

## Occurrence of species of the *Nectria* s.l. (Bionectriaceae, Nectriaceae, Hypocreales, Ascomycetes) in Central and South-eastern Europe

Ivan Mihál, Alojz Cicák<sup>1</sup>, Hristo Tsakov<sup>2</sup>, Petar Petkov<sup>2</sup>

<sup>1</sup>Institute of Forest Ecology, Slovak Academy of Sciences, Štúrova 2, 960 53 Zvolen, Slovak Republic,  
E-mail: mihal@sav.savzv.sk

<sup>2</sup>Forest Research Institute, Bulgarian Academy of Sciences, St. Kliment Ohridski Blvd. 132,  
1756 Sofia, Bulgaria,  
E-mail: forestin@bulnet.bg

### Abstract

MIHÁL, I., CÍČÁK, A., TSAKOV, H., PETKOV, P. 2009. Occurrence of species of the *Nectria* s.l. (Bionectriaceae, Nectriaceae, Hypocreales, Ascomycetes) in Central and South-eastern Europe. *Folia oecol.*, 36: 32–38.

Recent data on the occurrence of species of *Nectria* s.l. (Bionectriaceae, Nectriaceae, Hypocreales, Ascomycetes) in the Czech Republic, Poland, Slovakia, Hungary, Romania and Bulgaria (Central and South-eastern Europe) are presented, including some notes on their ecological characteristics. Eight species were found in the five countries outside Slovakia (*Cosmospora coccinea*, *C. purtonii*, *Nectria aurantiaca*, *N. cinnabarina*, *N. coryli*, *Neonectria coccinea*, *N. galligena*, *N. punicea*). Due to long-term investigations in a large number of localities, we found six additional species in Slovakia (*Cosmospora episphaeria*, *Hydropisphaeria peziza*, *Nectria berolinensis*, *N. cucurbitula*, *Neonectria ditissima*, *N. radicolica*). *Nectria aurantiaca* (one locality in Bulgaria), *N. coryli* (one locality in Slovakia and Bulgaria) and *Neonectria punicea* (three localities in Slovakia and one in Bulgaria) can be considered as rare. The records of these three species in Bulgaria can be regarded as the first ones for this country. The data were collected mainly in the course of a long-term study of the necrotic bark disease of beech (*Fagus sylvatica* L.) focused on Slovakia. The disease is apparently mainly caused by some species of *Neonectria* (*N. coccinea*, *N. ditissima*, *N. galligena*). It has spread in the last decades and often provokes epiphytias.

### Key words

Ascomycetes, Central Europe, fungi, *Nectria* s.l., Nectriaceae, South-eastern Europe

### Introduction

The genus *Nectria* s.l. belongs to the significant genera of ascomycetous fungi. Species of this genus occur mostly as saproparasites of herbs and wooden plants, in form of sexual stage (telemorpha) and asexual stage (anamorpha), for example genera *Cylindrocarpon* Wallenw., *Fusarium* Link., *Tubercularia* Tode or *Verticillium* Nees. The genus *Nectria* s.l. includes species that are significant vascular parasites of forest trees. In contrast to the original tracheomycotic fungi, for example those of the genus *Ophiostoma* Syd. et P. Syd., some species of the genus *Nectria* are considered to evoke secondary disease of tracheomycotic type, which is mani-

festated by creation of necrotic wounds on the tree barks (JANČAŘÍK, 2000).

Occurrence and distribution of the fungi of the families Bionectriaceae and Nectriaceae, but especially of the genus *Nectria* is in focus of many mycologists and phytopathologists in Central and South-eastern Europe. In the Czechia these families were studied, for example by ANTONÍN and VÁGNER (2001), JANČAŘÍK (2000), NOVOTNÝ (2003), in Poland MAŃKA (2005), ROZYCKI (1993), RYKOWSKI et al. (1989), in Slovakia by CÍČÁK and MIHÁL (2002), MIHÁL (2002), MIHÁL et al. (2007), in Hungary by MIHÁL and CÍČÁK (2005), STANDOVÁR and KEREKES (2003), in Romania by CHIRA and CHIRA (1997, 1998), CHIRA et al. (1996), MIHÁL and CÍČÁK (2007),

MIHALCIUC et al. (2001), in Bulgaria by CÍČÁK et al. (2006), ROSNEV and PETKOV (1996). Important for the control and possible elimination of dangerous effects of the fungi of the genus *Nectria* in forests stands is deeper knowledge of biology and ecology of these fungi.

