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MYCOLOGICAL CHARACTERIZATION AND COMPARISON OF CLIMAX FOREST ASSOCIATIONS IN THE MECSEK MOUNTAINS

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Deciduous forests, developed in Submediterrean climate, differ essentially from those in Central and Western Europe. Present paper concerns fungistical characterization of four Submediterranean climax associations based on 8 years investigation, as well as on literary data. Near common and rare species differential and local character ones are considered, those with indicative value, too. In addition, functional distribution of these associations is discussed.

Keywords: climax forests, submediterranean climate, macrofungi

Introduction

One of the poorly investigated areas of Hungary, by a mycological point of view, was the Mecsek Mountains.

Publications made by VASS [1] concerning 278 macrofungi species were pioneers in exploration of the area. BABOS [2] noted 30, RIMÓCZI [3] 158 species occurring in Mecsek.

The authors investigation on macrofungi of Mecsek started in 1994 with first results published in 1998 [4], and 1999 [5]. Complete species list revised [6] as well as data according to the author [7], were published in 2001, containing occurrence data of 523 species. After these publications some 100 species (60 new for Mecsek) have been recorded, which are being published in the close future.

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Climax plant associations in Mecsek, developed in Submediterranean climate, are considerably different from those in Central and Western Europe, as well as those in the Mediterranean, too. Investigations in similar associations were made by LISIEWSKA et JELIC [8] in Serbia; TORTIC [9, 10] and TORTIC et LISIEWSKA [11] in Croatia; TORTIC et LISIEWSKA [12] in Bosnia.

The object of present work was to make fungistical and functional characterization as well as comparison of Mecseks climax forest associations.

Material and methods

Short geographic characterization of Mecsek

Being situated in Southwest Hungary, "South Transdanubia" (MTB 9774-9876), on 9.5°C isotherm, the area has Submediterranean climate with average annual precipitation of about 700 mm, two maximums (60-80 mm in May–June and 60–78 mm in October-November). Its total area is 500 km^2, its highest peak is 680 m altitude above sea-level. It is characterized mainly by brown forest soils, developed on limestone [13]. From plant geographic point of view it belongs to Pannonicum floristic territory, Praeillyricum floristic region, Sopianicum floristic district with several Submediterranean, Balkan and alpine plant species. Its climax plant associations are oak-, hornbeam-oak- and beech-forests [14].

Characterization of the investigated plant associations

Characterization is made on the basis of BORHIDI et SÁNTA [15], HORVÁT [16] and BARTHA et al. [17].

1. *Asperulo taurinae-Carpinetum* SOÓ et BORHIDI in SOÓ 1962; CORINE N° 41.2A15

Syn: *Querco-Carpinetum mecsekense* A. O. HORV. (1948) 1958; *Querco petraeae-Carpinetum mecsekense* SOÓ 1937; *Querco-Carpinetum serbicum aculeatetosum* JANKOVIC et MISIC 1954.

Belonging to mesophilous deciduous forests (*Querco-Fagetea* BR.-BL. et VLIEGER in Vlieger 1937 em. BORHIDI 1996), mesophilous forests from South Transdanubia (*Aremonio-Fagion* [I. HORV. 1938] BORHIDI in TÖRÖK et al. 1989), hornbeam-oak-forest is the most widespread plant association occupying the largest area in Mecsek, developed on limestone, brown forest soils. Characteristic forest species are *Quercus petraea* and *Qu. cerris* in upper, *Carpinus betulus* in lower crown-

level. Additionally *Tilia tomentosa, Cerasus avium, Acer campestre* and *A. platanoides* may also occur. Near typical deciduous shrubs: *Staphylea pinnata* and *Ruscus aculeatus* characterizes it. Facies forming species in grass-level are *Melica uniflora, Carex pilosa, Galium odoratum, Aegopodium podagraria*, other characteristic ones are *Helleborus odorus, Doronicum orientale* and *Lonicera caprifolium*.

Examined localities from East to West: Ófalu, Zobákpuszta, Vasas, Árpádtető Koszonyatető, Dömörkapu, Kantavár, Misinatető, Egervölgy, Reményi Zsomboly, Orfű, Abaliget, Kövesdi Hát É.

