

MACROFUNGI RECORDS FROM A WOOD PASTURE IN THE BELSŐ-CSEREHÁT (NE HUNGARY)

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Abstract: In the Belső-Cseréhát the oak-wood pastures have significant natural values. These areas remaining after the abandonment of grazing become more and more conspicuous as protected areas nowadays, Europe-wide. The Irota wood pasture has been formed from *Quercetum petraeae-cerris* and *Carici pilosae-Carpinetum* forest associations. In the 1980s after the abandonment of grazing the area went through a spontaneous afforestation. The myco- and phyto-coenological survey of the Irota wood pasture was made in 2004–2005 and was repeated in 2014–2015. The size of samples was determined following myco-coenological methodology in five plots. During the mycological field survey 107 macrofungi species were recorded, 31 of which are new in this area. Among them several rare species were found such as *Aureoboletus gentilis*, *Rugosomyces carneus*, *Helvella pezizoides*, *Mycena abramsii*, *Pluteus cinereofuscus*, *Tubaria conspersa*, *Bolbitius reticulatus* and *Lentinellus ursinus*.

Key words: biodiversity, Irota, land use, macrofungi, myco-coenology, preservation

INTRODUCTION

In recent decades, the formerly widespread traditional form of land use in the Carpathian basin, wood-pasturing was abandoned or relegated to the background because of the decrease of pasturing livestock (ANDRÁSFALVY 2007, VARGA and BÖLÖNI 2009). The evidence of wood-pasturing was preserved by used or abandoned wood pastures and grazed forests. Beside the cultural history values, the mosaic structure of these habitats is of great importance for preservation of biodiversity (HARASZTHY *et al.* 1997, MANNING *et al.* 2006). In the Belső-Cseréhát the oak-wood pastures have significant natural values. These areas remaining after the abandonment of grazing become more and more conspicuous as protected areas nowadays, Europe-wide. Hungarian wood pastures have scarcely been studied from botanical and mycological points of view in spite of their significant natural values. Botanical surveys have been made in wood pastures of Csokonyavisonta (JUHÁSZ 1994) and Péterhida (BÖRCSÖK 2004) in Somogy

County, near the villages of Cserépfalu and Erdőbénye in Bükk and Zemplén Mts (PENKSZA 2013), in the wood pasture of Irota in the Belső-Cserehát (RUDOLF *et al.* 2008), as well as near the village of Olaszfalu in the Bakony Mts (SONNEVEND 2005). Studies including botanical surveys have been made in the case of the wood pasture of Hárskút in the Northern Bakony (HORVÁTH and PINTÉR 2003, KENÉZ *et al.* 2008, SZABÓ *et al.* 2007). However, mycological surveys have been prepared only by RUDOLF (2013) and RUDOLF *et al.* (2008, 2012, 2013).

In Hungarian wood pastures mycological survey has been made only in the Belső-Cserehát, therefore this is the first report on the fungal diversity of wood pastures in Hungary. In several countries of Europe, especially Spain, Italy, and Great Britain botanical and conservation biological surveys (MANNING *et al.* 2006) have been made; however, mycological studies have scarcely been carried out, thus our report has an outstanding international significance. The aim of the present study is to continue fungal research of wood pastures in Hungary and to complete the macrofungi taxon list of the Belső-Cserehát with new records.

MATERIAL AND METHODS

Study site

The study area was the abandoned wood-pasture of Irota village (48.24° N, 20.52° E) in the Cserehát Hills, in NE Hungary (Fig. 1). The Irota wood pasture is 2–3 ha in size, it is situated at 197–246 m above sea level. Its climate is rather cool, with a mean annual temperature of 8–8.5 °C. The mean annual precipitation is 600 mm, with 400 mm falling during the growing season (DORGAI 1986), which is important for fungal fructification. The investigated stand has developed on slightly acidic brown forest soil with pseudogley the pH (H₂O) of which is 4.59–5.10 (RUDOLF 2013).