It is to be stressed, that few data about the occurrence, distribution and ecological requirements of representatives of the genus *Nectria* in Central and South-eastern Europe are recorded. For this reason, when studying the necrotic disease of beech in Czech Republic, Poland, Slovakia, Hungary, Romania and

Bulgaria we focused on the evidence of the present occurrence of some species of the genus *Nectria* s.l. Their occurrence together with ecological characteristics and taxonomical notes are presented in this study.

## Material and methods

Occurrence of the fungi of different genera of the families Bionectriaceae and Nectriaceae was recorded in

Table 1. Basic characteristics of research localities in the individual countries

Country	Orographic unit	Locality	Date of research	Altitude [m asl]	Exposition	Beech composition [%] / Age of stand [years]
CZ	Moravsko-sliezské Beskydy	Šance	2. 4. 2001	650	SW	90.0 / 60
	Moravsko-sliezské Beskydy	Hukvaldy	3. 4. 2001	450	E	38.0 / 90
	Moravsko-sliezské Beskydy	Pustevny	3. 4. 2001	680	SE	74.0 / 115
PL	Beskid Sądecki	Kiczera	17. 4. 2007	695	W	80.0 / 60–70
	Beskid Nizki	Przełęcz Zebrak	18. 4. 2007	825	W	95.0 / 90–110
	Bieszczady	Połanki	19. 4. 2007	500	NE	30.0 / 60–80
	Bieszczady	Przysłop	19. 4. 2007	610	S	80.0 / 70
SK*	35 in total	77 in total	1990–2008	280–1,025	all	25–100 / 20–250
H	Börzöny	Diosjenő	17. 4. 2001	500	N	80.0 / 100
	Bükk	Öserdő	18. 4. 2001	800	SW	92.0 / 20–200
	Zempéni-Hegység	Telkibánya	18. 4. 2001	300	SE	50.0 / 65
RO	Munții Stânișoarei	Crucea	17. 10. 2006	690	SW	90.0 / 30–100
	Munții Bistriței	Holda	17. 10. 2006	655	NE	95.0 / 30–120
	Munții Bârgau	Piatra Fântânele	18. 10. 2006	1,017	E	98.0 / 80
	Munții Tibleș	Telciu	19. 10. 2006	420	E	90.0 / 70
BG	Vitosha	Dragalevski monastir	18. 4. 2005	1,080	NE	100 / 70–130
	Stara planina	Petrohan	20. 4. 2005	1,400	NE	100 / 100–110
	Stara planina	Barzia	20. 4. 2005	1,150	NW	100 / 100–120
	Stara planina	Etropole	21. 4. 2005	720	NE	99.0 / 120–130
	Stara planina	Ribaritsa	24. 4. 2006	1,100	NW	100 / 70
	Stara planina	Shipkovo	25. 4. 2006	650	NE	100 / 70
	Stara planina	Troyan	25. 4. 2006	480	N	100 / 80
	Stara planina	Balkanets	26. 4. 2006	1,250	N	100 / 100–120
	Stara planina	Shipka	28. 4. 2006	1,100	NE	90.0 / 65
	Stara planina	Kotel	24. 10. 2007	700	N	100 / 120
	Stara planina	Ticha	25. 10. 2007	750	SW	90.0 / 70
	Stara planina	Ichera	26. 10. 2007	700	NW	100 / 80
	Stara planina	Karandila	26. 10. 2007	1,000	SE	100 / 135
	Strandzha	Silkosia	25. 4. 2009	305	N	100 / 98

SK\*, nomenclature of the basic characteristics of Slovakia's localities is given by CÍČÁK and MIHÁL (2002) and MIHÁL (2002); CZ, Czech Republic; PL, Poland; SK, Slovakia; H, Hungaria; RO, Romania; BG, Bulgaria

countries mentioned above during evaluation of the degree of the necrotic disease in 2001, 2005–2009. In Slovakia this investigation was running longer, since 1990 until 2008. The basic characteristic of the study sites in individual countries are given in the Table 1.

