Fr., *Scolecconectria cucurbitula* (Tode) C. Booth, *Nectria cylindrospora* Sollm., *Ophionectria cylindrospora* (Sollm.) Berl. et Voglino, *Nectria fuckeliana* C. Booth, anamorph – *Cylindrocarpon cylindroides* Wollenw., *Cylindrocarpon cylindroides* var. *tenue* Wollenw., *Zythiostroma pinastri* (P. Karst.) Höhn. ex Weese]

Published data: the Belianske Tatry Mts – Tatranská Kotlina, Dolina Siedmich prameňov valley, May 1961, the Bukovské vrchy Mts – Stuzica, September 1999, the Nízke Beskydy Mts – Udava, October 1989, the Oravské Beskydy Mts – Babia hora, September 2000, the Veporské vrchy Mts – Vrch Dobroč hill, September 1996, the Štiavnické vrchy Mts – Sitno, April 2000 (SVRČEK, 1987; KUTHAN et al., 1999; KUNCA, 1996; MIHÁL, 2002a in ŠKUBLA, 2003).

Unpublished data: the Muránska planina mountain plateau – Veľká Stožka, 22 February 2008, the Revúcka vrchovina Mts – Muránska Dlhá Lúka, 31 December 2000, the Stolické vrchy Mts – Kohút, 13 June 2008, the Poľana Mts – Výbohovo, 20 May 2010.

An interesting species, preferring substrate of coniferous woody plants. It is a surprise that the species has hitherto been identified in a few localities only. In Slovakia was saproparasitic and parasitic occurrence of *N. fuckeliana* identified only on *Abies alba* Mill., *Picea abies* (L.) P. Karst. and *Pinus sylvestris* L. The fungus

often causes necrotic bark disease of tracheomycotic type on conifers, in Slovakia primarily on spruce.

***Neonectria galligena* (Bres.) Rossman et Samuels**

[syn.: teleomorpha – *Nectria galligena* Bres. ex Strasser, anamorpha – *Fusarium mali* Allesch., *Cylindrocarpon mali* (Allesch.) Wollenw., *Cylindrocarpon heteronema* Berk et Broome]

Published data: In total 40 localities in 22 geomorphological units in Slovakia (ŠKUBLA, 2003).

Unpublished data: the Muránska planina mountain plateau – valley of the Rimava river, 24 June 2003, Muránska Huta, 31 December 2008, the Nitrianska pahorkatina hills – Chynoranský luh, 20 September 1998 (lgt. et det. G. Juhásová), the Revúcka vrchovina Mts – Revúca (intravilan), 13 June 2008, the Stolické vrchy Mts – Muránska Zdychava, 9 October 2008.

The species is in Slovakia common and wide-spread – growing as a saproparasite and parasite on bark of broadleaved woody plants. Parasitizing in beech forest stands, it is the causal agent of necrotic beech bark disease of tracheomycotic type. Apart from beech, *N. galligena* was also found growing on *Malus domestica* Borkh. and *Quercus* sp.

***Neonectria punicea* (J. C. Schmidt)**

Castl. & Rossman

[syn.: teleomorpha – *Sphaeria punicea* Kunze et J. C. Schmidt, *Nectria punicea* (Kuntze et J. C. Schmidt) Fr., anamorpha – *Cylindrocarpon album* (Sacc.) Wollenw.]
Published data: the Bukovské vrchy Mts – Nová Sedlica, September 1998, the Kremnické vrchy Mts – Turová, Štagiar-Zábučie, March 2001 (MIHÁL, 2002a in ŠKUBLA, 2003).

Unpublished data: the Javorie hills – Michalková, 27 July 2008, the Revúcka vrchovina Mts – Hodošov les, 18 September 2007, Revúca (intravilan), 17 November 2008, the Stolické vrchy Mts – Muránska Zdychava, 16 November 2008, the Zvolenská kotlina basin – Borová Hora, 4 October 1997.

A less known and rather rare species growing on broadleaved woody plants. Several of our records have been taken from cut surfaces on old beech stumps. Apart from beech, *N. punicea* was also identified on bark of *Laburnum anagyroides* Medik.

