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Contributions to the Macrofungal Diversity of Çelikhan (Adıyaman) District

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Abstract: The study is based on the macrofungi samples collected from the region within the boundaries of Çelikhan (Adıyaman) district between 2003 and 2010, and 60 macrofungi species within Ascomycota and Basidiomycota were determined. All of the determined taxa are new for the region. With the addition of the previously reported species, 76 macrofungi species belonging to 2 divisio, 2 classes, 10 orders, 41 families and 60 genera were compiled. The list of the species is presented together with their localities, habitats or substrates, collection dates and voucher numbers.

Keywords: Biodiversity, *Agaricomycetes*, *Basidiomycetes*, Türkiye

Çelikhan (Adıyaman) Yöresi Makromantar Çeşitliliğine Katkıları

Öz: Çalışma 2003-2010 yılları arasında Çelikhan (Adıyaman) ilçe sınırları içinde kalan bölgeden toplanan makromantar örnekleri üzerinde gerçekleştirilmiş, ve 60 makromantar türü tespit edilmiştir. Belirlenen türlerin tamamı yöre için yenidir. Önceden rapor edilen türlerin de ilave edilmesiyle, 2 bölüm, 2 sınıf, 10 takım, 41 familya ve 60 cinse ait 76 makromantar türü derlenmiştir. Türlerin listesi, yayılış yerleri, habitat veya substratları, toplanma tarihleri ve toplayıcı numaralarıyla birlikte verilmiştir.

Anahtar kelimeler: Biyoçeşitlilik, *Agaricomycetes*, *Basidiomycetes*, Türkiye

Introduction

Fungi are known as a diverse kingdom with the members growing almost everywhere in the world as saprophytes, parasites and symbionts (Hawksworth et al., 1995; Şelem et al., 2021). Macrofungi constitutes a group of this kingdom with fruiting bodies larger enough to be seen by naked eye. Though more than 2600 naturally growing macromycete taxa of Türkiye were presented by the latest checklists (Sesli et al., 2020; Solak and Türkoğlu, 2022; Uzun, 2023), macrofungal biodiversity of majority of the regions of Türkiye still remain unstudied in detail.

Çelikhan is a district of Adıyaman Province located between 37°57'-38°09' northern latitudes and 38°08'-38°27' eastern longitudes. The district is bordered by Yeşilyurt (Malatya) to the north, Doğanşehir (Malatya) to the west, Sürgü (Adıyaman) to the east, and Adıyaman to the south. According to the Davis' grid square system, the district is situated within B7 square (Davis, 1965).

Çat Dam Lake and Çelikhan stream are the two primary hydrologic components of the region. *Quercus* L. sp. forests are the main natural forest cover of the research area. Planted *Pinus* L. and *Cedrus* L. sp. populations in the mountainous areas, between Çelikhan district center and Çat Dam lake, also form another



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significant forest component of the research area. *Salix* L. and *Populus* L. sp. trees, growing especially around the streams and wetlands, represent other notable riparian elements of the region's vegetation.

Though some macrofungi (16 species) have previously been reported from the region (Kaya, 2009a, 2015), current check-lists (Sesli et al., 2020, Solak and Türkoğlu, 2022; Uzun, 2023) and the latest contributory local lists (Kaplan et al., 2023; Keleş and Kaya, 2023; Şahin et al., 2023; Aslan et al., 2024; Dalkıran et al., 2024; Kaya and Akçay, 2024; Keleş et al., 2024; Sadullahoğlu et al., 2025) indicate that a detailed taxonomic study has not been carried out in the area. The work was carried out to present the macrofungal diversity of the region, and to make a contribution the mycobiota of Türkiye.

Material and Method

Fruit body sampling was performed from 2003 to 2010 in the region within the boundaries of Çelikhan (Adıyaman) district (Fig. 1). During field investigations, fruit bodies were photographed at their natural habitats, and some characteristics such as taste and smell were recorded in the field notebook. The collected specimens were transferred to the laboratory within paper cases, and dried in an air-conditioned room. Micromorphological investigation was carried out on dry specimens. Sections, prepared for micromorphological investigations, were rehydrated with 5% KOH and distilled water. Additional reagents, including Melzer's reagent, Congo-Red and Lactophenol Cotton Blue were also employed to enhance the visualization of specific micromorphological structures.