The samples of fruiting bodies *in vivo* in the form of teleomorpha were collected from beech bark as well as from other woody trees and various substrates. In the laboratory the species were identified under the microscope. The identification keys by BREITENBACH and KRÄNZLIN (1986), BUTIN (1995), ČERVENKA (1971), ROSSMAN et al. (1999), SAMUELS and BLACKWELL (2001) were used. The species *Neonectria ditissima* and *Neonectria radiculicola* were identified by cultivation *in vitro* (*N. ditissima* – det. G. JUHÁSOVÁ, *N. radiculicola* – det. K. BUČINOVÁ). Samples of fruiting bodies were collected and identified by the authors of this study and they have been deposited in the form of exicates in the collection of the first author in the Institute of Forest Ecology of SAS in Zvolen (Slovakia).

Data on the distribution, validity of taxonomical names as well as ecotrophy (ie nutrition requirement to substrate) of the species of both families included in this study were taken from the works by ČERVENKA (1971), ROSSMAN et al. (1999), ŠKUBLA (2003) and from the CABI BIOSCIENCE (2008), as well as from the existing papers of the authors of this study (MIHÁL, 2002; MIHÁL et al., 2007). The nomenclature and taxonomical classification of the identified species mainly by ROSSMAN et al. (1999) as well as by CASTLEBURY et al. (2006), MANTIRI et al. (2001) and SAMUELS et al. (2006) were used.

## Results and discussion

During the investigation of the beech necrotic disease in the selected localities in individual Central and South-eastern countries the occurrence of several species of the families Bionectriaceae and Nectriaceae were recorded. Their survey in individual localities is given in the Table 2.

As shown in this table, in these countries, outside of Slovakia except, we recorded the occurrence of 8 species. Due to a long-term investigation in Slovakia, which was carried out in many localities, we recorded occurrence of further 6 species, which we have not found outside of Slovakia, viz. *Cosmospora episphaeria*, *Hydropisphaeria peziza*, *Nectria berolinensis*, *N. cucurbitula*, *Neonectria ditissima* and *N. radiculicola* (see Table 2). However, many of them may also occur in other Central and South-eastern European countries. For example, we have no doubts about the occurrence of the generally distributed species like *Nectria cucurbitula* or *Neonectria ditissima*. How-

ever, we have a few data on the occurrence of other target species in the adjacent countries.

The data on the occurrence of Bionectriaceae and Nectriaceae in the adjacent countries found in the available literature are given in the Table 3. When compared with the findings given in the Table 2, we see that also in these countries some species were recorded in the past, which in recent study we have found only in Slovakia (*Cosmospora episphaeria*, *Hydropisphaeria peziza*, *Neonectria ditissima* and *N. radiculicola*). Therefore the data from the Table 3 can be considered as complementary data to the species we recorded in those countries during our investigations. According to BREITENBACH and KRÄNZLIN (1986), among all species given in Tables 2 and 3 the species *Nectria coryli* and *Neonectria punicea* can be considered as rare. However, from the point of view *Cosmospora purtonii*, *Hydropisphaeria peziza* and *Nectria berolinensis* can be included in the group of rare fungi. For example, in Slovakia *Nectria coryli* was recorded in only one locality, *Neonectria punicea* in three localities, while *Hydropisphaeria peziza* in four localities (MIHÁL et al., 2007; MIHÁL, 2008 – unpubl.). In the adjacent countries the occurrence of these species is not known and in the literature (ANTONÍN and VÁGNER, 2001) we have found only one record of *Hydropisphaeria peziza* occurrence. For this reason, the rarer our data of *Cosmospora purtonii* occurrence in Hungary, whereas the *Nectria aurantiaca*, *N. coryli* and *Neonectria punicea* occurrence in Bulgaria can be considered as the first record for the Hungary and Bulgaria.

All species given in the Tables 2 and 3 can be classified, according to the newest taxonomical concepts (ROSSMAN et al., 1999), into 2 families and 4 genera:

- o Bionectriaceae Samuels et Rossman *fam. nov.* (genus: *Hydropisphaeria* Dumort.)
- o Nectriaceae Tul et C. Tul. (genera: *Cosmospora* Rabenh., *Nectria* (Fr.) Fr., *Neonectria* Wollenw.).

