

## Macrofungi determined in Yuvacık Basin (Kocaeli) and its close environs

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### Abstract

*Aim of the study:* The purpose of this study was to determine the macrofungal diversity of Yuvacık Basin (Kocaeli) and its close environs.

*Study area:* The study area is situated in the east part of Marmara region within the boundaries of Kocaeli and Sakarya provinces of Turkey and it covers 25.759 hectares. The altitude range of region is 150-1610 meters. In addition, the region is in the transition zones of the three different phytogeographic regions containing the Euro-Siberian, the Mediterranean and Irano-Turanian

*Material and Method:* The fungal samples were collected from different localities of Yuvacık Basin and its close environs between 2015 and 2017. During field studies, macroscopic and ecological features of the samples were recorded and they were photographed in their natural habitats and then brought to the laboratory. In the laboratory, macroscopic and microscopic characteristics of the samples were examined. After obtaining relevant macroscopic and microscopic data, fungal samples were identified. The identified samples were kept at the herbarium of Ankara University (ANK).

*Main Results:* As a result of field and laboratory studies, a total of 140 species belonging to 44 family and 14 order within the 2 divisions were listed. Among them, 13 species belonged to Ascomycota, 127 to Basidiomycota.

*Research highlights:* In this study, macrofungal diversity of Yuvacık Basin and its close environs were determined. One hundred and thirty-nine species were new for the region. Moreover, edible and poisonous macrofungi species were emphasized.

**Keywords:** Macrofungi, Biodiversity, Yuvacık Basin, Turkey

## Yuvacık Havzası (Kocaeli) ve yakın çevresinden belirlenen makrofunguslar

### Özet

*Çalışmanın amacı:* Bu çalışmanın amacı, Yuvacık Havzası (Kocaeli) ve yakın çevrelerindeki makrofungus çeşitliliğini ortaya çıkarmaktır.

*Çalışma alanı:* Araştırma alanı, Marmara bölgesinin doğu kesiminde, Kocaeli ve Sakarya illeri sınırları içerisinde olup 25.759 hektarlık bir alanı kapsamaktadır. Alanın yükseklik aralığı 150-1610 metre arasında değişir. Buna ek olarak, çalışma alanı Avrupa-Sibirya, Akdeniz ve İran-Turan olmak üzere üç farklı fitocoğrafik bölgenin geçiş zonunda yer almaktadır

*Materyal ve Yöntem:* Mantar örnekleri 2015-2017 yılları arasında Yuvacık Havzası ve yakın çevrelerinden toplanmıştır. Arazi çalışmaları sırasında örneklerin makroskopik ve ekolojik özellikleri kaydedilmiş ve doğal ortamlarında fotoğraflanmıştır ve daha sonra bu örnekler laboratuvara getirilmiştir. Laboratuvarda örneklerin makroskopik ve mikroskopik özellikleri incelenmiştir. Gerekli makroskopik ve mikroskopik veriler elde edildikten sonra, mantar örnekleri teşhis edilmiştir. Teşhis edilen örnekler, Ankara Üniversitesi (ANK) herbaryumunda saklanmaktadır.

*Temel Sonuçlar:* Arazi ve laboratuvar çalışmalarının sonucunda, 2 bölüm, 14 ordo ve 44 familya içinde dağılım gösteren 140 tür listelenmiştir. Bunların arasında 13 tür Ascomycota, 127 tür ise Basidiomycota'ya aittir.

*Araştırma vurguları:* Bu çalışmada, Yuvacık Havzası ve yakın çevresinin makrofungus çeşitliliği ortaya çıkarılmıştır. Yüz otuz dokuz tür bölge için yenidir. Ayrıca, yenilebilir ve zehirli makrofungus türlerine vurgu yapılmıştır.

**Anahtar Kelimeler:** Makrofunguslar, Biyoçeşitlilik, Yuvacık Havzası, Türkiye



## Introduction

Yuvacık Basin is situated in the east part of Marmara region within the boundaries of Kocaeli and Sakarya provinces of Turkey (Figure 1). The basin, which is located in the A2 and A3 grid (see Davis 1965), covers 25.759 hectares with elevation varying between 150 and 1610 meters. It is in the transition zones of the three different phytogeographic regions including the Euro-Siberian, the Mediterranean and Irano-

Turanian (Efe et al., 2013; Keten et al., 2010).

The region is characterized by transitional climate between the climates of the Mediterranean and the Black Sea (Çobanoğlu et al., 2013). The average annual precipitation is 1038.7 mm with December (159,5 mm) being the heaviest month. The average annual temperature is 9.5°C and the coldest and the warmest months of year are January and July respectively (Efe et al., 2013).

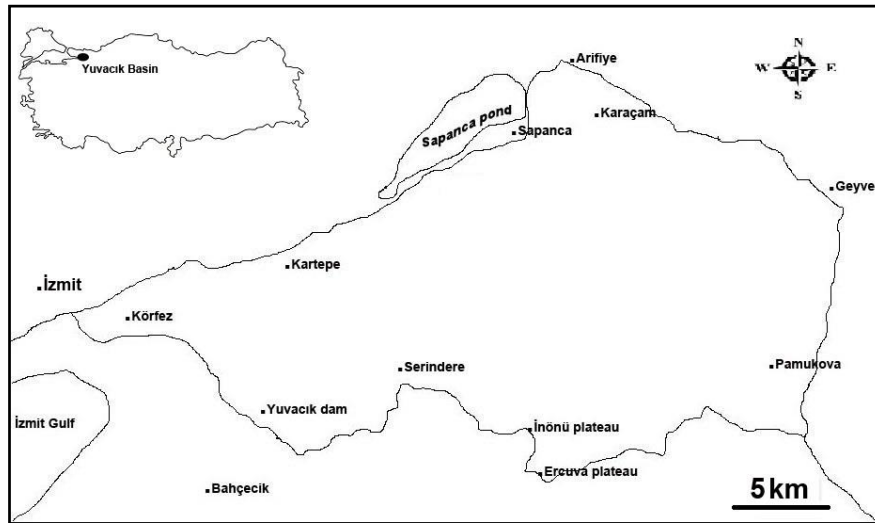


Figure 1. Map of the research area

The research area consists of agricultural areas, pastures, scrub and forests. The forest vegetation is dominated by fir, sometimes forming mixed stands with beech, Scots pine, black pine and oak. Some other trees such as common hornbeam, chestnut, common hazel, alder, poplar, walnut are also seen in the research area (Beşkardeş, 2012).

