

Basidiomycetes of Temska village area (Eastern Serbia, Mt Stara Planina)

Dušan Sadiković^{1*}, *Eleonora Čapelja*², *Marko Dašić*³

¹*Mycological society of Niš, Somborska 81 A/9, 18000 Niš, Serbia*

²*University of Novi Sad, Faculty of Siences, Department of Biology and Ecology, Trg Dositeja Obradovica 3, 21000 Novi Sad, Serbia*

³*Svetosavska 38, 19370 Boljevac, Serbia*

**E-mail: dusan.sadikovic@gmail.com*

Abstract:

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As a result of mycological research, a total of 110 species belonging to 45 genera, 27 families were recorded in the Temska village area. The examination of ecological-trophic structure showed that the most numerous were the mycorrhizal fungi. Of all identified species 19 are protected by the national law and 16 are included in the preliminary national Red List.

Key words: *Endangered, Macrofungi, Red List.*

Introduction

The village of Temska (43° 15' 38" N, 22° 32' 39" E) is situated in the South-Western foothill of the mountain Stara Planina, at an altitude of about 500 m (**Fig. 1**). It is surrounded by the Temska gorge, Krušavica, Temačko Brdo, Kulišta and Ravna hills. The area has a temperate continental climate. Mean annual temperature is 9°C, with the amount of precipitation ranging from 500mm to 1000mm per year (Ducić et al., 2005). Alluvial deposits can be found in this area. Rendzina soil type was developed on marlstone and limestone geological ground (Anđelković 1958). Although an overview of mycomycete fungi for Stara Planina Mt. was given by Ivancević & Beronja (2004), this is the first paper focusing on Basidiomycetes of the area surrounding Temska village.

Materials and methods

Fungal specimens were being collected in the period between 2010. and 2012. in spring, summer

and autumn. Endangered and protected species were not collected and were identified on the spot. A large proportion of fungal basidiocarps were collected at the altitudes between 500 and 1100 m in the oak forest belt (*Quercus cerris* L., *Q. frainetto* Ten., *Q. petraea* (Mattuschka) Liebl., *Q. pubescens* Willd.), also inhabited by some other wood species such as *Betula pendula* Roth, *Fraxinus excelsior* L., *F. ornus* L., *Crataegus monogyna* Jacq., *Acer campestre* L., *A. pseudoplatanus* L., *A. tataricum* L., etc. Also a number of species was collected from a belt of coniferous forest, consisting mainly of planted *Pinus nigra* J.F. Arnold trees. The fungi were identified on the basis of macroscopic and microscopic morphological characteristics and specific chemical reactions of fruiting bodies according to specific identification keys: (Božac 1978; Foht 1986; Breitenbach & Kränzlin 1995; Maca et al., 1995; McKnight et al., 1998; Jordan 2004; Uzelac 2009). Author citations for each taxon are abbreviated according to the Index Fungorum (2013).