According to the most recent literature, the fungi of the families Bionectriaceae and Nectriaceae have a relatively stabilized taxonomical status. Similarly as the other macromycetes, also these species were subjected to different taxonomical nomenclature in the past. According to ROSSMAN et al. (1999), more than 200 species related to the genus *Nectria* have been described up to day. Among the complex works presenting the newest knowledge on the biology and taxonomy of the genus *Nectria* s.l. and other related genera, the works of BRAYFORD et al. (2004), CASTLEBURY et al. (2006), MANTIRI et al. (2001), ROSSMAN et al. (1999), SAMUELS (1976), SAMUELS and BLACKWELL (2001) and SAMUELS et al. (2006) should be mentioned. The overview of the current taxonomical validity of the nomenclature within the genus *Nectria*

s.l., in the sexual stage (teleomorpha) as well as the asexual stage (anamorpha) is presented in the Table 4. However, the anamorphic developmental stages of several species of the genus *Nectria* and related genera have not been identified with certainty. They are also an objective of different studies (for example BRAY-

FORD et al., 2004; ROSSMAN et al., 1999). Absence of the described anamorphs of some species of *Nectria* s.l., especially in older literatures is understandable because of the demanding field and laboratory studies of the asexual developmental stage of the fungi of the genus *Nectria*.

Table 2. Findings of species of Bionectriaceae and Nectriaceae in selected localities in individual countries of Central and South-eastern Europe

Country	Locality	<i>C. coc.</i>	<i>C. pur.</i>	<i>N. aur.</i>	<i>N. cin.</i>	<i>N. cor.</i>	<i>Neo. pun.</i>	<i>Neo. coc.</i>	<i>Neo. gal.</i>
CZ	Šance							*	
	Hukvaldy							*	
	Pustevny				*				
PL	Kiczera								*
	Przełecz Zebrak	*							
	Połanki								*
	Przysłop								*
SK*	77	6	4	0	36	1	3	29	39
H	Diosjenő		*					*	
	Öserdő	*			*				*
	Telkibánya								*
RO	Crucea				*				
	Holda							*	*
	Piatra Fântânele				*			*	
	Telciu								*
BG	Dragalevski monastir	*							
	Petrohan	*							*
	Barzia								*
	Etropole							*	
	Ribaritsa								*
	Shipkovo							*	
	Troyan							*	
	Balkanets	*							*
	Shipka	*							
	Kotel						*		*
	Ticha							*	
	Ichera								*
	Karandila							*	*
	Silkosia			*					
Total	102	12	5	1	40	2	4	39	52

*C. coc.*, *Cosmospora coccinea* Rabenh.; *C. pur.*, *Cosmospora purtonii* (Grev.) Rossman & Samuels; *N. aur.*, *Nectria aurantiaca* (Tul. et C. Tul.) Jacz.; *N. cin.*, *Nectria cinnabarina* (Tode: Fr.) Fr.; *N. cor.*, *Nectria coryli* Fuckel; *Neo. pun.*, *Neonectria punicea* (Kuntze et J.C. Schmidt) Fr.; *Neo. coc.*, *Neonectria coccinea* (Pers.: Fr.) Rossman & Samuels; *Neo. gal.*, *Neonectria galligena* (Bres.) Rossman & Samuels

SK\*: We found altogether 13 species of Bionectriaceae and Nectriaceae on 77 localities in Slovakia. Besides listed species (see Table 2) have been determined further six species in Slovakia: *Cosmospora episphaeria* (Tode: Fr.) Rossman et Samuels (on 19 localities), *Hydropisphaeria peziza* (Tode: Fr.) Dumort. (on four ones), *Nectria berlinensis* (Sacc.) Cooke (two ones), *Nectria cucurbitula* (Tode: Fr.) Fr. (four ones), *Neonectria ditissima* Tul. et C. Tul. (three ones) and *Neonectria radiculicola* Gerlach & L. Nilsson (on one locality).