2. *Asperulo taurinae-Carpinetum* SOÓ et BORHIDI in SOÓ 1962 nudum: CORINE N^{o} 41.2A15

All characteristics are the same as *Asperulo taurinae-Carpinetum* except facies forming species (they are absent), exposition (steeper) and soil (thinner layer). Because of these differences (come out in macrofungi composition, too) "nudum" stands must be treated separately.

Localities of examined stands from East to West: Vasas, Égervölgy, Abaliget.

3. *Helleboro odori-Fagetum* SOÓ et BORHIDI in SOÓ 1960: CORINE N^{o} 41.1C24

Syn: *Fagetum mecsekense* A. O. HORV. 1959; *Helleboro-(odoro)-Fagetum* SOÓ et BORHIDI 1960 *mecsekense* (A. O. HORV. 1959) SOÓ et BORHIDI ap. SOO 1962; *Fagetum serbicum tilietosum argenteae* et *festucetosum drymeiae* JANKOVIC et MISIC 1954.

Belonging to the same phytocoenological unit, beech-forests consist mainly of extrazonally developed stands on limestone, brown forest soils, characterized by *Fagus sylvatica* in crown-level. Besides, *Tilia tomentosa, Quercus cerris, Qu. petraea* and *Carpinus betulus* may occur. Shrub-level is missing, characteristic species in grass-level are *Lonicera caprifolium, Tamus communis, Ruscus aculeatus, R. hypoglossum, Scutellaria altissima, Potentilla micrantha* and *Festuca drymeia*. Facies forming species are *Carex pilosa, Galium odoratum, Melica uniflora, Allium ursinum, Oxalis acetosella* and *Aegopodium podagraria*.

Localities of examined stands from East to West: Ófalu, Árpádtető, Koszonyatető, Dömörkapu, Kantavár, Egervölgy, Orfű, Abaliget.

4. *Potentillo micranthae-Quercetum dalechampii* A. O. HORVÁT 1981: CORINE N^{o} 41.892

Syn: *Quercetum petraeae-cerris mecsekense* A. O. HORV. 1956; *Tilio argenteae-Quercetum petraeae-cerris kapitälchen* 1957; *Tilio argenteae-Quercetum dalechampii-cerris kapitälchen* 1939; *Quercetum montanum* JANKOVIC et MISIC 1952.

Association belonging to Submediterranean and subcontinental xerotherm forests (*Quercetea pubescentis-petraeae* [OBERD. 1948] JAKUCS 1960), Balcanian oak-forests (*Quercion farnetto* I. HORVAT 1954), developed on brown forest soils, different native rock types, occupying significant area in Mecsek. Species in the crown-level are *Quercus cerris, Qu. dalechampii, Tilia tomentosa* and *Acer campestre*. Its well-developed shrub-level can be characterized by *Fraxinus ornus, Sorbus domestica* and *Cornus mas*. Grass-level is well-developed, too, with *Melica uniflora, Festuca heterophylla, Brachypodium sylvaticum, Carex flacca* as facies forming, *Potentilla micrantha, Ruscus aculeatus, Helleborus odorus, Doromcum orientale, Paeonia officinalis* subsp. *banatica* as characteristic species.

Localities of examined stands from East to West: Ófalu, Mecseknádasd, Zengővárkony, Vasas, Csertető, Árpádtető, Koszonyatető, Dömörkapu, Kantavár, Mohosi Kiskút, Abaliget.

Collecting and processing methods

Field surveys were made between autumn 1994 and autumn 2001 (total 104 days), recording basic data (locality, habitat, date of occurrence and substrate) of alI species. The majority of species have been documented by fungaria, photo and/or description. For species list and basic data up to 2000 summer see [6, 7], those collected after this time will be published in the close future. Nomenclature used was those of KRIEGLSTEINER [39], functional grouping after ARNOLDS et al. [18].

