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Inventory of Basidiomycetes and Ascomycetes harvested in the Moroccan Central Plateau

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ABSTRACT

The present work provides a catalog of 73 fungal species (Basidiomycetes and Ascomycetes) encountered between 2000- 2008 in the Moroccan central plateau. Among them, 19 species are new for this region and 17 are new to the fungal flora of Morocco : *Agrocybe arvalis*, *Bovista pila*, *Collybia hybrida*, *Collybia ocior*, *Copelandia panaeolus*, *Entoloma mougeotii*, *Hebeloma pumilum*, *Lactarius pterosporus*, *Leccinum scabrum*, *Russula betulina*, *Russula exalbicans*, *Russula cyanoxantha*, *Russula krombholzii*, *Russula gracillima*, *Sarcosphaera crassa*, *Trametes versicolor* et *Tricholoma inamoenum*. Similarly, other species not identified, were encountered, they belong to the genera of *Agaricus*, *Agrocybe*, *Inocybe*, *Entoloma*, *Pluteus*, *Psathyrella*, *Lycoperdon*, *Collybia*, *Leccinum*, *Paxillus*, *Lactarius* and *Russula*. The determination of these species, not considered in the catalog, was not carried out until the end because of the insufficient number of the encountered specimens. This study is still not exhaustive but will contribute to the development of fungal inventory of Morocco.

Keywords: Morocco, Central Plateau, catalog, Ascomycetes, Basidiomycetes.

INTRODUCTION

Morocco is geologically divided into four domains: the Rif, the Mesetien domain, the Atlas Mountains and the Sahara area and Anti-Atlas Mountains¹. According to this author, the raised portion and eroded area Mesetien, tabular, constitutes the central plateau, all plates and bearings at different levels, largely lacerated by incised valleys. The backbone of the field Mesetien is formed by the interior plateau, elongated in the direction NE-SW. It culminates to the NE in the Massif Central Morocco, also known as Plateau Central² or Central Plateau³. These are table mountains semiarid to subhumid, the basement fact pleated and primary granitized. The central massif is subjected under different factors of the Middle Atlas.

The forests of the central plateau, some are influenced by ocean conditions, are likely to harbor a major fungal patrimony.

In the present work, we have grouped in a catalog the encountered species in the central plateau between 2000 and 2008. This work is a continuation of work by Mayor and Werner⁴, Malençon and Bertault^{5,6,7,8,9}, Ouabbou *et al.*,¹⁰; Larouz *et al.*,¹¹; Haimed *et al.*,¹²; Nounsi *et al.*,¹³; Outcoumit *et al.*,¹⁴; El Kholfy *et al.*,^{15,16,17}.

MATERIALS AND METHODS

Prospecting carried out between 2000 and 2007 in the Central Plateau' forests have allowed encountering some species of higher fungi (Basidiomycetes and Ascomycetes).

Preharvest, the specimens were photographed, and some details were also noted. Then, the fruiting bodies and ascocarps were brought to the laboratory. The macroscopic descriptions concerned the external appearance of the 'fruiting': shape, color and other features of the cap and stipe. This study was completed by a microscopic description of the cuts at the hymenium, cuticle, flesh, stipe, and the veil. Spores' dimensions, cystids, basidia were noted also. The microscopic observations were made in the tap water. The determination of the studied species was achieved through to the determination's keys^{18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,6,9,35,36,37,38,39,40.}

RESULTS AND DISCUSSION

Class: Ascomycetes

Order: Pezizales

Family: Helvellaceae

**Helvella lacunosa* Afzel., (1783), Fr., (1818); species harvested in 2005, during autumn, on sandy soil in Sidi Taybi, under the pines.

Family: Morchellaceae

**Morchella conica* Krombh., (1834), Pers., (1818), (= *Morchella esculenta* (L.) Pers., 1801); species harvested on weathered sandstone in Skhirat, winter 2003.