Figure 1. Macrofungi collection sites (Çelikhan, Adıyaman)

Spore micromorphology was mainly based on the spores obtained from spore prints. Identification of the samples was performed by comparing the obtained data by Breitenbach and Kränzlin (1984-2000), Arora (1986), Miller and Miller (1988), Ellis and Ellis (1990), Jordan (1995), Kibby (1997), Bessette et al. (1997, 2007), Arroyo et al. (2005), Kränzlin (2005), Sterry and Hughes (2009), Kuo and Methven (2010), Phillips (2010) and Læssøe and Petersen (2019).

Results

The determined species are listed alphabetically, regarding the taxonomic categories, together with their

localities, habitats or substrates, collection dates and voucher numbers.

Fungi R.T. Moore

Ascomycota Whittaker

Pezizomycetes O.E. Erikss. & Winka

Pezizales J. Schröt.

Incertae sedis

1. ***Pseudombrophila ripensis*** (E.C. Hansen) Brumm: (Kaya, 2015)

Caloscyphaceae Harmaja

2. ***Caloscypha fulgens*** (Pers.) Boud.: Köseuşağı village, 1520 m, 15.04.2010, K.7156.

Helvellaceae Fr.

3. ***Dissingia leucomelaena*** (Pers.) K. Hansen & X.H. Wang.: Yukarköy village, *Pinus* L. sp. forest, on soil

among needle litter, 1470 m, 09.05.2009, K.6352; 1450 m, 02.05.2010, K.7210.

4. *Helvella acetabulum* (L.) Quél.: Recep village, *Quercus* L. sp. forest, on soil among leaf litter, 890 m, 09.05.2009, K.6330.
5. *Helvella leucopus* Pers.: Yukarıköy village, poplar grove, on soil among leaf litter, 1470, 09.05.2009, K.6333.

Morchellaceae Rchb.

6. *Morchella crassipes* (Vent.) Pers.: Yukarıköy village, poplar grove, on soil among leaf litter, 1470, 09.05.2009, K.6331.
7. *Morchella elata* Fr.: Yukarıköy village, poplar grove, on soil among leaf litter, 1470, 09.05.2009, K.6340.
8. *Morchella esculenta* (L.) Pers.: (Kaya, 2009a)
9. *Morchella populiphila* M. Kuo, M.C. Carter J.D. Moore): Yukarıköy village, poplar grove, on soil among leaf litter, 1470, 09.05.2009, K.6346.
10. *Morchella semilibera* DC.: (Kaya, 2009a)

Pezizaceae Dumort.

11. *Peziza pseudoviolacea* Donadini: (Kaya, 2015)
12. *Sarcosphaera coronaria* (Jacq.) J. Schröt.: From city centre to Çat Dam Lake, pine forest, 1525 m, 15.04.2010, K. 7162.

Pyronemataceae Corda

13. *Geopora sumneriana* (Cooke ex W. Phillips) M. Torre: (Kaya, 2009a)

Basidiomycota R.T. Moore

Agaricomycetes Doweld

Agaricales Underw.

Agaricaceae Chevall

14. *Coprinus comatus* (O.F. Müll.) Pers.: Mestan village, on soil among grass, 1280 m, 22.05.2007, K.4688.
15. *Crucibulum laeve* (Huds.) Kambly: Mestan village, on decaying twigs, 1280 m, 22.05.2007, K.4690.
16. *Cyathus olla* (Batsch) Pers.: Köseuşağı village, around decaying stump, 1450 m, 01.11.2006, K. 3919.
17. *Cystodermella granulosa* (Batsch) Harmaja: Pınarbaşı village, among mossy ground among needle litter, 1380 m, 21.11.2009, K.6737.
18. *Leucocoprinus leucothites* (Vittad.) Redhead: Köseuşağı village, pine forest edge, among grass, 1450 m, 01.11.2006, K.3921.
19. *Macrolepiota mastoidea* (Fr.) Singer: Pınarbaşı village, on soil among grass, 1365 m, 21.11.2009, K. 6744.
20. *Tulostoma fimbriatum* Fr.: Pınarbaşı village, on soil among grass, 1365 m, K.6741.

