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Macrofungi of Tavas (Denizli) District in Turkey

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Abstract: Macrofungi samples have been collected during the field trips carried out in Tavas (Denizli) between in 1999-2001. As a result of field and Laboratory studies totally 45 taxa belong to 19 families were identified. Nine of these belong to Ascomycetes and 36 to Basidiomycetes. Seventeen species are edible and four taxa are poisonous.

Key words: Macrofungal diversity, taxonomy, Tavas, Denizli, Turkey

INTRODUCTION

Many taxonomic studies of the macrofungal flora of Turkey have been carried out and many others are in progress. The studies carried out on macrofungi species between 1932 and 2005 have been reviewed and as a result it was determined that there are approximately 1600 documented macrofungi species in Turkey (Sesli and Denchev, 2005). In these studies, the Mediterranean, Marmara, Black Sea and Western part of Turkey have been investigated. Although there are many taxonomic studies in the Aegean region, there are no results available for Tavas. Therefore the area was chosen as a research area.

The research area (Tavas) is located in the Inner Aegean region at a distance of 44 km. from the province of Denizli and at longitude 28° 15′-28° 45′ N and latitude 37° 45′-37° 15′ E. According to the grid square system used in the Flora of Turkey (Davis, 1965-1968), Tavas is situated in Square C2. The study area is between the mediterrenean region and the Irano-Turanian region belonging to the Old Mediterranean (Tethys) subkingdom of the Holoarctic flora region (Zohary, 1973). Because of climate, topography and differences of substrate, six soil groups were taken from the study area: brown forest soil, rendzina soil, noncalcerious brown forest soil, noncalcerious brown soil, red brown mediterranean soil, coluvial soil (TDG, 1999a). Brown forest soil and brown mediterranean soil which are the larger soil groups of the study area consist of clay stone including a reach amount of $CaCO_3$, schist and gneisses. The above mentioned soil groups show a typical Mediterranean climate.

The climatic data of the study area were obtained from the meteorology station at Tavas (950 m). For the climatic station, the mean annual temperature is 13.1°C and precipitation is 595.3 mm. According to Emberger's formula, the values of (M) and (m) of the hottest and coldest months were calculated to be 38.8 and -13.0°C, respectively (TGD, 1999b). The dry period in the region is between the end of April and end of October. The coldest month is January with mean temperature of 1.9°C. With respect to Emberger's Mediterranean bioclimatic zones as modified for Turkey by Akman (1990), the area belongs to the Mediterranean zone, semi-arid winters.

There are a number of trees such as *Pinus brutia*, *P. nigra* subsp. *pallasiana* mixed *Juniperus oxycedrus*, *J. communis*, *Cedrus libani*, *Quercus cerris* var. *cerris*, *Q. ithaburensis* subsp. *macrolepis*, these trees is dominant forest plants while *Populus nigra*, *P. tremula*, *Salix alba* and *Platanus orientalis* trees are growing near streams and these suitable climate and the type of vegetation make it very favorable place for the growth of macrofungi.

The aim of this study was to identify edible and poisonous species and contribute more data on macrofungi flora of Turkey.

MATERIALS AND METHODS

Macrofungi carpophores were collected on field trips carried out from Tavas district (1999-2001) (Fig. 1). The field studies were conducted mostly in autumn and spring, since during these periods the climatic conditions are most suitable for carpophore formation. Relevant

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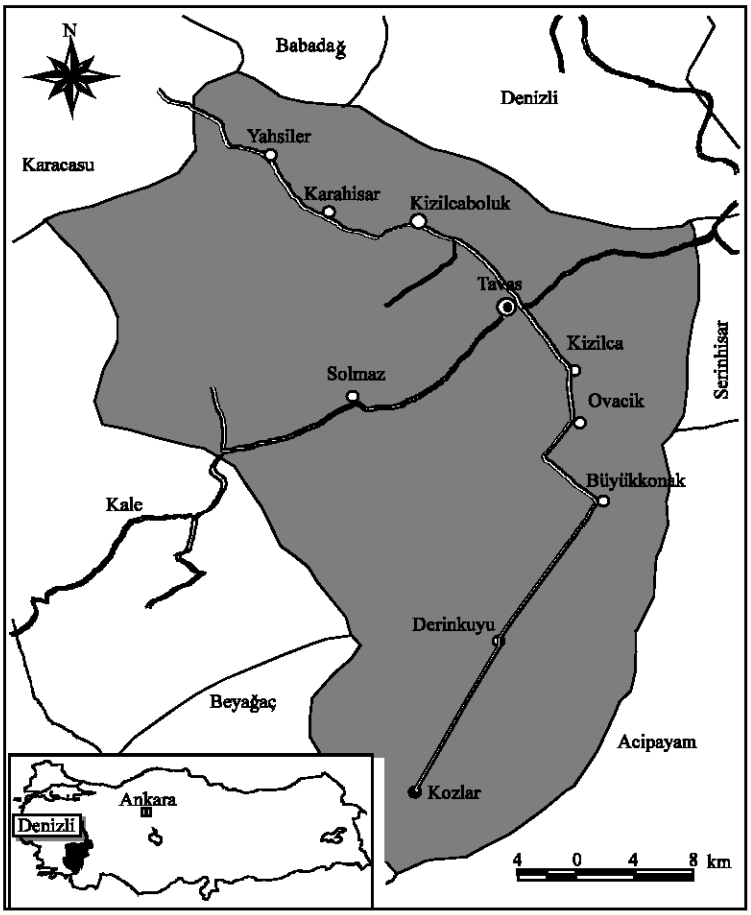