Numerous studies have been carried out on Turkish macromycota and some of them are still in progress (Akata, 2017; Akata and Uzun, 2017; Akata et al., 2015a,b, Alkan et al, 2016; Allı et al., 2017; Altuntaş et al., 2017; Demirel et al., 2016; Doğan and Kurt, 2016; Öztürk et al, 2017; Sesli and Denchev, 2008; Sesli et al., 2016). According to the present literature, some investigations on macrofungal taxonomy around the research area were carried out by Akata (2017), Allı et al. (2017), Karamanoğlu and Öder (1973), Öztürk et al. (1990), Solak and Gücin, 1992; Stojchev et al. (1998). But there is not any

detailed study on macrofungal diversity of Yuvacık Basin and its surrounding area.

## Materials and Methods

Macrofungi samples were collected from Yuvacık Basin (Kocaeli and Sakarya) between 2015 and 2017. During the field studies, macroscopic and ecological features of the samples were noted and they were photographed in their natural habitats. Macroscopic and microscopic characteristics of the samples, as well as their characteristic reactions against some chemical reagents were examined. The reagents such as distilled water, Melzer's reagent, 5% KOH, H<sub>2</sub>SO<sub>4</sub>, Cotton blue, Congo red etc. were used. Identification was performed with the aid of the literature (Breitenbach and Kränzlin, 1986–2000; Hansen and Knudsen, 1992–2000; Ryvarden and Gilbertson, 1993; Pegler et al., 1997; Calonge, 1998; Heilmann-Clausen et al., 1998; Kränzlin,

2005). All samples were deposited to Ankara University Herbarium (ANK).

## Results

The systematic of the taxa was in accordance with Cannon and Kirk (2008), Kirk et al. (2008), and Index fungorum (www.indexfungorum.org: accessed 1 November 2016). The taxa were listed in alphabetical order and they were presented together with notes on habitat, locality, collection date, geographical position, and accession numbers (I. Akata: A.; Ş. Kabaktepe: K.; H. Akgül: HA.; M. Sevindik: S.).

## Systematic overview

### Fungi

#### Ascomycota

#### Helotiales

##### Helotiaceae

1. *Ascocoryne cylichnium* (Tul.) Korf: İnönü plateau, on beech stump, 1100 m, N 40° 33' - E 30° 00', 25.10.2015, A&HA. 080.

2. *Bisporella citrina* (Batsch) Korf & S.E. Carp.: Serindere, on fallen beech branch, 900 m, N 40° 37' - E 30° 00', 27.10.2015, A&HA. 115; İnönü plateau, on fallen beech branch, 1130 m, N 40° 34' - E 29° 59', 15.09.2016, A. 6471; İnönü plateau, on beech stump, 1120 m, N 40° 33' - E 30° 01', 01.11.2017, A&K&S. 115.

3. *Hymenoscyphus serotinus* (Pers.) W. Phillips: İnönü plateau, on fallen beech branch, 1170 m, N 40° 34' - E 30° 00', 30.10.2015, A&HA. 225.

##### Leotiaceae

4. *Leotia lubrica* (Scop.) Pers.: İnönü plateau, in fir and beech mixed forest, 1120 m, N 40° 33' - E 30° 00', 29.10.2015, A&HA. 210.

#### Pezizales

##### Helvellaceae

5. *Helvella crispa* (Scop.) Fr.: Yuvacık Dam, near road, 190 m, N 40° 38' - E 29° 56', 02.10.2015, A&HA. 057.

6. *Helvella elastica* Bull.: İnönü plateau, in fir and beech mixed forest, 1170 m, N 40° 34' - E 30° 00', 30.10.2015, A&HA. 212.

##### Pezizaceae

7. *Peziza domiciliana* Cooke: Karaaslan recreational area, near stream, 290 m, N 40° 38' - E 29° 56', 28.10.2015, A&HA. 151.

#### Pyronemataceae

8. *Aleuria aurantia* (Pers.) Fuckel: Ercova plateau, in fir forest, 1160 m, N 40° 32' - E 29° 56', 01.10.2015, A&HA. 024.

9. *Otidea onotica* (Pers.) Fuckel: Pamukova, in fir forest, 600 m, N 40° 32' - E 30° 06', 30.10.2015, A&HA. 265.

#### Xylariales

##### Xylariaceae

10. *Hypoxylon fragiforme* (Pers.) J. Kickx f.: İnönü plateau, on beech stump, 1260 m, N 40° 34' - E 29° 59', 15.09.2016, A. 6469.

11. *Kretzschmaria deusta* (Hoffm.) P.M.D. Martin: İnönü plateau, on beech stump, 1140 m, N 40° 34' - E 30° 00', 10.10.2016, A. 6539.

12. *Xylaria hypoxylon* (L.) Grev.: İnönü plateau, on beech stump, 1170 m, N 40° 33' - E 30° 00', 29.10.2015, A&HA. 168; Kartepe, on beech stump, 254 m, N 40° 41' - E 30° 00', 30.10.2017, A&K&S. 070; Serindere, on apple stump, 480 m, N 40° 38' - E 30° 01', 01.11.2017, A&K&S. 123.

13. *Xylaria polymorpha* (Pers.) Grev.: İnönü plateau, on beech stump, 1135 m, N 40° 33' - E 30° 00', 14.09.2016, A. 6457.

#### Basidiomycota

##### Agaricales

##### Agaricaceae

14. *Coprinus comatus* (O.F. Müll.) Pers.: Yuvacık Dam, near road, 180 m, N 40° 38' - E 29° 56', 02.10.2015, A&HA. 051; Ercova plateau, near fir forest, 1170 m, N 40° 31' - E 29° 56', 29.10.2017, A&K&S. 002; Serindere, near road, 489 m, N 40° 38' - E 29° 59', 30.10.2017, A&K&S. 043; Kartepe, near road, 394 m, N 40° 40' - E 30° 01', 30.10.2017, A&K&S. 056.