***Neonectria radicola* (Gerlach & L. Nilsson)**

Mantiri & Samuels

[syn.: teleomorpha – *Nectria radicola* Gerlach & L. Nilsson, anamorpha – *Cylindrocarpon destructans* (Zins.) Scholten]

Published data: the Kremnické vrchy Mts – Kováčovská dolina valley, 30 May 2005 (lgt. et det. K. Bučínová, in MIHÁL et al., 2009a).

This species is parasitizing on roots of broadleaved woody plants – primarily beech and oak. It frequently occurs in its vegetative form *Cylindrocarpon de-*

structans. The fungus can cause considerable damage to plants in forest nurseries. The presence of this species in the locality Kováčovská dolina valley in the Kremnické vrchy Mts was identified by *in vitro* cultivation from soil samples, by sequencing clones from nrDNA templates (BUČINOVÁ, 2008; GRYNGLER et al., 2004). The literature does not contain an earlier record of this species in Slovakia, except MIHÁL et al. (2009a).

***Pseudonectria rousseliana* (Mont.) Wollenw.**

[syn.: teleomorpha – *Nectria rousseliana* Mont., *Stigmaea rousseliana* (Mont.) Fuckel, *Nectriella rousseliana* (Mont.) Sacc., *Notarisiella rousseliana* (Mont.) Sacc. in Clem. & Shear, *Nectria rousseliana* Mont. var. *viridis* Berk. & Broome, anamorpha – *Sesquicillium buxi* (Link: Fr.) W.Gams., *Volutella buxi* (DC.: Fr.) Berk.]

Unpublished data: the Revúcka vrchovina Mts – Jelšava (extravilan), 19 April 2009, Revúca (extra- and intravilan), 10 January 2009 (lgt. D. Blanár).

A very rare species – with occurrence hitherto recorded only on leaves and rotting branches of *Buxus sempervirens* L. ROSSMAN et al. (1999) report occurrence of *P. rousseliana* in the North America and France as a type locality for Europe. We recorded a large amount of *P. rousseliana* fruting bodies on adaxial leaf sides of *Buxus sempervirens*. The occurrence of this species in the Revúcka vrchovina Mts represents the first record in Slovakia.

The species *Nectria cinnabarina*, *Neonectria coccinea*, *N. galligena* and *Cosmospora episphaeria* are common across Slovakia, and their occurrence can be very abundant in presence of suitable substrate and favourable conditions. Less frequent is the occurrence of the species *Cosmospora coccinea*, *C. purtonii*, *Hydropisphaeria peziza*, *Neonectria ditissima*, *N. fuckeliana* and *N. punicea*. The species *Nectria berolinensis* and *Nectriopsis violacea* can be classified as rare. A special group consists of the species recorded in Slovakia only one or two times. The first records in the Slovak mycoflora can be considered the very rare *Nectria coryli*, *Neonectria radicola*, *Monographella nivalis*, *Paranectria oropensis*, *Pronectria pertusariicola*, *Pseudonectria rousseliana* and *Sphaerostibella aureonitens*. The *Nectria tuberculariformis*, *Nectriopsis indigena* and *Pronectria tinctoria* can also be classified as very rare and, in context of their occurrence period, endangered or extinct. Their actual occurrence in the Slovak mycoflora needs to confirm with additional records.

At the same time, several species of the genus *Nectria* s.l. are important parasites on forest woody plants. As vascular parasites, these fungi cause serious damage, locally even epiphytoses. An example is the epiphytosis of necrotic beech bark disease in Slovakia (CÍČAK and MIHÁL, 2002). The first symptoms of necrotic disease of forest woody plants are: crown reduction due to branches broken in the necrotised parts and drying out. The

most frequent symptoms are: necrotic wounds on tree stems and branches – from small and inconspicuous up to so called break necroses severely distorting the stems and branches. Very frequent are breaks in necrotised parts – due to considerably lowered wood strength.

The primary common entrance spots for spreading infections by these parasites into the conductive pathways in trees are: bark injuries caused by beetles and forest game, tree felling, leaf scarfs, lenticels, frost cracks and sunburnt cracks. The fungi of the *Nectria* genus penetrate these wounds with germinating hyphae of ascospores, conidia and mycelium hyphae. The spreading of the parasite is promoted by several abiotic (wind, water) and especially biotic vectors (insects, birds, forest game, man).

