

## CONTRIBUTION TO THE MACROMYCETES BIODIVERSITY FROM BOLINTIN DEAL FOREST – GIURGIU, ROMANIA

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**Abstract:** The paper contains the results of macromycetes investigations within the Bolintin Deal Forest near the city of Bucharest. The research objective was to inventory the species for this area, establishing the present status of biodiversity of fungi. There were identified 59 species of macromycetes. All the identified species represent a new contribution due to the lack of mycological research in the given area. The study is part of a larger research regarding the diversity and distribution of macromycetes in Bucharest and its surroundings, Romania.

**Keywords:** fungal distribution and diversity, macromycetes, taxonomy, Bolintin Deal Forest, Giurgiu, Romania

### Introduction

The Bolintin-Deal Forest, also known as Berceni Forest or Cetroceanca Forest is located in west of the Bucharest city, in-between the meadows of the rivers Ciorogârla (on the east side) and Sabar (on the west side). The forest should not be confused with Bolintin Forest or the Large Forest of Bolintin which is located more to the west and which is a SCI site according to the European Commission Habitats Directive (92/43/EEC). The geographic limits coordinates are East – Lat. 44°44'77" / Lon. 25°83'13", West – Lat. 44°44'33" / Lon. 25°86'49", North – Lat. 44°45'00" / Lon. 25°83'56" and South – Lat. 44°43'27" / Lon. 25°84'66" according to the WGS84 standard and is located in MK-02 according to the Universal Transverse Mercator (UTM) geographic coordinate system. The altitude is 102–117 meters.

From a geographical point of view the area is part of the Vlășia Plain, which is a climatic and hydro-geographically interference area belonging to the Valachian platform. The link-up of the atmospheric masses from the NE and W-SW reflects a characteristic vegetation and soil structure [POSEA & ȘTEFĂNESCU, 1983].

The climate is temperate with some slight immoderate changes. The excessive humidity area which would characterize the general location between two river meadows is slightly attenuated, as the forest is also neighbored on west by the village Bolintin Deal and on the east the village Ciorogârla. Overall the forest has, in spite of its location, slight xerophile characteristics, most of the small herbs found during early and mid summer having small vegetation period. The soils are typical brown and brown-auburn forest soils.

Vegetation is typical to the forest-stepic area and consists of trees (mainly *Quercus* genus) and small herbs (mainly from the Poaceae family).

The native flora consists especially of trees and bushes belonging to the following species: *Quercus pedunculiflora* L., *Quercus cerris* L., *Tilia platyphyllos* Scop., *Tilia*

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*tomentosa* Moench., *Ulmus* sp., *Carpinus betulus* L., *Cornus mas* L., *Crataegus monogyna* Jacq. On the southern side, there is a swampy area with *Salix* sp. and *Populus alba*. Also on each edge of the forest there are species of *Sambucus nigra* L. și *Prunus cerasifera* Ehrh. var. *cerasifera* (cultivated). The herbs consists of early species, which blossom before the trees can develop their crowns such as: *Corydalis cava* (L.) Schweigg. et Koerte, *Ficaria verna* Hudson, *Anemone ranunculoides* L., *Anemone nemorosa* L., *Scilla bifolia* L., *Viola hirta* L. etc. Also species of *Arum maculatum* L. and *Pulmonaria officinalis* L. are frequent.

### Material and method

The mycological material was gathered during many field trips to the specified area in different seasons of the years 2009, 2010 and 2011. Some of the easiest identifications were made in the field and noted. Also in situ photographs have been taken using a Canon S3 IS camera. The material collected was brought to analysis in the laboratory. The examinations included macroscopic as well as microscopic aspects. The macroscopic consisted in the analysis of the color (cap, gills, spore-print, stalk), consistency, morphology, taste, odor, presence and characteristics of the latex and so on. For macroscopic analysis an Optika trinocular stereozoom microscope model SZM-GEM-2, eyepieces 10x and zoom head magnification 0.7x – 4.5x, equipped with an USB digital camera model Optikam Pro5, 5Mp have been used.

