Thaiszia - J. Bot., Košice, 25 (2): 121-142, 2015
http://www.bz.upjs.sk/thaiszia

THAISZIA
JOURNAL OF
BOTANY

Enhancing knowledge of mycoflora (Myxomycota, Zygomycota, Ascomycota, Basidiomycota) in oak-hornbeam forests in the vicinity of the magnesite plants at Lubeník and Jelšava (central Slovakia)

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Mihál I., Blanár D. & Glejdura S. (2015): Enhancing knowledge of mycoflora (Myxomycota, Zygomycota, Ascomycota, Basidiomycota) in oak-hornbeam forests in the vicinity of the magnesite plants at Lubeník and Jelšava (central Slovakia). – Thaiszia – J. Bot. 25 (2): 121-142. – ISSN 1210-0420.

Abstract: The authors present the mycocoenological characteristics of selected localities situated near magnesite plants in Central Slovakia. 24 researched plots were situated in the Slovenské rudohorie Mts (Revúcka vrchovina highland) in 4 degradation stages: A – pollution crust slope with almost no vegetation, B – deforested slopes with grassland vegetation, C – thinned forest cover, D – normal forest cover. The total of 212 macromycetous species as well as 3 slime molds were determined in the individual degradation stages. The species *Agyrium rufum*, *Ceratosphaeria lampadophora*, *Encoelia glaberrima*, *Massaria inquinans*, *Melanomma pulvis-pyrius*, *Nectria decora*, *Patellaria atrata*, *Steccherinum laeticolor* and *Tympanis corylina* are presented as the first findings for Slovakia. The species *Coprotus winteri*, *Entomophthora coleopterorum*, *Sistotremastrum niveocremeum* and *Tomentella sublilacina* are presented as the second finding for Slovakia. Within Slovakia, the findings of the species *Claussenomyces olivaceus*, *Laeticorticium roseum*, *Phanerochaete sordida*, *Sistrotremastrum suecicum*, *Tomentella fibrosa* and *Trechispora farinacea* are very interesting and rare. Due to the abundance of dead wood at the researched localities, the majority of the 117 species determined here belong to the group of lignicolous saprophytes. Only 30 mycorrhizal symbionts have been documented due to adverse conditions, (low precipitation, dry soil horizons), and strong imissions impact; (e.g. no mycorrhizal symbionts in the degradation stage A, one symbiont in B, 13 symbionts in C and 23 symbionts in the degradation stage D). The value of ectomycorrhizal potential was upgraded for all stages (A: 0.0, B: 0.08, C: 0.45, D: 0.56). In general, the increase of the species spectrum of all fungi has been observed throughout all stages (14 species in stage A, 33 species in stage B, 107 species in stage C and 149 species in stage D). Moreover, the increasing number of Ascomycotina species has been observed from the stage A to D (3 species in stage A, 25 species in stage C and 23 in stage D).

Keywords: Lubenícky kras karst, magnesite imissions, mycoflora, oak-hornbeam forests, Slovenské rudohorie Mts, West Carpathians.

Introduction

One of the most up to date topical issues in forest protection is the problem of industrial imissions and their impact on the state of forest health. In terms of damage caused by imissions we record the greatest damage to forests in those areas with increased imissions concentration. A typical example of this is the surroundings of the magnesite plants at Lubeník and Jelšava that produce emissions as a result of magnesite processing. This is a case of so called magnesite (alkaline) type of imission pollution, that, unlike for example fluor (acidic) type of imission pollution in Žiarska kotlina basin, is local but has a significant negative impact on countryside and its ecology.

It is a known fact, that fungi are suitable monitoring objects, particularly in imission areas, thanks to their ability to cumulate various substances from the surroundings and react fast to the imission pollution of the surroundings. This issue was the subject of several studies, for example STIJVE et al. (1990) watched changes in arsenic concentration in the fruiting bodies of fungi; GORDIENKO & GORLENKO (1987) and JUPINA (1987) studied the impact of imissions on the species diversity of parasitic fungi.

In the past, several authors researched biota in the surroundings of the magnesite plants SMZ, a. s. Jelšava and SLOVMAG, a. s. Lubeník. For example CICÁK et al. (1999), MIHÁL (1996), MIHÁL & BLANÁR (2007), VANÍK et al. (1997) researched mycoflora in the surroundings of these plants. PIŠÚT (1978) and PIŠÚT & PIŠÚT (2006) carried out a research of lichens in this area. BLANÁR & MIHÁL (2002) and CICÁK & MIHÁL (1999) assessed the health state of trees and mycoflora in the wider surroundings of Lubeník and Jelšava. In the comprehensive study, (HOLOBRADÝ et al. 1994), several authors dealt with the overall assessment of the state of imission pollution in the Jelšava – Lubeník region, with the impact of the pollution on forest environment and with the proposal of remedial and corrective measures. The impact of imission pollution on beech forests near Lubeník was researched by CICÁK at al. (2011). Changes in the biota of soil microorganisms near the magnesite plant at Lubeník were researched by KAUTZ et al. (2001). TUČEKOVÁ et al. (1995) and TUŽINSKÝ & TÓTHOVÁ (1995) researched the issue of imission pollution and artificial regeneration of forest in the Jelšava and Lubeník region.

In this study, we present the species spectrum of slime molds and macromycetes (Myxomycota, Zygomycota, Ascomycota and Basidiomycota) found during the mycofloristic research in the years 2011 to 2014 in various stages of degradation in the oak-hornbeam forests near the magnesite plants SLOVMAG, a. s. Lubeník and SMZ, a. s. Jelšava. Forest degradation due to magnesite dust fall in the researched area was happening from 1960s to 1980s, a period of the highest intensity of emissions release from the plants mentioned above. At present, the values of dust fall are below the set limits.

The aim of this study is to supplement the mycofloristic list of fungi from the area, resp. from the valley of Muránka (cf. BLANÁR & MIHÁL 2002, CICÁK et al. 1999, MIHÁL 1996, MIHÁL & BLANÁR 2007), known to date, and to point out the occurrence of some rare and otherwise interesting species of macromycetes in connection with imission pollution of forests in the area. At the same time, we provide information about species diversity of macromycetes in oak/hornbeam forests of Lubeník kras karst.

Methods and materials

The researched area with degradation stages of oak-hornbeam forests (alliance *Carpinion betuli* Issler 1931) is situated in central Gemer, in the valley of the Muránka river near the village of Lubeník (Figs. 1 and 2). Geomorphologically, the area is situated in Slovenské rudohorie Mts, Revúcka vrchovina highland (MAZÚR & LUKNIŠ 1980). The area where we have set up our research plots is built up of crystalline carbon limestones and metamorphosed sandstones and sandstones with schists positions (BAJANÍK et al. 1984). The research area built of crystalline carbon limestones is part of a small scale karst area called Lubeník kras karst. Prevailing winds are the north-west winds, i.e. down the Muránska dolina valley (KALETA 1975). Average annual temperature is 8.0 ℃ (14.8 ℃ in vegetation period). Average annu al precipitation is 700 mm and 400 mm in vegetation period (HOLOBRADÝ et al. 1994).

The research of mycoflora was carried out on 24 partial research plots in 4 stages of oak-hornbeam forests degradation (stage A – imission slope with soil crust, almost no vegetation; B – slope with no trees, grass vegetation only; C – sparse crown closure/thin forest cover; D – full crown cover/normal forest). Degradation of the environment in the stage A has taken place due to dust fall from the magnesite plant SLOVMAG, a. s. Lubeník (emission source No. 1 – EZ_1). Stages B, C and D were affected also by imissions from the plant SMZ, a. s. Jelšava (emission source No. 2 – EZ_2). We defined the degradation stages with emphasis on the similarity of site conditions (that is exposure and slope, geological bedrock, formerly uniform type of the forest phytocenosis). We have set up 6 research plots sized 10 × 10 m for each stage of degradation. The description of degradation stages is presented in Tab. 1. The structure of individual stages of forest degradation corresponds with imission zones – A, A/B, B/C and C/D. General description of the imission pollution threat zones in the research area (A, B, C and D) is presented in the study by GRÉK et al. (1991).