Several authors (LEONTOVYČ and GÁPER, 1997; PARKER, 1976; PERRIN, 1984) consider as the most dangerous parasites on forest woody plants, especially on European beech (*Fagus sylvatica* L.), the species *Neonectria coccinea*, *N. ditissima* and *N. galligena* – initiating beech bark necrotic disease with typical tracheomycotic symptoms. For example, LEONTOVYČ and GÁPER (1997) characterise the species *N. ditissima* and *N. galligena* as the most important pathogenic fungi in young beech forest stands. PERRIN and GARBAGE (1984) and SUROVEC (1992) report occurrence of *N. ditissima* mostly on beech trees in earlier growth phases (natural seeding, young growth), and pinpoint the negative effects of this fungus mainly on beech branches. SUROVEC (1990) accents the fact that the primary cause of epiphytoses-related dieback of young beech forest stands is deposition of airborne pollutants, persistent water deficit in soils, and frequent damage caused by frosts and hail. In coniferous forests, primarily spruce, the species *Neonectria fockeliana* manifests parasitic activities.

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Príspevok k výskytu húb rodu *Nectria* s.l. (Ascomycota, Hypocreales, Bionectriaceae, Nectriaceae) na Slovensku

Súhrn

V príspevku uvádzame aktuálne údaje o výskyte 22 druhov húb, prináležiacich k širšiemu okruhu druhov rodu *Nectria* s.l. z čeľadi Bionectriaceae a Nectriaceae, ktorých výskyt sme zistili na Slovensku, resp. ktorých výskyt bol už v minulosti zaznamenaný a publikovaný inými autormi z územia Slovenska. Opisujeme aj niektoré ekologické charakteristiky druhov a uvádzame ich fytopatologický význam. Sporadický výskyt bol zistený u druhov *Cosmospora coccinea*, *C. purtonii*, *Hydropisphaeria peziza*, *Nectria berlinensis*, *Nectriopsis violacea*, *Neonectria ditissima*, *N. fuckeliana*, *N. punicea*. Ako prvonálezy pre Slovensko uvádzame druhy *Nectria coryli*, *Neonectria radiculicola*, *Monographella nivalis*, *Paranectria oropensis*, *Pronectria pertusariicola*, *Pseudonectria rousseliana* a *Sphaerostibella aureonitens*. Druhy *Nectria tuberculariformis*, *Nectriopsis indigens* a *Pronectria tinctoria* taktiež považujeme za veľmi vzácne huby a vzhľadom na ich dávnu dobu nálezu dokonca za huby ohrozené, príp. už vymiznuté z našej mykoflóry. U druhov z rodov *Nectria* a *Neonectria*, ktoré sú najvýznamnejšie z lesoochránárskeho hľadiska, sa plodničky najčastejšie vyskytovali na kôre listnatých drevín, najviac na *Fagus sylvatica*, menej na *Acer pseudoplatanus*, *Carpinus betulus* a vzácne aj na ihličnatých drevinách. Druh *Neonectria fuckeliana* sa vyskytoval len na ihličnatých drevinách (*Abies alba*, *Picea abies* a *Pinus sylvestris*). Zaujímavé sú druhy *Cosmospora episphaeria* a *C. purtonii*, ktoré boli zbierané ako mykotrofní saproparaziti na starých plodniciach lignikolných pyrenomycétov *Diatrype disciformis*, *D. stigma*, *Eutypella quaternata*, *Hypoxyton fragiforme*, *H. multiforme* a *Valsa ambiens*. Viaceré druhy rodu *Nectria* sú zároveň významnými parazitmi lesných drevín, na ktorých ako vaskulárni paraziti spôsobujú veľké škody, miestami až epifytácie. Za najnebezpečnejších parazitov listnatých drevín, a zvlášť buka lesného (*Fagus sylvatica*), sa považujú druhy *Neonectria coccinea*, *N. ditissima* a *N. galligena*, ktoré vyvolávajú nekrotické ochorenie kôry buka s typickými tracheomykóznymi príznakmi.

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