The microscopic features that were pursued are referring to the morphology of the spores and other structures (cystidia, cap cuticle etc.). The observations made were noted and used in the process of identification the species. Most of the material was dried and is in the author's possession.

During determination, on some taxons we have also analyzed chemical characteristics using ferrous sulphate (FeSO<sub>4</sub>) – aqueous solution 10% and sulphovanilin (for *Russula* species), Melzer's reagent (aqueous solution of chloral hydrate, potassium iodide and iodine) – to test spores on white spored mushrooms – and potassium hydroxide – aqueous solution 10%.

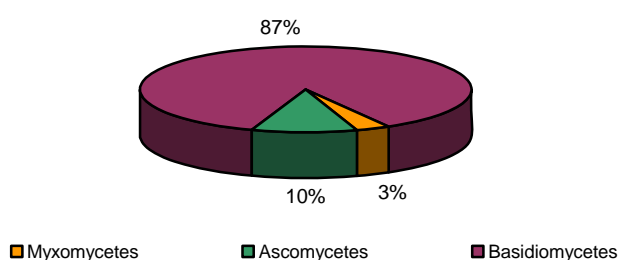
For microscopic staining techniques several other chemicals were also used such as Congo red, aniline blue (Cotton blue 4B), Phloxine and Cresyl blue.

The mycological nomenclature used is taken after SĂLĂGEANU & SĂLĂGEANU (1985), ȘESAN & TĂNASE (2006), TĂNASE & ȘESAN (2006), TĂNASE et al. (2009) as well as some macromycetes books and monographs such as ROMAGNESI (1967, 1981), BON (1988a, b), BREITENBACH & KRÄNZLIN (1984, 1986, 1991), COURTECUISE & DUHEM (1994), BORGARINO & HURTADO (2001), ROUX (2006) and others. The international herbaria names are taken after HOLMGREN & al. (1990), the name of the authors, after KIRK & ANSELL (1992) and Systematics of the Fungi regnum after KIRK & al. (2001, 2008) and CANNON & KIRK (2007). The scientific names (current names) have been updated according to the *Index Fungorum* [KIRK, 2011]. The Tracheophytes nomenclature is taken after *Flora of Romania* [SĂVULESCU, 1952-1976].

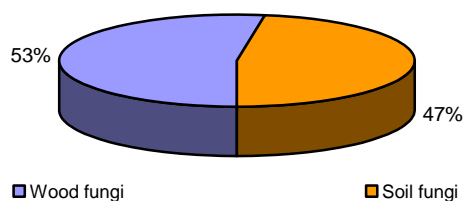
**Results and discussions**

There were identified 59 species of macromycetes (49 genera) belonging to 3 classes of the regnum Fungi: 2 Myxomycetes (3%), 6 Ascomycetes (10%) and 51 Basidiomycetes (87%) (Fig. 1). All the taxons represent an absolute novelty for the studied area [ELIADE, 1965; BONTEA, 1985-1986; TĂNASE & POP, 2005].

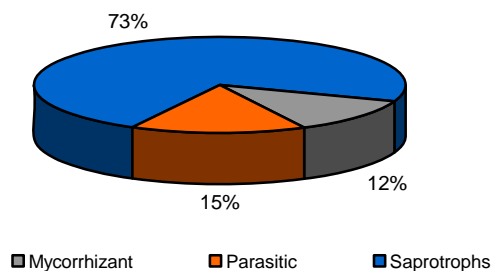
Out of the taxons identified, from ecological point of view, there were identified 31 species (53%) of wood fungi and 28 species (47%) of soil fungi (Fig. 2); a number of 7 species (12%) form ectomycorrhizas, 9 (15%) are parasitic and 43 species (73%) are saprotrophs (Fig. 3).