Table 3. Occurrence of species of Bionectriaceae and Nectriaceae in the individual countries of Central and South-eastern Europe by selected literature sources

Country	Literature source	Species
CZ	ANTONÍN and VÁGNER (2001)	<i>Cosmospora episphaeria</i> , <i>Hydropisphaeria peziza</i>
	JANČAŘÍK (2000)	<i>Neonectria ditissima</i> , <i>Neonectria coccinea</i> , <i>Neonectria galligena</i>
	NOVOTNÝ (2003)	<i>Neonectria radicolica</i>
PL	MAŃKA (2005)	<i>Neonectria ditissima</i> , <i>Neonectria coccinea</i> , <i>Neonectria galligena</i>
	ROZYCKI (1993)	<i>Neonectria radicolica</i>
	RYKOWSKI et al. (1989)	<i>Neonectria coccinea</i>
H	MIHÁL and CÍČÁK (2005)	<i>Cosmospora coccinea</i> , <i>Cosmospora purtonii</i> , <i>Nectria cinnabarina</i> , <i>Neonectria coccinea</i> , <i>Neonectria galligena</i>
	STANDOVÁR and KEREKES (2003)	<i>Neonectria ditissima</i> , <i>Neonectria galligena</i>
RO	CHIRA and CHIRA (1997)	<i>Neonectria ditissima</i>
	CHIRA and CHIRA (1998)	<i>Nectria cinnabarina</i> , <i>Neonectria ditissima</i> , <i>Neonectria coccinea</i>
	CHIRA et al. (1996)	<i>Neonectria ditissima</i> , <i>Neonectria galligena</i>
	MIHALCIUC et al. (2001)	<i>Nectria cinnabarina</i> , <i>Neonectria ditissima</i> , <i>Neonectria coccinea</i>
BG	CÍČÁK et al. (2006)	<i>Cosmospora coccinea</i> , <i>Neonectria coccinea</i> , <i>Neonectria galligena</i>
	ROSNEV and PETKOV (1996)	<i>Neonectria ditissima</i> , <i>Neonectria coccinea</i>

Table 4. Current status of taxonomy of species of the family Bionectriaceae and Nectriaceae according to selected literature sources

Teleomorpha (ROSSMAN et al., 1999)	Teleomorpha CABI BIOSCIENCE, 2008)	Anamorpha (ROSSMAN et al., 1999)
<i>Cosmospora coccinea</i>	<i>Cosmospora coccinea</i>	<i>Verticillium olivaceum</i> W. Gams
<i>Cosmospora episphaeria</i>	<i>Nectria episphaeria</i>	<i>Fusarium aquaeductum</i> var. <i>medium</i> (Radlk. et Rabenh.) Lagerh.
<i>Cosmospora purtonii</i>	<i>Cosmospora purtonii</i>	<i>Fusarium aquaeductum</i> var. <i>aquaeductum</i> (Radlk. et Rabenh.) Lagerh.
<i>Neonectria radicolica</i> <sup>1)</sup>	<i>Neonectria radicolica</i>	<i>Cylindrocarpon destructans</i> (Zins.) Scholten <sup>2)</sup>
<i>Hydropisphaeria peziza</i>	<i>Nectria peziza</i>	<i>Acremonium</i> sp. <sup>3)</sup>
<i>Nectria aurantiaca</i>	<i>Nectria aurantiaca</i>	<i>Tubercularia aurantiaca</i> (Babington) Seifert
<i>Nectria berolinensis</i>	<i>Thyronectria berolinensis</i>	<i>Tubercularia berolinensis</i> (Wollenw.) Rossman
<i>Nectria cinnabarina</i>	<i>Nectria cinnabarina</i>	<i>Tubercularia vulgaris</i> (Tode: Fr.) Fr.
<i>Nectria coryli</i>	<i>Nectria coryli</i>	<i>Tubercularia</i> sp.???
<i>Nectria cucurbitula</i>	<i>Neonectria fuckeliana</i>	<i>Zythiostroma pinastri</i> (P. Karst.) Höhn. ex Weese
<i>Neonectria ditissima</i> <sup>4)</sup>	<i>Neonectria ditissima</i>	<i>Cylindrocarpon willkommii</i> (Lindau) Wollenw. <sup>2)</sup>
<i>Neonectria punicea</i> <sup>5)</sup>	<i>Neonectria punicea</i>	<i>Cylindrocarpon album</i> (Sacc.) Wollenw. <sup>6)</sup>
<i>Neonectria coccinea</i>	<i>Nectria coccinea</i>	<i>Cylindrocarpon candidum</i> (Link) Wollenw.
<i>Neonectria galligena</i>	<i>Neonectria galligena</i>	<i>Cylindrocarpon heteronema</i> (Berk. et Broome) Wollenw.