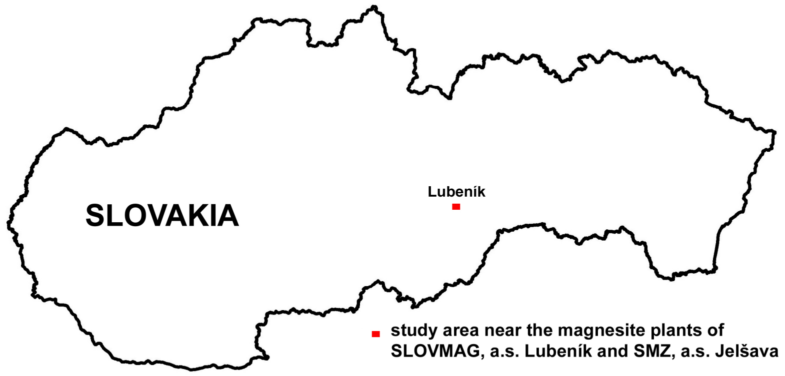

Fig. 1. The map of Slovakia with the position of study area (author: D. Blanár)

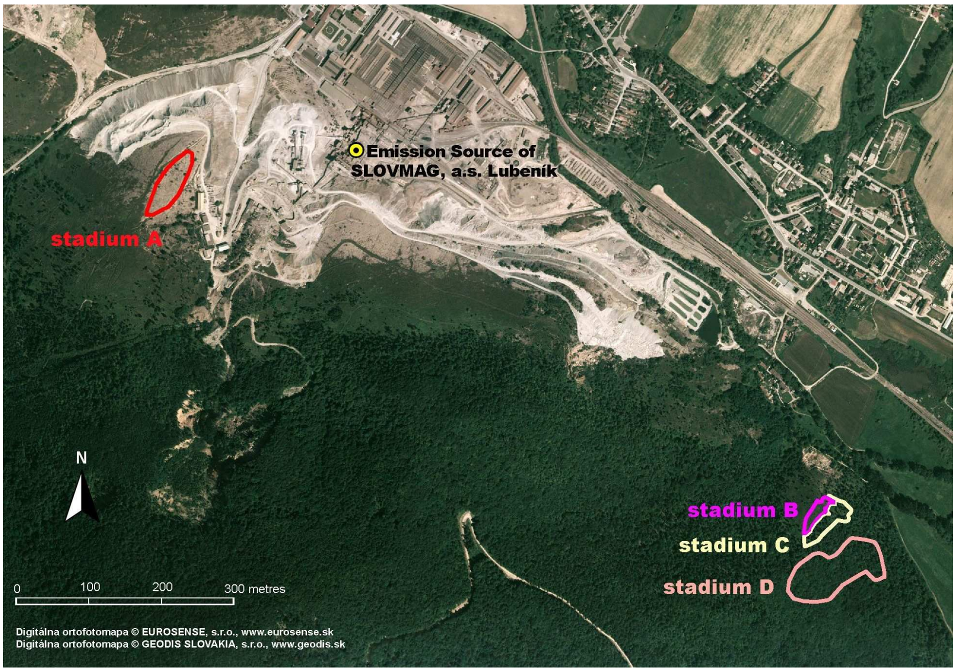

Fig. 2. The orthomap with degradated stages – A, B, C and D of oak-hornbeam forests in the study area near the town of Lubeník (modified by: D. Blanár)

Tab. 1. Characteristics of investigated area of the magnesite plant surroundings

Degradation stages	**A**	**B**	**C**	**D**
Immission zone	A	A/B	B/C	C/D
Code of DFS	7387a	7387c	7387c	7387c
Altitude (m a.s.l.)	360–382	355–361	330–359	318–357
Distance from EZ_1 (m)	470–573	1,596–1,612	1,630–1,661	1,707–1,774
Distance from EZ_2 (m)	3,573–3,617	1,635–1,666	1,577–1,650	1,521–1,636
Aspect	SEE	E	SEE-E	SEE-E
Geological substrate	converted sandstones with schists positions	crystalline carbon limestones	crystalline carbon limestones	crystalline carbon limestones
Soil type	anthropogenic sediments	rendzina	rendzina	rendzina
pH of soil	8.0–9.4	6.5–7.2	6.7–7.3	6.4–7.2
Group of forest types	-	-	*Fageto-Quercetum*	*Fageto-Quercetum*
Cover of tree layer (%)	0	0 –(1)	65–95	(70)85–90
Cover of shrub layer (%)	0–(8)	0	(0)1(15)	0–10
Cover of herb layer (%)	1–25	80–95	55–80	1–55
Characteristic species in tree layer	-	-	*Carpinus betulus*, *Quercus robur*	*Carpinus betulus*, *Quercus robur* + *Q. petraea* s.l.
Characteristic species in herb layer	*Agrostis stolonifera*, *Puccinellia distans*	*Calamagrostis epigejos*, *Poa angustifolia*, *Cirsium arvense*	*Calamagrostis epigejos*, *Melica nutans*, *Convallaria majalis*	*Melica nutans*, *Brachypodium sylvaticum*, *Viola reichenbachiana*

DFS – central European mapping grid quadrant, EZ_1 – emmission source No. 1 (SLOVMAG, a.s. Lubeník), EZ_2 – emmissiom source No. 2 (SMZ, a.s. Jelšava)

The following phytosociological relevé show the vegetation composition in various immission degradation stages of oak-hornbeam forests:

Relevé No. 1: Lubeník; SWW of the town, SWW of SWW of SLOVMAG a.s. Lubeník; unforested slope (with magnesite crust); 20.17197° E – 48.65390° N; 382 m a. s. l.; aspect: SEE (120°); slope: 20°; are a of record: 10 × 10 m; grassland sparse vegetation – community with *Agrostis stolonifera* and *Puccinellia distans*; 12. 8. 2014 D. Blanár [original relevé DB-46/2014; plot A_1].

Cover $\mathbf{E_T}$: 30%, $\mathbf{E_1}$: 25%, $\mathbf{E_0}$: 10%; h_{E1} = 20–25/60 cm

$\mathbf{E_1}$**:** *Agrostis stolonifera* 2b, *Puccinellia distans* +, *Lactuca saligna* +

$\mathbf{E_0}$**:** *Bryum caespiticium* 1, *Desmatodon cernuus* +, *Didymodon tophaceus* 1, *Funaria hygrometrica* +, *Nostoc* sp. +, *Schizothrix* sp. +.

Relevé No. 2: Lubeník; SSE of the town, Marvan; the slope above of the quarry – unforested part of the slope; 20.197181° E – 48.647 190° N; 360 m a. s. l.; aspect: SEE (115°); slope: 12°; area of record: 10 × 10 m; grassland vegetation with *Calamagrostis epigejos*; 3. 6. 2012 D. Blanár [original relevé DB-32/2014; plot B_3].

Cover **E$_T$**: 95%, E$_1$: 95%, **E$_0$**: 1%; h$_{E1}$ = 50–60 cm

E$_1$: *Calamagrostis epigejos* 5, *Carex muricata* agg. 2a, *Poa angustifolia* 2a, *Cirsium arvense* 1, *Melica nutans* 1, *Phragmites australis* 1, *Achillea millefolium* +, *Alopecurus pratensis* +, *Astragalus glycyphyllos* +, *Atriplex patula* +, *Elytrigia repens* +, *Fallopia convolvulus* +, *Glechoma hirsuta* +, *Lavatera thuringiaca* +, *Silene latifolia* subsp. *alba* +, *Vicia cracca* +, *V. tetrasperma* +, *Viola mirabilis* +, *Acer campestre* r, *Cerasus avium* r, *Silene inflata* r, *Taraxacum* sect. *Ruderalia*

E$_0$: *Amblystegium serpens* +, *Brachythecium velutinum* +, *Bryum caespiticium* +.