15. *Crucibulum laeve* (Huds.) Kambly: Ercova plateau, on fir stump, 1180 m, N 40° 32' - E 29° 56', 01.10.2015, A&HA. 023.

16. *Cyathus striatus* (Huds.) Willd.: İnönü plateau, on fallen beech branch, 1120 m, N 40° 33' - E 30° 00', 29.10.2015, A&HA. 194.

17. *Cystoderma amianthinum* (Scop.) Fayod: İnönü plateau, near fir forest, 1140 m, N 40° 33' - E 29° 59', 26.10.2015, A&HA. 103.

18. *Cystoderma carcharias* (Pers.) Fayod: Ercova plateau, in fir forest, 940 m, N 40° 34' - E 29° 56', 01.10.2015, A&HA. 034.

19. *Lepiota castanea* Quéf.: İnönü plateau, in fir and beech mixed forest, 1100 m, N 40° 33' - E 30° 00', 25.10.2015, A&HA. 076.
20. *Lepiota cristata* (Bolton) P. Kumm.: İnönü plateau, in meadow, 1180 m, N 40° 34' - E 30° 00', 30.09.2015, A&HA. 002.
21. *Lepiota clypeolaria* (Bull.) P. Kumm.: İnönü plateau, in fir and beech mixed forest, 1125 m, N 40° 33' - E 30° 00', 29.10.2015, A&HA. 198.
22. *Lepiota ignivolvata* Bousset & Joss. Ex Joss.: İnönü plateau, in fir and beech mixed forest, 1160 m, N 40° 34' - E 30° 00', 30.10.2015, A&HA. 217.
23. *Leucoagaricus leucothites* (Vittad.) Wasser: Balaban, in meadow, 200 m, N 40° 41' - E 30° 05', 02.10.2015, A&HA. 070.
24. *Lycoperdon echinatum* Pers.: İnönü plateau, in fir and beech mixed forest, 1120 m, N 40° 33' - E 30° 00', 25.10.2015, A&HA. 081.
25. *Lycoperdon excipuliforme* (Scop.) Pers.: İnönü plateau, fir and beech mixed forest edge, 1175 m, N 40° 34' - E 30° 00', 30.10.2015, A&HA. 220.
26. *Lycoperdon molle* Pers.: İnönü plateau, fir forest edge, 1150 m, N 40° 34' - E 29° 59', 28.10.2015, A&HA. 146.
27. *Lycoperdon perlatum* Pers.: İnönü plateau, fir forest edge, 1170 m, N 40° 34' - E 30° 00', 30.09.2015, A&HA. 007.
28. *Lycoperdon pyriforme* Schaeff.: Ercova plateau, on fir stump, 900 m, N 40° 34' - E 29° 56', 01.10.2015, A&HA. 037.
29. *Lycoperdon utriforme* Bull.: İnönü plateau, in meadow, 1170 m, N 40° 34' - E 30° 00', 30.09.2015, A&HA. 001.
30. *Macrolepiota konradii* (Huijsmanex P.D. Orton) M.M. Moser: İnönü plateau, in fir and beech mixed forest edge, 1250 m, N 40° 34' - E 29° 59', 10.10.2016, A. 6526.
31. *Macrolepiota mastoidea* (Fr.) Singer: İnönü plateau, in fir and beech mixed forest, 1125 m, N 40° 33' - E 30° 00', 29.10.2015, A&HA. 182.
32. *Macrolepiota procera* (Scop.) Singer: İnönü plateau, in fir and beech mixed forest edge, 1170 m, N 40° 34' - E 30° 00', 30.10.2015, A&HA. 211; İnönü plateau, in fir forest, 1085 m, N 40° 34' - E 30° 01', 30.10.2017, A&K&S. 060; Ercova plateau,

in fir forest, 1140m, N 40° 34' - E 30° 01', 30.10.2017, A&K&S. 080.

#### **Amanitaceae**

33. *Amanita citrina* Pers.: İnönü plateau, in fir forest, 1140 m, N 40° 33' - E 29° 59', 26.10.2015, A&HA. 108.
34. *Amanita muscaria* (L.) Lam.: Ercova plateau, in fir forest, 1150 m, N 40° 32' - E 29° 55', 01.10.2015, A&HA. 008; Ercova plateau, in fir forest, 1140m, N 40° 34' - E 30° 01', 30.10.2017, A&K&S. 081; İnönü plateau, in fir and beech forest, 1110 m, N 40° 33' - E 30° 01', 01.11.2017, A&K&S. 099.
35. *Amanita pantherina* (DC.) Krombh.: Ercova plateau, in fir forest, 920 m, N 40° 32' - E 29° 56', 01.10.2015, A&HA. 033.
36. *Amanita phalloides* (Vaill. ex Fr.) Link: İnönü plateau, in fir and beech mixed forest, 1110 m, N 40° 33' - E 30° 00', A&HA. 074.
37. *Amanita rubescens* Pers.: Ercova plateau, in fir forest, 910 m, N 40° 34' - E 29° 56', 01.10.2015, A&HA. 035.
38. *Amanita vaginata* (Bull.) Lam.: İnönü plateau, in fir and beech mixed forest edge, 1250 m, N 40° 34' - E 29° 59', 10.10.2016, A. 6530.

#### **Cortinariaceae**

39. *Cortinarius caperatus* (Pers.) Fr.: Pamukova, in fir forest, under bilberry, 900 m, N 40° 32' - E 30° 06', 30.10.2015, A&HA. 263.

#### **Fistulinaceae**

40. *Fistulina hepatica* (Schaeff.) With.: İnönü plateau, on beech stump, 1135 m, N 40° 33' - E 30° 00', 10.10.2016, A. 6516.