**Fig. 1.** Classes of macromycetes identified in the Bolintin Deal Forest



**Fig. 2.** Wood and soil fungi identified in the Bolintin Deal Forest



**Fig. 3.** Proportion of the fungi, after their nutritional characteristics, identified in the Bolintin Deal Forest

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List of species is presented in alphabetical order, with indication of location and date of first occurrence.

### Myxogastrea

*Arcyria denudata* (L.) Wettst., ad solum - 21.05.2011, in *Carpino-Quercetum*, alt. 107 m.

*Lycogala epidendrum* (J. C. Buxb. ex L.) Fr., in ligno ramulos deciduos - 30.08.2009, in *Carpino-Quercetum*, alt. 107 m.

### Ascomycota

*Arachnopeziza aurelia* (Pers.) Fuckel, ad ramulos deciduos - 20.06.2009, in *Tilio-Quercetum*, alt. 110 m.

*Humaria hemisphaerica* (F. H. Wigg.) Fuckel, ad solum - 30.08.2009, in *Quercetum*, alt. 110 m.

*Hypoxyton fragiforme* (Pers.) J. Kickx, ad truncus amputatus decorticatus- 30.08.2009, in *Carpino-Quercetum*, alt. 107 m.

*Peziza vesiculosa* Bull., ad solum - 21.05.2011, ad marginem *Quercetum*, alt. 115 m. (Fig. 4).

*Tarzetta catinus* (Holmsk.) Korf & J. K. Rogers, ad solum - 21.05.2011, in *Tilio-Quercetum*, alt. 110 m (Fig. 5).

*Xylaria polymorpha* (Pers.) Grev., in ligno trunci amputati - 30.08.2009, in *Quercetum* alt. 110 m.

### Basidiomycota

*Amanita rubescens* Pers. var. *rubescens*, ad solum - 21.05.2011, in *Tilio-Quercetum*, alt. 110 m (Fig. 7).

*Armillaria mellea* (Vahl) P. Kumm. s.l., ad cortex truncus amputatus - 30.08.2009, in *Carpino-Quercetum*, alt. 107 m.

*Auricularia auricula-judae* (Bull.) Quél., ad cortex ramulos deciduos sambuci - 21.05.2011, ad marginem silvarum, alt. 115 m.

*Auricularia mesenterica* (Dicks.) Pers., ad truncus amputatus decorticatus - 30.08.2009, in *Tilio-Quercetum*, alt. 110 m.

*Bjerkandera adusta* (Willd.) P. Karst., ad cortex truncus amputatus - 20.06.2009, in *Quercetum*, alt. 117m.

*Bolbitius titubans* (Bull.) Fr. var. *titubans*, ad cortex putrido in solum - 21.05.2011, in *Tilio-Quercetum*, alt. 110 m.

*Boletus badius* (Fr.) Fr. ?, ad solum - 20.06.2009, in *Carpino-Quercetum*, alt. 107 m.

*Calocera cornea* (Batsch) Fr., ad ramulos deciduos - 21.05.2011, in *Quercetum*, alt. 115 m (Fig. 9).

*Coprinopsis picacea* (Bull.) Redhead, Vilgalys & Moncalvo, ad solum - 30.08.2009, in *Carpino-Quercetum*, alt. 107 m.

*Coprinellus disseminatus* (Pers.) J. E. Lange [‘disseminata’], ad cortex putrido truncus amputatus - 30.08.2009, in *Quercetum*, alt. 110 m.

*Cyathus striatus* (Huds.) Willd., ad radices crataegi parti in solum - 13.08.2011, ad marginem silvarum, alt. 117 m.

*Dacrymyces stillatus* Nees, ad ramulos deciduos decorticatae - 30.08.2009, in *Tilio-Quercetum*, alt. 110 m.

*Daedalea quercina* (L.) Pers., ad cortex truncus amputatus - 20.06.2009, in *Quercetum*, alt. 117 m.