Bolbitiaceae Singer

21. *Conocybe apala* (Fr.) Arnolds: Yukarıköy village, on soil among grass near poplar grove, 1470 m, 09.05.2009, K.6337.

22. *Conocybe tenera* (Schaeff.) Kühner: Köseuşağı village, on soil among grass, 1435 m, K.6356.

Clitocybaceae Roze

23. *Collybia nuda* (Bull.) Z.M. He & Zhu L. Yang: Fram city centre to Çat Dam Lake, pine forest, 1525 m, 01.11.2005, K.2947; Aksu village, among leaf litter under *Quercus* sp., 890 m, 21.11.2009, K.6686.

Galeropsidaceae Singer

24. *Panaeolus ater* (J.E. Lange) Kühner & Romagn. ex Bon: (Kaya, 2009a).

Hymenogastraceae Vittad.

25. *Psilocybe semilanceata* (Fr.) P. Kumm.: City centre, on manured soil among grass, 1450 m, 21.11.2009, K.6726.

Inocybaceae Jülich

26. *Mallocybe perbrevis* (Weinm.) Matheny & Esteve-Rav.: Kavak village, among leaf litter under *Salix* and *Populus* spp., 1315 m, 21.11.2009, K.6703.

Lycoperdaceae F. Berchtold & J. Presl

27. *Lycoperdon perlatum* Pers.: Aksu village, among leaf litter under *Quercus* sp., 890 m, 21.11.2009, K.6682.

28. *Utraria mollis* (Pers.) R.L. Zhao & J.Xin Li: Aksu village, among leaf litter under *Quercus* sp., 890 m, 21.11.2009, K.6678; Pınarbaşı villae, among grass in pine forest clearing, 1370 m, 21.11.2009, K.6735.

Lyophyllaceae Jülich

29. *Calocybe gambosa* (Fr.) Donk: (Kaya, 2009a)

Marasmiaceae Roze ex Kühner

30. *Marasmius oreades* (Bolton) Fr.: Pınarbaşı village, among grass in pine forest, 1375 m, 22.05.2007, K.4692.

Melanoleucaceae Locq. ex Vizzini, Consiglio & P. Alvarado

31. *Melanoleuca cognata* (Fr.) Konrad & Maubl.: Pınarbaşı village, among grass in forest clearing, 1365 m, 21.11.2009, K. 6738.
32. *Melanoleuca excissa* (Fr.) Singer: Yukarıköy village, among grass in poplar grove, 1470 m, 09.05.2009, K.6332.
33. *Melanoleuca stridula* (Fr.) Singer: Yukarıköy village, among grass in pine forest, 1450 m, 09.05.2009, K.6353.
34. *Melanoleuca subalpina* (Britzelm.) Bresinsky & Stangl: Pınarbaşı village, among grass in pine forest, 1360 m, 21.11.2009, K.6733.

Mycenaceae Overeem

35. *Mycena galericulata* (Scop.) Gray: City center, on *Quercus* sp. stump, 1450 m, 21.11.2009, K.6724.
36. *Xeromphalina campanella* (Batsch) Kühner & Maire: From city center to Çat Dam Lake, pine forest, on decaying stump, 1525 m, 15.04.2010, K. 7164.

Omphalotaceae Bresinsky

37. *Gymnopus dryophilus* (Bull.) Murrill: Aksu village, among leaf litter under *Quercus* sp., 1020 m, 21.11.2009, K. 6680.