Family: Pezizaceae

**Sarcosphaera crassa* (Santi) Pouzar, (1972), (= *Sarcosphaera coronaria* (Jacq.) J. Schröt., 1893); species harvested on sandy soil in Sidi Taybi, under the pine trees during spring.

Subdivision: Basidiomycotina

Class: Basidiomycetes

Order: Agaricales

Family: Agaricaceae

**Agaricus campestris* L., (1753); species harvested under *Quercus suber*, during the winter of 2004, in Benslimane' forests.

**Agaricus comtulus* (Fr.) Quéf., (1872); species harvested under *Quercus suber*, during the winter of 2004, in Benslimane' forests.

**Agaricus edulis* Vill., (1779), Bull., (1783), Krombh., (1831), (Vittad.) Konrad & Maublanc, (1948); species harvested in the clearings of *Quercus suber* during winter 2004, in Benslimane' forests.

**Agaricus semotus* Fr., (1863); species harvested under *Q. suber*, during winter 2004, in Benslimane' forests.

**Agaricus spissicaulis* F.H. Møller, (1950); species harvested under *Quercus suber*, during winter 2004, in Benslimane and Oued Cherrat's forests.

**Bovista pila* Berk. & M.A. Curtis, (1873); species harvested in the pastures of Sidi Taybi in spring 2004.

**Calvatia excipuliformis* (Scop.) Perdeck, (1950) (= *Lycoperdon excipuliforme* (Scop.) Pers., 1801); espèce récoltée sous pins à Sidi Taybi en printemps 2003.

**Coprinus comatus* (O.F. Müll.) Pers., (1797); species harvested during winter 2004, in the pine' clearings at Oued Cherrat.

**Geaster fimbriatus* Tul. & C. Tul., (1842), Fr., (1829), (= *Geastrum fimbriatum* Fr., 1829); species encountered under pine trees on the edge of Oulmes during winter of 2005.

**Lycoperdon nigrescens* Pers., (1794), Wahlenb., (1826), (Pers.) Vittad., (1843), (= *Bovista nigrescens* Pers., 1794); species harvested in spring 2003 at Ain sferjla.

**Lycoperdon perlatum* Pers., (1796); species encountered under pine in Sidi Taybi during spring 2005.

**Lycoperdon umbrinum* Pers., (1801), Hornem., (1823), sensu auct, (= *Lycoperdon molle* Pers., 1801); species harvested under pine at Oulmès in winter 2004.

**Vascellum pratense* (Pers.) Kreisel, (1962), (= *Lycoperdon pratense* Pers., 1797); species harvested in the clearings of Benslimane' oak in spring 2004.

Family: Amanitaceae

**Amanita crocea* (Quél.) Singer, (1951); species harvested under *Quercus suber* during spring 2004 in the Rabat's region.

**Amanita mairei* Foley, (1949), sensu auct. mult., (= *Amanita argentea* Huijsman, 1959); species harvested in Benslimane' brushwood in winter 2003.

**Amanita pantherina* (D.C.) Krombh., (1846), sensu Gonnermann & Rabenhorst, (1869); species harvested under *Quercus suber* during spring 2004 in the Rabat's region.

**Amanita rubescens* Pers., (1797); species harvested under *Quercus suber* during spring 2004 in the Rabat's region.

**Amanita strobiliformis* Gonn. & Rabenh., (Paulet ex Vittad.) Bertill., (1866); species harvested in Benslimane' brushwood in spring 2003.

Family: Cortinariaceae

**Cortinarius cinnamomeolutescens* Rob. Henry (1940), (1988); species harvested under *Quercus suber* during the winter of 2004 in Benslimane' forests.

**Cortinarius orellanus* Fr., (1838); during the winter of 2003 in Benslimane' forests.

**Hebeloma pumilum* J.E. Lange, (1938), J.E. Lange, (1940), (= *Hebeloma birrus* (Fr.) Sacc., 1887); species harvested in the oak's clearings of Ain Sferjla during winter 2003.