- Daedaleopsis confragosa* (Bolton) J. Schröt., ad ramulos deciduos - 13.08.2011, in *Tilio-Quercetum*, alt. 110 m.
- Fistulina hepatica* (Schaeff.) With., ad cortex quercinum - 13.08.2011, in *Quercetum*, alt. 117 m.
- Fomes fomentarius* (L.) J. J. Kickx, ad cortex tili - 30.08.2009, in *Tilio-Quercetum*, alt. 110 m.
- Galerina paludosa* (Fr.) Kühner, ad muscum super trunco amputato - 21.05.2011, in *Tilio-Quercetum*, alt. 110 m.
- Ganoderma applanatum* (Pers.) Pat., in ligno truncus amputatus - 20.06.2009, in *Carpino-Quercetum*, alt. 107 m.
- Ganoderma lucidum* (Curtis) P. Karst., in ligno truncus amputatus - 20.06.2009, in *Quercetum*, alt. 117 m.
- Gymnopus dryophilus* (Bull.) Murrill, ad solum - 20.06.2009, in *Carpino-Quercetum*, alt. 107 m.
- Gymnopus fusipes* (Bull.) Gray, ad solum - 30.08.2009, in *Quercetum*, alt. 115 m.
- Hymenochaete rubiginosa* (Dicks.) Lév., ad trunco amputato - 20.06.2009, in *Tilio-Quercetum*, alt. 110 m.
- Hyphodontia quercina* (Pers.) J. Erikss., ad ramulos deciduos - 20.06.2009, in *Carpino-Quercetum*, alt. 107 m.
- Hypholoma fasciculare* (Huds.) P. Kumm. var. *fasciculare*, ad cortex putrido - 20.06.2009, in *Quercetum*, alt. 110 m.
- Kuehneromyces lignicola* (Peck) Redhead, ad cortex truncus amputatus - 30.08.2009, in *Tilio-Quercetum*, alt. 110 m.
- Lactarius acerrimus* Britzelm., ad solum - 13.08.2011, in *Carpino-Quercetum*, alt. 107 m.
- Lenzites betulina* (L.) Fr., ad ramulos deciduos - 13.08.2011, in *Carpino-Quercetum*, alt. 107 m.
- Lepista nuda* (Bull.) Cooke, ad solum - 21.05.2011, in *Quercetum*, alt. 110 m.
- Leucopaxillus giganteus* (Sowerby) Singer, ad solum - 20.06.2009, ad marginem *Quercetum*, alt. 117 m.
- Lycoperdon pyriforme* Schaeff., ad solum - 20.06.2009, in *Tilio-Quercetum*, alt. 110 m.
- Macrolepiota procera* (Scop.) Singer var. *Procera*, ad solum - 30.08.2009, in *Quercetum*, alt. 117 m.
- Marasmius oreades* (Bolton) Fr., ad solum - 30.08.2009, ad marginem silvarum, alt. 117 m.
- Marasmius rotula* (Scop.) Fr., ad cortex putrido - 20.06.2009, in *Tilio-Quercetum*, alt. 110 m.
- Oudemansiella mucida* (Schrad.) Höhn., ad cortex truncus amputatus - 20.06.2009, in *Tilio-Quercetum*, alt. 110 m.
- Parasola plicatilis* (Curtis) Redhead, Vilgalys & Hopple, ad solum - 21.05.2011, ad marginem callis intram *Quercetum*, alt. 117 m.
- Phallus impudicus* L. var. *impudicus*, ad solum - 13.08.2011, in *Carpino-Quercetum*, alt. 107 m (Fig. 6).
- Phylloporia ribis* (Schumach.) Ryvarden, ad cortex crataegi - 20.06.2009, in *Tilio-Quercetum*, alt. 110 m.
- Pluteus cervinus* (Schaeff.) P. Kumm., ad cortex truncus amputatus - 30.08.2009, in *Tilio-Quercetum*, alt. 110 m.