The Irota wood pasture was identified applying the P45 General National Habitat Classification System (Á-NÉR) categories including wood pastures (Magyarország élőhelyei, ÁNÉR 2011) and *Castanea sativa* woods. It has been formed from *Quercetum petraeae-cerris* and *Carici pilosae-Carpinetum* forests by deforestation and grazing. In the 1980s after the abandonment of grazing with cattle the area went through a spontaneous afforestation. It is characterised by the alternation of several-hundred-year-old Turkey oak (*Quercus cerris*) trees in small groups or standing alone and patches of grass. Wild pear (*Pyrus pyraster*) is frequent among old Turkey oak trees, in some places *Pinus sylvestris*, *Betula pendula*, and *Populus tremula* are also found. Its growing stock belongs to several age groups. The amount of deadwood and stumps is insignificant; their cover is below 1%. The shrub layer consists of xerotherm, thorny shrubs: *Crataegus mono-*

gyna, *Prunus spinosa*, *Rosa canina*, but beside these, hornbeam-oak forest species can also be found: *Carpinus betulus*, *Cerasus avium*, *Cornus sanguinea*, *Euonymus europaeus*. The herb layer is rich in species. Among the grasses and sedges there is a significant cover of *Agrostis tenuis*, *Anthoxanthum odoratum*, *Festuca pratensis*, *F. rupicola*, *F. valesiaca*, as well as *Carex pallescens* (RUDOLF *et al.* 2012).

Sampling

The myco- and phyto-coenological survey of the Irota wood pasture was made in 2004–2005 and repeated in 2014–2015. Fungi were sampled in September and October. For sampling five plots of 25 m × 25 m were determined following myco-coenological methodology. In this paper macrofungi records were evaluated from detected samples.

The macrofungi species were documented with digital photos. Fungarium was not made due to the low number of sporocarps or their state. Microscopic examinations were made with Nikon Eclipse 80i type microscope. Species names of macrofungi followed the current Index Fungorum (CABI 2016) and MYCOBANK (2016). The works of SIMON (2000) and KIRÁLY (2009) were used for the identification of vascular plants. The work of ARNOLDS *et al.* (1995) was used for the identification of the ecological groups. The conservation status of the macrofungi (IUCN categories) was indicated according to the work of RIMÓCZI *et al.* (1999).

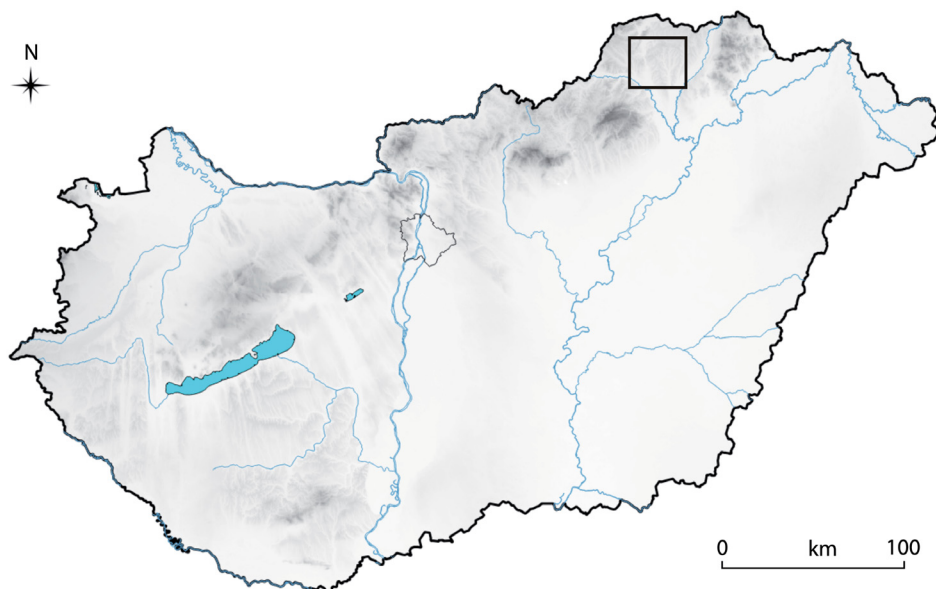


Fig. 1. Situation of the study area.

For the identification of macrofungi species the following works were used: BERNICCHIA (2005), BREITENBACH and KRÄNZLIN (1981, 1986, 1991, 1995, 2000), GERHARDT (2008), HANSEN and KNUDSEN (1992, 1997), KNUDSEN and VESTERHOLT (2008), RYVARDEN and GILBERTSON (1993).

RESULTS AND DISCUSSION

During the last 10 years the Irota wood pasture has gone through a spontaneous afforestation, resulting in a decreased ratio of grass patches (Fig. 2). The present stand of wood pasture can be characterised by the alternation of old Turkey oak trees in small groups or standing alone and patches of grass, partially dense scrub layer and a herb layer rich in species. In 2015 the periods of drought did not favour the summer fructification of fungi, however due to the large quantity of rainfall in October several species developed sporocarps. In 2014–2015, during the mycological field survey 107 macrofungi species were recorded, 31 of which have not been published in this area. These species have not been recorded from wood pastures in Hungary and among the fungi of Belső-Cserhát.