Family: Entolomataceae

**Entoloma mougeotii* (Fr.) Hesler, (1967); species harvested under *Quercus suber* during winter 2004 at Ain Sferjla.

**Entoloma rusticoides* (Gillet) Noordel., (1981); species harvested in the oak's clearings of Benslimane during winter 2004.

Family: Hygrophoraceae

**Hygrophorus cossus* (Sowerby) Fr., (1838), sensu auct., (= *Hygrophorus eburneus* (Bull.) Fr., 1838), sensu auct. brit., (= *Hygrophorus discoxanthus* (Fr.) Rea, 1908); species harvested in the oak's clearings of Benslimane during winter 2003.

**Hygrophorus russula* (Schaeff.) Kauffman, (1918); species harvested under *Cistus salvifolius* at Ain sferjla and Benslimane during winter 2004.

Family: Hydnangiaceae

**Laccaria bicolor* (Maire) P.D. Orton, (1960); species harvested in the oak's clearings of Benslimane during winter 2004.

Family: Incertae sedis

Copelandia papilionacea (Bull.) Bres., (1912), (= *Panaeolus papilionaceus* (Bull.) Quél., 1872); in Benslimane' meadows, in winter 2003.

Family: Marasmiaceae

**Marasmiellus vaillantii* (Pers.) Singer, (1973); species harvested in winter 2003 in the clearings of Ain Sferjla.

**Marasmius oreades* (Bolton) Fr., (1838); species harvested in winter 2003, in the Skhirat's pastures.

Family: *Omphalotaceae*

**Omphalotus olearius* (DC.) Singer, (1948), sensu auct. brit., (= *Omphalotus illudens* (Schwein.) Bresinsky & Besl, 1979); species harvested in winter 2003, on *Olea europea*, in the clearings of Ain Sferjla.

Family: Pleurotaceae

**Pleurotus ostreatus* (Jacq.) P. Kumm., (1871), sensu Stevenson, (= *Pleurotus purpureo-olivaceus* (G. Stev.) Segedin, P.K. Buchanan & J.P. Wilkie, 1995), (= *Pleurotus australis* Sacc., 1891), sensu Cooke [Ill. Brit. Fung. 279 (195) Vol.2 (1883)], (= *Pleurotus cornucopiae* (Paulet) Rolland, 1910); species harvested in winter 2003, on a decaying trunk of *Quercus suber* at Ain Sferjla.

Family: Pluteaceae

**Pluteus cervinus* (Schaeff.) P. Kumm., (1871); species harvested on *Quercus suber*, during spring 2003 in Benslimane.

**Pluteus petasatus* (Fr.) Gillet, (1876); species harvested on *Quercus suber*, during spring 2003 in Benslimane.

**Volvariella gloiocephala* (DC.) Boekhout & Enderle, (1986), (= *Volvopluteus gloiocephalus* (DC.) Vizzini, Contu & Justo, 2011); species harvested in the meadows during winter 2004 in the Rabat's region.

Family: Strophariaceae

**Agrocybe arvalis* (Fr.) Singer 1936, sensu auct., (= *Agrocybe pediades* (Fr.) Fayod, 1889); species harvested on *Quercus suber*, during winter 2004 at Ain Sferjla.

**Geophila coronilla* (Bull.) Quél., (1886), (= *Stropharia coronilla* (Bull.) Quél., 1872); species encountered in the prairie grass at Benslimane in autumn 2004.

Family: Tricholomataceae

**Collybia dryophila* (Bull.) P. Kumm., (1871), (= *Gymnopus dryophilus* (Bull.) Murrill, 1916); species harvested under *Quercus suber* during the spring of 2004 in Benslimane' forests.

**Collybia hybrida* (Kühner & Romagn.) Svrček & Kubička (1964); species harvested under *Quercus suber* during the winter of 2004 in Benslimane' forests.

**Collybia ocior* (Pers.) Vilgalys & O.K. Mill., (1987), (= *Gymnopus ocior* (Pers.) Antonín & Noordel., 1997); species harvested under *Quercus suber* during the spring of 2004 in Benslimane' forests.