Fig. 1: Collection areas

morphological and ecological characteristics of the macrofungi were recorded and photographed in their natural habitats. The local consumption of macrofungi and their local names were recorded by interviewing local people. Then they were carried to the laboratory for further investigation. Spore prints were prepared and spores photographed. Some reagents (Melzer's reagent, 5% KOH, H_2SO_4, cotton blue, etc.) were used for identification. The specimens were identified by examining their macroscopic and microscopic features, using references by Breitenbach and Kränzlin (1984-2000), Brensinsky and Besl (1990), Marchand (1971-1986), Moser (1983), Grunert and Grunert (1984) and Phillips (1981). Taxa are arranged according to Kirk *et al*. (2001). Dried specimens were numbered and placed in sealed bags. In addition they were put into a deep freeze for a week to protect against internal and external parasite attacks. All collected specimens are now deposited at Pamukkale University, Science and Art Faculty, Laboratory of Biology Department, in Denizli.

RESULTS

The macrofungi taxa consisting of 45 taxa belonging to 19 families are identified. These taxa, their localities, distributions, collection dates, fungarium numbers are given below. T, G and U are the abbreviation of the authors in the citations of herbarium specimens.

Ascomycetes

Morchellaceae

1. *Morchella conica* var. *conica* (Pers.) Bound.
Pınarlık village, in *P. brutia* forest, 29.05.2001, T, G 398.
2. *Morchella elata* Fr.
Seki village, near road, 29.05.2001, T, G 399.
3. *Morchella esculenta* (L.) Pers.
Bıçakçı village, in pine forest, 29.04.2001, U 116.

Pezizaceae

4. *Peziza vesiculosa* Bull.
Seki village, near the road, 23.03.2001, U, T, G 254, Karahisar district, 23.03.2001 U, T, G 264.

5. *Sarcoscypha coccinea* (Jacq.) Sacc.
Aydoğdu village, in *P. nigra* subsp. *pallasiana* forest, 26. 02. 2001, U 185, 191.
6. *Sarcosphaera coronaria* (Jacq.) J. Schröt.
Aydoğdu village, in *J. communis* and *J. oxycedrus* mixed forest, 29.05.2001, T, G 340.

Helvellaceae
7. *Helvella acetabulum* (L.) Quél.
Pınarlar village, in *P. brutia* forest, 24. 04. 2001, U 166.
8. *Helvella lacunosa* Afzel.
Pınarlık village, near stream, 29.05.2001, T, G 341.

Discinaceae
9. *Gyromitra esculenta* (Pers.) Fr.
Pınarlık village, in *P. brutia* forest, 27. 04. 2000, U 244.

Basidiomycetes
Polyporaceae
10. *Polyporus squamosus* (Huds.) Fr.
Kızılcabölük district, on *Populus nigra*, 21.05.2001, U 186.
11. *Fomes fomentarius* (L.) J.J. Kickx
Yahşiler village, on *P. brutia* trunks, 15.12.2000, U, 121.
12. *Trametes gibbosa* (Pers.) Fr.
Yahşiler village, on trunks, 29.05.2001, T, G 342.

Schizophyllaceae
13. *Schizophyllum commune* Fr.
Sarıabat village, on *Morus alba* trees, 25.05.2001, U 178.

Hymenochaetaceae
14. *Phellinus torulosus* (Pers.) Bourdot and Galzin
Pınarlar village, on *Platanus orientalis,* 21.01.2001, U 153.

Geastraceae
15. *Geastrum triplex* Jungh.
Karahisar village, 02.01.2001 U 16, Yahşiler village, in grass, 01.12. 2000, U 4, Sarıabat village, in grass, 09.02.2001, U 45, Garipköy, in grass, 11.03.1999, U 85.