Characterizations and comparisons were made on the basis of common, rare, differential, local character species as well as species with indicative value and functional grouping, too. Species with more than 5 occurrence data were considered common, those with one occurrence were considered rare. Differential species were established on the basis of their occurrence in only one of the examined associations but considered by European literary data belonging to other habitats too, in the case when these environmental conditions (or habitats) exist in Mecsek. So it is possible that a differential species for one of these associations occur in edaphic, planted etc. habitats in Mecsek, too. If these conditions do not exist (on the basis of our present knowledge) those species were regarding as local character ones. In doubtful cases (e.g. few occurrence data) potential differential and character species were considered to

become real ones if enough data will be available (8 years of investigation and literary data are not supposing the full knowledge of species set in Mecsek).

Results

Occurrence data of 458 **species** with 2351 data have been recorded from total 35 stands of the four climax associations. These data according to plant associations:

Association	N° of stands	N° of species	N° of occurrence data
Asperulo taurinae-Carpinetum	13	371	1416
Asperulo taurinae-Carpinetum nudum	3	104	187
Helleboro odori-Fagetum	8	190	346
Potentillo micranthae-Quercetum dalechampii	11	198	402

Species **common** for all associations (more than 5 occurrence data) are: *Amanita rubescens* (PERS.: FR.) GRAY, *Russula cyanoxantha* (SCHAEFF.) FR., *Stereum hirsutum* (WILLD.: FR.) GRAY and *Xerula radicata* (RELHAN: FR.) DOERFELT; those common for alI associations except "nudum": *Russula atropurpurea* (KRBH.) BRITZ., non PECK, *Lycoperdon perlatum* PERS.: PERS., *Macrolepiota procera* (SCOP.: FR.) SING. and *Russula delica* FR.; those common for *Asperulo taurinae-Carpinetum* and *Potentillo micranthae-Quercetum dalechampii* are: *Lactarius piperatus* (L.: FR.) GRAY (ss. MOS. 1983), *Collybia dryophila* (BULL.: FR.) KUMMER, *Clitocybe gibba* (PERS.: FR.) KUMMER, *Clitopilus prunulus* (SCOP.: FR.) KUMMER, *Collybia peronata* (BOLT.: FR.) SINGER, *Omphalotus olearius* (DC.: FR.) SING., *Russula vesca* FR, *Amanita pantherina* (DC.: FR.) KROMBH., *Armillaria tabescens* (SCOP.: FR.) SING., *Cantharellus cibarius* FR, *Collybia fusipes* (BULL.: FR.); QUÉL., *Hypholoma fasciculare* (HUDS.: FR.) KUMMER, *Mycena pura* (PERS.: FR.) KUMMER and *Russua heterophylla* (FR.) FR. Finally, common species for *Asperulo taurinae-Carpinetum* and *Helleboro odori-Fagetum* are: *Russula nigricans* (BULL.) FR., *Trametes versicolor* (L.: FR.) PILAT, *Lactarius blennius* FR., *Pluteus cervinus* (SCHAEFF.) KUMMER, *Megacollybia platyphylla* (PERS.: FR.) KOTL. et POUZ, *Amanita vaginata* (BULL.: FR.) VITT., *Clavulina cristata* (FR.) SCHROETER, *Craterellus cornucopioides* (L.) PERS., *Fomes fomentarius* (L.: FR.) FR. and *Lactarius quietus* (FR.) FR. Majority of these species are common to Hungarian medium-height mountains, too.

Asperulo taurinae-Carpinetum can be characterized by several other common species, like *Schizophyllum commune* FR.: FR., *Hypholoma sublateritium* (FR.) QUÉL., *Trichaptum biforme* (FR. IN KL.) RYV., *Stereum subtomentosum* POUZ, *Xerocomus chrysenteron* (BULL.: ST. AMANS) QUÉL., *Amanita citrina* (SCHAEFF.) GRAY, *Lactarius chrysorrheus* FR., *Armillaria mellea* (VAHL.: FR.) KARST. s. str., *Bjerkandera adusta* (WILLD.: FR.) KARST., *Laccaria laccata* (SCOP.: FR.) BERK. et BR., *Trametes gibbosa* (PERS.: FR.) FR., *Panellus stypticus* (BULL.: FR.) KARST., *Trametes hirsuta* (WULF.: FR.) PILAT, *Xylaria hypoxylon* (L. ex : HOOKER) GREV., *Amanita phalloides* (FR.) LINK, *Hymenochaete rubiginosa* (DICKS.: FR.) LEV., *Lactarius vellereus* (FR.) FR., *Daedaleopsis confragosa* var. *tricolor* (BULL.) BOND., *Laccaria amethystea* (BULL.) MURR., *Lycoperdon pyriforme* SCHAEFF.: PERS., *Psathyrella pilulifarmis* (BULL.: FR.) ORTON, *Russula foetens* (PERS.: FR.) FR. and *Russula rosea* PERS.