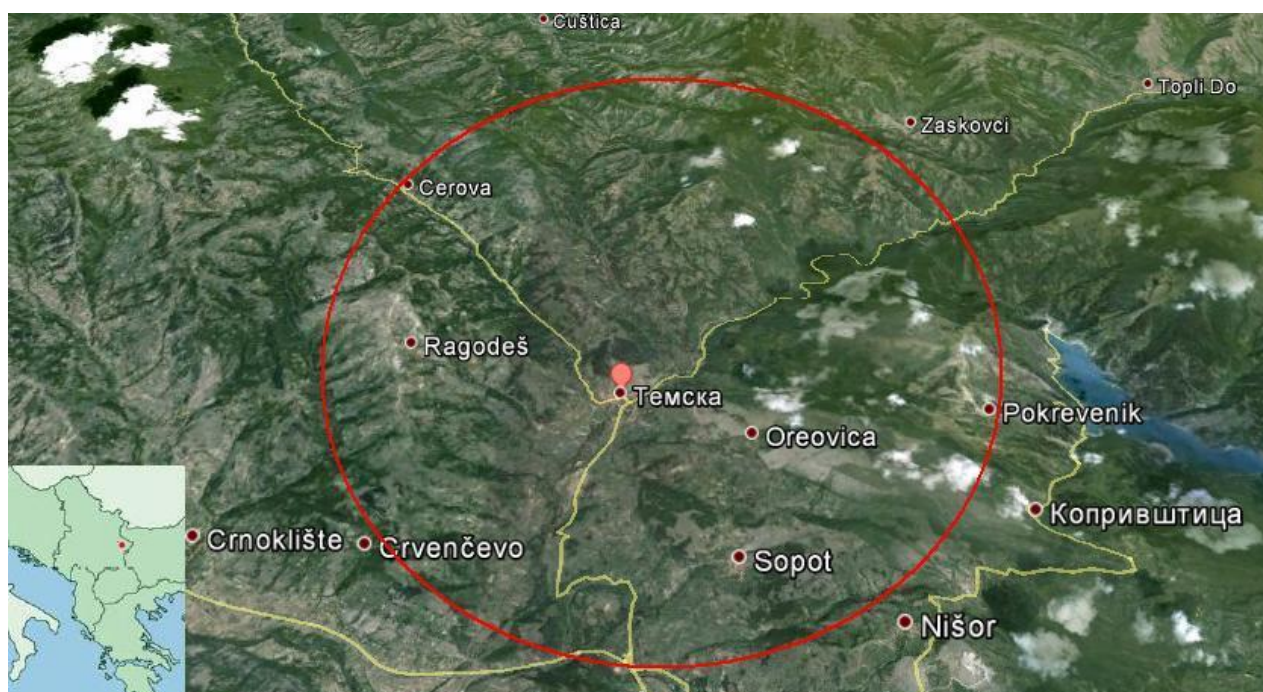


Figure 1. Geographical position of investigated area based on Google Earth satellite image

Table 1. List of mycomycete fungi with preferred habitat type and substrate

Taxa	Habitat	Life form
AGARICALES		
Agaricaceae		
<i>Agaricus bitorquis</i> (Quél.) Sacc.	Edge of broadleaf forest	Saprophytic
<i>Agaricus campestris</i> var. <i>campestris</i> L.	Meadow	Saprophytic
<i>Agaricus macrosporus</i> (F.H. Møller & Jul. Schaeff.) Pilat	Meadow	Saprophytic
<i>Agarius nivescens</i> (F.H. Møller) F.H. Møller	Meadow	Saprophytic
<i>Agaricus moelleri</i> Wasser.	Broadleaf forest	Saprophytic
<i>Agaricus silvaticus</i> Schaeff.	Edge of broadleaf forest	Saprophytic
<i>Lepiota castanea</i> Quél.	Mixed broadleaf forest	Saprophytic
<i>Macrolepiota procera</i> (Scop.) Singer	Meadow; edge of the forest	Saprophytic
<i>Macrolepiota rhacodes</i> (Vittad.) Singer	Meadow; edge of the forest	Saprophytic
Amanitaceae		
<i>Amanita caesarea</i> (Scop.) Pers.	Edge of broadleaf forest	Mycorrhizal
<i>Amanita fulva</i> (Schaeff.) Fr.	Broadleaf forest	Mycorrhizal
<i>Amanita lividopallescens</i> (Secr. ex Boud.) Kühner & Romagn.	Mixed broadleaf forest	Mycorrhizal
<i>Amanita pantherina</i> (DC.) Krombh.	Broadleaf forest	Mycorrhizal
<i>Amanita phalloides</i> (Vaill. ex Fr.)	Broadleaf forest	Mycorrhizal
<i>Amanita rubescens</i> Pers.	Mixed broadleaf forest	Mycorrhizal
<i>Amanita vaginata</i> (Bull.) Fr.	Broadleaf forest	Mycorrhizal
<i>Amanita vaginata</i> var. <i>alba</i> (Sacc.) Romagn.	Broadleaf forest	Mycorrhizal
<i>Amanita virosa</i> (Fr.) Bertill	Mixed forest	Mycorrhizal
Coprinaceae		
<i>Coprinus niveus</i> (Pers.)	Meadow; tilled fields	Saprophytic
<i>Coprinus comatus</i> (O.F. Müll.) Pers.	Tilled fields	Saprophytic