Relevé No. 3: Lubeník; SSE of the town, Marvan; the slope above of the quarry; 20.197942°E – 48.647426°N; 341 m a. s. l.; aspect : NEE (70°); slope: 35°; area of record: 10 × 10 m; 3. 6. 2012 D. Blanár [original relevé DB-19/2012; plot C$_4$].

Cover **E$_T$**: 95%, **E$_3$**: 65%, **E$_2$**: 1%; **E$_1$**: 80%, **E$_0$**: 1%; h$_{E1}$ = 30/50–70 cm

E$_3$: *Carpinus betulus* 3, *Quercus robur* 2b

E$_2$: *Carpinus betulus* +, *Tilia platyphallos* +

E$_1$: *Convallaria majalis* 3, *Calamagrostis epigejos* 2a, *Carex muricata* agg. 1, *Festuca pratensis* 1, *Phragmites australis* 1, *Poa angustifolia* 1, *Agrostis stolonifera* +, *Astragalus glycyphyllos* +, *Atriplex patula* +, *Carpinus betulus* +, *Cerasus avium* +, *Cirsium arvense* +, *Fagus sylvatica* +, *Fallopia convolvulus* +, *Pastinaca sativa* +, *Picris hieracioides* r, *Quercus robur* +, *Rubus idaeus* +, *Sambucus nigra* +, *Securigera varia* +, *Silene inflata* +, *Poa humilis* +, *Solanum dulcamara* +, *Solidago canadense* +, *Sorbus aria* +, *Taraxacum* sect. *Ruderalia* +, *Chelidonius majus* r, *Lactuca saligna* r, *L. serriola* r, *Silene latifolia* subsp. *alba* r, *Tragopogon orientalis* r

E$_0$: *Amblystegium serpens* +, *Didymodon tophaceus* +.

Relevé No. 4: Lubeník; SSE of the town, Marvan; the slope above of the quarry; 20.197933°E – 48.645757°N; 346 m a. s. l.; aspect : SEE (105°); slope: 15°; area of record: 10 × 10 m; 3. 6. 2012 D. Blanár [original relevé DB-27/2012; plot D$_3$].

Cover **E$_T$**: 90%, **E$_3$**: 90%, **E$_2$**: 0%; **E$_1$**: 7%, **E$_0$**: 0%; h$_{E1}$ = 20–30/50 cm

E$_3$: *Carpinus betulus 4, Quercus robur* 2b, *Betula pendula* +

E$_1$: *Carpinus betulus* 1, *Polygonatum multiflorum* 1, *Acer campestre* +, *A. platanoides* +, *Brachypodium sylvaticum* +, *Carex digitata* +, *Deschampsia caespitosa* +, *Fagus sylvatica* +, *Maianthemum bifolium* +, *Melica nutans* +, *Quercus robur* +, *Sambucus nigra* +, *Solanum dulcamara* +, *Taraxacum* sect. *Ruderalia* +, *Tilia cordata* +, *Viola reichenbachiana* +, *Acer pseudoplatanus* r, *Cerasus avium* r, *Hedera helix* r, *Lilium martagon* r, *Prunus spinosa* r.

We studied the mycoflora at the research plots during irregular field trips in vegetation periods from July 2011 to October 2014. Species diversity of macromycetes and the type of trophic substrate colonised by individual fungi was recorded during each field trip. Several species of macromycetes were collected outside of the defined research plots (but in their close vicinity) within a given degradation stage, resp. imission zone. Material that was not directly identified in the field was determined in the laboratory according to the determination literature by Breitenbach & Kränzlin (1986), Červenka et al. (1972), Hagara

(1987, 1992), HAGARA et al. (1999), HANSEN & HENNINGS (2000), HANSEN & KNUDSEN (2000), JÜLICH (1984), KEIZER (1998), MOSER (1963, 1983), PAPOUŠEK (2004), VESELÝ et al. (1972) and other sources. Herbarium items of the majority of specimens are deposited in the private herbarium of the second author in Revúca, some specimens are deposited in the herbarium of the first author at the Institute of Forest Ecology of SAS (Slovak Academy of Science) in Zvolen and some specimens (genus species *Crepidotus*, *Resupinatus* and *Rimbachia*) are deposited in the herbarium of the Department of Botany at the Faculty of Natural Sciences of Comenius University in Bratislava (SLO) and in personal herbarium of Stanislav Glejdura (PSG). Scientific nomenclature of macromycetes and authors' abbreviations are taken from literature sources LIZOŇ & BACIGÁLOVÁ (1998), ŠKUBLA (2003), resp. from the database COPPER & KIRK (2014). The scientific nomenclature of cyanophytes, bryophytes and vascular plants is unified in accordance with Checklist of non-vascular and vascular plants of Slovakia (HINDÁK 1998, KUBINSKÁ & JANOVICOVÁ 1998, MARHOLD 1998). The phytocoenological relevés were prepared according to the the Zürich-Montpellier school (BRAUN-BLANQUET 1964), with an extended Braun-Blanquet's scale (BARKMAN et al. 1964). The nomenclature of syntaxa (alliance) is according to the List of the syntaxa of Slovakia (JAROLÍMEK et al. 2008). The title of group of forest types *Fageto-Quercetum* (FQ) is used in accordance with the forest typology (cf. HANČINSKÝ 1972). In phytosociological relevé we have used these abbrevations: E_T – total vegetation cover, E_3 – cover of tree layer, E_2 – cover of shrub layer, E_1 – cover of herb layer, E_0 – cover of moss layer, h_{E1} – average height of E_1 layer.

To assess the mycocenological syntaxony, species diversity was divided into two basic ecotrophic groups: 1. lignicolous species (parasitic and saprophytic), growing only on woody substrate, 2. terrestrial species (ectomycorrhizal and saprophytic), growing from soil and debris (cf. FELLNER 1987a, 1987b). Mycoparasitic, insectoparasitic and herboparasitic fungi were also recorded, as well as coprophilous and lichenophilous species of macromycetes. Assessing the importance of mycorrhizal macromycetes, we also present the values of ectomycorrhizal potential, which was calculated as a ratio of the number of mycorrhizal species and a number of terrestrial saprophytic species of macromycetes (cf. GÁPER & MIHÁL 2008).

Results and discussion

The following overview lists the species of macromycetes determined in individual stages of degradation at the research plots (resp. outside the plots). Species are filed according to the division to Myxomycota, Zygomycota, Ascomycota, Basidiomycota and Incertae sedis.