#### **Hydnangiaceae**

41. *Laccaria amethystina* Cooke: Ercova plateau, in fir forest, 1160 m, N 40° 32' - E 29° 55', 01.10.2015, A&HA. 009.
42. *Laccaria laccata* (Scop.) Cooke: İnönü plateau, in fir forest, 1130 m, N 40° 33' - E 29° 59', 26.10.2015, A&HA. 107; Ercova plateau, in fir forest, 1085 m, N 40° 34' - E 30° 01', 30.10.2017, A&K&S. 077; Ercova plateau, in fir forest, 1102 m, N 40° 33' - E 30° 01', 30.10.2017, A&K&S. 094; İnönü plateau, in fir forest, 1130 m, N 40° 32' - E 30° 01', 01.11.2017, A&K&S. 107.

#### **Hygrophoraceae**

43. *Cuphophyllus virgineus* (Wulfen) Kovalenko: İnönü plateau, in fir and beech

mixed forest edge, 1250 m, N 40° 34' - E 29° 59', 10.10.2016, A. 6535.

44. *Hygrocybe coccinea* (Schaeff.) P. Kumm.: İnönü plateau, in fir and beech mixed forest edge, 1120 m, N 40° 33' - E 30° 00', 29.10.2015, A&HA. 200.

45. *Hygrocybe glutinipes* (J.E. Lange) R. Haller Aar.: İnönü plateau, on beech stump, 1120 m, N 40° 34' - E 29° 59', 15.09.2016, A. 6466.

46. *Hygrocybe punicea* (Fr.) P. Kumm.: İnönü plateau, in fir forest edge, 1150 m, N 40° 34' - E 29° 59', 27.10.2015, A&HA. 125.

47. *Hygrophorus chrysodon* (Batsch) Fr.: Ercova plateau, in fir forest, 900 m, N 40° 34' - E 29° 56', 01.10.2015, A.&HA. 032.

48. *Hygrophorus erubescens* (Fr.) Fr.: İnönü plateau, in fir and beech mixed forest, 1160 m, N 40° 34' - E 30° 00', 30.10.2015, A&HA. 216.

49. *Hygrophorus pudorinus* (Fr.) Fr.: İnönü plateau, in fir and beech mixed forest edge, 1150 m, N 40° 34' - E 29° 59', 27.10.2015, A&HA. 122.

#### Hymenogastraceae

50. *Galerina marginata* (Batsch) Kühner: İnönü plateau, on fir stump, 1150 m, N 40° 33' - E 30° 00', 25.10.2015, A&HA. 084.

#### Inocybaceae

51. *Crepidotus epibryus* (Fr.) Quél.: İnönü plateau, on beech leaves, 1120 m, N 40° 33' - E 30° 00', 29.10.2015, A&HA. 170.

52. *Crepidotus variabilis* (Pers.) P. Kumm.: İnönü plateau, on beech stump, 1100 m, N 40° 33' - E 30° 00', 25.10.2015, A&HA. 086.

53. *Inocybe flocculosa* Sacc.: Pamukova, in fir forest, 700 m, N 40° 32' - E 30° 06', 25.10.2015, A&HA. 260.

54. *Inocybe geophylla* (Bull.) P. Kumm.: Ercova plateau, in fir forest, 1180 m, N 40° 34' - E 29° 56', 01.10.2015, A&HA. 040; İnönü plateau, in fir forest, 1150 m, N 40° 33' - E 29° 59', 01.11.2017, A&K&S. 116; Ercova plateau, in fir forest, 1140m, N 40°34' - E 30° 01', 30.10.2017, A&K&S. 083.

55. *Inocybe nitidiuscula* (Britzelm.) Lapl.: İnönü plateau, in fir forest, 1150 m, N 40° 34' - E 29° 59', 27.10.2015, A&HA. 121.

#### Marasmiaceae

56. *Marasmius oreades* (Bolton) Fr.: İnönü plateau, in meadow, 1190 m, N 40° 34' - E 30° 00', 30.09.2015, A&HA. 003; Serindere, in meadow, 530 m, N 40°37' - E 30° 01', 01.11.2017, A&K&S. 127; İnönü plateau, fir and beech mixed forest, 1120 m, N 40° 33' - E 30° 01', 01.11.2017, A&K&S. 109.

57. *Marasmius rotula* (Scop.) Fr.: İnönü plateau, on fallen beech branch, 1120 m, N 40° 33' - E 30° 00', 29.10.2015, A&HA. 167.

#### Mycenaceae

58. *Mycena crocata* (Schrad.) P. Kumm.: İnönü plateau, on beech stump, 1170 m, N 40° 34' - E 30° 00', 30.10.2015, A&HA. 216.

59. *Mycena epipterygia* (Scop.) Gray: Ercova plateau, on fir stump, 1180 m, N 40° 34' - E 29° 56', 01.10.2015, A&HA. 039; Ercova plateau, on fir stump, 1170 m, N 40° 31' - E 29° 56', 29.10.2017, A&K&S. 013; Ercova plateau, on fir stump, 1090 m, N 40° 34' - E 39° 01', 30.10.2017, A&K&S. 097; İnönü plateau, on fir stump, 1150 m, N 40° 33' - E 29° 59', 01.11.2017, A&K&S. 112.

60. *Mycena pura* (Pers.) P. Kumm.: Ercova plateau, in fir forest, 1150 m, N 40° 32' - E 29° 55', 01.10.2015, A&HA. 015.

61. *Panellus mitis* (Pers.) Singer: İnönü plateau, on fir stump, 1140 m, N 40° 34' - E 29° 59', 27.10.2015, A&HA. 119.

#### Omphalotaceae

62. *Gymnopus androsaceus* (L.) DellaMaggiora & Trassinelli: Ercova plateau, on fallen fir branch, 1175m, N 40° 32' - E 29° 56', 14.09.2016, A. 6469.

63. *Gymnopus dryophilus* (Bull.) Murrill: Pamukova, in fir forest, 700 m, N 40° 32' - E 30° 06', 30.10.2015, A&HA. 254.

64. *Marasmiellus ramealis* (Bull.) Singer: İnönü plateau, on beech stump, 1135 m, N 40° 33' - E 30° 00', 10.10.2016, A. 6576.

