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## Macromycetes of Karadağ (Karaman) and its Environs

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**Abstract:** This study was carried out on macrofungi samples collected from Karadağ Mountain and its environs (Karaman) between 2014 and 2019, and 84 species, belonging to 62 genera, 38 families, 12 orders and 6 classes within *Ascomycota* and *Basidiomycota* were determined. The list of the taxa is presented together with their habitats and localities.

**Key words:** Biodiversity, macrofungi, taxonomy, Turkey

### Karadağ (Karaman) ve Çevresinin Makromantar Biyoçeşitliliği

**Öz:** Bu çalışma Karadağ ve çevresinden (Karaman) 2014 ve 2019 yılları arasında toplanan örnekler üzerinde gerçekleştirilmiş ve *Ascomycota* ve *Basidiomycota* bölümleri içinde yer alan 6 sınıf, 12 takım, 38 familya ve 62 cinse ait 84 tür belirlenmiştir. Türlerin listesi habitat ve lokaliteleri ile birlikte verilmiştir.

**Anahtar kelimeler:** Biyoçeşitlilik, makromantarlar, taksonomi, Türkiye

#### Introduction

Karadağ is located in the southern part of Central Anatolian Region of Turkey within the boundaries of Karaman province (Figure 1). The research area takes place in C4 according to Davis' grid square system and is situated between 37°09'-37°31' north latitudes and 32°57'-33°19' east longitudes. The region falls in Irano-Turanian phytogeographical sector within the holoarctic floral kingdom and has a Mediterranean climate according to Emberger's formula (Akman, 1999). The average temperature is 12 °C and the annual precipitation is 331.7 mm. *Quercus* L. sp. dominated forest areas are visible especially at northern and southern slopes of Karadağ, even the steppe vegetation is the dominant vegetation in the region.

Though some studies were carried out within the boundaries of Karaman (Kaşık et al., 2000; Öztürk et al., 2001; Doğan et al., 2003; Doğan and Öztürk, 2006) and a new record was given from the region (İleri et al., 2019), a research related to macrofungal biodiversity of Karadağ

and its environs hasn't been conducted. The work aims to determine the macrofungal composition of the region and make a contribution to the mycobiota of Turkey.

#### Material and method

The macrofungi samples were collected between 2014 and 2019 from the suitable habitats within the research area. They were photographed at their natural habitats and the descriptive characteristics related to their morphologies and ecologies were recorded. Detailed investigations were carried out in the fungarium. Microscopic investigations were performed by using a Nikon Eclipse Ci-S trinocular compound microscope, coupled with a Nikon DS-Fi2 camera. Comparing the obtained data with Watling (1973), Phillips (1981), Moser (1983), Cappelli (1984), Breitenbach and Kränzlin (1984, 1986, 1991, 1995, 2000), Miller and Miller (1988), Ellis and Ellis (1990, 1997), Candusso and Lanzoni (1990), Buczacki (1992), Hansen and Knudsen (1992, 1997), Jordan (1995), Pegler et al. (1993, 1995), Bessette et al.



(1997, 2007, 2010), Medardi (2006), Hausknecht (2009), Antonin and Noordeloos (2010), Thompson (2013) and Beug et al. (2014), the samples were identified.

The specimens are kept at Karamanoğlu Mehmetbey University, Kamil Özdağ Science Faculty, Department of Biology.