Myxomycota (total: 3 species)

Arcyria *obvelata* (Oeder) Onsberg[3], ***Mucilago*** *crustacea* F. H. Wigg.[2,3,4], ***Trichia*** *varia* (Pers.) Pers.[4]

Zygomycota (total: 1 species)

Entomophthora *coleopterorum* Petsch[3]

Ascomycota (total: 47 species, 41 species in degradation stages)

Agyrium *rufum* (Pers.) Fr.[2], ***Ascobolus*** *stercorarius* (Bull.) J. Schröt.[3], ***Beauveria*** *bassiana* (Bals. – Criv.) Vuill[3,4], ***Bisporella*** *citrina* (Batsch) Korf & S. E. Carp.[3,4], ***Bulgaria*** *inquinans* (Pers.) Fr.[3], ***Ceratosphaeria*** *lampadophora* (Berk. et Br.) Niessl.[1], ***Cheilymenia*** *granulata* (Bull.) J. Moravec[4], ***Chlorociboria*** *aeruginascens* (Nyl.) Kanouse ex Ramamurthi et al.[4], ***Claussenomyces*** *olivaceus* (Fuckel) Sherwood[3], ***Colpoma*** *quercinum* (Pers.) Wallr.***, ***Coprotus*** *lacteus* (Cooke& W. Phillips) Kimbr., Luck-Allen & Cain.[3], *C. winteri* (Marchal) Kimbr.[4],***Cosmospora*** *purtonii* (Grev.) Rossman & Samuels[3], ***Diatrype*** *disciformis* (Hoffm.) Fr.[3,4], *D. stigma* (Hoffm.) Fr.[4], ***Diatrypella*** *quercina* (Pers.) Nitschke[4], ***Encoelia*** *glaberrima* (Rehm) Kirschst.[3], ***Eutypella*** *quaternata* (Pers.) Rappaz[3], ***Humaria haemisphaerica*** (F. H. Wigg.)[3,4], ***Hymenoscyphus*** *fructigenus* (Bull.) Gray[2,3,4], ***Hypocrea*** *rufa* (Pers.) Fr.[3], ***Hypomyces*** *chrysospermus* Tul. et C. Tul.[3], *H. luteovirens* (Fr.) Tul. [2], ***Hypoxylon*** *fragiforme* (Pers.) J. Kickx f.[3,4], *H. fuscum* (Pers.) Fr.[4], *H. howeanum* Peck[3,4], *H. multiforme* (Fr.) Fr.[4], ***Lachnum*** *virgineum* (Batsch) P. Karst.***, ***Lasiobolus*** *macrotrichus* Rea[4], ***Lasiosphaeria*** *ovina* (Pers.) Ces. et De Not.[3], ***Massaria*** *inquinans* (Tode) de Not.**, ***Melanomma*** *pulvis-pyrius* (Pers.:Fr.) Fuck.[3], ***Microsphaera*** *alphitoides* Griffon et Maubl.[4], ***Mollisia*** *cinerea* (Batsch) P. Karst.[3,4], *M. fusca* (Pers.) P. Karst.[2], ***Nectria*** *cinnabarina* Tode: Fr.[3,4], *N. decora* (Wallr.) Fuckel**, ***Neonectria*** *punicea* (J. C. Schmidt) Castl. & Rossman[3,4], ***Patellaria*** *atrata* (Hedw.) Fr.[1], ***Pezicula*** *carpinea* (Pers.) Tul ex Fuckel***, ***Phaeospora*** *parasitica* (Lönnr.) Arnold***, ***Polydesmia*** *pruinosa* (Berk. et Broome) Pat.[4], ***Propolis*** *farinosa* (Pers.) Fr.[2,3,4], ***Rhytisma*** *acerinum* (Pers.) Fr.[3,4], ***Taphrina*** *carpini* (Rostr.) Johanson[3], ***Trichoderma*** *viride* Pers.[1,2,3], ***Tympanis*** *corylina* (Sacc.) Rehm[4]

Basidiomycota (total: 182 species, 169 species in degradation stages)

Agaricus *sylvaticus* Schaeff.[3], ***Armillaria*** *mellea* agg.[1,3,4], ***Auricularia*** *mesenterica* (Dicks.) Pers.[3,4], ***Basidioradulum*** *radula* (Fr.) Nobles[3,4], ***Bjerkandera*** *adusta* (Willd.) P. Karst.[4], *B. fumosa* (Pers.) P. Karst.[4], ***Boletus*** *luridus* Schaeff.**, *B. queleti* var. *discolor* (Quél.) Alessio[4], ***Botryobasidium*** *laeve* (J. Erikss.) Parmasto[3,4], *B. robustior* Pouzar & Hol.-Jech.[3], *B. subcoronatum* (Höhn. et Litsch) Donk[4], ***Bovista*** *pusilla* (Batsch) Pers.[3], ***Byssomerulius*** *corium* (Pers.) Parmasto[4], ***Calocera*** *cornea* (Batsch) Fr.[4], ***Calyptella*** *capula* (Holmsk.) Quél.[1], ***Chondrostereum*** *purpureum* (Pers.) Pouzar[4], ***Clavulina*** *cinerea* (Bull.) J. Schroet.[3,4], *C. coralloides* (L.) J. Schroet.[4], ***Clitocybe*** *alba* (Bataille) Singer[2], *C. augeana* (Mont.) Sacc.[3,4], *C. candicans* (Pers.) P. Kumm.[2,3], *C. clavipes* (Pers.) P. Kumm.[4], ***C.*** *fragrans* (Sowerby) P. Kumm.[4], *C. gibba* (Pers.) P. Kumm.[3,4], *C. incilis* (Fr.) Quél.[3], *C. nebularis* (Batsch.) P. Kumm.[4], *C. phyllophila* (Pers.) P. Kumm.[3,4], *C. sinopica* (Fr.) P. Kumm.[2], ***Conocybe*** *tenera* (Schaeff.) Fayod[2,3,4], ***Coprinus*** *disseminatus* (Pers.)