65. *Mycetinis alliaceus* (Jacq.) Earleex A.W. Wilson &Desjardin: İnönü plateau, on fallen beech branch, 1130 m, N 40° 33' - E 30° 00', 10.10.2016, A. 6519.

66. *Armillaria mellea* (Vahl) P. Kumm.: Kartepe, on apple stump, 120 m, N 40° 41' - E 30° 04', 02.10.2015, A&HA. 065.

67. *Flammulina velutipes* (Curtis) Singer: Kartepe, on apple stump, 120 m, N 40° 41' - E 30° 04', 02.10.2015, A&HA. 064.

68. *Hymenopellis radicata* (Relhan) R.H. Petersen: İnönü plateau, in fir and beech mixed forest, 1120 m, N 40° 34' - E 29° 59', 15.09.2016, A. 6480.

69. *Mucidula mucida* (Schrad.) Pat.: İnönü plateau, on beech stump, 1100 m, N 40° 33' - E 30° 00', 25.10.2015, A&HA. 091.

70. *Oudemansiella melanotricha* (Dörfelt) M.M. Moser: İnönü plateau, on fir root, 1120 m, N 40° 34' - E 29° 59', 27.10.2015, A&HA. 129.

#### **Pleurotaceae**

71. *Pleurotus ostreatus* (Jacq.) P. Kumm.: Serindere, on beech stump, 900 m, N 40° 37' - E 30° 00', 27.10.2015, A&HA. 110.

#### **Pluteaceae**

72. *Pluteus atromarginatus* (Konrad) Kühner: İnönü plateau, on fir stump, 1150 m, N 40° 34' - E 29° 59', 27.10.2015, A&HA. 134.

#### **Psathyrellaceae**

73. *Coprinellus disseminatus* (Pers.) J.E. Lange: Balaban, on plum stump, 200 m, N 40° 41' - E 30° 05', 02.10.2015, A&HA. 069.

74. *Coprinellus micaceus* (Bull.) Vilgalys, Hopple & Jacq. Johnson: İnönü plateau, on rotten beech stump, 1140 m, N 40° 33' - E 30° 00', 10.10.2016, A. 6546.

75. *Psathyrella candolleana* (Fr.) Maire: İnönü plateau, near road, 1080 m, N 40° 34' - E 30° 00', 10.10.2016, A. 6465.

#### **Rickenellaceae**

76. *Rickenella fibula* (Bull.) Raitheh.: İnönü plateau, amanog mosses, 1150 m, N 40° 34' - E 29° 59', 27.10.2015, A&HA. 137.

#### **Schizophyllaceae**

77. *Schizophyllum commune* Fr.: İnönü plateau, on fallen beech branch, 1100 m, N 40° 33' - E 30° 00', 02.10.2015, A&HA. 049.

#### **Strophariaceae**

78. *Hypholoma fasciculare* (Huds.) P. Kumm.: İnönü plateau, on fir stump, 1160 m, N 40° 34' - E 29° 59', A&HA. 149.

79. *Hypholoma lateritium* (Schaeff.) P. Kumm.: İnönü plateau, on beech stump, 1100 m, N 40° 33' - E 30° 00', 25.10.2015, A&HA. 087.

80. *Pholiota limonella* (Peck) Sacc.: Ercova plateau, on fir stump, 1160 m, N 40° 32' - E 29° 56', 01.10.2015, A&HA. 017.

81. *Stropharia aeruginosa* (Curtis) Quéf.: İnönü plateau, in fir forest edge, 1150

m, N 40° 34' - E 29° 59', 28.10.2015, A&HA. 147.

#### **Tricholomataceae**

82. *Clitocybe odora* (Bull.) P. Kumm.: Pamukova, in fir forest, 650 m, N 40° 32' - E 30° 06', 30.10.2015, A&HA. 253.

83. *Clitocybe nebularis* (Batsch) P. Kumm.: İnönü plateau, in fir forest, 1130 m, N 40° 33' - E 29° 59', 26.10.2015, A&HA. 106.

84. *Lepista nuda* (Bull.) Cooke: İnönü plateau, in fir forest edge, 1160 m, N 40° 34' - E 29° 59', 27.10.2015, A&HA. 140; Ercova plateau, in fir forest, 1170 m, N 40° 31' - E 29° 56', 29.10.2017, A&K&S. 004; İnönü plateau, in fir forest, 1150 m, N 40° 33' - E 29° 59', 30.10.2017, A&K&S. 029.

85. *Pseudoclitocybe cyathiformis* (Bull.) Singer: İnönü plateau, in fir and beech mixed forest, 1120 m, N 40° 34' - E 29° 59', 15.09.2016, A. 6473.

86. *Tricholoma bufonium* (Pers.) Gillet: Pamukova, in fir forest, 650 m, N 40° 32' - E 30° 06', 30.10.2015, A&HA. 249.

87. *Tricholoma sulphureum* (Bull.) P. Kumm.: İnönü plateau, in fir forest, 1180 m, N 40° 33' - E 30° 00', 10.10.2015, A. 6550.

88. *Tricholoma terreum* (Schaeff.) P. Kumm.: Pamukova, in fir forest, 700 m, N 40° 32' - E 30° 06', 30.10.2015, A&HA. 244; Ercova plateau, in fir forest, 1085 m, N 40° 34' - E 30° 01' 30.10.2017, A&K&S. 072; Ercova plateau, in fir forest, 1102m, N 40° 33' - E 30° 01', 30.10.2017, A&K&S. 093; İnönü plateau, in beech forest, 1110 m, N 40° 33' - E 30° 01', 01.11.2017, A&K&S. 111.

89. *Tricholoma portentosum* (Fr.) Quéf.: Ercova plateau, in fir forest, 1175 m, N 40° 32' - E 29° 56', 01.10.2015, A&HA. 029.

90. *Tricholoma ustaloides* Romagn.: İnönü plateau, in fir and beech mixed forest, 1130 m, N 40° 33' - E 30° 00', 29.10.2015, A&HA. 183.

