

Received: September 22, 2016
Accepted: November 25, 2016

ISSN 1857–9027
e-ISSN 1857–9949
UDC:582.284(497.7)
DOI: 10.20903/CSNMBS_MASA.2016.37.2.41

Original scientific paper

NEW DATA ON MACROMYCETE SPECIES (BASIDIOMYCOTA) IN MACEDONIA

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A study of mycodiversity in Macedonia is underway. The interest in macrofungi studies in Macedonia has been growing in the past 20 years. According to the research conducted up to now, approximately 2,500 macromycetes species have been recorded in the country. A half of this number is a result of the field and taxonomic work in the Mycological Laboratory in the last decade. This work represents a contribution to the Macedonian mycobiota with some rare fungi species.

Key words: new data; Basidiomycota; Macedonia

INTRODUCTION

The Republic of Macedonia is mycologically well investigated. Recently, mycological studies with special emphasis on systematical researches in various groups, such as: *Amanita*, *Peniophora*, *Phellinus*, bolets, morels, Pyrenomycetes, hypogeous fungi, has been conducted by the following authors (Karadelev *et al.* [1–5], Lambevskaja *et al.* [6], Karadelev & Rusevska [7], Kajevska *et al.* [8], Chavdarova *et al.* [9]). In addition, phylogenetic analyses and assessment of antioxidant activities for certain fungi species have been provided (Martín *et al.* [10], Rusevska *et al.* [11, 12], Nikolovska-Nedelkoska *et al.* [13]). The large data amount enabled us to update the preliminary Red List of fungi (Karadelev & Rusevska [14]). On the basis of the research done so far, 2,500 macromycetes species have been recorded in the Republic of Macedonia. The majority of the species (1,300) belong to the class Basidiomycetes, and 200 species to the class Ascomycetes.

EXPERIMENTAL SECTION

The data sources used are as follows: exsiccatae and notes from our own studies, the Macedonian

Collection of Fungi (MCF), the database (MAK FUNGI), as well as specimens from other collectors.

The determination of the species was performed during the field research and in the Mycological Laboratory of the Institute of Biology at the Faculty of Natural Science in Skopje, microscopically, by using reagents (Melzers reagent, KOH, Cotton blue, Congo Red, sulphovanillin etc.). Certain species were identified while still in a fresh condition, and the others were to undergo further laboratory analyses. Part of the samples was preserved and deposited in MCF, while all indispensable data about the species were stored in the MACFUNGI database. The identification of the species was carried out using Jülich [15], Allesio [16], Breitenbach & Kranzlin [17, 18], Hansen & Knudsen [19], Fernández [20], Krieglsteiner [21, 22], Horak [23], Galli [24] and Knudsen & Vesterholt [25]. The species names follow Index Fungorum (Kirk, 2016) and MycoBank (Stalpers & Cock, 2016). The species are reported in alphabetical order. All important data pertaining to geographical distribution, altitude, forest association, and data source are provided under each species. The species distribution map was generated in ArcGIS 10.1 based on Digital Elevation Model (ASTERGDEM) (<http://asterweb.jpl.nasa.gov/gdem.asp>, 09. 2012).

RESULTS AND DISCUSSION

A list of 15 taxa with important data (localities, associations and/or substrates) and distribution maps is presented.

1. *Amanita crocea* var. *subnudipes* Romagn.

Skopska Crna Gora: Brodec vill. (vicinity), *Quercus* forest, soil, 1400 m a.s.l., 16.06.2016.

Papradishte vill. (vicinity), footpath to Solunska Glava, oak forest, soil, 900 m a.s.l., 19.06.2016.

2. *Amanita verna* var. *decipiens* Trimbach

Skopska Crna Gora: Brodec vill. (vicinity), *Fagus* forest, soil, 1400 m a.s.l., 16.06.2016.

3. *Arrhenia griseopallida* (Desm.) Watling (syn. *Omphalina griseopallida* (Desm.) Quél.)

Ljubanci vill., along r. Ljubanska Reka, *Quercus* forest with *Populus* and *Salix*, 900 m a.s.l., 11.03.2016.

4. *Lachnella alboviolascens* (Alb. & Schwein.) Fr.

Markova Reka, yard, *Clematis vitalba* (fallen branch), 21.02.2016.

5. *Leucocoprinus birnbaumii* (Corda) Singer (Figure 3)

Skopje: Botanical Garden, pot, soil, 250 m a.s.l., 28.06.2010.