Gray[4], *C. domesticus* (Bolton) Gray[3,4], *C. micaceus* (Bull.) Fr.[4], ***Cortinarius*** *multiformis* (Fr.) Fr.[3,4], *C. orellanus* Fr.[3,4], ***Crepidotus*** *cesatii* Rabenh.[3], *C. crocophyllus* (Berk.) Sacc.[3], *C. luteolus* Sacc.[3], *C. subverrucisporus* Pilát[4], ***Cyathus*** *striatus* (Huds.) Willd.[3,4], ***Daedalea*** *quercina* (L.) Pers.[1,2,3], ***Exidia*** *glandulosa* (Bull.) Fr.[1,3,4], ***Fistulina*** *hepatica* (Schaeff.) With.[4], ***Fomes*** *fomentarius* (L.) J. Kickx*, ***Geastrum*** *saccatum* Fr.**, *G. triplex* Jungh.[4], *G. vulgatum* Vittad.[4], ***Gymnopus*** *dryophilus* (Bull.) Murrill[4], *G. erythropus* (Pers.) Antonín et al.[3,4], *G. fusipes* (Bull.) Gray**, *G. peronatus* (Bolton) Antonín et al.[3,4], ***Hebeloma*** *sinapizans* (Paulet) Gillet[4], ***Hirneola*** *auricula-judae* (Bull.) Berk.[3,4], ***Hymenochaete*** *rubiginosa* (J. Dicks.) Lév.[2,3,4], ***Hymenochaete*** *tabacina* (Sowerby) Lév.[2,3], ***Hyphodontia*** *sambuci* (Pers.) J. Erikss.***, ***Hypholoma*** *fasciculare* (Huds.) P. Kumm.[4], *H. sublateritium* (Schaeff.) Quél.[4], ***Inocybe*** *adaequata* (Britzelm.) Sacc.[3,4], *I. asterospora* Quél.[3,4], *I. bresadolae* Massee***, *I. erubescens* A. Blytt[3,4], *I. rimosa* (Bull.) P. Kumm.[2,3,4], ***Junghuhnia*** *nitida* (Pers.) Ryvarden[3], ***Kuehneromyces*** *mutabilis* (Schaeff.) Singer et A. H. Sm.[4], ***Laccaria*** *amethystina* (Huds.) Cooke[3], *L. laccata* agg.[4], ***Lactarius*** *blennius* (Fr.) Fr.[4], *L. piperatus* (L.) Gray[4], *L. vellereus* (Fr.) Fr.[4], ***Laeticorticium*** *roseum* (Pers.) Donk[1,3,4], ***Laetiporus*** *sulphureus* (Bull.) Bondartsev et Singer [1,3], ***Leccinum*** *carpini* (R. Schulz) M. M. Moser ex D. A. Reid[3], ***Lentinus*** *strigosus* (Schwein.) Fr.[4], ***Lepiota*** *aspera* (Pers.) Quél.[4], *L. cristata* (Alb. et Schwein.) P. Kumm.[3,4], ***Lepista*** *flaccida* (Sowerby) Pat.[3,4,] *L. nuda* (Bull.) Cooke[3,4], ***Leucocortinarius*** *bulbiger* (Alb. et Schwein.) Singer[4], ***Lycoperdon*** *lividum* Pers.[4], *L. perlatum* Pers.[4], *L. pyriforme* Schaeff.[4], *L. umbrinum* Pers.[3], ***Marasmiellus*** *foetidus* (Sowerby) Antonín et al.[4], *M. ramealis* (Bull.) Singer[4], ***Marasmius*** *alliaceus* (Jacq.) Fr.[4], *M. bulliardii* Quél.[4], *M. cohaerens* (Pers.) Cooke et Quél.[4], *M. oreades* (Bolton) Fr.[2], *M. scorodonius* (Fr.) Fr.[3], ***Megacollybia*** *plathyphylla* (Pers.) Kotl. et Pouzar[4], ***Meripilus*** *giganteus* (Pers.) P. Karst.[2], ***Mycena*** *acicula* (Schaeff.) P. Kumm.[3,4], *M. alcalina* agg.[2], *M. capillaris* (Schumach.) P. Kumm.[3,4], *M. crocata* (Schrad.) P. Kumm.[2,3,4], *M. epipterygia* (Scop.) Gray[3,4], *M. filopes* (Bull.) P. Kumm.[2,3], *M. galericulata* (Scop.) Gray[4], *M. galopus* (Pers.) P. Kumm.[4], *M. inclinata* (Fr.) Quél.[3,4], *M. polygramma* (Bull.) Gray[4], *M. renati* Quél.[2,4], *M. stylobates* (Pers.) P. Kumm.[4], *M. tintinnabulum* (Batsch) Quél.[3], ***Mycoacia*** *nothofagi* (G. Cunn.) Ryvarden[4], ***Nyctalis*** *parasitica* (Bull.) Fr.**, ***Oligoporus*** *fragilis* (Fr.) Gilb. et Ryvarden[4], *O. subcaesius* (A. David) Ryvarden & Gilb.[3], *O. tephroleucus* (Fr.) Gilb. et Ryvarden[2,4], ***Omphalina*** *pyxidata* (Pers.) Quél.***, ***Omphalotus*** *olearius* (DC.) Singer[3,4], ***Ossicaulis*** *lignatilis* (Pers.) Redhead et Ginns***, ***Panaeolina*** *foenisecii* (Pers.) Maire[2], ***Panaeolus*** *papilionaceus* (Bull.) Quél.[2], ***Panellus*** *stipticus* (Bull.) P. Karst.[4], ***Paxillus*** *involutus* (Batsch) Fr.[3,4], ***Peniophora*** *incarnata* (Pers.) P. Karst.[4], *P. quercina* (Pers.) Cooke[1,3,4], ***Phanerochaete*** *laevis* (Pers.) J. Erikss. et Ryvarden[3], *P. sordida* (P. Karst.) J. Erikss. et Ryvarden[4], ***Phellinus*** *contiguus* (Pers.) Pat.[4], *P. ferruginosus* (Schrad.) Pat.[3], *P. igniarius* (L.) Quél.[3], *P. punctatus* (Fr.) Pilát[2,3], ***Phlebia*** *tremellosa* (Schad.) Nakasone et Burds.[1,4], ***Phleogena*** *faginea* (Fr.) Link.[4], ***Pholiota*** *tuberculosa* (Schaeff.) P. Kumm.[4], ***Piptoporus*** *quercinus* (Schrad.)

Pilát[2], ***Pleurotus*** sp.[1], ***Plicarutopsis*** *crispa* (Pers.) D. A. Reid[4], ***Polyporus*** *arcularius* (Batsch) Fr.[2,3], *P. ciliatus* Fr.***, ***Psathyrella*** *candolleana* (Fr.) Maire[2], *P. corrugis* (Pers.) Konrad et Maubl.[3,4], *P. piluliformis* (Bull.) P. D. Orton[3,4], ***Radulomyces*** *molaris* (Chaillet ex Fr.) M. P. Christ.[4], ***Resupinatus*** *applicatus* (Batsch) Gray[3], ***Rhodocollybia*** *butyracea* f. *asema* (Fr.) Antonín et al.[4], ***Rickenella*** *swartzii* (Fr.) Kuyper[2], ***Rimbachia*** sp.[3], ***Rozites*** *caperatus* (Pers.) P. Karst.[4], ***Russula*** *amoenolens* Romang.[3,4], *R. grisea* (Pers.) Fr.[4], *R. luteotacta* Rea***, *R. nobilis* Velen.[3], ***R.*** *vesca* Fr.[4], ***Schizophyllum*** *commune* Fr.[1,3,4], ***Schizopora*** *radula* (Pers.) Hallenb.[4], ***Scytinostroma*** *portentosum* (Berk. et M. A. Curtis) Donk[4], ***Setulipes*** *androsaceus* (L.) Antonín[4], *S. quercophilus* (Pouzar) Antonín[3,4], ***Sistotremastrum*** *niveocremeum* (Höhn et Litsch.) J. Erikss.[4], *S. suecicum* Litsch. ex J. Erikss.***, ***Steccherinum*** *laeticolor* (Berk. & M. A. Curtis) Banker[3], *S. ochraceum* (Pers.) Gray[4], ***Stereum*** *gausapatum* (Fr.) Fr.[2,3], *S. hirsutum* (Willd.) Gray[1,2,3,4], *S. rugosum* (Pers.) Fr.[1,3], *S. subtomentosum* Pouzar[3,4], ***Stropharia*** *semiglobata* (Batsch) Quél.[2], ***Thelephora*** *palmata* (Scop.) Fr.[4], *T. penicillata* Pers.[4], ***Tomentella*** *cinerascens* (P. Karst.) Höhn. et Litsch.[3], *T. ellisii* (Sacc.) Jülich et Stalpers[4], *T. fibrosa* (Berk. et M. A. Curtis) Kõljalg[4], *T. sublilacina* (Ellis et Holw.) Wakef.[4], ***Trametes*** *gibbosa* (Pers.) Fr.[3,4], *T. ochracea* (Pers.) Gilb. et Ryvarden[4], *T. pubescens* (Schumach.) Pilát[4], *T. versicolor* (L.) Pilát[4], ***Trechispora*** *farinacea* (Pers.) Liberta**, ***Tremella*** *mesenterica* Retz.[3,4], ***Tricholoma*** *pardalotum* Herink et Kotl.[3,4], *T. saponaceum* (Fr.) P. Kumm.[4], *T. scalpturatum* (Fr.) Quél.[4], ***Tubaria*** *conspersa* (Pers.) Fayod[4], ***Tubaria*** *romagnesiana* Arnolds[4], ***Typhula*** *sclerotioides* (Pers.) Fr.[3], ***Volvariella*** *murinella* (Quél.) M. M. Moser ex Courtec.[4], ***Xerocomus*** *subtomentosus* (L.) Fr.[3,4], ***Xerula*** *radicata* (Relhan) Dörfelt[2,3,4], ***Xylobolus*** *frustulatus* (Pers.) Boidin[3,4]

Incertae sedis (total: 1 species)

Bispora *antennata* (Pers.) E. W. Mason[4]

Notes: [1]a presence in the degradation stage A, [2]a presence in the degradation stage B, [3]a presence in stage C, [4]a presence in stage D, *a presence in stage A (outside of the research plots), **a presence in stage C (outside of the research plots), ***a presence in stage D (outside of the research plots) .

Overall, we have recorded 231 macromycetes species and 3 slime mold species (including also species outside of the research plots). The classification of macromycetes according to their taxonomy and abundance in a particular stage of degradation is presented in Tab. 2; this table shows that the most macromycetes (169 species) belonged to division Basidiomycota. Species spectrum of ascomycetous fungi (from 3 to 25 species) as well as basidiomycetous fungi (from 11 to 123 species) from the most degraded stage A to the least degraded stage D is expected to rise. This trend is typical for macromycetes in the conditions of imission pollution of their biotops, as this is a sensitive bio-indication group of organisms (cf. MIHÁL 1996, MIHÁL & BLANÁR 2007, ŠTEFANČÍK & MIHÁL 1993).