List of new taxa

Ascomycota

Helvella lacunosa Afzel. – st, 3; *Helvella macropus* (Pers.) P. Karst. – st, 3; *Helvella pezizoides* Afzel. – st, 3; *Otidea alutacea* (Pers.) Masee – m/st, under oak trees, 3.

Basidiomycota

Agaricus semotus Fr. – st; *Aureoboletus gentilis* (Quél.) Pouzar – m, under *Quercus cerris*, 2; *Bolbitius reticulatus* (Pers.) Ricken – sh, on dead wood of *Quercus cerris*, 3; *Boletus ferrugineus* Schaeff. – m, under oak trees, 4; *Cortinarius casimiri* (Velen.) Huijsman – m, under *Quercus cerris*, 3; *Cortinarius lividoviolaceus* (Rob. Henry ex M. M. Moser) M. M. Moser – m, under *Quercus cerris*, 3; *Cortinarius quercetorum* (Velen.) J. Breitenb. et F. Kränzlin. – m, under *Quercus cerris*, 3; *Cortinarius betuletorum* M. M. Moser ex M. M. Moser – m, under *Betula pendula*, 3; *Cortinarius viscidulus* M. M. Moser – m, under *Quercus cerris*, 3; *Ganoderma resinaceum* Boud. – pn, on oak tree, 3; *Gliophorus psittacinus* (Schaeff.) Herink – st, 2; *Inocybe bongardii* (Weinm.) Quél. – m, under oak trees, 3; *Inocybe cervicolor* (Pers.) Quél. – m, under oak trees, 3; *Inocybe dulcamara* (Pers.) P. Kumm. – m, under oak trees, 3; *Inonotus nidus-pici* Pilát – pn, on oak tree; *Lactarius luridus* (Pers.) Gray – m, under oak trees; *Lactarius subumbonatus* Lindgr. – m, under oak trees;



Fig. 2.- A plot of Irota wood pasture in 2005 (left) and 2015 (right) (photo: K. Rudolf).

Lentinellus ursinus (Fr.) Kühner – sh, on dead wood of oak tree; *Lepiota grangei* (Eyre) Kühner – st, 2; *Mycena abramsii* (Murrill) Murrill – sh, on dead wood of oak tree, 3; *Mycena sanguinolenta* (Alb. et Schwein.) P. Kumm. – sk, 3; *Pluteus cinereofuscus* J. E. Lange – sh, on dead wood of oak tree, 4; *Rugosomyces carneus* (Bull.) Bon – st, 2; *Russula cyanoxantha* f. *cutefracta* (Cooke) Sarnari – m, under oak trees; *Russula lilacea* Quél. – m, under oak trees, 3; *Simocybe centunculus* (Fr.) P. Karst. – sh, on dead wood of oak tree, 3; *Tubaria conspersa* (Pers.) Fayod – sh/st, 2.

Key to the functional groups: st = soil saprotrophic; sh = wood saprotrophic; m = mycorrhizal species; pn = necrotrophic parasites, sk = saprotrophic on other plant remains; IUCN Categories (based on Rimóczi *et al.* 1999): 2 = Endangered/EN; 3 = Vulnerable/VU; 4 = Lower Risk/LR.

Because of the spontaneous afforestation the majority of new macrofungi species are forest species and only some of them occur in grasslands. Many species are included in the Red list of fungi in Hungary (RIMÓCZI *et al.* 1999). Among the reviewed species *Inonotus nidus-pici* and *Lentinellus ursinus* are rare and included in the endangered categories of the Slovakian red list of fungi. There are also some endangered species in the Red list of fungi in Ukraine: *Agaricus semotus*, *Bolbitius reticulatus*, *Ganoderma resinaceum*, *Helvella pezizoides*, *H. macropus*, *H. lacunosa*, *Inocybe dulcamara*, *Mycena sanguinolenta*, *Pluteus cinereofuscus*.



Fig. 3. The mycorrhizal *Aureoboletus gentilis* occurs in deciduous forest principally under oak (photo: K. Rudolf).

The *Aureoboletus gentilis* (Fig. 3) occurs in deciduous forest, it is a mycorrhizal species growing principally under oaks, more rarely under beech and hornbeam trees (MUÑOZ 2005). It is distributed in Europe, North Africa and North America and included in the red lists of fungi in several countries of Europe (AINSWORTH *et al.* 2013, BISERKOV *et al.* 2015, KASOM and KARADELEV 2012).