91. *Tricholomopsis rutilans* (Schaeff.) Singer: Pamukova, on fir stump, 710 m, N 40° 32' - E 30° 06', 30.10.2015, A&HA. 241.

#### **Tubariaceae**

92. *Tubaria conspersa* (Pers.) Fayod: Pamukova, in fir forest, 710 m, N 40° 32' - E 30° 06', 30.10.2015, A&HA. 245.

#### **Auriculariales**

#### **Incertae sedis**

93. *Pseudohydnum gelatinosum* (Scop.) P. Karst.: İnönü plateau, on fir stump, 1140 m, N 40° 33' - E 29° 59', 26.10.2015, A&HA. 099.

#### **Boletales**

##### **Boletaceae**

94. *Boletus erythropus* Pers.: İnönü plateau, in fir forest, 1150 m, N 40° 34' - E 29° 59', 28.10.2015, A&HA. 144.

95. *Caloboletus calopus* (Pers.) Vizzini: İnönü plateau, in fir and beech mixed forest, 1120 m, N 40° 33' - E 30° 00', 29.10.2015, A&HA. 180.

96. *Imleria badia* (Fr.) Vizzini: İnönü plateau, in fir and beech mixed forest, 1140 m, N 40° 33' - E 30° 00', 10.10.2016, A. 6547.

97. *Leccinum aurantiacum* (Bull.) Gray: İnönü plateau, in fir and beech mixed forest, 1140 m, N 40° 33' - E 30° 00', 10.10.2016, A. 6527.

98. *Leccinum pseudoscabrum* (Kallenb.) Šutara Gray: İnönü plateau, in fir and beech mixed forest, 1120 m, N 40° 34' - E 29° 59', 15.09.2016, A. 6478.

99. *Strobilomyces strobilaceus* (Scop.) Berk.: İnönü plateau, in fir and beech mixed forest, 1125 m, N 40° 34' - E 30° 00', 30.10.2015, A&HA. 218.

##### **Paxillaceae**

100. *Paxillus involutus* (Batsch) Fr.: Pamukova, in fir forest edge, 690 m, N 40° 32' - E 30° 06', 30.10.2015, A&HA. 240.

##### **Sclerodermataceae**

101. *Scleroderma bovista* Fr.: Yuvacık Dam, near road, 190 m, N 40° 38' - E 29° 56', 02.10.2015, A&HA. 054.

102. *Scleroderma citrinum* Pers.: Karaaslan recreational area, near road, 300 m, N 40° 38' - E 29° 56', 02.10.2015, A&HA. 045.

##### **Suillaceae**

103. *Suillus bovinus* (L.) Roussel: İnönü plateau, under pine, 1080 m, N 40° 34' - E 30° 00', 10.10.2016, A. 6552.

104. *Suillus luteus* (L.) Roussel: İnönü plateau, under pine, 1070 m, N 40° 34' - E 30° 00', 15.09.2016, A. 6462.

#### **Cantharellales**

##### **Cantharellaceae**

105. *Cantharellus cibarius* Fr.: İnönü plateau, fir and beech mixed forest, 1120 m, N 40° 33' - E 30° 00', 29.10.2015, A&HA.

209; Ercova plateau, in fir forest, 1085 m, N 40° 34' - E 30° 01', 30.10.2017, A&K&S. 063; Ercova plateau, in fir forest, 1102m, N 40° 33' - E 30° 01' E 30.10.2017, A&K&S. 090.

106. *Craterellus cornucopioides* (L.) Pers.: İnönü plateau, fir and beech mixed forest, 1170 m, N 40° 34' - E 30° 00', 30.10.2015, A&HA. 230; İnönü plateau, fir and beech mixed forest, 1120 m, N 40° 33' - E 30° 01', 01.11.2017, A&K&S. 114.

107. *Craterellus tubaeformis* (Fr.) Qué.: İnönü plateau, fir and beech mixed forest edge, 1120 m, N 40° 34' - E 29° 59', 15.09.2016, A. 6463.

108. *Pseudocraterellus undulatus* (Pers.) Rauschert: İnönü plateau, fir and beech mixed forest, 1120 m, N 40° 33' - E 30° 00', 10.10.2016, A. 6555.

##### **Clavulinaceae**

109. *Clavulina cinerea* (Bull.) J. Schröt.: İnönü plateau, fir forest, 1150 m, N 40° 34' - E 29° 59', 27.10.2015, A&HA. 120.

110. *Clavulina coralloides* (L.) J. Schröt.: İnönü plateau, fir forest, 1160 m, N 40° 34' - E 29° 59', 28.10.2015, A&HA. 142.

##### **Hydnaceae**

111. *Hydnum repandum* L.: İnönü plateau, in beech forest, 1100 m, N 40° 33' - E 30° 00', 25.10.2015, A&HA. 090.

#### **Dacrymycetales**

##### **Dacrymycetaceae**

112. *Calocera cornea* (Batsch) Fr.: İnönü plateau, on beech stump, 1120 m, N 40° 33' - E 30° 00', 29.10.2015, A&HA. 177.

113. *Calocera viscosa* (Pers.) Fr.: Ercova plateau, on fir stump, 1160 m, N 40° 32' - E 29° 55', 01.10.2015, A&HA. 020.

#### **Gomphales**

##### **Clavariadelphaceae**

114. *Clavariadelphus truncatus* Donk: Ercova plateau, in fir forest, 1160 m, N 40° 32' - E 29° 55', 01.10.2015, A&HA. 019.

#### **Hymenochaetales**

##### **Incertae sedis**

115. *Trichaptum biforme* (Fr.) Ryvarden: İnönü plateau, on beech stump, 1130 m, N 40° 33' - E 30° 00', 29.10.2015, A&HA. 173; Kartepe, on beech stump, 254m, N 40°41' - E 30° 00', 30.10.2017, A&K&S. 075; İnönü plateau, on beech stump, 1110 m, N 40° 33' - E 30° 01', 01.11.2017, A&K&S. 108.

#### **Phallales**

### Phallaceae

116. *Clathrus ruber* P. Micheli ex Pers.: Karaaslan recreational area, near road, 300 m, N 40° 38' - E 29° 56', 02.10.2015, A&HA. 040.