Tab. 2. Number of macromycetes species on individual taxonomical divisions and in the individual degradation stages

Division	Degradation stages				Total
	A	B	C	D	
Myxomycota	0	1	2	2	3
Zygomycota	0	0	1	0	1
Ascomycota	3	6	25	23	41
Basidiomycota	12	26	79	123	169
Incertae sedis	0	0	0	1	1
Total	**15**	**33**	**107**	**149**	**215**

The abundance of macromycetous species in individual ecotrophic groups including also species outside of the research plots is presented in Tab. 3; this table shows that overall 138 lignicolous and 96 terrestrial species of macromycetes were recorded. Given the above mentioned numbers, we can conclude that the researched mycoflora was mostly lignicolous with low representation of terrestrial and mycorrhizal fungi. Low representation of mycorrhizal species also showed in the overall value of mycorrhizal potential for the whole researched area (0.45). The prevalence of lignicolous saprophytes is apparent also in Table 4, where, together with lignicolous parasites, these were the only two ecotrophic groups occurring at the research plots in all four stages of degradation. Simultaneously, Tab. 4 shows rising trend of the abundance of mycorrhizal symbionts from stage B (1 species) to stage D (23 species). The increase of ectomycorrhizal potential values from 0.0 in stage A to 0.56 in stage D documents the increase in frequency of mycorrhizal species of fungi in individual stages of degradation.

Tab. 3. Number of macromycetes species within the individual ecotrophical groups and the value of ectomycorrhizal potential – including also species outside of the research plots

Lig.							Ter.			
LP	HP	MP	LiP	IP	LS	Total	TS	CS	MS / ECM	Total
10	3	5	1	2	117	138	59	7	30 / 0.45	96

Lig. – lignicolous species, Ter. – terrestrial species, LP – lignicolous parasites, HP – herboparasites, MP – mycoparasites, LiP – lichenicolous parasites, IP – insectoparasites, LS – lignicolous saprophytes, TS – terrestrial saprophytes, CS – coprophilous species, MS – mycorrhizal symbionts, ECM – value of ectomycorrhizal potential

What is interesting, is a relatively low number of lignicolous parasitic fungi species as shown in tables 3 and 4, some of which, (particularly *Armillaria mellea* agg.), were parasitic on oaks, hornbeams and beeches, the health of which has been undermined mainly by intensive dust fall (during previous decades) from the nearby magnesite plants. Apart from *Armillaria mellea* agg., the most frequently found parasitic species were *Daedalea quercina, Rhytisma acerinum* and *Taphrina carpini*. There was a rare occurrence of the species *Fistulina* *hepatica* and *Fomes fomentarius*. GORDIENKO & GORLENKO (1987) and JUPINA (1987) also report the occurrence of parasitic fungi in forests damaged by imission pollution. They found that the area of parasitic fungi, for example the species of genus *Nectria* spp. and *Armillaria* spp., was spreading. Similarly, SOUKUP (1996) observed the increase of tracheomycoses in oak stands with poor health due to imissions. The occurrence of several saproparasitic (*Armillaria mellea*) and parasitic (*Nectria* spp.) fungal species in beech forests near Lubeník and Jelšava is mentioned also by VANÍK et al. (1997).

Tab. 4. Number of macromycetes species within the individual ecotrophical groups and the value of ectomycorrhizal potential within the individual degradation stages – including also species outside of the research plots

Stages	**Lignicolous and other parasitic species**							**Terrestrial species**			
	LP	**HP**	**MP**	**LiP**	**IP**	**LS**	**Total**	**TS**	**CS**	**MS / ECM**	Total
A	3	0	0	0	0	12	15	0	0	0 / 0.0	0
B	2	0	1	0	0	16	19	12	1	1 / 0.08	14
C	7	2	2	0	2	50	63	28	3	13 / 0.45	44
D	3	2	0	0	1	77	83	40	3	23 / 0.56	66
A*	1	0	0	0	0	0	1	0	0	0	0
C**	1	0	2	0	0	2	5	1	0	1	2
D***	0	0	0	1	0	7	8	1	0	2	3

* outside of the research plots in A stage, ** outside of the research plots in C stage, *** outside of the research plots in D stage

Apart from the direct impact of imissions, we can explain the acute damage to oaks in the degradation stages A and B by the lack of mycorrhizal flora and extreme climatic conditions during summer months, (long term droughts, lack of precipitation in some years), when so-called desert effect occurred on magnesite crust on the soil surface at localities with the highest intensity of dust fall. POWER & ASHMORE (1996) studied similar issue in beech forests, when they discovered that beech roots infected by mycorrhizes were much more resistant to soil desiccation than roots not infected by mycorrhizes. Crust and high pH of the soil, unsuitable for the survival of mycelium of the mycorrhizal fungi, prevent any potential mycorrhizal process in the imission zones A and B. Similar situation is reflected in a low share of mycorrhizal symbionts during our research (29 species); this is a typical indicator of adverse climatic and imission environmental conditions. Mycorrhizal fungi generally recede from these biotopes, resp. rarely form fruiting bodies in such adverse conditions (CICÁK et al. 1999, MIHÁL 1994, MIHÁL & BLANÁR 2007).

MIHÁL (1996), studied the mycoflora of Lubeník and its surroundings in the zones A, B, C and at a control plot in the zone D, where he found altogether 57 species of macromycetes. Within the individual ecotrophic groups, he found the following: lignicolous parasites 7 species, lignicolous saprophytes 33, terrestrial saprophytes 4 and mycorrhizal symbionts 13 species. At the same time, he observed a rising trend of fungi species spectrum from zone A to zone D (particularly in mycorrhizal species), which can be associated with a high contamination of humus horizons in zones A, B and C, with alkaline imissions and a significant change in soil pH to the detriment of fungal mycelium. Mycoflora of the surroundings of the magnesite plant at Lubeník was studied also by MIHÁL & BLANÁR (2007) in the years 1995 to 2006. During this research period, they found 261 species of macromycetes, of which there were 27 species of Ascomycota and 234 species of Basidiomycota. Overall, the authors determined 21 species in zone A, 60 species in zone B, 172 in zone C and 143 species of macromycetes in control zone D. Only 8 species of macromycetes were found in all 4 zones. Overall, as much as 161 macromycetes were found in one imission zone only. An interesting observation was the increasing number of parasitic macromycetes from zone A to C, which is connected with the abundance of trees in zones C and D as hosts for many lignicolous parasites (as well as lignicolous saprophytes). Thanks to this research, the number of mycorrhizal species rose even in the relatively cleanest zone D (control). A high number of mycorrhizal species in zones C and D is connected with a wide range of tree species in forest stands in these zones, which, unlike zone B, is characteristic for a stand with close canopy closure without visible damage from imissions.

In our research, we recorded several species with little knowledge about them, resp. no data in Slovakia about their occurrence. The species of rare and interesting occurrence are for example:

Zygomycota:

Entomophthora coleopterorum – an interesting zygomycetous (entomophagous fungus) parasitic on beetle imago. We found this fungus in November 2012 in debris on the dead imago of a beetle (Coleoptera). Entomophagous fungi regularly attack several classes and orders of insects, often serious pests on plants and man. From the nearest surroundings, the species *E. coleopterorum* was determined on the imago of *Polydrusus* spp. (Curculionidae) in November 2010 at the locality Nižná Bartová in the alluvium of river Muránka near Revúca village (MIHÁL & BLANÁR 2014). D. Benedik (DATABASE 2014a) found a species related to entomophagous fungi *Entomophaga grylli*, parasitic on grasshopper imago *Euthystira brachyptera*, near Revúcka Lehota village in June 2013.