**Melanoleuca cognata* (Fr.) konrad & Maubl., (1927); species harvested under pine trees during the spring of 2005 in the Rabat's region.

**Rhodopaxillus nudus* (Bull.) Maire, (1913), (= *Lepista nuda* (Bull.) Cooke, 1871); species harvested close to the road under *Quercus suber* at Ain Sferjla and Oued Cherrat, 2004.

**Tricholoma inamoenum* (Fr.) Gillet, (1874); species harvested in winter 2003 in Ain Sferjla' clearings.

Order: Auriculariales

Family: Auriculariaceae

**Auricularia auricula-judae* (Bull.) Quél., (1886), sensu Cranwell, (= *Auricularia cornea* Ehrenb., 1820); species collected on a Pinus dead tree trunk in Oued Yekem during the spring of 2003.

Order: Boletales

Family: Boletaceae

**Boletus aereus* Secr., Bull., (1789); species harvested under oak in autumn 2004 at Benslimane.

**Boletus aestivalis* Paulet Fr., (1838), (= *Boletus reticulatus* Schaeff., 1774); species harvested under oak in autumn 2004 at Benslimane.

**Leccinum scabrum* (Bull.) Gray, (1821); species harvested in the autumn of 2004 in Benslimane' underbrush.

**Xerocomus chrysenteron* (Bull.) Quél., (1888), (= *Xerocomellus chrysenteron* (Bull.) Šutara, 2008); species harvested in spring 2005 at Ain Sferjla.

Family: Sclerodermataceae

**Pisolithus arhizus* (Scop.) Rauschert, (1959); species encountered in Eucalyptus' clearings at Oued Nfifikh during winter 2005.

Family: Suillaceae

**Suillus bovinus* (Pers.) Roussel, (1796); species harvested close to the road under *Quercus suber* at Ain Sferjla during the winter of 2003.

Order: Cantharellales

Family: Cantharellaceae

**Craterellus cornucopioides* (L.) Pers., (1825); species harvested in spring 2003 under *Pinus* at Oued Yekem.

Order: Hymenochaetales

Family: Hymenochaetaceae

**Phellinus torulosus* (Pers.) Bourdot & Galzin, (1925), (= *Fuscoporia torulosa* (Pers.) T. Wagner & M. Fisch., 2001); species harvested under *Eucalyptus* during spring 2003 at Ain Sferjla.

Order: Polyporales

Family: Ganodermataceae

**Ganoderma lucidum* (Curtis) P. Karst., (1881), sensu auct. asiatic., (= *Ganoderma orbiforme* (Fr.) Ryvarden, 2000); species harvested in the Harcha' forest, on a dead holm oak during winter 2003.

**Ganoderma resinaceum* Boud., (1890); species harvested in Ain Sferjla' forest on *Quercus suber* during winter 2005.

Family: Meruliaceae

**Abortiporus biennis* (Bull.) Singer, (1944); species harvested in Ain Sferjla' forest at the base of a dead trunk of *Quercus suber* during winter 2003.

Family: Polyporaceae

**Trametes versicolor* (L.) Lloyd, 1921); species harvested in the Harsha' forest on dead oak in Winter 2003.

Order: Russulales

Family: Russulaceae

**Lactarius deliciosus* (L.) Gray, (1821); species harvested near the road in clearings in the Ain Sferjla forest's during Winter 2003.

**Lactarius pterosporus* Romagn., (1949); species harvested under *Quercus suber* at Benslimane during winter 2003.

**Lactarius romagnesii* Bon, (1979); species harvested under *Quercus suber* at Ain Sferjla during winter 2003.

**Russula amoenolens* Romagn., (1952); species harvested under *Quercus suber* at Benslimane during spring 2004.

**Russula amoenicolor* Romagn., (1962); species harvested under *Quercus suber* at Benslimane during spring 2004.

**Russula betulina* Melzer, (1925), Burl., (1915); species harvested under *Quercus suber* at Benslimane during spring 2004.