Physalacriaceae Corner

38. *Strobilurus stephanocystis* (Kühner & Romagn. ex Hora) Singer: Pınarbaşı village, on pine cone remains, 1375 m, 2205.2007, K.4692.

Pleurotaceae Kühner

39. **Pleurotus eryngii** (DC.) Quél.: Mestan village, on remains of *Ferula* sp., 1400 m, K.4689.

40. **Pleurotus ostreatus** (Jacq.) P. Kumm.: Yukarıköy village, around *Populus* sp. stump, 1470 m, K.6337; Yeşilyayla village, 1502 m, K.7136.

Pluteaceae Kotl. & Pouzar

41. **Volvopluteus gloiocephalus** (DC.) Vizzini, Contu & Justo: Korucak village, on soil among grass, 1400 m, 06.05.2010, K.7238.

Psathyrellaceae Vilgalys, Moncalvo & Redhead

42. **Candolleomyces candolleanus** (Fr.) D. Wächt. & A. Melzer: Yukarıköy village, among leaf litter, 1450, K.6348.

43. **Coprinellus disseminatus** (Pers.) J.E. Lange: Yukarıköy village, around *Populus* sp. stump, 1470 m, K.6343; Taşdamlar village, 1540 m, 02.05.2010, K.7198.

44. **Coprinellus micaceus** (Bull.) Vilgalys, Hopple & Jacq. Johnson: Yeşilyayla village, around *Salix* sp. stump, 1502 m, K.7137; Taşdamlar village, 1540 m, 02.05.2010, K.7199.

45. **Coprinopsis atramentaria** (Bull.) Redhead, Vilgalys & Moncalvo: Köseuşağı village, around *Salix* sp. stump, 1435 m, K.7203.

46. **Parasola auricoma** (Pat.) Redhead, Vilgalys & Hopple: Kavak village, on soil among grass, 1315 m, K.6705.

Pseudoclitocybaceae Vizzini, Consiglio, P.-A. Moreau & P. Alvarado

47. **Pseudoclitocybe cyathiformis** (Bull.) Singer: Pınarbaşı village, on soil among leaf litter, 1375 m, 21.11.2009, K.6732.

Schizophyllaceae Quél.

48. **Schizophyllum commune** Fr.: Çat Dam Lake, gendarmerie memorial forest, 1450 m, on pine remains, 01.11.2005, K.2946.

Strophariaceae Singer & A.H. Sm.

49. **Agrocybe pediades** (Fr.) Fayod: Yukarıköy village, on soil among grass, 1475 m, 09.05.2009, K.6338.

50. **Deconica coprophila** (Bull.) P. Karst.: Pınarbaşı village, on cow dung, 1350 m, 22.05.2007, K.4693.

51. **Hebeloma mesophaeum** (Pers.) Quél.: Köseuşağı village, among leaf litter, 1500 m, 02.05.2010, K.7211.

52. **Hebeloma populinum** Romagn.: (Kaya, 2009a).

53. **Pholiota aurivella** (Batsch) P. Kumm.: (Kaya, 2009a).

54. **Pholiota gummosa** (Lasch) Singer: (Kaya, 2009a).

55. **Stropharia ambigua** (Peck) Zeller: Aksu village, among leaf litter under *Quercus* sp., 890 m, 21.11.2009, K.6679.

56. **Stropharia coronilla** (Bull.) Quél.: (Kaya, 2009a).

Tricholomataceae R. Heim ex Pouzar

57. **Tricholoma batschii** Gulden ex Mort. Chr. & Noordel.: (Kaya, 2009a).

58. **Tricholoma populinum** J.E. Lange: (Kaya, 2009a).

Tubariaceae Vizzini

59. **Cyclocybe cylindracea** (DC.) Vizzini & Angelini: Yukarıköy village, around *Salix* sp. stump, 1470 m, 01.11.2006, K.3922.

60. **Tubaria conspersa** (Pers.) Fayod: Kavak village, on damp soil among leaf litter, 1320 m, 21.11.2009, K.6691.