Just like common ones, rare species can also be found in large number. Species worthy of mention are: *Amanita ceciliae* (BERK. et BR.) BAS, *Amanita lividopallescens* GILL., *Boletus regius* KRBH., *Cantharellus tubaeformis* var. *lutescens* (FR.) GILL., *Cortinarius (Phl.) cliduchus* FR., *Cortinarius (Phl.) magicus* EICHH., *Cortinarius (Phl.) multiformis* (FR.) FR., *Cortinarius (Phl.) prasinus* FR. ss. J. LGE., *Cortinarius (Tel.) castaneus* (BULL.: FR.) FR., *Floccularia straminea* (KUMM.) POUZ, *Hericium coralloides* (SCOP.: FR.) GRAY, *Hygrophorus arbustivus* (FR.) FR., *Inocybe griseovelata* KUEHN., *Ischnoderma resinosum* (FR.) P. KARST., *Lactarius pallidus* (PERS.: FR.) FR., *Lactarius pyrogalus* (BULL.: FR.) FR., *Lentinellus cochleatus* (PERS.: FR.) KARST., *Microcollybia cookei* (BRES.) LENNOX, *Mycena aurantiomarginata* (FR.) QUEL., *Phaeomarasmius muricatus* (FR.) ROMAGN., *Pluteus umbrosus* (PERS.: FR.) KUMMER, *Russula maculata* QUEL. et ROZ, *Scleroderma meridionale* DEMOULIN et MALENCON, *Tylopilus felleus* (BULL.: FR.) KARST. and *Volvariella caesiotincta* ORTON.

Asperulo taurinae-Carpinetum nudum had only a few common species, which also occur mainly in the other associations. Beside species mentioned in the foregoing, *Russula nigricans* (BULL.) FR., *Russula vesca* FR., *Boletus reticulatus* SCHAEFFER, *Lactarius vellereus* (FR.) FR., *Panellus stypticus* (BULL.: FR.) KARST. and *Russula pectinatoides* Peck characterizes this type of the association.

Rare ones are: *Amanita rubescens* var. *annulosulphurea* GILL., *Cortinarius (Lepr.) melanotus* KALCHBR, *Ischnoderma resinosum* (FR.) P. KARST., *Lepista panaeola* (FR.) P. KARST. and *Phellinus torulosus* (PERS.) BOURD. et GALZ.

Helleboro odori-Fagetum has another common species, *Stropharia aeruginosa* (CURT.: FR.) QUÉL. near those, mentioned in the foregoing.

Number of rare species is also considerable: *Amanita lividopallescens* GILL., *Clavulinopsis corniculata* (SCHAEFF.: FR.) CORNER, *Coprinus alopecia* LASCH, *Cortinarius (Lepr.) brunneofulvus* FR. ss. BRES., *Cortinarius (Lepr.) orellanus* (FR.) FR., *Cortinarius (Lepr.) venetus* (FR.: FR.) FR., *Cortinarius (Tel.) rigens* (PERS.: FR.) FR., *Hygrophorus chrysodon* (BATSCH: FR.) FR., *Ischnoderma resinosum* (FR.) P. KARST., *Lactarius pallidus* (PERS.: FR.) FR., *Tuber rufum* PICO ex FR. and *Xerula caussei* MRE.

Potentillo micranthae-Quercetum dalechampii can be characterized by another two common species: *Collybia butyracea* var. *asema* FR. and *Lycoperdon molle* PERS.: PERS.