Lycoperdaceae
16. *Lycoperdon molle* Pers.
Tekke village, in grass in *P. nigra* subsp. *pallasia* forest, 29.01.2001, U 33, Akyar village, in grass and in *P. brutia* forest, 09.12.2000, U 30.
17. *Lycoperdon perlatum* Pers.
Derinkuyu village, 17.04.2001, U 257, Akyar village, the bank of the stream, 05.04.2001, U 189.
18. *Handkea utriformis* (Bull.) Pers.
Yoran plateau, in grass, 26.04.2001, U 267.
19. *Bovista plumbea* Pers.
Kızılcabölük, in grass, 21.03.2001, U 213, 243, Yoran plateau, in grass, 26.04.2001, U 199, Konak district, in grass, 12.04.2001, U 255.

Rhizopogonaceae
20. *Rhizopogon luteolus* Fr.
Kızılca forest, in *Quercus ithaburensi* var. *macrolepis* forest, 13.12.2000, U 78, Garipköy, 06.03.2001, U 110, Yoran plateau, in *J. communis* and *J. oxycedrus* mixed forest, 10.05.2001, U 27.
21. *Rhizopogon roseolus* (Corda) Th. Fr.
Seki village, 15.05. 2001, U 122, Konak district, in *J. communis* and *P. nigra* subsp. *pallasiana* mixed forest, 23.05.2001, U 332, Akyar village, in pine forest, 01.12.2000, U 175, Karataş village, in *P. brutia* forest, 12.10.2000, U 150.

Gomphidiaceae
22. *Chroogomphus rutilus* (Schaeff.) 0. K. Mill.
Pınarlık village, in *P. nigra* subsp. *pallasiana* forest, 02.06.2001, U 215, Kızılcabölük district, in *P. nigra* subsp. *pallasiana* forest, 29.05.2001, U 182.

Pleurotaceae
23. *Pleurotus ostreatus* (Jacq.) P. Kumm.
Aydoğdu village, on *Populus nigra*, 07.03.2001, U 80, Sarabat village, on *Populus nigra*, 05.12.2000, U 24.
24. *Pleurotus eryngii* (DC.) Gillet
Dede Mountain, in grass, 22.05.2001, U 149.

Hydnangiaceae
25. *Laccaria laccata* (Scop.) Fr.
Pınarlar village, in *P. brutia* forest, 21.05.2001, U 227.

Tricholomataceae
26. *Lepista nuda* (Bull.) Cooke
Kızılca district, in *P. nigra* subsp. *pallasiana* and *Juniperus oxycedrus* mixed forest, 21.03.2001, U 222, Derinkuyu village, 25.04.2001,
U 373.
27. *Clitocybe geotropa* (Bull.) Quél.
Yahşiler village, in *P. nigra* subsp. *pallasiana*, 23.05.2001, U 343.
28. *Tricholoma terreum* (Schaeff.) Quél.
Bahçeköy village, in *P. brutia* forest, 22.12.2000, U 199, Eski hamamlar district, 15.02.2001, U 283.
29. *Tricholoma ustale* (Fr.) P. Kumm.
Derinkuyu village, in *P. brutia*, 29.05.2001, T, G 345.
30. *Mycena strobilicola* J. Favre and Kühner
Karahisar village, *P. brutia* forest, 05.01.2001, U 22.
31. *Melanoleuca excissa* var. *excissa* (Fr.) Singer
Karahisar village, in *P. brutia* forest, 29.05.2001, T, G 347.
32. *Melanoleuca graminicola* (Velen.) Kühner and Maire
Karahisar village, in pine forest, 29.05.2001, T, G 347.

Marasmiaceae
33. *Armillaria mellea* (Vahl) P. Kumm.
Derinkuyu village, in *P. brutia* forest, 29.05.2001, T, G 343.
34. *Armillaria tabescens* (Scop.) Emel
Bahçeköy village, in *P. nigra* subsp. *pallasiana* forest, 29.05.2001, T, G 344.

Agaricaceae
35. *Agaricus bisporus* (J.E. Lange) Pilát.
Seki village, 17.11.2001, U 117, Pınarlık village, near stream, 25.04.2001, U 276.
36. *Agaricus campestris* L.
Çakıroluk district, in *P. brutia* forest, 25.05.2001, U 245.
37. *Macrolepiota procera* (Scop.) Singer
Derinkuyu village, near the road, 10 km., 29.05.2001, U 271

Pluteaceae
38. *Amanita phalloides* (Vaill. ex Fr.) Link
Avdan village, in *P. brutia* forest, 25.05.2001, U 132.

Coprinaceae
39. *Coprinus atramentarius* (Bull.) Fr.
Derinkuyu village, near the road, 20.05.2001, U 194.
40. *Coprinus comatus* (O. F. Müll.) Gray
Pınarlık village, near stream, 11.02.2001, U 186, Eski hamamlar district, 08.03.2001, U 213.
41. *Coprinus micaceus* (Bull.) Fr.
Sarıabat village, near stream, 05.05.2001, U 136.