Taxa	Habitat	Life form
<i>Coprinus micaceus</i> (Bull.) Fr.	Tilled fields	Saprophytic
<i>Panaeolus acuminatus</i> (Schaeff.)	Edge of the forest	Saprophytic
Hygrophoraceae		
<i>Hygrocybe conica</i> (Schaeff.) Quél.	Meadow; edge of the forest	Saprophytic
Marasmiaceae		
<i>Marasmius oreades</i> (Bolton) Fr.	Meadow; edge of the forest	Saprophytic
<i>Marasmius rotula</i> (Scop.) Fr.	Meadow	Saprophytic
<i>Marasmius torquescens</i> Quél.	Broadleaf forest	Saprophytic
<i>Omphalotus olearius</i> (DC.) Singer	Broadleaf forest	Saprophytic
Mycenaceae		
<i>Mycena renati</i> Quél.	Mixed forest	Saprophytic
<i>Mycena vitilis</i> (Fr.) Quél.	Mixed forest	Saprophytic
Pleurotaceae		
<i>Pleurotus eryngii</i> (DC.) Quél.	Broadleaf forest	Parasitic
<i>Pleurotus ostreatus</i> (Jacq.) P. Kumm.	Broadleaf forest	Parasitic/ Saprophytic
Pluteaceae		
<i>Pluteus cervinus</i> (Schaeff.) P. Kumm.	Edge of broadleaf forest	Saprophytic
<i>Pluteus salicinus</i> (Pers.) P. Kumm.	Broadleaf forest	Saprophytic
Schizophyllaceae		
<i>Schizophyllum commune</i> Fr.	Mixed forest	Parasitic
Strophariaceae		
<i>Pholiota highlandensis</i> Quadr. & Lunghini	Meadow	Saprophytic
Tricholomataceae		
<i>Clitocybe odora</i> (Bull.:Fr.) Kummer	Broadleaf forest	Saprophytic
<i>Leucopaxillus giganteus</i> (Quél.) Singer	Broadleaf forest	Saprophytic
<i>Oudemansiella radicata</i> (Relhan) Singer	Mixed broadleaf forest	Saprophytic
<i>Rugosomyces ionides</i> (Bull.) Bon	Broadleaf forest	Saprophytic
<i>Tricholoma fulvum</i> (Fr.) Bigeard & H. Guill	Mixed broadleaf forest	Mycorrhizal
AURICULARIALES		
Auriculariaceae		
<i>Auricularia auricula-judae</i> (Bull.) Quél.	Mixed broadleaf forest	Saprophytic
<i>Auricularia mesenterica</i> (Dicks.) Pers.	Edge of the forest	Saprophytic
BOLETALES		
Boletaceae		
<i>Boletus aestivalis</i> (Paulet) Fr.	Broadleaf forest	Mycorrhizal
<i>Boletus aereus</i> Secr.	Mixed broadleaf forest	Mycorrhizal
<i>Boletus chrysenteron</i> (Bull.)	Edge of broadleaf forest	Mycorrhizal
<i>Boletus calopus</i> Pers.	Broadleaf forest	Mycorrhizal
<i>Boletus edulis</i> (Bull.)	Broadleaf forest	Mycorrhizal
<i>Boletus luridus</i> (Schaeff.)	Meadow; edge of the forest;	Mycorrhizal
<i>Boletus luridiformis</i> (Rostk.)	Meadow; edge of the forest;	Mycorrhizal
<i>Boletus rubellus</i> (Krombh.)	Broadleaf forest	Mycorrhizal
<i>Boletus satanas</i> Rostk.	Edge of broadleaf forest	Mycorrhizal
<i>Boletus subtomentosus</i> J.F. Gmel.	Broadleaf forest	Mycorrhizal
<i>Leccinum carpini</i> (R. Schulz) M.M. Moser ex D.A. Reid	Mixed broadleaf forest	Mycorrhizal
<i>Leccinum scabrum</i> (Bull.) Gray	Mixed broadleaf forest	Mycorrhizal
<i>Leccinum variicolor</i> Watling	Mixed broadleaf forest	Mycorrhizal
<i>Xerocomus porosporus</i> (Imler ex Bon & G. Moreno) Contu	Mixed forest	Mycorrhizal