Rare ones from this association are: *Aspropaxillus giganteus* (SOW.: FR.) KUEHN. et MRE., *Boletus regius* KRBH., *Clavariadelphus pistillaris* (L.: FR.) DONK, *Cortinarius (Derm.) olivaceofuscus* KUEHNER, *Cortinarius (Myx.) lividoochraceus* (BERK.) BERK., *Cortinarius (Phl.) magicus* EICHH., *Cortinarius (Phl.) pseudosulphureus* HRY. ex ORTON, *Entoloma placidum* (FR.: FR.) NOORD., *Hygrophorus lindtneri* MOSER, *Inocybe bongardii* var. *cervicolor* (PERS.) HENKEL, *Inocybe obscurobadia* (FAVRE) GRUND et STUNTZ, *Inonotus dryadeus* (PERS.: FR.), MURRILL, *Meripilus giganteus* (PERS.: FR.) KARST., *Otidea onotica* (PERS.) FCKL., *Panus lecomtei* (FR.) CORNER and *Xerocomus rubellus* (KRBH.) QUÉL.

Differential species considered for these associations are:

Differential species	**Potential differential species**
Asperulo taurinae-Carpinetum	
Calocera cornea (BATSCH: FR.) FR.	*Chondrostereum purpureum* (PERS.: FR.) POUZ
Hapalopilus rutilans (PERS.: FR.) KARST.	*Flammulaster muricatus* (FR.) WATL.
Tremella mesenterica RETZ. in HOOK.: FR.	*Hygrophorus arbustivus* (FR.) FR.
Marasmius alliaceus (JACQ.: FR.) FR.	*Lentinellus cochleatus* (PERS.: FR.) KARST.
Hypsizygus tessulatus (FR.) SING.	*Pluteus umbrosus* (PERS.: FR.) KUMMER
	Spongiporus subcaesius (DAVID) DAVID
Asperulo taurinae-Carpinetum nudum	
Scutiger cristatus (PERS.: FR.) BOND. et SINGER	*Cortinarius (Derm.) phoeniceus* BULL.: MRE.
	Phellinus torulosus (PERS.) BOURD. et GALZ.

	Tricholoma sciodes (PERS.) MART.
Helleboro odori-Fagetum	
	Clavulinopsis corniculata (SCHAEFF.: FR.) CORNER
	Macrotyphulafistulosa (HOLMSK.: FR.) PETERSEN
	Russula faginea ROMAGN.
	Russula risigallina (BATSCH) KUYP. et VAN VUURE
Potentillo micranthae-Quercetum dalechampii	
Hygrophorus lindtneri MOSER	*Clavariadelphus pistillaris* (L.: FR.) DONK
Cortinarius (Derm.) olivaceofuscus KUEHNER	*Lactarius serifluus* (DC.: FR.) FR.
	Lepiota fuscovinacea LGE. et MOELL.
	Lepiota ignicolor BRES.

Local character species considered are:

Character species	**Potential character species**
Asperulo taurinae-Carpinetum	
Rozites caperatus (PERS.: FR.) KARST.	
Lactarius pyrogalus (BULL.: FR.) FR.	
Asperulo taurinae-Carpinetum nudum	
	Amanita rubescens var. *annulosulphurea* GILL.
	Cortinarius (Lepr.) melanotus KALCHBR.
Helleboro odori-Fagetum	
Hygrophorus chrysodon (BATSCH: FR.) FR.	
Hygrophorus unicolor GROEGER	
Potentillo micranthae-Quercetum dalechampii	
Cortinarius (Tel.) bulliardii (PERS.: FR.) FR.	
lnonotus dryadeus (PERS.: FR.) MURRILL	
Lactarius subsericatus KUEHN. ex BON	

Common for Asperulo taurinae-Carpinetum and "nudum"

Lactarius circellatus FR.
Lactarius decipiens QUÉL.

Common for Asperulo taurinae-Carpinetum and Helleboro odori-Fagetum

Lactarius blennius FR.
Lactarius jluens BOUD.

