

MACROMYCETES RECORDED IN THE CAMPUS OF THE UNIVERSITY OF AGRONOMIC SCIENCES AND VETERINARY MEDICINE OF BUCHAREST: PRELIMINARY DATA

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Abstract

Basic components in the stability of natural ecosystems, with an important role in nature conservation, macromycetes are indicators of different substrates and specific habitats. In this preliminary survey, some of the macroscopic fungi (Basidiomycota: Agaricomycetes) collected from "Agronomie-Herăstrău" campus of the University of Agronomic Sciences and Veterinary Medicine of Bucharest were morphologically described, in terms of cap (pileus), gills (lamellae), stipe (stem), ring (annulus) and spores. Also, some aspects concerning edibility were discussed. The following species were subjected to the research: *Coprinellus micaceus*, *Agaricus arvensis*, *Macrolepiota excoriata*, *Hypholoma fasciculare*, *Scleroderma citrinum*, *Xerocomellus porosporus* and *Marasmius oreades*.

Key words: macrofungi, mushroom, morphology, spores, edible, Bucharest.

INTRODUCTION

Mushrooms are very important both from a practical and scientific point of view. Preservation of the gene pool of fungi is necessary to deepen the evolution and diversity of species and to better understand their morphology related to ecological adaptations (Tănase et al., 2009). The knowledge regarding mycodiversity is relatively poor despite its immense significance in natural ecosystems as recyclers of organic matter (Loguercio-Leite et al., 2009).

Macrofungi species form a major component of the biodiversity of Romania (Tănase and Pop, 2005). Since the urban regions including parks are propitious habitats for wild growing mushrooms, the picking of edible species is of interest, but at the same time there is a risk that some of them will be contaminated with toxic elements (Zsigmond et al., 2018).

The aim of this study was to report and describe the features of macroscopic fungi (Basidiomycota) species as part of biodiversity encountered in the campus of the University of Agronomic Sciences and Veterinary Medicine (UASVM) in Bucharest - an area often frequented both by students and academic staff

but also by people from the surroundings, as leisure-time activity.

MATERIALS AND METHODS

Located in sector 1 of Bucharest, with an area of 38 ha, "Agronomie-Herăstrău" campus is home to six of the seven faculties of UASVM. Gathered from several green areas of the campus in November 2019, mushroom species were photographed, identified, classified and described based on their macroscopic and microscopic features (Bielli, 1999; Locsmandi & Vasas, 2013) in the laboratory of the Faculty of Agriculture.

The main elements of the mushroom morphology were characterized herein: cap (pileus); gills (lamellae) and spores; ring (annulus); stipe (stem).

For analyzing the spores, wet mount slides and photographs were performed using a binocular microscope model Motic Panthera S (20x and 40x magnification). Also, some observations and images were obtained using a Krüss Optronic binocular microscope.

The following species were characterized: *Coprinellus micaceus*, *Agaricus arvensis*, *Macrolepiota excoriata*, *Hypholoma*

fasciculare, *Scloderma citrinum*, *Xerocomellus porosporus*, *Marasmius oreades*. For each macroscopic fungi, taxonomic lineage was listed in accordance with NCBI (National Center for Biotechnology Information), EOL (Encyclopedia of Life) and First Nature - Fungi Identification online databases. When applicable, the common names were given both in English and Romanian.

RESULTS AND DISCUSSIONS

Seven species of macromycetes were reported and described within the study period, as follows:

1. *Coprinellus micaceus* (Bull.) Vilgalys, Hopple & Jacq. Johnson 2001 (Figure 1a) - Glistening inkcap; Mica cap; Romanian common names: “burete de mică”; “balegă strălucitoare”; “bureți de rouă”.

Phylum Basidiomycota
Subphylum Agaricomycotina
Class Agaricomycetes
Subclass Agaricomycetidae
Order Agaricales
Family Psathyrellaceae

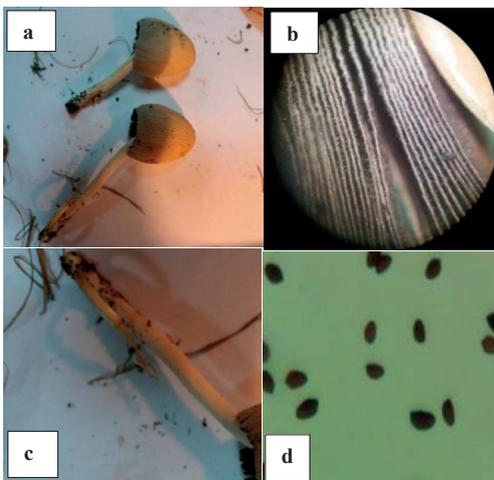


Figure 1. *Coprinellus micaceus*

The cap is thin and fragile with a diameter between 0.5-1.5 cm, color varies from white-yellow, yellowish-brown to brown-brown. At the beginning it is ovoid and at maturity it takes on a conical shape (bell), the edge growing radially and turning upwards.