Taxa	Habitat	Life form
<i>Xerocomus chrysenteron</i> (Bull.) Quélet.	Mixed forest	Mycorrhizal
Suillaceae		
<i>Suillus granulatus</i> (L.) Roussel	Coniferous forest	Mycorrhizal
<i>Suillus luteus</i> (L.) Roussel	Coniferous forest	Mycorrhizal
CANTHARELLALES		
Cantharellaceae		
<i>Craterellus cornucopioides</i> (Pers.)	Broadleaf forest	Saprophytic
<i>Cantharellus cibarius</i> Fr.	Broadleaf forest	Saprophytic
<i>Cantharellus cinereus</i> (Pers.) Fr.	Broadleaf forest	Saprophytic
DACRYMYCETALES		
Dacrymycetaceae		
<i>Ditiola peziziformis</i> (Lév.) D.A. Reid	Broadleaf forest	Saprophytic
LYCOPERDALES		
Lycoperdonaceae		
<i>Calvatia excipuliformis</i> (Scop.) Perdeck	Mixed broadleaf forest	Saprophytic
<i>Lycoperdon echinatum</i> Schumach.	Broadleaf forest	Saprophytic
<i>Lycoperdon mammiforme</i> Pers.	Mixed broadleaf forest	Saprophytic
<i>Lycoperdon perlatum</i> Pers.	Mixed Broadleaf forest	Saprophytic
GEASTRALES		
Geastraceae		
<i>Geastrum fornicatum</i> (Huds.) Hook.	Mixed broadleaf forest	Saprophytic
PHALLALES		
Gomphaceae		
<i>Ramaria eumorpha</i> (P. Karst.) Corner	Mixed broadleaf forest	Mycorrhizal
<i>Ramaria fennica</i> (P. Karst.) Ricken	Mixed broadleaf forest	Mycorrhizal
Phallaceae		
<i>Phallus hadriani</i> Vent.	Edge of broadleaf forest	Saprophytic
POLYPORALES		
Fomitopsidaceae		
<i>Postia stiptica</i> (Pers.) Jülich	Mixed forest	Saprophytic
Ganodermataceae		
<i>Ganoderma lucidum</i> (Curtis) P. Karst	Broadleaf forest	Parasitic/ Saprophytic
<i>Ganoderma resinaceum</i> Boud.	Broadleaf forest	Parasitic / Saprophytic
Polyporaceae		
<i>Daedalea quercina</i> (L.) Pers.	Broadleaf forest	Saprophytic
<i>Fomes fomentarius</i> (L.) Fr.	Broadleaf forest	Parasitic
<i>Polyporus badius</i> Jungh.	Broadleaf forest	Saprophytic
<i>Polyporus leptcephalus</i> (Jacq.) Fr.	Broadleaf forest	Parasitic/ Saprophytic
<i>Polyporus squamosus</i> (Huds.) Fr.	Broadleaf forest	Parasitic/ Saprophytic
<i>Trametes gibbosa</i> (Pers.) Fr.	Mixed broadleaf forest	Saprophytic
<i>Trametes hirsuta</i> (Wulfen) Lloyd	Broadleaf forest	Saprophytic
<i>Trametes versicolor</i> (L.) Lloyd	Broadleaf forest	Saprophytic
<i>Flammulina velutipes</i> (Curtis) Singer	Broadleaf forest	Saprophytic
RUSSULALES		
Auriscalpiaceae		
<i>Auriscalpium vulgare</i> Gray.	Coniferous forest	Saprophytic
Russulaceae		
<i>Lactarius aurantiofulvus</i> J. Blum ex Bon	Meadow;edge of the forest	Mycorrhizal