Species with indicative value considered are:

Indicated feature	**Species**
Forest habitat disturbance	*Aleuria aurantia* (PERS.: FR.) FCKL.
Undisturbed hornbeam-oak-forest and beech-forest stands	*Ganoderma pfeifferi* BRES.
	Hericium coralloides (SCOP.: FR.) GRAY
	Hypsizygus tessulatus (FR.) SING.
	Hypsizygus ulmarius (BULL.: FR.) REDH. 1984
	Ischnoderma resinosum (FR.) P. KARST.
	Laxitextum bicolor (PERS.: FR.) LENTZ
	Meripilus giganteus (PERS.: FR.) KARST.
	Pluteus leoninus (SCHAEFF.: FR.) KUMMER
Acidic soils (below pH 4.5)	*Cortinarius (Derm.) phoeniceus* BULL.: MRE.
	Tricholoma sciodes (PERS.) MART.
Calcareous soils	*Cortinarius (Tel.) bulliardii* (PERS.: FR.) FR.
	Lactarius subsericatus KUEHN. ex BON
	Lepiota fuscovinacea LGE. et MOELL.
lnitial phase hornbeam-oak-forest and beech-forest stands	*Chondrostereum purpureum* (PERS.: FR.) POUZ.
	Trametes gibbosa (PERS.: FR.) FR.
Optimal phase hornbeam-oak-forest and beech-forest stands	*Mycena haematopus* (PERS.: FR.) KUMMER
	Pluteus nanus (PERS.: FR.) KUMMER
	Pluteus umbrosus (PERS.: FR.) KUMMER
Final phase hornbeam-oak-forest and	*Hypoxylon deustum* (HOFFM.: FR.) GREV.

beech-forest stands

From these species 267 are mentioned in the preliminary **Red Data List** of Hungarian Macrofungi [19], 39 in "highly endangered", 192 in "endangered" and 36 in "potentially endangered" categories.

Discussion

Number of species collected in different habitats depend on their area size [20]. That is why *Asperulo taurinae-Carpinetum*, the most widespread association in Mecsek, had the largest number of species. On the other hand "nudum" stands were the poorest ones, because of their small areas, while *Helleboro odori-Fagetum* and *Potentillo micranthae-Quercetum dalechampii* had about 200 species according to their medium size area in Mecsek.

Asperulo taurinae-Carpinetum was the richest association considering to both **common** and **rare species**. On the other hand *Helleboro odori-Fagetum* and *Potentillo micranthae-Quercetum dalechampii* had well defined species structure, too. *Asperulo taurinae-Carpinetum nudum* was the poorest and the less defined, which can be explained with its small-area stands as well as with its transition character between *Asperulo taurinae-Carpinetum* and calciphobous associations in Mecsek (*Sorbo torminalis-Fagetum* and *Luzulo forsteri-Quercetum*). Many of common species were reported from the same associations as in the former Yugoslavia: *Amanita rubescens, Lactarius quietus, Amanita phalloides, Lactarius vellereus*, common in *Asperulo taurinae-Carpinetum* [8]; *Lactarius piperatus*, common in *Helleboro odori-Fagetum* [8]; *Fomes fomentarius, Bjerkandera adusta, Trametes gibbosa, T. hirsuta* [10], common for *Fagetum croaticum montanum* (an association close to *Helleboro odori-Fagetum*). *Trichaptum biforme*, a common species from Mecsek is considered rather rare [8]. In contrary, the rare *Ischnoderma resinosum* from Mecsek is noted as very common [8]. According to literary data, *Meripilus giganteus* is rare, too [8, 10].

Asperulo taurinae-Carpinetum and *Helleboro odori-Fagetum* are very close habitats in Mecsek, differing slightly only by proportion of trees as weIl as by temperature and water conditions. According to LISIEWSKA [21] beech considerably influences the character of the Funga. Occurring in both associations causes high overlaps in macrofungi species set. That is why differential and characteristic species are difficult to establish, many macrofungi occurring in both associations alike.