6. *Leucopaxillus lepistoides* (Maire) Singer

Kumanovo (vicinity): Studena Bara vill., hill pasture, soil, 17.10.2008;

Skopska Crna Gora Mt.: Ljubanci vill., meadow, soil, 800 m a.s.l., 26.04.2010; Pobožhje vill. (vicinity), soil, 27.05.2010 meadow;

Pijanec: Delchevo, soil, 15.08.2014

7. *Marasmius buxi* Quél.

Taorska Klisura and Badar: between the monasteries of St. Bogorodica and St. Ilija, azonal vegetation (*Buxus*, *Phillyrea*, *Quercus*, *Carpinus*), *Buxus* (fallen leaves), 03.05.2012.

8. *Neolentinus schaefferi* (Weinm.) Redhead & Ginns (*Lentinus cyathiformis* (Schaeff.) Bres.)

Skopsko Pole: Saraj, park, *Populus*, 06.04.2016, 09.05.2016.

9. *Phaeogalera dissimulans* (Berk. & Broome) Holec (syn. *Pholiota oedipus* (Cooke) P. D. Orton)

Vodno, deciduous forest (? *Tilia* sp.), leaves litter, 24.02.2016.

10. *Pholiota highlandensis* (Peck) Quadr. & Lunghini (*Ph. carbonaria* (Fr.) Singer non A. H. Sm.)

Jasen reserve: Selishte, Plocha, Pinetum (burned) with *Acer*, 1180 m a.s.l., 14.10.2010;

Taorska Klisura and Badar: Kozhle vill. (below), azonal vegetation, sandy soil, 05.04.2016.

11. *Pholiota populnea* (Pers.) Kuyper & Tjall.-Beuk.

Skopska Crna Gora Mt.: Banjani vill., at roadsides, *Populus* (trunk), 800 m a.s.l., 25.09.2005; Ljubanci vill., above the monastery of St. Nikola, deciduous forest with chestnut plantings, *Castanea sativa*? (fallen trunk), 800–900 m a.s.l., 07.10.2007, *Populus*, (fallen trunk), 18.10.2009.

Kumanovo (vicinity): by the r. Pchinja, *Pinus* plantings, unknown substrate, 29.10.2007;

Vodno: between Sredno Vodno and the peak, mixed forest, deciduous tree.

12. *Resupinatus trichotis* (Pers.) Singer

Kozhuf Mt.: Umida, deciduous tree, rotten wood, 800 m a.s.l., 29.04.2002;

Osogovski Planini Mt.: Sasa vill. (vicinity), Quercetum frainetto-cerris, *Quercus frainetto* (fallen branch), 685 m a.s.l., 09.04.2008;

Dobra Voda Mt.: Quercetum frainetto-cerris, *Salix* sp. (fallen branches), 850-900 m a.s.l., 21.01.2009;

Skopje: Flower market, park, unknown tree (fallen branch), 250 m a.s.l., 09.11.2009.

13. *Rubroboletus rubrosanguineus* (Cheype) Kuan Zhao et Zhu L. Yang (Fig. 4)

German, *Fagus* forest, soil, 1400 m a.s.l., 02.07.2016.

14. *Xerocomus ichnusanus* Alessio

Kumanovo (vicinity): Vojnik vill., *Salix* and *Populus* forest, soil, 311 m a.s.l., 17.04.2011;

Galičica Mt.: Leskoec vill. (above), Quercetum frainetto-cerris, soil, 1150 m a.s.l., 13.10.2011.

15. *Xerocomus persicolor* H. Engel (Fig. 5)

Skopska Crna Gora: Brodec vill. (vicinity), *Quercus* and *Fagus* forest, soil, 1400 m a.s.l., 16.06.2016.

A total of 15 species, belonging to Basidiomycota, are part of this work, representing new data for Macedonian mycobiota. One third of the species (5) are lignicolous, all found as saprobes (*Lachnella alboviolascens*, *Marasmius buxi*, *Neolentinus schaefferi*, *Pholiota populnea* and *Resupinatus trichotis*), while the other 10 are terricolous.

The following eight species: *Amanita verna* var. *decipiens*, *Arrhenia griseopallida*, *Lachnella alboviolascens*, *Leucocoprinus birnbaumii*, *Marasmius buxi*, *Neolentinus schaefferi*, *Phaeogalera dissimulans* and *Rubroboletus rubrosanguineus* were found only on single localities, while the other on two or four localities (Figures 1 and 2).