117. *Mutinus caninus* (Huds.) Fr.: İnönü plateau, in fir and beech mixed forest, 1120 m, N 40° 33' - E 30° 00', 29.10.2015, A&HA. 177.

118. *Phallus impudicus* L.: İnönü plateau, in fir and beech mixed forest, 1150 m, N 40° 34' - E 29° 59', 10.10.2016, A. 6529.

### Polyporales

#### Fomitopsidaceae

119. *Fomitopsis pinicola* (Sw.) P. Karst.: Ercova plateau, on fir, 1160 m, N 40° 32' - E 29° 55', 01.10.2015, A&HA. 014; Ercova plateau, on fir trunk, 1170 m, N 40° 31' - E 29° 56', 29.10.2017, A&K&S. 007; Ercova plateau, on fir stump, 1102 m, N 40° 33' - 30° 01', 30.10.2017, A&K&S. 091; İnönü plateau, on fir stump, 1120 m, N 40° 33' - E 30° 01', 01.11.2017, A&K&S. 122.

#### Meruliaceae

120. *Bjerkandera adusta* (Willd.) P. Karst.: İnönü plateau, on beech stump, 1175 m, N 40° 34' - E 30° 00', 15.04.2016, A. 6419; İnönü plateau, on beech stump, 1130 m, N 40° 33' - E 30° 00', 10.10.2016, A. 6548; Kartepe, on beech stump, 254m, N 40° 41' - E 30° 00', 30.10.2017, A&K&S. 074; İnönü plateau, on beech stump, 1110 m, N 40° 33' - E 30° 01', 01.11.2017, A&K&S. 103.

#### Polyporaceae

121. *Daedaleopsis confragosa* (Bolton) J. Schröt.: İnönü plateau, on beech stump, 1130 m, N 40° 33' - E 30° 00', 29.10.2015, A&HA. 172.

122. *Fomes fomentarius* (L.) Fr.: İnönü plateau, on beech stump, 1100 m, N 40° 33' - E 30° 00', 25.10.2015, A&HA. 073.

123. *Lentinus brumalis* (Pers.) Zmitr.: İnönü plateau, on beech stump, 1135 m, N 40° 33' - E 30° 00', 10.10.2016, A. 6524.

124. *Lenzites betulina* (L.) Fr.: İnönü plateau, on beech stump, 1120 m, N 40° 33' - E 30° 00', 29.10.2015, A&HA. 202.

125. *Polyporus varius* (Pers.) Fr.: İnönü plateau, on beech stump, 1170 m, N 40° 34' - E 30° 00', 30.10.2015, A&HA. 224.

126. *Trametes hirsuta* (Wulfen) Lloyd: İnönü plateau, on beech stump, 1125 m, N 40° 34' - E 29° 59', 15.09.2016, A. 6479;

127. *Trametes versicolor* (L.) Lloyd: İnönü plateau, on beech stump, 1100 m, N 40° 33' - E 30° 00', 25.10.2015, A&HA. 078; İnönü plateau, on beech stump, 1110 m, N 40° 33' - E 30° 01', 01.11.2017, A&K&S. 106.

#### Sparassidaceae

128. *Sparassis crispa* (Wulfen) Fr.: İnönü plateau, on fir root, 1150 m, N 40° 34' - E 09° 59', 27.10.2015, A&HA. 124.

#### Russulales

#### Hericiaceae

129. *Hericum cirrhatum* (Pers.) Nikol.: İnönü plateau, on beech stump, 1135 m, N 40° 33' - E 30° 00', 10.10.2016, A. 6521.

130. *Hericum coralloides* (Scop.) Pers.: İnönü plateau, on fir stump, 1150 m, N 40° 33' - E 29° 59', 26.10.2015, A&HA. 097.

131. *Hericum erinaceus* (Bull.) Pers.: İnönü plateau, on beech stump, 1180 m, N 40° 34' - E 30° 00', 30.10.2015, A&HA. 239.

#### Incertae sedis

132. *Laeticutis cristata* (Schaeff.) Audet: İnönü plateau, in fir forest, 1110 m, N 40° 33' - E 29° 59', 10.10.2015, A. 6556.

#### Russulaceae

133. *Lactarius aurantiacus* (Pers.) Gray: İnönü plateau, in fir forest, 1140 m, N 40° 33' - E 29° 59', 26.10.2015, A&HA. 101.

134. *Lactarius blennius* (Fr.) Fr.: İnönü plateau, in fir and beech mixed forest, 1170 m, N 40° 34' - E 30° 00', 30.10.2015, A&HA. 229.

135. *Lactarius deliciosus* (L.) Gray: Yuvacık Dam, under pine, 200 m, N 40° 38' - E 29° 56', 11.10.2016, A. 6571.

136. *Lactarius salmonicolor* R. Heim & Leclair: Ercova plateau, in fir forest, 1175 m, N 40° 32' - E 29° 56', 01.10.2015, A&HA. 027; Ercova plateau, in fir forest, 1170 m, N 40° 31' - E 29° 56', 29.10.2017, A&K&S. 014; Ercova plateau, in fir forest, 1100 m, N 40° 33' - E 30° 01', 30.10.2017; A&K&S. 019; Ercova plateau, in fir forest, 1140m, N 40° 34' - E 30° 01', 30.10.2017, A&K&S. 078; İnönü plateau, in fir forest, 1110 m, N 40° 33' - E 30° 01', 01.11.2017, A&K&S. 101.



137. *Lactarius vellereus* (Fr.) Fr.: İnönü plateau, fir and beech mixed forest, 1120 m, N 40° 34' - E 29° 59', 15.09.2016, A. 6483.

138. *Russula delica* Fr.: İnönü plateau, in fir and beech mixed forest edge, 1210 m, N 40° 34' - E 29° 59', 14.09.2016, A. 6468.