<sup>1)</sup>Nomenclature of species and literature source by MANTIRI et al. (2001); <sup>2)</sup>nomenclature of species and literature source by BUTIN (1995); <sup>3)</sup>nomenclature of species and literature source by SAMUELS (1976); <sup>4)</sup>nomenclature of species and literature source by SAMUELS et al. (2006); <sup>5)</sup>nomenclature of species and literature source by CASTLEBURY et al. (2006); <sup>6)</sup>nomenclature of species and literature source by DEUTSCHE SAMMLUNG VON MIKROORGANISMEN UND ZELLKULTUREN (2001)

The species of both families grow as saprophytes or parasites on forest trees. More species are able to occupy substrate of both broadleaved and coniferous trees. The species *Nectria aurantiaca*, *N. cinnabarina*, *N. coryli*, *Neonectria punicea*, *N. galligena* and *N. coccinea* are typical for broadleaved trees, especially for beeches. However, they can be also found on untypical substrates. For example, in some cases in Slovakia we found *Nectria cinnabarina* on the wood of oaks, Norway spruces, firs or even vine (MIHÁL et al., 2007). In our collections we have also species that grow as saproparasites on old fruiting bodies of the pyrenomycetic fungi (Pyrenomycetales, Ascomycetes) or on the fruiting bodies of polyporous tinder fungi (Polyporales, Basidiomycetes). The species of *Cosmospora coccinea*, *C. episphaeria* and *C. purtonii* also belong to such species. On the other hand, the species *Nectria cucurbitula* is typical for coniferous trees and *Nectria berolinensis* occurs on bark of the *Ribes* sp.

### Acknowledgement

The authors thank to G. Juhásová and K. Bučinová for their help by determination of *Neonectria ditissima* and *Neonectria radicolica*. Supported by the Grant Agency VEGA of the Ministry of Education, Slovak Republic (No. 2/7004/27) and by the joint Project of the Institute of Forest Ecology of Slovak Academy of Sciences, Zvolen (Slovak Republic) and Forest Research Institute of the Bulgarian Academy of Sciences, Sofia (Bulgaria): *The Structure, Health Status and Soil Conditions of Beech Forest Ecosystems in South-eastern and Central Europe*.