Ascomycota:

Agyrium rufum **–** a rare species belonging to the order Lecanorales, whose representatives often grow on the thalli of various lichens. *A. rufum* forms tiny red/brown fruiting bodies that grow on bark-free wood of various broadleaves, as well as directly on the thalli of various lichens. ČERVENKA et al. (1972) presents more detailed description of this interesting species. We have found tiny fruiting bodies of this fungus growing on oak in the degradation stage B. It is interesting that we found another geographically close specimen of *A. rufum* on the thallus of lichen *Xanthoria parietina*, on the branch of *Sambucus nigra* near an industrial water settling pond, outside the built up area of the magnesite plat at Jelšava, (Mihál et al. 2012). Previous mycological researches of the surroundings of the magnesite plants Jelšava and Lubeník show that despite imission pollution many fungi species can exist in such conditions (Mihál & Blanár 2007). According to the available literature, we can conclude that the occurrence of *A. rufum* has not been recorded so far in Slovakia; therefore we can consider this occurrence at the two localities in the surroundings of the magnesite plants at Jelšava and Lubeník to be the first finding for Slovakia.

Ceratosphaeria lampadophora – a rare species that forms groups of tiny blackish fruiting bodies with an elongated and often bent little beak on the wood of broadleaves (Červenka et al. 1972). The species *C. lampadophora* has not been known so far from the territory of Slovakia, therefore we consider the occurrence recorded by us to be the first finding of this species in Slovakia. *C. lampadophora*, found by F. Neuschl (Database 2014b), in March 2011 on the wood of *Cerasus* spp., at the locality of Kajetín in western Bohemia, was the closest record to ours. There are other known findings of related species from Czech Republic: *Ceratosphaeria abietis* – found on the wood of *Abies alba* and *C. incolorata* – on the wood of *Sambucus nigra* (Réblová 1997). Réblová & Seifert (2007) present genus *Ceratosphaeria* as an anagram for the new genus they created – *Teracosphaeria* Réblová & Seifert, gen. nov.

Coprotus winteri – a coprophilous species developed small barrel fruitbodies 0.5 mm diam., with large asci with 200–250 ascospores. *C. winteri* is a very rare species, described by Marschal (1889) from Belgium, it is known also from USA (Kimbrough & Allen 1971) and Martinique in the Little Antiles (Delpont 2014). An occurrence of *C. winteri* has been published also from Slovakia, from Muránska Zdychava village surroundings in the Stolické vrchy Mts (Glejdura 2013). Our finding of *C. winteri* is the second finding of this species in Slovakia and fifth in the world. This species is growing on cow dung (collections outside of Slovakia); in Slovakia it has been documented growing on horse dung. Our collection of *C. winteri* on the boar dung is a new substratum for this species.

Encoelia glaberrima (Fig. 3) – an extremelly rare ascomycetous fungus growing on the wood of *Carpinus betulus*. We found several fruiting bodies on the branch of *C. betulus* in the oak/hornbeam stand in the degradation stage C. *E. glaberrima* varies from a generally widespread species *Encoelia furfuracea* by smaller fruiting bodies and a sole occurrence on the wood of hornbeam. Another related and less widespread species, *E. fascicularis,* was determined in the nearby hills of Stolické vrchy Mts near Muránska Zdychava on the wood of *Sorbus aucuparia* and *Populus tremula* (Mihál et al. 2011). The species *E. glaberrima* has not been known so far from the territory of Slovakia, therefore we consider the occurrence recorded by us to be the first finding of this species for Slovakia.

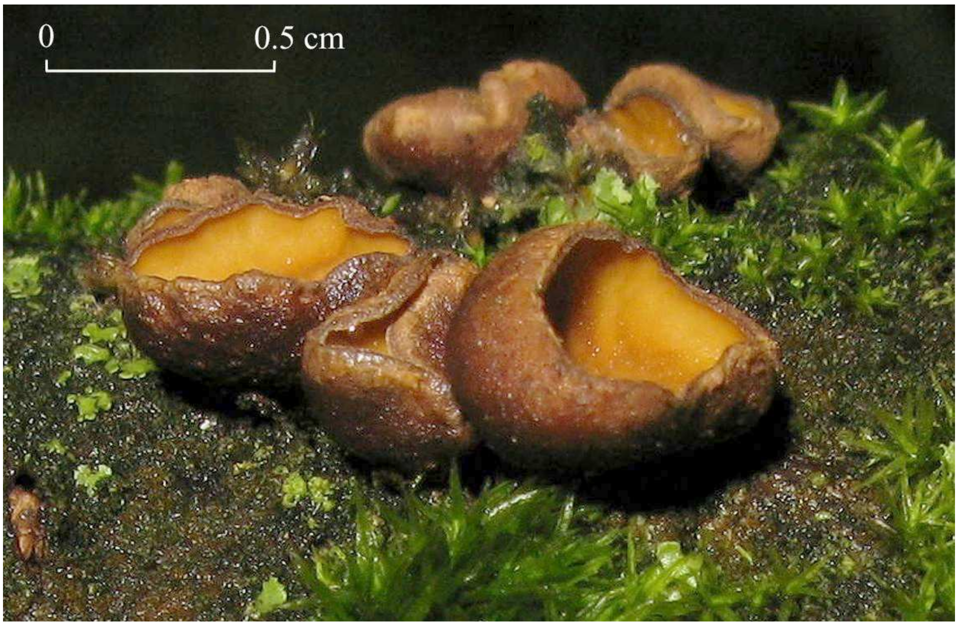

Fig. 3. *Encoelia glaberrima*, Lubenícky kras karst, locality Marvan (photo: D. Blanár, 25th June 2013)

Massaria inquinans – an interesting and rare fungus that forms tiny black fruiting bodies breaking through bark *Acer pseudoplatanus* (ČERVENKA et al. 1972). We recorded this species on the lying branch of *Robinia pseudoaccacia* in the oak/hornbeam stand in the degradation stage C (outside the research plots), whilst another rare species *Nectria decora* was found parasitic on fruiting bodies of *M. inquinans*. The species *M. inquinans* has not been known so far from the teritory of Slovakia, therefore we consider our record to be the first finding of this species in Slovakia, whilst there were two related species *Massaria (Massarina) eburnea* and *M. stipitata* determined in the past at Ľubietovsky Vepor, part of Poľana mountain (ŠKUBLA 2003). The species *Massaria pyri*, that is considered to be a form of the species *M. inquinans (=Massaria inquinans* f. *pyri)*, was determined in Czech Republic, near Prague. RÉBLOVÁ & SVRČEK (1997) found this species on the bark branch of *Pyrus communis*.

Melanomma pulvis-pyrius – is an interesting and rare ascomycetous fungus, forming small black spherical fruiting bodies on wood and bark of deciduous trees (ČERVENKA et al. 1972). We found this fungus growing on the branch of *Carpinus betulus* at two research plots in the degradation stage C. It is interesting that fruiting bodies of the species *Cosmospora purtonii*, which belongs to a group of fungi of the genus *Nectria* s.l., were parasitic on the fruiting bodies of *M. pulvis-pyrius*. *M. pulvis-pyrius* grows as a saprophyte scattered on wood of *Alnus viridis* and *Sorbus chamaemespilus* in the sub-alpine region of Bavarian Alps (SCHMID-HECKEL 1988a). Within Slovakia, ŠKUBLA (2003) mentions the occurrence of related species *Melanomma conica*, *M. fallax* and *M. ovoidea* (=*Chaetosphaeria ovoidea*: a species known from a locality at Poľana) and *M. fissum* (=*Trematosphaeria fissa*: a species known from a locality at Muránska planina). In connection with the related fungi mentioned above, we can consider record of the species *M. pulvis-pyrius* to be the first finding for Slovakia.