**Russula cyanoxantha* (Schaeff.) Fr., (1863); species harvested under *Quercus suber* at Benslimane during spring 2004.

**Russula emeticicolor* Jul. Schäff., (1937); species harvested under *Quercus suber* at Benslimane during spring 2004.

**Russula exalbicans* (Pers.) Melzer & Zvára, (1927); species harvested in the underbrush at Benslimane during spring 2004.

**Russula gracillima* Jul. Schäff., (1931); species harvested in the underbrush at Ain Sferjla during spring 2004.

**Russula krombholzii* Shaffer, (1970), (= *Russula atropurpurea* (Krombh.) Britzelm., 1893); species harvested in the oak's glades at Benslimane during spring 2004.

**Russula pectinatoides* Peck, (1907), sensu auct., (= *Russula praetervisa* Sarnari, 1998), sensu NCL (1960), Rayner (1985), (= *Russula insignis* Quél., 1888); species harvested under pine trees in Benslimane during spring 2004.

Family: Stereaceae

**Stereum hirsutum* (Willd.) Pers., (1800); species harvested in the Harsha' forest on a dead trunk of *Quercus suber* in winter 2003.

Order: Thelephorales

Family: Thelephoraceae

**Thelephora caryophyllea* (Schaeff.) Pers., (1801); species harvested under pine trees at Sidi Taybi during spring 2005.

Order: Tremellales

Family: Tremellaceae

**Tremella mesenterica* Schumach., (1803), J.F. Gmel., (1792), Schaeff., (1774), Retz., (1769); species harvested on a decaying green oak trunk at Harsha' forest during winter 2003.

Fig. 1: Some Ascomycetes and Basidiomycetes of the Moroccan central plateau



Helvella lacunosa (A), *Morchella conica* (B), *Sarcosphaera crassa* (C) and *Agaricus campestris* (D).

Fig. 2 : Some Basidiomycetes of the Moroccan central plateau



Amanita maerei (A), *Copelandia papilionacea* (B), *Coprinus comatus* (C) and *Entoloma mougeotii* (D).

Fig. 3: Some Basidiomycetes of the Moroccan central plateau



Hygrophorus russula (A), *Omphalotus olearius* (B), *Pleurotus oestreatus* (C) and *Volvaria gloiocephala* (D).

CONCLUSION

This work allowed to inventory 73 fungal species of in the Central Plateau including:

-7 Wild edible species: *Agaricus campestris*, *Coprinus comatus*, *Marasmius oreades*, *Pleurotus ostreatus*, *Amanita rubescens*, *Craterellus cornucopioides* and *Lactarius deliciosus*⁴¹.

- 4 Medicinal mushrooms: *Pleurotus ostreatus*, *Auricularia auricula-judae*, *Ganoderma lucidum* and *Trametes versicolor*⁴².

- 19 Species are new to mycoflora of the Central Plateau: *Abortiporus biennis*, *Agaricus semotus*, *Amanita strobiliformis*, *Boletus aestivalis*, *Calvatia excipuliformis*, *Cortinarius cinnamomeus*, *Cortinarius orellanus*, *Entoloma rusticoides*, *Ganoderma resinaceum*, *Geastrum fimbriatum*, *Helvella lacunosa*, *Lactarius deliciosus*, *Lactarius romagnesii*, *Marasmiellus vaillantii*, *Morchella conica*, *Russula emetica*, *Russula pectinatoides*, *Vascellum pratense* and *Xerocomus chrysenteron*.

- 17 Species are new to the fungal flora of Morocco: *Agrocybe arvalis*, *Bovista pila*, *Collybia hybrida*, *Collybia ocior*, *Copelandia panaeolus*, *Entoloma mougeotii*, *Hebeloma pumilum*, *Lactarius pterosporus*, *Leccinum scabrum*, *Russula betulina*, *Russula exalbicans*, *Russula cyan*, *Russula krombholzii*, *Russula gracillima*, *Sarcosphaera crassa*, *Trametes versicolor* and *Tricholoma inamoenum*.

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