Some of the species are more or less specific to the substrate. *Marasmius buxi* grows on fallen leaves of *Buxus sempervirens*. This fungus was collected from one locality, although its host is not so rare in the country. According to the host distribution we expected to find *M. buxi* on more localities. *Pholiota populnea* occurs on dead or living poplar wood and more rarely also on other hardwoods. It

was found on four localities and according to the data available up to now it is a rare species.

Three very rare boletoid species should be pointed out. *Xerocomus ichnusanus* is a rare thermophilic species distributed in the southern part of Europe, connected mainly to oak forests, but also with other deciduous trees. Our collections originate from oak forest and azonal vegetation with willows and poplars.

Rubroboletus rubrosanguineus is a very rare species, found in the beech forest, on German Mountain. *Xerocomus persicolor* forms mycorrhiza with oak and beech. It was found only on one locality, in mixed oak and beech forest.

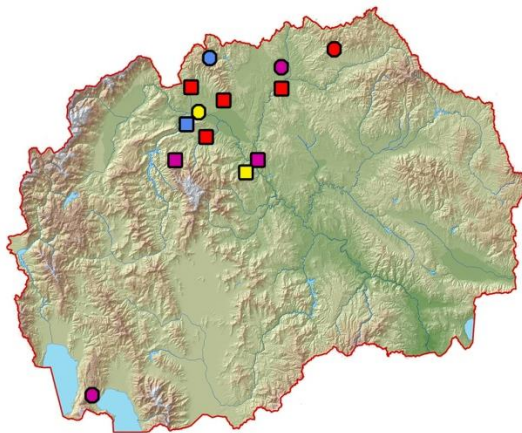


Figure 1. Distribution map of the species: *Leucocoprinus birnbaumii* (●), *Marasmius buxi* (■), *Neolentinus schaefferi* (■), *Pholiota highlandensis* (■), *Ph. populnea* (■), *Rubroboletus rubrosanguineus* (●), *Xerocomus ichnusanus* (●), *X. persicolor* (●).

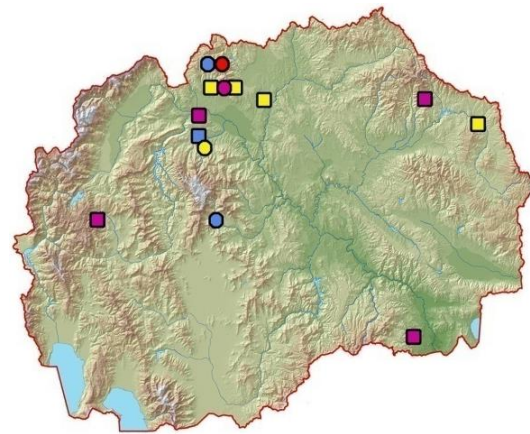


Figure 2. Distribution map of the species: *A. crocea* var. *subnudipes* (●), *A. verna* var. *decipiens* (●), *Arrhenia griseopallida* (●), *Lachnella alboviolascens* (●), *Leucopaxillus lepistoides* (■), *Phaeogalera dissimulans* (■), and *Resupinatus trichotis* (■).



Figure 3. *Leucocoprinus birnbaumii*, basidiocarps (photo: Mitko Karadelev)



Figure 4. *Rubroboletus rubrosanguineus*, basidiocarp (photo: Tome Jovanovski)



Figure 5. *Xerocomus persicolor*, basidiocarp (photo: Tome Jovanovski)

Acknowledgement. We thank Tome Jovanovski for his generous help for collections and photos.

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НОВИ ПОДАТОЦИ ЗА МАКРОМИЦЕТИТЕ (BASIDIOMYCOTA) ВО МАКЕДОНИЈА

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Истражувањата на микодиверзитетот во Македонија се во тек. Во последните дваесетина години се посветува особено внимание на диверзитетот на макромикетите во Македонија. Според податоците од досегашните истражувања за Македонија се познати околу 2500 видови макромикети. Приближно половина од нив се резултат на интензивните теренски и лабораториски истражувања во однос на нивната таксономија во последната декада. Овој труд претставува прилог кон микодиверзитетот на Македонија, во кој се претставени некои ретки видови габи.

Клучни зборови: нови податоци; Basidiomycota; Македонија