***Nectria decora* –** a very interesting and rare species parasitic on the fruiting bodies of *Massaria inquinans*, forming clusters of tiny orange-red hairy fruiting bodies. Parasitic mycelium of *N. decora* enters the host through an ostiolum and attacks its spores (BEENKEN 1997). Within Europe, the species *N. decora*, together with its host *Massaria inquinans*, is known also from Austria, Germany, Italy and Spain (BEENKEN 1997). *N. decora* has not been known so far from the territory of Slovakia, therefore we consider the occurrence recorded by us to be the first finding of this species in Slovakia.

Patellaria atrata – a rare ascomycetous fungus forming clusters of tiny blackish fruiting bodies on wood of deciduous trees (ČERVENKA et al. 1972). We found this species growing on the bark of *Quercus petraea* branches in the degradation stage A. The species *P. atrata* has not been known so far from the territory of Slovakia, therefore we consider the occurance recorded by us to be the first finding of this species in Slovakia. Only the related species *Patellaria atrovinosa* (=*Patellariopsis atrovinosa*) has been determined here, found by H. Deckerová in Oravská kotlina basin near Trstená (ŠKUBLA 2003). In Europe, fungus *P. atrata* is widespread in the West European countries; the closest places where this species was found were Czech Republic and Slovenia (DATABASE 2014c), as well as Serbia (KEĆA & KARADŽIĆ 2004).

Phaeospora parasitica – an ascomycetous species forming tiny black fruiting bodies parasitic on thalluses of various lichens (ČERVENKA et al. 1972). Our find comes from the locality Marvan near Lubeník, from an oak/hornbeam forest stand in the degradation stage D, where it was growing on the fruiting bodies of lichen *Lecanora* sp. which were growing on a lying branch of *Quercus robur*. This interesting lichenicolous species is probably far more widespread, which is confirmed by further finds: We determined *P. parasitica* also at the locality Biele Vody and Šiance in Muránska planina plain, Hrádok in Jelšava kras karst and near the village of Gemerská Ves in Rimavská kotlina basin (MIHÁL & BLANÁR, unpubl.). Within Slovakia, ŠKUBLA (2003) mentions only one find of *P. parasitica* and one find of the related species *P. vesicularia*. From old herbarium collections of lichens from Czech Republic and Slovakia, KOCOURKOVÁ (2000) determined the occurence of *P. parasitica* for both of these countries. Apart from Czech Republic and Slovakia, the species *P. parasitica* is also known from Ukraine (VONDRÁK 2007) and from Poland (KOSOWSKA & FAŁTYNOWICZ 2009).

Tympanis corylina – an interesting lignicolous ascomycetous species belonging to order Helotiales, was found by GALLIOT & SUGNY (2005) growing on the branches of *Corylus avellana* in eastern France. Currently, the genus *Tympanis* Fr. includes a number of lignicoline species usualy described by substrate on which they are found, for example *Tympanis alnea* (growing on *Alnus* spp., also found in Slovakia – DATABASE 2014d), *T. aucuparia* and *T. conspersa* (growing on *Sorbus aucuparia*, while *T. conspersa* is a species found also in Slovakia – MIHÁL 2011), *T. pithya* (on *Picea* spp.) etc. According to the latest information, (DATABASE 2014e), there are over 272 species, (including subspecies and forms), that have not been clearly taxonomically defined and are difficult to determine. According to ŠKUBLA (2003), a rare occurance of only two species, *Tympanis piceina* and *T. pithya*, has been published in Slovakia so far; however, these grow on soft wood, therefore we can consider the specimen *T. corylina* found near Lubeník to be the first finding for Slovakia.

Basidiomycota:

Crepidotus crocophyllus – an interesting, decoratively coloured fungus that is mentioned in the Red Book of endangered and rare plant and animal species of Czech and Slovak republics as a critically endangered species (KOTLABA et al. 1995). *C. crocophyllus* is a major species of floodplain forests, whilst it is occasionally recorded also from other habitats in the territory of Slovakia (RIPKOVÁ 2002, ĎURIŠKA 2010). RIPKOVÁ & BLANÁR (2004) carried out a more detailed research of the species of genus *Crepidotus* in a wider research area that included Muránska planina plateau. We found the species *C. crocophyllus* growing only at one research plot in the degradation stage C, on the branch of *Carpinus betulus.* This research plot is situated on a slope above the alluvium of the Muránka river with remnants of floodplain willow riverside forests. The occurrence of *C. crocophyllus* has been documented from 7 orographic units in Slovakia till now (JANČOVIČOVÁ 2011).

Sistotremastrum niveocremeum – an interesting basidiomycetous species forming thin, white to cream fruiting bodies on the wood of deciduous trees, often in a form of cracked surface, which distinguishes it from the light brown fruiting bodies of a related species *S. suecicum*. We found *S. niveocremeum* on the branches of *Sambucus nigra* in the degradation stage D. SCHMID-HECKEL (1998b) found *S. niveocremeum* on the dead wood of *Alnus viridis* in the mountain zone of the Bavarian Alps. ŠKUBLA (2003) mentions the occurance of the species *S. niveocremeum* in Slovakia but without detailed information about the finding. Similarly, other source (DATABASE 2014f) mentions three findings of *S. niveocremeum* in Slovakia (leg. D.W. Minter) without identification of the collection location. In connection with these resources, we can consider the occurance of *S. niveocremeum* near Lubeník to be the second finding for Slovakia. Apart from Slovakia, the occurance of this species was recorded also in southern Moravia and Czech Republic (ANTONÍN et al. 2014).

Steccherinum laeticolor – an interesting lignicolous fungus growing rarely on the dead wood of deciduous trees forming effused fruiting bodies with yellow-orange to brick-red small spikes (HAGARA et al. 1999). We found this species growing on a rotting branch of *Carpinus betulus* at the research plot in the degradation stage C. In Slovakia, there are known findings of related species *Steccherinum fimbriatum*, *S. lintschaueri*, *S. ochraceum*, *S. oreophilum* and *S. queletii* (ŠKUBLA 2003). In connection with these resources, we can consider the occurance of the species *S. laeticolor* near Lubeník to be the first finding for Slovakia. Apart from Slovakia, the occurance of this species was recorded also in southern Moravia and Czech Republic (ANTONÍN et al. 2014).

Tomentella sublilacina – a basidiomycetous fungus forming thin felt-like coatings brownish to violet with purple hints in colour (HAGARA et al. 1999). In the conditions of the Bavarian Alps, SCHMID-HECKEL (1988b) found this species growing on the stems of *Eupatorium cannabinum*. In Slovakia, the species *T. sublilacina* is recorded from the Malé Karpaty Mts (ŠKUBLA 2003); another occurence in Slovakia as well as in Czech Republic is mentioned by ČÍŽEK (2010).

Amongst other interesting species, we have recorded the occurrrence of the fruiting bodies of insectoparasitic species *Beauveria bassiana* parasitising dead adults of the true bug (Heteroptera) and ladybug (Coccinellidae) in damp waste. We have found the species *Claussenomyces olivaceus* on rodent excrements at the research plot in the degradation stage C. From other coprophilous species (on the boar faeces), we can mention species *Ascobolus stercorarius, Coprotus winteri, C. lacteus* and *Cheilymenia granulata*.

Acknowledgements

The authors thank to A. PETRÁŠOVÁ for determining bryophytes and A. HINDÁKOVÁ for determining *Nostoc* and *Schizothrix* genus as well as to S. JANČOVIČOVÁ for determining species of the genus *Crepidotus* and *Resupinatus applicatus* and precious comments to the manuscript. The authors also thank J. EDWARDS for the translation of this contribution into English and O. KOVÁČIK for the help with field works. This publication was created also thanks to the support of the Scientific Grant Agency VEGA (project No. 2/0039/14).

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Received: March 30th 2015
Revised: October 2nd 2015
Accepted: October 6th 2015