Taxa	Habitat	Life form
<i>Lactarius deliciosus</i> (L.) Gray	Broadleaf forest	Mycorrhizal
<i>Lactarius evosmus</i> Kuhner & Romagnesi	Mixed Broadleaf forest	Mycorrhizal
<i>Lactarius fulvissimus</i> (Romagn.)	Broadleaf forest	Mycorrhizal
<i>Lactarius piperatus</i> (L.) Pers.	Broadleaf forest	Mycorrhizal
<i>Lactarius tabidus</i> Fr.	Edge of broadleaf forest	Mycorrhizal
<i>Lactarius vellereus</i> (Fr.) Fr.	Broadleaf forest	Mycorrhizal
<i>Lactarius zonarius</i> (Bull.)	Meadow; edge of the forest	Mycorrhizal
<i>Russula aeruginea</i> Lindbl. ex Fr.	Edge of broadleaf forest	Mycorrhizal
<i>Russula chloroides</i> (Krombholz) Bresadola	Broadleaf forest	Mycorrhizal
<i>Russula cyanoxantha</i> (Schaeff.) Fr.	Broadleaf forest	Mycorrhizal
<i>Russula emetica</i> (Schaeff.) Pers.	Broadleaf forest	Mycorrhizal
<i>Russula fellea</i> (Fr.) Fr.	Broadleaf forest	Mycorrhizal
<i>Russula fragilis</i> var. <i>fallax</i> (Schaeff.) Masee	Edge of broadleaf forest	Mycorrhizal
<i>Russula grisea</i> Fr.	Broadleaf forest	Mycorrhizal
<i>Russula heterophylla</i> (Fr.) Fr.	Broadleaf forest	Mycorrhizal
<i>Russula lepida</i> Fr.	Broadleaf forest	Mycorrhizal
<i>Russula mairei</i> (Singer)	Broadleaf forest	Mycorrhizal
<i>Russula melliolens</i> Quél.	Broadleaf forest	Mycorrhizal
<i>Russula nigricans</i> Fr.	Broadleaf forest	Mycorrhizal
<i>Russula sanguinea</i> Fr.	Broadleaf forest	Mycorrhizal
<i>Russula turci</i> Bres.	Broadleaf forest	Mycorrhizal
<i>Russula vesca</i> Fr.	Broadleaf forest	Mycorrhizal
<i>Russula virescens</i> (Schaeff.) Fr.	Broadleaf forest	Mycorrhizal
Stereaceae		
<i>Stereum hirsutum</i> (Willd.) Pers.	Mixed forest	Parasitic
THELEPHORALES		
Bankeraceae		
<i>Sarcodon imbricatus</i> (L.) P. Karst.	Broadleaf forest	Mycorrhizal

Results

The total of 110 basidiomycetes were identified during the mycological investigation of the area surrounding Temska village. These species of fungi belong to 45 genera, 27 families and 11 orders and are listed in the Table 1 (Table 1. List of mycomycete fungi with preferred habitat type and substrate).

Discussion

Taxonomic analysis

Mycological survey of the area surrounding the village Temska has resulted in a total of 110 fungi species belonging to 45 genera, 27 families and 11 orders.

The families with the highest species diversity are: Russulaceae (24 species or 21.82 % of total species number), Boletaceae (15 species or 16.64 %), Agaricaceae (9 species or 8.19 %) and Amanitaceae (9 species or 8.19 %). Regarding the

species diversity, the richest genera are: *Russula* (16 species), *Boletus* (10 species) and *Lactarius* (8 species).

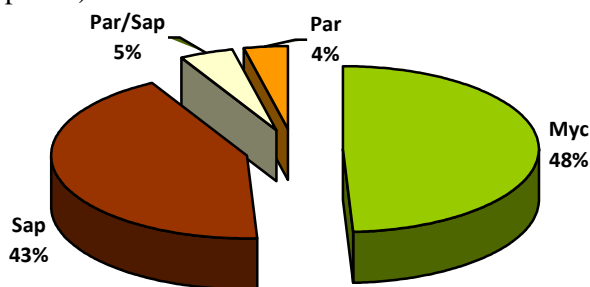


Figure 2. The proportion of groups in fungal species (**Myc** - Mycorrhizal fungi, **Sap** - Saprophytic fungi, **Par/Sap** - Fungi with parasitic and/or saprophytic ecology, **Par** – Parasitic fungi)

Ecological-trophic structure

Four trophic groups of fungi were found in the plant communities of the Temska village area. Analysis of the data presented showed that

mycorrhizal fungi represent the highest number of species (48 % of total species number), followed by saprophytic fungi (43 %), fungi with parasitic and/or saprophytic ecology (5 %) and parasitic fungi (4 %) (Fig. 2).