The gills are thin, high, arranged very close (Figure 1b). At first they are white, then they turn brown, as the spores mature, later becoming black.

The stem (Figure 1c) has a height of 1.5 - 4 cm, hollow inside, cylindrical in shape, with no visible ring. It doesn't smell. The spores are dark brown to black (Figure 1d), fusiform, showing a sharp tip.

This mushroom is considered edible (Tersoo-Abiem et al., 2019), but potentially poisonous if collected from polluted areas (First Nature database). Mogildea (2008) has recorded a frequent occurrence of *C. micaceus* in another urban ecosystem from Bucharest - Cișmigiu Park.

2. *Agaricus arvensis* Schaeff., 1774 (Figure 2a) - Horse mushroom; Romanian common names: “ciupercă de câmp”; “șampionionul oilor”; “ciupercă de braniște”; “ciuperca calului”.

Phylum Basidiomycota
Subphylum Agaricomycotina
Class Agaricomycetes
Subclass Agaricomycetidae
Order Agaricales
Family Agaricaceae

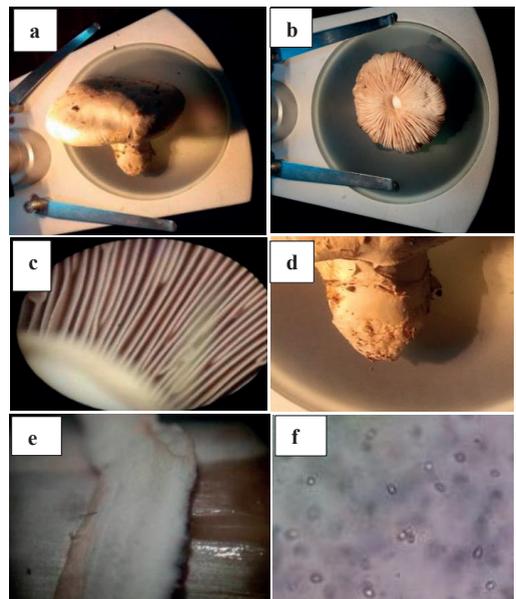


Figure 2. *Agaricus arvensis*

The cap has a diameter between 6 and 10 cm, is globular, with a soft, white cuticle that later becomes cream-whitish-yellowish (Figure 2b).

Initially, the edge of the cap is slightly curved inwards, and at maturity it flattens.

The gills (Figure 2c) are smooth, velvety, initially whitish, becoming brownish-black at maturity.

The stem (Figure 2d) is cylindrical with a fibrous tissue. It has a length of 8-12 cm and a diameter of 1-2 cm. At the base it is more swollen and has an almost glued ring reflected down on the stem (Figure 2e).

The spores are smooth, slightly elongated, dark brown (Figure 2f).

This mushroom is an edible species, however it can accumulate heavy metals such as Cd and Hg (Mogîldea, 2016).

3. *Macrolepiota excoriata* (Schaeff.) Wasser, 1978 (Figure 3a) - Romanian common name: “ghebă de pășune”.