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- Russula cyanoxantha* (Schaeff.) Fr., ad solum - 20.06.2009, in *Tilio-Quercetum*, alt. 110 m.
- Russula foetens* (Pers.) Pers., ad solum - 20.06.2009, in *Quercetum*, alt. 115 m.
- Russula heterophylla* (Fr.) Fr., ad solum - 13.08.2011, in *Tilio-Quercetum*, alt. 110 m.
- Russula persicina* Krombh., ad solum - 13.08.2011, in *Quercetum*, alt. 115 m (Fig. 8).
- Russula virescens* (Schaeff.) Fr., ad solum - 13.08.2011, in *Quercetum*, alt. 115 m.
- Schizophyllum commune* Fr., ad ramulos deciduos - 20.06.2009, in *Quercetum*, alt. 117 m.
- Scleroderma citrinum* Pers. var. *citrinum*, ad solum - 30.08.2009, in *Tilio-Quercetum* alt. 110 m.
- Scleroderma verrucosum* (Bull.) Pers., ad solum - 13.08.2011, in *Quercetum*, alt. 115 m.
- Stereum hirsutum* (Willd.) Pers., ad cortex truncus amputatus - 20.06.2009, in *Tilio-Quercetum*, alt. 110 m.
- Trametes hirsutum* (Wulfen) Lloyd, ad cortex truncus amputatus - 30.08.2009, in *Tilio-Quercetum*, alt. 110 m.
- Trametes versicolor* (L.) Lloyd, ad cortex truncus amputatus - 20.06.2009, in *Tilio-Quercetum*, alt. 110 m.
- Volvariella bombycina* (Schaeff.) Singer, ad cortex truncus amputatus - 20.06.2009, in *Carpino-Quercetum*, alt. 107 m.
- Xerula radicata* (Relhan) Dörfelt, ad trunco amputato putrido - 20.06.2009, in *Carpino-Quercetum*, alt. 107 m.

#### Conclusions

The study of macromycetes biodiversity in Bolintin-Deal Forest is the first one of this kind in this area, and since there are no bibliographic references, the whole study brings new mycological data regarding the surrounding forests of Bucharest that have been once part of the Vlăsia Plain.

Determination of 59 different taxa during 2009-2011 indicated a large biodiversity in an area that is virtually unknown.

Importance of the study resides in the new information of an area far too little investigated, keeping open a perspective of a more larger study of the forests near Bucharest with the purpose to know, protect and conserve their biodiversity.

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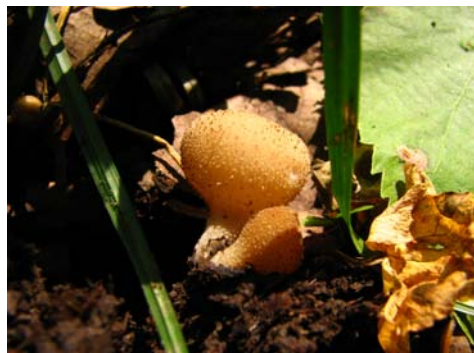
This contribution has been presented at the XVI<sup>th</sup> Congress of European Mycologists, in Halkidiki, Porto Carras, Greece (19-23 September 2011), in the Section of *Fungal distribution and diversity* under the moderation of Paul M. KIRK (UK).

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23. \* \* <http://www.indexfungorum.org/Index.htm>.
24. \* \* European Commission Habitats Directive (92/43/EEC).



**Fig. 4.** *Peziza vesiculosa* Bull.



**Fig. 5.** *Tarzetta catinus* (Holmsk.) Korf & J.K. Rogers



**Fig. 6.** *Phallus impudicus* L. var. *impudicus*



**Fig. 7.** *Amanita rubescens* Pers. var. *rubescens*



**Fig. 8.** *Russula persicina* Krombh.



**Fig. 9.** *Calocera cornea* (Batsch) Fr.