According to literary data many **differential species** from *Asperulo taurinae-Carpinetum* are characteristic or even character to European beech-forests, too:

Calocera cornea [22], *Tremella mesenterica* [21], the potentials: *Chondrostereum purpureum* [22] and *Spongiporus subcaesius* [23, 24]. *Marasmius alliaceus* is regarded unanimously as European beech-forest character species, too [21, 22, 25, 26]. Beside this the author considered these species differential for *Asperulo taurinae-Carpinetum* in Mecsek because they have no occurrence in beech-forests. Beech-connected species from this group follows their host or mycorrhizal partner in hornbeam-oak-forests, lacking occurrence in beech-forests in Mecsek. By literary data *Hapalopilus rutilans* is considered to belong to all deciduous forests with *Quercus* species [27], but not occurring in other associations in Mecsek. Being a transitional habitat between hornbeam-oak-forests and edaphic calcifuguous forests, all of differential species of *Asperulo taurinae-Carpinetum nudum* have documented occurrence from the *Sorbo torminalis-Fagetum* association in Mecsek. Moreover, *Cortinarius phoeniceus* is the character species of the latter [7]. Despite, these acidophilous species differentiates the "*nudum*" subassociation for the other climax associations investigated and discussed here. According to literary data all of *Helleboro odori-Fagetum* differential species are noted from European beech-forests, too [28]. *Cortinarius olivaceofuscus* and *Hygrophorus lindtneri*, differential species from *Potentilio micranthae-Quercetum dalechampii* are regarded as differential ones for Mediterranean oak-forests [29]. The latter [30], together with *Lactarius serifluus* [22] belongs to European hornbeam-oak-forest characteristic species, too. Many authors consider *Clavariadelphus pistillaris* as European beech-forest characteristic species [22, 25, 31, 32]. We have no occurrence documented from the beech-forests in Mecsek. *Lepiota ignicolor* and *L. fuscovinacea* occurs in grassy forests [28]. In the area the only grassy climax forests are oak-forests.

Local character species were relatively few. *Lactarius pyrogalus*, a species connected with *Corylus* is regarded by many authors characteristic to European hornbeam-oak-forests [22, 30, 33]. Together with *Rozites caperatus* the author considers them *Asperulo taurinae-Carpinetum* character species. The latter occurs in many other habitats in Europe (coniferous forests, high moors), but the only habitat in which it can live in Mecsek is hornbeam-oak-forest. The few data do not allow to establish local character species for *Asverulo taurinae-Carpinetum nudum*, only two potential ones: *Amanita rubescens* var. *annulosulphurea*, an ecological less known variety and *Cortinarius melanotus* occurring only in this subassociation, both with one occurrence data. Both *Helleboro odori-Fagetum* character species: *Hygrophorus chrysodon* [30] and *H. unicolor* [34] are noted as European beech-forest species. From *Potentillo micranthae-Quercetum dalechampii* local character species *Inonotus dryadeus* is also confined from European hornbeam-oak-forests [22], occurring always on *Quercus* [27], *Cortinarius bulliardi* is characteristic to Mediterranean oak-forests,

too [29]. Four common character species were established. *Lactarius blennius* and *L. fluens*, beech mycorrhizal species follows the beech in hornbeam-oak-forests, being even more frequent in this association. *Lactarius circellatus* and *L. decipiens* occurred in both *Asperulo taurinae-Carpinetum* and "*nudum*" subassociation connected with hornbeam.

Many **species of indicative value** are confirmed by literary data, too: *Cortinarius phoeniceus* and *Tricholoma sciodes* [28, 35] as acidophilic; *Cortinarius bulliardii* [29] as calciphilous species; indicator species of different forest decomposition stages: *Chondrostereum purpureum* [22, 26], *Trametes gibbosa* [26, 36, 37, 38] of initial; *Lycoperdon pyriforme* [36], *Mycena haematopus* [26], *Pluteus nanus* [26], *P. umbrosus* [26] and *Stereum subtomentosum* [36] of optimal; *Hypoxylon deustum* [36, 37, 38] of final phase. Indicators of undisturbed stands were established on the basis of their occurrence exclusively in undisturbed, unmanaged forest stands.