### References

- ANTONÍN, V., VÁGNER, A. 2001. *Makromycety* [Macromycetes]. In ANTONÍN, V. (ed.). *Houby, lišejníky a mechy Národního parku Podyjí* [Fungi, Lichens and Mosses of the Podyjí National Park]. Brno: Masarykova Univerzita, Czech Republic, p. 9–96.
- BRAYFORD, D., HONDA, B.M., MANTIRI, F.R., SAMUELS, G.J. 2004. *Neonectria* and *Cylindrocarpon*: the *Nectria mammoidea* group and species lacking microconidia. *Mycologia*, 96: 572–597.
- BREITENBACH, J., KRÄNZLIN, F. 1986. *Fungi of Switzerland. Vol. 1. Ascomycetes*. Luzern: Verlag Mykologia. 412 p.
- BUTIN, H. 1995. *Tree diseases and disorders. Causes, biology and control in forest and amenity trees*. Oxford: University Press, Great Britain. 252 p.
- CASTLEBURY, L.A., ROSSMAN, A.Y., HYTEN, A.S. 2006. Phylogenetic relationships of *Neonectria/Cylindrocarpon* on *Fagus* in North America. *Can. J. Bot.*, 84: 1417–1433.
- CHIRA, D., CHIRA, F. 1997. Beech canker spreading in Romania. In KNÍŽEK, M. (ed.). *Workshop on forest insect and disease survey Písek, Czech Republic, April 7–10, 1997: proceedings*. Jiloviště-Strnady: Forestry and Game Management Research Institute, p. 46–53.
- CHIRA, D., CHIRA, F. 1998. Beech problems in Romania. In *Disease/Environment interactions in forest decline. Proceedings of a workshop at the IUFRO Working Party 7.02.06 Vienna, Austria, March 16–21, 1998*. p. 23–28.
- CHIRA, F., CHIRA, D., NEMTEANU, P., VLADUTI, S. 1996. Beech canker (*Nectria* sp.) – a disease which continues to spreading. *Revta Silv.*, 1: 25–29.
- CICÁK, A., MIHÁL, I. 2002. State of necrotic disease of beech stands in Slovakia. *Mikol. i Fitopat.*, 36: 93–105.
- CICÁK, A., MIHÁL, I., TSAKOV, H., PETKOV, P. 2006. Actual status of the beech bark necrotic disease in the North-Western Bulgaria. *J. Forest Sci.*, 52: 226–233.
- ČERVENKA, M. [ed.], 1972. *Kľúč na určovanie výtrusných rastlín. 2. diel. Slizovky a huby* [Key to determination of sporulating plants. Pt. 2. Myxomycetes and Fungi]. Bratislava: SPN. 392 p.
- CABI BIOSCIENCE, CBS, LANDCARE RESEARCH 2008. *Index Fungorum Database* [online]. [cit. 2008-11-19]. <http://www.speciesfungorum.org/Names/Names.asp>
- DEUTSCHE SAMMLUNG VON MIKROORGANISMEN UND ZELLKULTUREN 2001. DSM No. 62810. In *Catalogue of strains 2001: archaea, bacteria, filamentous fungi, yeasts, plasmids, phages / DSMZ – Deutsche Sammlung von Mikroorganismen und Zellkulturen* Braunschweig: DSMZ, 2001. Available also at: <http://www.dsmz.de/microorganisms/html/strains/strain.dsm062810.html>
- JANČARIK, V. 2000. *Korní nekrozy buku* [Beech bark necrosis]. *Lesn. Práce*, 79: 314–316.
- MANTRINI, F.R., SAMUELS, G.J., RAHE, J.B., HONDA, B.M. 2001. Phylogenetic relationships in *Neonectria* species having *Cylindrocarpon* anamorphs inferred from mitochondrial ribosomal DNA sequences. *Can. J. Bot.*, 79: 334–340.
- MAŇKA, K. 2005. *Fitopatológia Lešna* [Forest phytopathology]. Warszawa: PWRiL. 368 p.
- MIHÁL, I. 2002. A contribution to distribution and ecology of fungi of the genus *Nectria* in Slovakia. *Ekológia (Bratislava)*, 21, Suppl. 2: 62–70.
- MIHÁL, I., CICÁK, A. 2005. State of beech bark necrotic disease in northern Hungary. *Lesn. Čas. – For. J.*, 52: 55–60.
- MIHÁL, I., CICÁK, A. 2007. A report of beech bark necrotic disease in northern Romania. *Proc. Rom. Acad., Ser. B*, 9: 95–98.