The *Rugosomyces carneus* and *Gliophorus psittacinus* occur in grassy areas. The *Gliophorus psittacinus* (Fig. 4) indicates low nutrient levels and grows on abandoned low-nutrient lawns (LODGE *et al.* 2014). Both are terricolous saprotrophic species. They are included in the endangered categories of the Red list of fungi in Hungary (RIMÓCZI *et al.* 1999).



Fig. 4. *Gliophorus psittacinus* grows on abandoned low-nutrient lawns (photo: K. Rudolf).

The species *Helvella pezizoides* and *H. macropus* are terricolous saprotroph species, which appear in deciduous and mixed forests. They are listed in the vulnerable categories of the Red list of fungi in Hungary.

The *Mycena abramsii* growing mainly on dead wood in deciduous forests and *Pluteus cinereofuscus* (Fig. 5) occurring on dead woods of deciduous trees (*Fagus*, *Populus*, *Quercus*, *Ulmus*) (JUSTO and CASTRO 2007) are rare species in Hungary. The *Tubaria conspersa* appears on dead woods, rarely on soil (FODOR 2003) in deciduous and coniferous forests and referred to as endangered in the Red list of fungi in Hungary (RIMÓCZI *et al.* 1999). The *Bolbitius reticulatus* and



Fig. 5. *Pluteus cinereofuscus* occurs on dead woods of deciduous trees (photo: F. Pál-Fám).

Lentinellus ursinus are found on dead woods of deciduous trees. Priority species have only a few Hungarian records published (Appendix 1).

The afforested wood pastures play an important role in the preservation of biodiversity, however homogenisation coupled with the progress of succession may lead to the decrease of diversity.

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Összefoglaló: A Belső-Cserehátban jelentős természetvédelmi értéket képviselnek a fás legelők, melyek Európa-szerte az egykori gazdálkodás maradványaiként, mára fokozott jelentőséggel bíró, védett területek. A vizsgált irotai állományt cseres- és gyertyános-tölgyesekből alakították ki. A 80-as években felhagytak legeltetésével, így elkezdődött a terület visszaerdősődése. Az irotai fás legelő növény- és gombafajainak állapotfelmérése 2004–2005-ben történt, melyet 2014–2015-ben monitoring vizsgálat követett. A mintavétel 5 kvadrátban történt, melyek mérete a mikocönológiai szempontokhoz igazodott. A fás legelő mai állományképére jellemzőek a gyeppen elszórtan, vagy kisebb csoportokban álló idős csertölgyek, a feldúsult cserjeszint és a fajgazdag gyepszint. A monitoring felmérés során, összesen 107 gombafajt regisztráltunk, közülük 31 faj új a területre nézve. Ezek között számos ritka faj is előfordult, mint pl. az *Aureoboletus gentilis*, *Rugosomyces carneus*,

Helvella pezizoides, *Mycena abramsii*, *Pluteus cinereofuscus*, *Tubaria conspersa*, *Bolbitius reticulatus* and *Lentinellus ursinus*.

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Appendix 1. Published Hungarian records of prioritised species.

Aureoboletus gentilis (Quél.) Pouzar; **Literature records:** EGRI (2009): Zemplén Mts, near Makkoshotyka, in *Luzulo-Carpinetum*, det. Egri K. 19.08.2006; BENEDEK (2011): Börzsöny Mts, in *Luzulo nemorosae-Fagetum sylvaticae*, leg. et det. Benedek L. 24.08.2002., 22.07.2005., 25.08.2005, 02.09.2005, 25.09.2005, 13.08.2006 and *Deschampsio flexuosae-Quercetum sessiliflorae*, leg. et det. Benedek L. 24.08.2002, 27.08.2005.

Bolbitius reticulatus (Pers.) Ricken; **Literature records:** FODOR and PÁL-FÁM (2003): Szigetköz, Bordacsi-erdő, in *Pimpinello majoris-Ulmetum*, leg. et det. Pál-Fám F., Fodor L. 15.09.2001; NAGY and GORLICZAI (2007): Alföld, Lakitelek (Töserdő), in *Fraxino pannonicarum-Alnetum*, leg. Nagy L. and Gorliczai Zs. 14.10.2006.; DIMA *et al.* (2012): Balaton-felvidék, Fekete-hegy, near Szentbékálla, leg. et det. Dima B., Pál-Fám F. and Takács K. 27–28.06.2009; FOLCZ *et al.* (2013): Sopron Mts, in loading stands of wood, leg. et det. Dima B. in 2011; SILLER and DIMA (2014): Uppony Mts, Éleskötető, (association is absent), leg. et det. Dima B., Siller I. in 2013 (correct date is missing).