Protected and endangered fungal species

16 of the species recorded in this area are included in the preliminary national Red List (Ivancevic 1998) : *Agaricus macrosporus*, *Amanita cesarea*, *Hygrocybe conica*, *Mycena renati*, *Pluteus salicinus*, *Leucopaxillus giganteus*, *Boletus aereus*, *Boletus satanas*, *Xerocomus porosporus*, *Cantharellus cinereus*, *Geastrum fornicatum*, *Phallus hadriani*, *Ganoderma resinaceum*, *Polyporus badius*, *Lactarius zonarius*, *Sarcodon imbracatus*. By the Nature Conservation Law (2009) and Regulation on the proclamation and protection of strictly protected and protected wild species of plants, animals and fungi (2010), 4 of recorded species are marked as strictly protected: *Leucopaxillus giganteus*, *Boletus satanas*, *Geastrum fornicatum* and *Phallus hadriani*. The following 10 species are listed as protected: *Amanita cesarea*, *Marasmius oreades*, *Boletus aereus*, *B. edulis*, *Craterellus cornucopioides*, *Cantharellus cibarius*, *C. cinereus*, *Lactarius deliciosus*, *Russula cyanoxantha*, *R. virescens* (Ivancevic et al., 2012).

Conclusion

Fungi are essential parts of ecosystems and should be conserved alongside their habitats (Ing 1993). In order to establish the actual fungal diversity in the Temska area, more extensive, purposeful and systematic mycological surveys are needed. In the course of these studies, numerous new records both for Stara Planina mountain and the Temska area are expected.

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References

- Andelković, M. (1958). Geološki sastav i tektonika Jugozapadnih padina Stare Planine. Beograd : Naučno delo.
- Božac, Romano. 1978: Gljive Naših Krajeva. Grafički zavod Hrvatske.
- Breitenbach, J., Kränzlin, F. 1995: Pilze Der Schweiz. Band 4. Verlag Mykologia, Luzern. 371p.
- Dučić, V., Radovanović, M., Milovanović, B. 2005: Temperature Variability on the Area of Stara Planina in the Instrumental Period. Glasnik Srpskog Geografskog Društva 85 (2): 23–28.
- Focht, I. 1986. Ključ Za Gljive: Ilustrirani Uvod u Gljivarstvo. Naprijed, Zagreb.
- Index Fungorum.
http://www.indexfungorum.org/names/names.asp [accessed January 2013]
- Ing, B. 1993: Towards a red list of endangered European macrofungi. In: Pegler, D. N., L.Boddy, B. Ing & P. M. Kirk (eds.) Fungi of Europe: Investigation, recording and conservation. The Royal Botanic Gardens, Kew. 322p.
- Ivančević, B. 1998: A preliminary Red List of the macromycetes of Yugoslavia. Conservation of fungi in Europe. Università degli Studi, Siena. pp. 57-61.
- Ivančević, B., Beronja, J. 2004: First Records of Macromycetes from the Serbian Side of Stara Planina Mts (Balkan Range). Mycologia Balcanica Vol. 1(1): 15-19.
- Ivančević, B., Matavulj, M., Vukojević, J., Karaman, M. 2012: Fungi in the Legislation of the Republic of Serbia. Zbornik Matice Srpske Za Prirodne Nauke (123): 51–64.
- Jordan, M. 2004: The Encyclopedia Of Fungi: Of Britain And Europe. Frances Fincoln Ltd., London.
- Josifović, M., (eds)., 1970-1976: Flora SR Srbije, I-IX. SANU. Beograd.
- Rikardo, M., Ileš, M., Unković, S. 1995: Kako Da Raspoznate Pečurke: Jestive Gljive i Njihovi Otrovnici. Evro, Beograd.
- McKnight, K., McKnight V. 1998: A Field Guide to Mushrooms: North America. Houghton Mifflin Harcourt, Boston.
- Milanović, A. 2010: Klima Stare Planine. Zbornik Radova Geografskog Instituta "Jovan Cvijić", SANU, 1-136.
- Uzelac, B. 2009: Gljive Srbije i Zapadnog Balkana. BGV logik, Beograd.