Boletales E.-J. Gilbert**Diplocystidiaceae** Kreisel

61. **Astraeus hygrometricus** (Pers.) Morgan: (Kaya, 2009a).

Gomphidiaceae Maire ex Jülich

62. **Chroogomphus rutilus** (Schaeff.) O.K. Mill.: From city center to Çat Dam Lake, among needle litter in pine forest, 1530 m, 14.04.2010, K.7166.

Paxillaceae Lotsy

63. **Paxillus involutus** (Batsch) Fr.: (Kaya, 2009a).

Rhizopogonaceae Gäum. & C.W. Dodge

64. **Rhizopogon luteolus** Fr.: Yukarıköy village, among grass in pine forest, 1450 m, 09.05.2009, K.6350.

Suillaceae Besl & Bresinsky

65. **Suillus granulatus** (L.) Roussel: Köseuşağı village, among grass in pine forest, 1480 m, 02.05.2010, K.7209.

Gaeastrales K. Hosaka & Castellano**Gaeastraceae** Corda

66. **Gaeastrum rufescens** Pers.: (Kaya, 2009a).

67. **Gaeastrum striatulum** Kalchbr.: Pınarbaşı village, among grass in pine forest, 1370 m, 21.11.2009, K.6730.

Gomphales Jülich**Gomphaceae** Donk

68. **Ramaria flava** (Schaeff.) Quél.: From city center to Çat Dam Lake, pine forest, on soil among needle litter, 1525 m, 15.04.2010, K.7161

Hymenochaetales Oberw.**Hymenochaetaceae** Donk

69. **Phellinus igniarius** (L.) Quél.: Köseuşağı village, on *Salix* sp., stump, 1430 m, 01.11.2006, K. 3918.

Polyporales Gäum.**Laetiporaceae** Jülich

70. **Laetiporus sulphureus** (Bull.) Murrill: City center, on *Salix* sp. stump, 1450 m, 01.11.2005, K.2945.

Phanerochaetaceae Jülich

71. **Bjerkandera adusta** (Willd.) P. Karst.: Adıyaman-Çelikhan road, around Bulam 1 bridge, on decaying *Salix* sp. remain, 1120 m, 01.11.2006, K.3925.

Polyporaceae Fr. ex Corda

72. **Fomes fomentarius** (L.) Fr.: Adıyaman-Çelikhan road, around Bulam-1 bridge, on decaying *Salix* sp. stump, 1120 m, 01.11.2006, K.3926.

73. **Trametes trogii** Berk.: Adıyaman-Çelikhan road, around Bulam-1 bridge, on decaying *Populus* sp. stump, 1120 m, 01.11.2006, K.3927.

Russulales Kreisel ex P.M. Kirk, P.F. Cannon & J.C. David**Russulaceae** Lotsy

74. **Lactarius controversus** Pers.: (Kaya, 2009a).

Stereaceae Pilát

75. *Stereum hirsutum* (Willd.) Pers.: Aksu village, on dead *Quercus* sp. stump, 890 m, 21.11.2009, K.9983. **Thelephorales** Corner ex Oberw.

Thelephorales Corner ex Oberw.

Thelephoraceae Chevall.

76. *Thelephora terrestris* Ehrh. ex Fr.: (Kaya, 2009a).

Discussions

Seventy six macrofungi species belonging to Ascomycota (13) and Basidiomycota (63) were compiled within the boundaries of Çelikhan district. The species are distributed in 2 classes (*Agaricomycetes* 63, *Pezizomycetes* 13) (Fig. 2), and 10 orders (*Agaricales* 47, *Pezizales* 12, *Boletales* 5, *Polyporales* 4, *Geastrales* 2, *Russulales* 2, *Gomphales* 1, *Hymenochaetales* 1, *Incertae sedis* 1, *Thelephorales* 1) (Fig.3).