Phylum Basidiomycota

Subphylum Agaricomycotina

Class Agaricomycetes

Subclass Agaricomycetidae

Order Agaricales

Family Agaricaceae

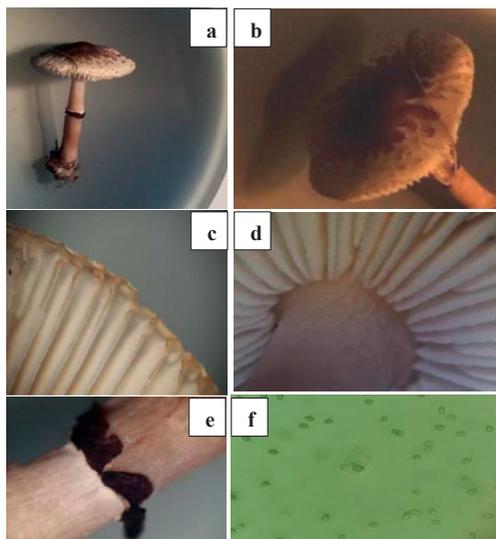


Figure 3. *Macrolepiota excoriata*

The cap is round, flattened (Figure 3b) with a diameter between 8 and 10 cm. The edges are slightly twisted inwards. On the central surface, it is smooth, with a large brown spot in the middle. The color of the cap varies from light brown to dark brown.

The cuticle is fringed at the edges; between the fringes there are white stripes (Figure 3c).

The gills (Figure 3d) are initially white, at maturity browns, crowded, fluffy and free.

The stem is cylindrical, hollow on the inside, with a slightly dilated base, has a length of 12 cm, is white with a rough surface at maturity. The annulus (Figure 3e) is narrow, ragged, dark in color. It is arranged approximately in the middle of the stem. Above the annulus, the stem is thicker.

The spores (Figure 3f) form a white powder. They are translucent, ellipsoidal in shape.

M. excoriata is an edible mushroom, but some studies have reported copper accumulated in this species over the maximum admitted level (Georgescu et al., 2016).

4. *Hypholoma fasciculare* Huds., 1778 (Figure 4a) - Sulphur tuft; Romanian common names: “gheba pucioasă”; “bureți de lemn”.

Phylum Basidiomycota

Subphylum Agaricomycotina

Class Agaricomycetes

Subclass Agaricomycetidae

Order Agaricales

Family Strophariaceae

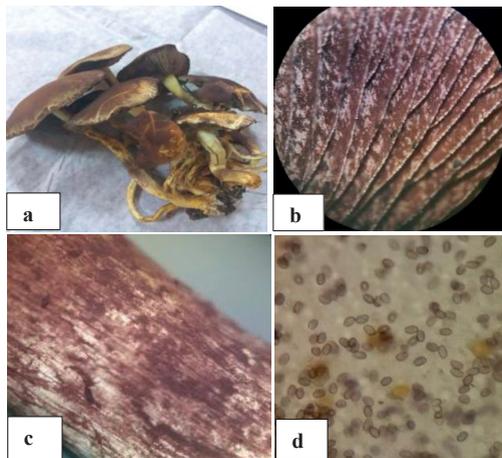


Figure 4. *Hypholoma fasciculare*

The cap with an unpleasant smell is thin, flattened at maturity, with a central tip on the surface.

The cuticle is smooth and glossy (in the darker central area) with various shades, from yellow-green to dark brown at maturity.

The gills are adherent to the stem, being at first yellowish and then, when mature, they turn dark brown (Figure 4b).

The stem (Figure 4c) has a length that varies between 3 and 10 cm. It is cylindrical curved, fragile.

The spores are very small, ellipsoidal in shape and brown to purple (Figure 4d).

H. fasciculare is an inedible mushroom, with a very bitter taste (First Nature database).

5. *Scleroderma citrinum* Pers., 1801 (Figure 5a) - Common earthball; Romanian common names: “buretele cerbilor”; “impermeabil fals”.

Phylum Basidiomycota
Subphylum Agaricomycotina
Class Agaricomycetes
Subclass Agaricomycetidae
Order Boletales
Family Sclerodermataceae

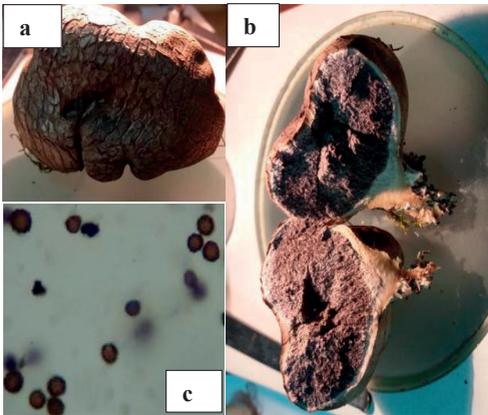


Figure 5. *Scleroderma citrinum*

The stem is a thick, oval, rigid fruiting body with rough black scales on the surface. The inside of the body is initially whitish, then becomes blackish-brown, powdery with an unpleasant odor.