Gliophorus psittacinus (Schaeff.) Herink; **Literature records:** SZEMERE (1968): Bakony, near Hárskút, det. Szemere L. 02.10.1963; EGRI (2009): Zemplén Mts, (further data are missing); BENEDEK (2011): Börzsöny Mts, in Cynosurion, leg. et det. Benedek L. 28.10.2001, 27.08.2005; KOSZKA (2011): Vértes Mts, near Csákberény, Horog-völgy, in *Quercetum petraeae-cerris*, under *Quercus cerris*, leg. et det. Koszka A. 23.05.2010.

Helvella macropus (Pers.) P. Karst.; **Literature records:** EGRI (2009): Zemplén Mts, near Makkoshotyka, in *Quercetum rubra cultum*, (further data are missing); SILLER *et al.* (2014): Örség, near Szalafő, in Forest reservation (further data are missing), in 2005.

Helvella pezizoides Afzel.; **Literature records:** EGRI (2009): Zemplén Mts, near Makkoshotyka, in *Luzulo-Carpinetum*, (further data are missing); BENEDEK (2011): Börzsöny Mts, in *Carici pilosae-Carpinetum*, leg. et det. Benedek L. 02.09.2005.

Lentinellus ursinus (Fr.) Kühner; **Literature records:** NAGY and GORLICZAI (2007): Alföld, Lakitelek (Töserdő), on *Alnus* stump, leg. Nagy L., Gorliczai Zs. 02.08.2004; BENEDEK (2011): Börzsöny, in *Luzulo nemorosae-Fagetum sylvaticae*, leg. et det. Benedek L. 26.08.2002; KOSZKA (2011): Vértes, Harmatos-völgy, on dead wood of deciduous tree, leg. et det. Koszka A. 01.11.2009; DIMA *et al.* (2012): Balaton-felvidék, Fekete-hegy, near Szentbékálla, leg. et det. Dima B., Pál-Fám F. and Takács K. 27–28.06.2009; SILLER *et al.* (2014): Örség, near Szalafő, in Forest reservation (further data are missing), in 2005.

Mycena abramsii (Murrill) Murrill; **Literature records:** DIMA *et al.* (2012): Balaton-felvidék, Fekete-hegy, near Szentbékállá, leg. et det. Dima B., Pál-Fám F. and Takács K. 27–28.06.2009.

Pluteus cinereofuscus J. E. Lange; **Literature records:** NAGY and GORLICZAI (2007): Alföld, Kecskemét, in Botanical garden, on *Populus*, leg. Nagy L. 14.05.2004, Lakitelek (Töserdő), in *Fraxino pannonicae-Alnetum*, leg. Nagy L. and Gorliczai Zs. 30.07.2006, 14.10.2006, Solt, Kalimajor, on *Populus nigra*, leg. Nagy L. 18.09.2005, Szeged, Boszorkány-sziget, *Salicetum albae-fragilis*, leg. Nagy L. 18.07.2005; BENEDEK (2011): Börzsöny Mts, in *Aegopodio-Alnetum*, leg. et det. Benedek L. 28.10.2001; SILLER *et al.* (2014): Őrség, near Szalafő, in Forest reservation (further data are missing), in 2005.

Rugosomyces carneus (Bull.) Bon; **Literature records:** BENEDEK (2011): Börzsöny Mts, in *Piceetum* cultum, leg. et det. Benedek L. 18.06.2010; KOSZKA (2011): Vértes Mts, near Csákberény, Réti-dűlő, in *Pruno spinosae-Crataegetum*, leg. et det. Koszka A. 23.05.2010.

Tubaria conspersa (Pers.) Fayod; **Literature records:** TÓTH (1999): Heves–Borsodi-domb-ság, Gyepes-völgy, (further data are missing); FODOR and PÁL-FÁM (2003): Szigetköz, Derék-erdő, in *Pinetum nigrae et sylvestris* cultum, leg. et det. Pál-Fám F. and Fodor L. 23.07.2001, Lóvári-erdő, in *Pimpinello majoris-Ulmetum*, leg. et det. Pál-Fám F. and Fodor L. 23.09.2001, Lóvári-erdő, in *Fraxinus, Acer, Quercus, Gleditsia* cultum, leg. et det. Pál-Fám F. and Fodor L. 23.09.2001, Bordacsi-erdő, in *Quercetum roboris* cultum, leg. et det. Pál-Fám F. and Fodor L. 23.09.2001; DIMA *et al.* (2012): Balaton-felvidék, Fekete-hegy, near Szentbékállá, leg. et det. Dima B., Pál-Fám F. and Takács K. 27–28.06.2009.