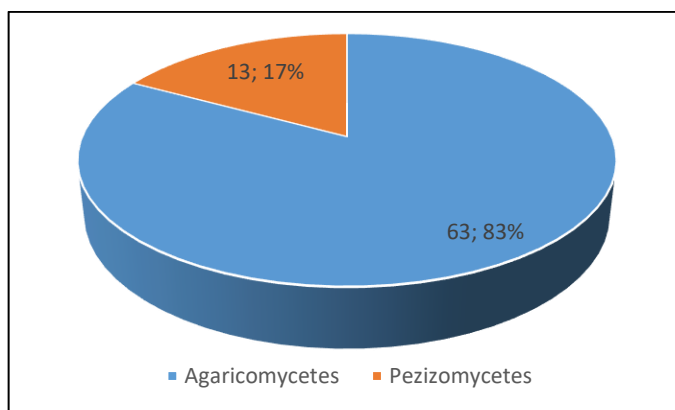


Figure 2. Class-wise distribution of the determined taxa

Strophariaceae is the most crowded family in the research area with eight species. *Agaricaceae* follows it with 7 species. *Morchellaceae* and *Psathyrellaceae* follow it each with 5 species. *Melanoleucaceae* and *Helvellaceae* were found to be represented with 4 and 3 species respectively. In the region, nine families

(*Bolbitiaceae*, *Geastraceae*, *Lycoperdaceae*, *Mycenaceae*, *Pezizaceae*, *Pleurotaceae*, *Polyporaceae*, *Tricholomataceae*, *Tubariaceae*) are represented with 2 species and the remaining 26 families are represented with only one species.

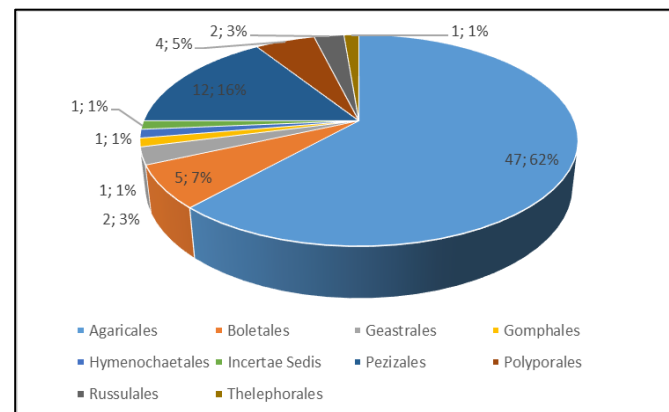


Figure 3. Order-wise distribution of the determined taxa

Forty-nine of the compiled 60 genera are represented by a single species in the region, whereas remaining 11 genera comprise by two or more species. Nine (*Conocybe*, *Coprinellus*, *Geastrum*, *Hebeloma*, *Helvella*, *Pholiota*, *Pleurotus*, *Stropharia*, *Tricholoma*) of these genera are represented species. Remaining two genera, *Melanoleuca* and *Morchella*, included 4 and 5 species respectively.

Thirty (%39.47) of the determined species are edible, and 4 of them (*Coprinus comatus*, *Pleurotus eryngii*, *P. ostreatus*, *Tricholoma populinum*) are collected and consumed by local people. No species were determined to have local economic importance in the region. Sixty-seven of the compiled species are inedible, while 9 are more or less poisonous.

The compiled species list were also compared by the species list of the studies, conducted in neighbouring regions in terms of taxa, similar species number and similarity percentages (Table 1).

Table 1. Comparison of the similarity of macrofungal species of Çelikhan with neighboring studies

The study	Identical taxa	Total taxa #	Similarity (%)
Işiloğlu and Öder (1995)	21	54	38,89
Kaya (2005)	30	76	39,47
Işiloğlu (1997)	24	44	54,55
Kaya et al. (2004)	28	56	50,00
Kaya (2009b)	38	101	37,62
Kaya et al. (2009)	47	110	42,73
Kaya (2015)	55	206	26,70

Author contributions

The authors have equal contributions.

Conflicts of interest

The author declare no competing interests.

Ethical Statement

It is declared that scientific and ethical principles have been followed while carrying out and writing this study and that all the sources used have been properly cited (Abdullah KAYA).

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