Number of species belonging to different **functional groups** reflects species number distribution in the different associations, except wood-inhabitant saprotrophic ones from *Helleboro odori-Fagetum*, higher than those of *Potentillo micranthae-Quercetum dalechampii* (Figure 1). General functional distribution of the four associations (Figure 2) does not differ essentially, they alI belong to "species with functional distribution similar to that general one to Mecsek" [7, p. 80]. Previous investigations [7] showed higher mycorrhizal value in *Asperulo taurinae-Carpinetum nudum*, but completed with new data after summer 2000 the association belongs to this group. All associations can be characterized with high (42–48%) mycorrhizal preponderance caused by favourable soil and water conditions, as weIl as many mycorrhizal partners. Necrotrophic parasite proportion is not accentuated because of forestry management present in almost complete area of Mecseks forests (of course functional distribution of small stands, not managed, shows much higher necrotrophic parasite and wood-inhabitant saprotrophic percentages). Wood-inhabitant (17–27%) and soil saprotrophic (15–27%) values are considerable. Being the driest from these association, *Potentillo micranthae-Quercetum dalechampii* shows the highest soil saprotrophic values, while the most acidic *Asperulo taurinae-Carpinetum nudum* shows the lowest one. The lowest wood-inhabitant saprotrophic values of *Potentillo micranthae-Quercetum dalechampii* is caused probably by lack of forest variety (no hornbeam and beech) combined with few dead wood, because of forestry management.

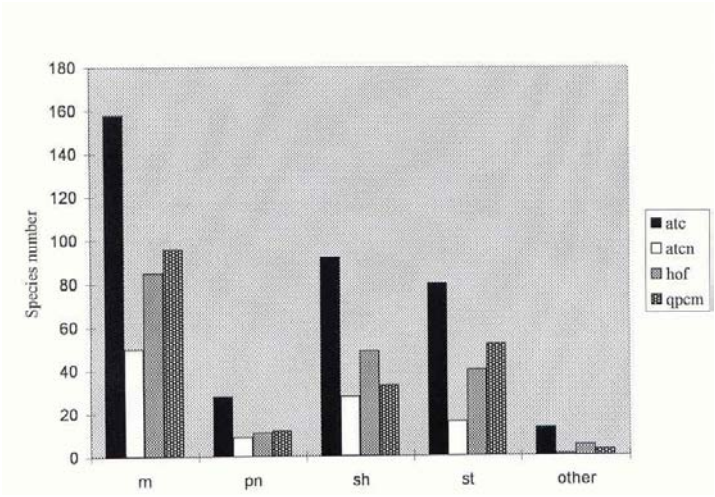

Figure 1. Species number of the different associations belonging to different funcional groups (atc=*Asperulo taurinae-Carpinetum*, atcn="nudum", hof=*Helleboro odori-Fagetum*, qpcm=*Potentillo micranthee-Quercetum*; other abbreviations: see Figure 2)

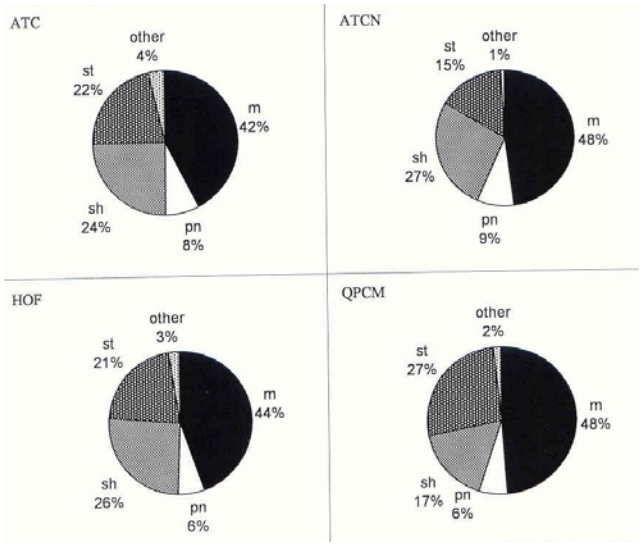

Figure 2. Functional distribution of macrofungi belonging to the different associations (for abbreviations see Figure 1; m=mycorrhizal, pn=necrotrophic parasite, sh=wood saprotrophic, st=soil saprotrophic, other/associated with moss, biotrophic parasite, coprotrophic and/or saprotrophic on grassy plant remains)

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