#### Stereaceae

139. *Stereum hirsutum* (Willd.) Pers.: İnönü plateau, on beech stump, 1170 m, N 40° 34' - E 30° 00', 30.10.2015, A&HA. 228; 15.04.2016, A. 6413; İnönü plateau, on beech stump, 1110 m, N 40° 33' - E 30° 01', 01.11.2017, A&K&S. 100; Serindere, on apple stump, 480 m, N 40° 38' - E 30° 01', 01.11.2017, A&K&S. 124.

#### Tremellales

##### Tremellaceae

140. *Tremella mesenterica* Retz.: İnönü plateau, on beech stump, 1125 m, N 40° 34' - E 29° 59', 15.09.2016, A. 6477.

#### Discussion

One hundred and forty macrofungi species belonging to ninety genera and forty-four families within the fourteen order were determined. Thirteen of them belonged to *Ascomycota* and one hundred and twenty-seven to *Basidiomycota*. All species except *Cortinarius caperatus* were new for the research area. The distribution of the species in their orders were as follows; *Agaricales*

79, *Russulales* and *Boletales* 11, *Polyporales* 10, *Cantharellales* 7, *Pezizales* 5, *Helotiales* and *Xylariales* 4, *Phallales* 3, *Dacrymycetales* 2, *Auriculariales*, *Gomphales*, *Hymenochaetales* and *Tremellales* 1.

In the study area, eighty-nine macrofungi species were terricolous and fifty-one were lignicolous. The most common terricolous macrofungi were *Amanita muscaria*, *Coprinus comatus*, *Craterellus cornucopioides*, *Inocybe geophylla*, *Laccaria laccata*, *Lactarius aurantiacus*, *L. salmonicolor*, *Lepista nuda*, *Macrolepiota procera*, *Mycena epipterygia* and *Tricholoma terreum*. Moreover, eight lignicolous macrofungi species (*Bisporella citrina*, *Bjerkandera adusta*, *Fomes fomentarius*, *Fomitopsis pinicola*, *Stereum hirsutum*, *Trametes versicolor*, *Trichaptum bifforme* and *Xylaria hypoxylon*) were widespread in the research area.

Fifty-four of one hundred and forty species determined in the study area were edible (Table 1). However, nine species (*Cantharellus cibarius*, *Craterellus cornucopioides*, *Lactarius deliciosus*, *L. salmonicolor*, *Lepista nuda*, *Macrolepiota procera*, *Marasmius oreades*, *Russula delica* and *Tricholoma terreum*) were known and commonly consumed by local people.

Table 1. Edible macrofungi species determined in the research area

<i>Helvella crispa</i>	<i>Laccaria amethystina</i>	<i>Suillus bovinus</i>
<i>Helvella elastica</i>	<i>Laccaria laccata</i>	<i>Cantharellus cibarius</i>
<i>Aleuria aurantia</i>	<i>Hygrophorus chrysodon</i>	<i>Craterellus cornucopioides</i>
<i>Coprinus comatus</i>	<i>Hygrophorus erubescens</i>	<i>Craterellus tubaeformis</i>
<i>Macrolepiota konradii</i>	<i>Hygrophorus pudorinus</i>	<i>Pseudocraterellus undulatus</i>
<i>Macrolepiota mastoidea</i>	<i>Marasmius oreades</i>	<i>Clavulina cinerea</i>
<i>Macrolepiota procera</i>	<i>Gymnopus dryophilus</i>	<i>Clavulina coralloides</i>
<i>Leucoagaricus leucothites</i>	<i>Armillaria mellea</i>	<i>Hydnum repandum</i>
<i>Lycoperdon echinatum</i>	<i>Flammulina velutipes</i>	<i>Clavariadelphus truncatus</i>
<i>Lycoperdon excipuliforme</i>	<i>Mucidula mucida</i>	<i>Sparassis crispa</i>
<i>Lycoperdon molle</i>	<i>Pleurotus ostreatus</i>	<i>Hericiium cirrhatum</i>
<i>Lycoperdon perlatum</i>	<i>Lepista nuda</i>	<i>Hericiium coralloides</i>
<i>Lycoperdon pyriforme</i>	<i>Tricholoma terreum</i>	<i>Hericiium erinaceus</i>

Table 1 (continued)

<i>Lycoperdon utriforme</i>	<i>Tricholoma portentosum</i>	<i>Laeticutis cristata</i>
<i>Amanita rubescens</i>	<i>Tricholomopsis rutilans</i>	<i>Lactarius deliciosus</i>
<i>Amanita vaginata</i>	<i>Imleria badia</i>	<i>Lactarius salmonicolor</i>
<i>Cortinarius caperatus</i>	<i>Leccinum aurantiacum</i>	<i>Lactarius vellereus</i>
<i>Fistulina hepatica</i>	<i>Suillus luteus</i>	<i>Russula delica</i>

Fifteen poisonous species (*Amanita muscaria*, *A. pantherina*, *A. phalloides*, *Boletus erythropus*, *Galerina marginata*, *Hypholoma fasciculare*, *H. lateritium*, *Inocybe geophylla*, *Lepiota castanea*, *L. cristata*, *L. clypeolaria*, *Mycena pura*, *Paxillus involutus*, *Tricholoma bufonium* and *T. sulphureum*) were also determined in the region. Among them, *A. phalloides*, *G. marginata* and *L. castanea* were deadly poisonous species which contains alpha

amanitin (Akata et al., 2015b). No poisoning event has hitherto been reported in the study area as the native people collect and consume only well known edible mushrooms.

The results of the current study were compared with the findings of the investigations compiled in close environs. Number of the determined species and similarity percentages were presented in Table 2. These similarities may be due to the similarities in climate and vegetation.

Table 2. Similarity percentages of the neighboring areas with the research area

Investigated areas	Number of species	Common species	Similarity (%)
Bursa (Karamanoğlu and Öder, 1973)	13	5	38.46
İnegöl/Bursa (Öztürk et al., 1990)	22	8	36.36
Bursa (Solak and Gücin, 1992)	80	26	32.50
Trakya (Stojchev et al., 1998)	67	27	40.29
Belgrad Forest/İstanbul (Akata, 2017)	279	96	34.40
Yalova (Allı et al., 2017)	92	36	39.13

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