At maturity, the fungus sheath breaks irregularly to allow spores to release (Figure 5b).

It has no stem or lamellae. It is fixed to the ground with the help of extensions of the thick cover layer.

The spores (Figure 5c) are rounded, brown, with a reticulated surface.

The members of Sclerodermataceae family are considered to be poisonous mushrooms (Sato et al., 2020).

6. *Xerocomellus porosporus* Imler ex Watling 1968 (Figure 6a) - Sepa bolete; unknown Romanian common name.

Phylum Basidiomycota
Subphylum Agaricomycotina
Class Agaricomycetes
Subclass Agaricomycetidae
Order Boletales
Family Boletaceae
Subfamily Xerocomoideae

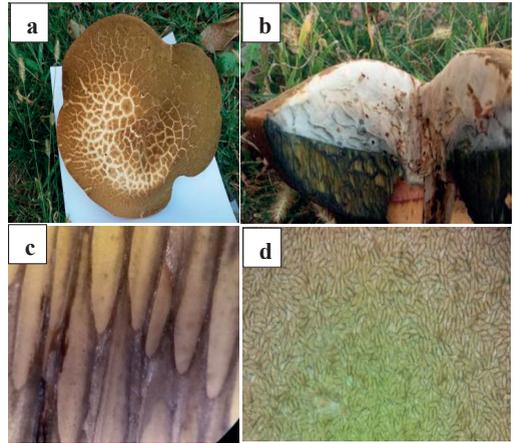


Figure 6. *Xerocomellus porosporus*

The cap of 6-9 cm in diameter, at first convex, with a turned edge, at maturity becomes flat, velvety, with a cracked cuticle and a brown color. The interior is whitish, soft and slightly elastic (Figure 6b). If it is cut, it turns blue for a short time.

The gills (Figure 6c) are fleshy, yellowish, of different sizes. At maturity it turns reddish-brown due to spores.

The stem is thick, smooth, 8-10 cm long, cylindrical and narrow at the base. It has no annulus. The spores are ellipsoidal and form a brown olive powder (Figure 6d).

Edible but not recommended, *X. porosporus* is bland and mushy (Phillips, 2013; <https://phas.ubc.ca/>).

7. *Marasmius oreades* (Bolton) Fr. 1836 (Figure 7a) - Fairy ring champignon; Romanian common names: “burete de rouă”; “buresciori de rouă”.

Phylum Basidiomycota
Subphylum Agaricomycotina
Class Agaricomycetes

Subclass Agaricomycetidae
 Order Agaricales
 Family Marasmiaceae



Figure 7. *Marasmius oreades*

The cap (Figure 7b) has a diameter between 1 and 4.5 cm; at first is conical and later becomes flat, notched on the edges and sticky. The cuticle is smooth, reddish-brown.

The gills (Figure 7c) are spaced apart, wide and not joined to the stem.

The stem is cylindrical, tall and thin with a slightly thickened base. It has a height between 5 and 7 cm.

The spores (Figure 7d) are ellipsoidal, transparent and form a white-brown powder.

This very common mushroom seems to thrive in public lawns and parks and is widely regarded as good edible, sweet-tasting (First Nature database).

During the study period, rainfall was abundant and favored the development of *Coprinellus micaceus*, *Agaricus arvensis*, *Macrolepiota excoriata*, *Hypholoma fasciculare*, *Xerocomellus porosporus*, in a humid and shady environment.

Future research will focus on documenting the biodiversity of these mushrooms species over several seasons, in relation with environmental conditions.

ACKNOWLEDGEMENTS

This paper was financed by the Faculty of Agriculture, University of Agronomic Sciences and Veterinary Medicine of Bucharest.

CONCLUSIONS

The observations on the diversity of wild macromycetes on the campus of the University of Agronomic Sciences and Veterinary Medicine in Bucharest have highlighted so far the presence of the following species belonging to Phylum Basidiomycota, Class Agaricomycetes: *Coprinellus micaceus*, *Agaricus arvensis*, *Macrolepiota excoriata*, *Hypholoma fasciculare*, *Scleroderma citrinum*, *Xerocomellus porosporus* and *Marasmius oreades*.

Of these, only *A. arvensis*, *X. porosporus*, *M. excoriata* and *M. oreades* are unanimously considered edible mushroom species, although it worth mentioning that several studies have been reported in this species the detection of heavy metals.

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