Bolbitiaceae
42. *Agrocybe cylindracea* (DC.) Gillet
Aydoğdu village, *Populus nigra*., 29.04.2001, U 71, Kızılcabölük district, on *Populus nigra*., 08.04.2001, U 325.

Cortinariceae
43. *Inocybe rimosa* (Bull.) P. Kumm.
Karahisar, in *P. brutia* forest, 05.01.2001, U 29.

Russulaceae
44. *Lactarius deterrimus* Gröger
Akyar village, in *P. nigra* subsp. *pallasiana* forest, 22.11.2000, U 16, Pınarlık village, in *Juniperus communis* forest, 22.11.2000, U 29.
45. *Lactarius deliciosus* (L.) Gray
Akyar village, in *Juniperus communis* forest, 29.05.2001, T, G 350.

DISCUSSION

In this study, 45 macrofungi taxa belonging to 19 families collected in Tavas Province were identified. Nine of these belong to Ascomycetes and 36 to Basidiomycetes. Of those taxa, 20% of the macrofungi belonged to the Ascomycetes, while 80% belonged to Basidiomycetes. The distribution of the 45 species in to families is as follows: *Tricholomataceae* 7, Lycoperdaceae 4, Coprinaceae 3, Polyporaceae 3, Morchellaceae 3, Helvellaceae 2, Pezizaceae 3, Pleurotaceae 2, Agaricaceae 3, Marasmiaceae 2, Rhizopoganaceae 2, Russulaceae 2, Hymenochaetaceae 1, Cortinariaceae 1, Bolbitiaceae 1, Gomphidiaceae 1, Discinaceae 1, Hydnangiaceae 1, Pluteaceae 1, Geastraceae 1 and Schizophyllaceae 1. Fifteen percent of macrofungi we found belong to Tricholomataceae. Pine, mixed forests and medows are very suitable conditions for members of Tricholomataceae. Tricholomataceae, Lycoperdaceae, Morchellaceae, Coprinaceae, Pezizaceae and Helvellaceae are similar to those of earlier studies carried out near present research area (Afyon, 1996; Işıloğlu and Óder, 1999; Solak *et al*., 1999; Gezer, 2000). This may be because of similarities in vegetation, climate and plant flora (Table 1).

Thirteen, out of 45 macrofungi species, found in the area are eaten by villagers. The edible known species and their local names are: *Morchella esculenta* (Kuzu göbeği), *M. conica* (Kuzu göbeği), *M. elata* (Kuzu göbeği), *Rhizopogon roseolus* (Dolaman), *R. luteus* (Dolaman), *Lactarius deliciosus* (Çıntar), *L. deterrimus* (Çıntar), *Pleurotus ostreatus* (Yaprak mantarı), *P. eryngii* (Diken mantarı), *Tricholoma terreum* (Karakız mantarı), *Agaricus campestris* (Beyaz mantar), *A. bisporus* (Beyaz mantar), *Macrolepiota procera* (Dede mantarı). We documented 4 poisonous species: *Amanita phalloides*, *Gyromitra esculenta*, *Inocybe rimosa* and

Table 1: Distribution of families

Families	Afyon (1996)	Işıloğlu and Öder (1995)	Solak *et al.* (1999)	Gezer (2000)	Tavas
Morchellaceae	3	3	6	3	3
Discinaceae					1
Helvellaceae	2	3	5	1	2
Pezizaceae		1	1	2	3
Hymenochaetaceae			3	4	1
Schizophyllaceae	1	1		1	1
Polyporaceae	7	5	5	3	3
Geastraceae			2	1	1
Lycoperdaceae	2	3	6	4	4
Rhizopogonaceae		2	2	2	2
Gomphidiaceae		1	1	1	1
Pleurotaceae		3	1	1	2
Hydnangiaceae					1
Tricholomataceae	2	24	35	21	7
Marasmiaceae					2
Pluteaceae	1	8		1	1
Agaricaceae	4	11	4	4	3
Coprinaceae	3	9	1	6	3
Bolbitiaceae	1	3	2	1	1
Cortinariaceae	1	7	2	2	1
Russulaceae	6	16	5	7	2
Total	33	100	81	65	45

Tricholoma ustale. No reports of deaths from mushroom poisoning in this area have been made because the villagers collect only well-known edible mushrooms.

Lignicolous macrofungi consist of 9 (20%) species in the area. *Schizophyllum commune* in particular is a very common species. Gezer (2000), reported that these and other species suffered an extensive damage in the area as well as in other localities in Turkey. *Fomes*, especially in beech forest in the Black Sea region and *Polyporus*, on *Castanea sativa* trees in Bolu Province and Belgrad Forest of Istanbul, have suffered a great damage.

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