- MIHÁL, I., CÍČÁK, A., BUČINOVÁ, K. 2007. Distribution, ecology and taxonomical notes to species of genera *Hypomyces* and *Nectria* (Hypocreales) in Slovakia. *Mikol. i Fitopat.*, 41: 242–251.
- MIHALCIUC, V., CHIRA, D., CHIRA, F., DANCI, A. 2001. Monitoring of forest insect and disease in Romania. In KNÍŽEK, M. (eds). *Methodology of Forest Insect and Disease Survey in Central Europe. Proceedings of the IUFRO WP 7.03.10 workshop, September 24–28, Bușteni, Romania*. Prague: Institute of agricultural and food information, p. 86–91.
- NOVOTNÝ, D. 2003. A comparison of two methods for the study of microscopic fungi associated with oak roots. *Czech Mycol.*, 55: 73–82.
- ROSNEV, B., PETKOV, P. 1996. Condition of the *Fagus sylvatica* stands in Central and Eastern part of Stara planina Mountains. In *Study, Conservation and Utilisation of Forest Resources. Proceedings, Vol. II., Sofia, Bulgaria*. p. 156–160.
- ROSSMAN, A.Y., SAMUELS, G.J., ROGERSON, C.T., LOWEN, R. 1999. *Genera of Bionectriaceae, Hypocreaceae and Nectriaceae (Hypocreales, Ascomycetes)*. Studies of Mycology, 42. Baarn Delft, The Netherlands: Centraalbureau voor Schimmelcultures. 248 p.
- ROZYCKI, H. 1993. Effect of heavy metals (Pb, Zn, Cu, Cd) on mycelial growth of *Cylindrocarpum destructans* (Zinssm.) Scholt. *Zbl. Mykol.*, 148: 265–275.
- RYKOWSKI, K., OSZAKO, T., SIEROTA, Z. 1989. Zagrożenie buka v Bieszczadach [Dieback of beech in Bieszczady]. *Las pol.*, 15: 5–8.
- SAMUELS, G.J. 1976. *A revision of the fungi formerly classified as Nectria subgenus Hyphonectria*. Memoirs of the New York Botanical Garden, U.S.A., 26. New York: New York Botanical Garden. 126 p.
- SAMUELS, G.J., BLACKWELL, M. 2001. Pyrenomycetes – Fungi with Perithecia. In McLAUGHLIN, McLAUGHLIN, LEMKE (eds). *Systematics and Evolution, The Mycota VII Part A*. Heidelberg, Berlin: Springer-Verlag, Germany, p. 221–255.
- SAMUELS, G.J., ROSSMAN, A.Y., CHAVERRI, P., OVERTON, B.E., PÖLDMAA, K. 2006. *Hypocreales of the Southeastern United States: An Identification Guide*. CBS Biodiversity Series, No. 4. Utrecht: Centraalbureau voor Schimmelcultures. 145 p.
- STANDOVÁR, T., KENDERES, K. 2003. A review on natural stands dynamics in beechwoods of East-Central Europe. *Appl. Ecol. and Envir. Res.*, 1: 13–46.
- ŠKUBLA, P. 2003. *Mycoflora Slovaca. Number of the Copy 19*. Bratislava: Mycelium Edition. 1103 p.

## Výskyt húb rodu *Nectria* s.l. (Bionectriaceae, Nectriaceae, Hypocreales, Ascomycetes) v strednej a juhovýchodnej Európe

### Súhrn

Autori uvádzajú aktuálne údaje o výskyte húb rodu *Nectria* s.l. (Bionectriaceae, Nectriaceae, Hypocreales, Ascomycetes) v Českej republike, Poľsku, Slovensku, Maďarsku, Rumunsku a Bulharsku, ako aj niektoré ekologické a taxonomické poznámky k determinovaným druhom. Mimo územia Slovenska bolo zistených osem druhov (*Cosmospora coccinea*, *C. purtonii*, *Nectria aurantiaca*, *N. cinnabarina*, *N. coryli*, *Neonectria coccinea*, *N. galligena*, *N. punicea*). Vďaka dlhotrvajúcemu výskumu na veľkom počte lokalít na Slovensku, autori zistili výskyt ďalších šiestich druhov (*Cosmospora episphaeria*, *Hydropisphaeria peziza*, *Nectria berolinensis*, *N. cucurbitula*, *Neonectria ditissima*, *N. radicola*). Ako vzácne huby boli zistené druhy *Nectria aurantiaca* (na jednej lokalite v Bulharsku), *N. coryli* (na jednej lokalite na Slovensku a v Bulharsku) a *Neonectria punicea* (tri lokality na Slovensku a jedna v Bulharsku). Všetky tri uvedené druhy boli ako prvonálezy zistené takisto aj v Bulharsku. Údaje autorov o výskyte druhov rodu *Nectria* s.l. v krajinách strednej a juhovýchodnej Európy pochádzajú najmä z nálezov týchto húb na kôre bukov (*Fagus sylvatica* L.), pričom niektoré druhy spôsobujú epifyticiu nekrotického ochorenia kôry buka (napr. druhy *Neonectria coccinea*, *N. ditissima* a *N. galligena*).

Received November 19, 2008

Accepted March 12, 2009