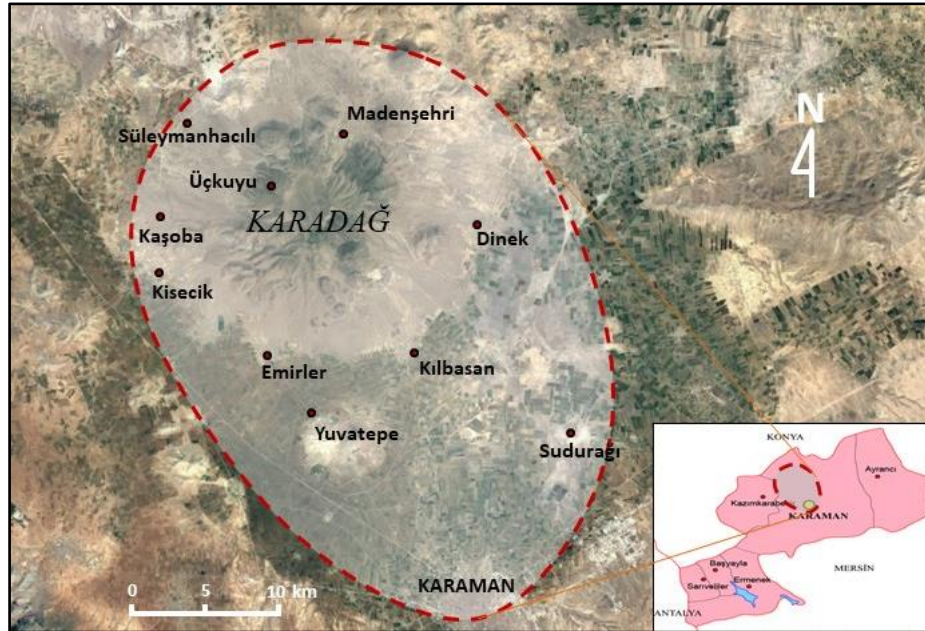


Figure 1. Map of the research area (modified from Google Earth)

Table 1. Macrofungi collection localities

Loc. No	Locality name	Coordinates	Altitude (m)
1	Alparslan Türkeş Park area	37°11'K-33°13'D	1035
2	Around Karaman Castle	37°10'K-33°12'D	1043
3	Around YHM shopping center	37°11'K-33°12'D	1020
4	Dereköy village	37°12'K-33°26'D	1040
5	Dinek village	37°23'K-33°14'D	1017
6	Dinek village	37°24'K-33°12'D	1175
7	Emirler village	37°19'K-33°05'D	1014
8	Karadağ south slopes	37°23'K-33°09'D	1926
9	Karadağ south slopes	37°23'K-33°10'D	1710
10	Karaman High School campus area	37°11'K-33°13'D	1040
11	Karayolları campus area	37°10'K-33°11'D	1030
12	Kaşoba village	37°25'K-33°01'D	1024
13	Kılbasan village	37°18'K-33°11'D	1010
14	Kılbasan village	37°20'K-33°12'D	1025
15	Kiseçik village	37°23'K-33°00'D	1052
16	KMU Campus area	37°10'K-33°15'D	1040
17	KMU Campus area	37°10'K-33°14'D	1040
18	Madenşehir village	37°25'K-33°09'D	1214
19	Madenşehir village	37°26'K-33°08'D	1300



20	Necmettin Erbakan Park area	37°10'K-33°11'D	1030
21	Sudurağı village	37°17'K-33°22'D	1016
22	Süleymanhacılı village	37°27'K-33°04'D	1066
23	Taptuk Emre Quarter	37°10'K-33°14'D	1080
24	Üçkuyu village	37°25'K-33°06'D	1390
25	Üçkuyu village	37°25'K-33°07'D	1478
26	Üçkuyu village	37°25'K-33°08'D	1490
27	Üçkuyu village	37°26'K-33°07'D	1371
28	Yuvatepe village	37°17'K-33°08'D	1015

## Results

The determined taxa are listed in alphabetical order, considering the division, order, families, genera and species respectively. Previously reported species was given with its citation. Kirk et al., (2008) and Index Fungorum (accessed on 30 November 2019) was followed for the systematics of the taxa.

### Ascomycota Caval-Sm

**Dothideomycetes** O.E. Erikss. & Winka

**Patellariales** D. Hawksw. & O.E. Erikss.

**Patellariaceae** Corda

1. **Patellaria atrata** (Hedw.) Fr: On dead *Salix* sp. stump, locality 16, 20.09.2014, K.9701.

**Leotiomyces** O.E. Erikss. & Winka

**Helotiales** Nannf. ex Korf & Lizoň

**Dermateaceae** Fr.

2. **Mollisia melaleuca** (Fr.) Sacc.: On dead *Quercus* sp. twig, locality 26, 27.04.2015, K.11840.

**Helotiaceae** Rehm

3. **Hymenoscyphus calyculus** (Fr.) W. Phillips: On dead *Quercus* sp. twig, locality 27, 15.12.2017, K.13962.

**Hyaloscyphaceae** Nannf.

4. **Brunnipila clandestina** (Bull.) Baral: Üçkuyu village, on dead *Quercus* sp. twig, locality 26, 27.04.2015, K.11852.

**Lachnaceae** Raitv.

5. **Lachnum virgineum** (Batsch) P. Karst.: On dead *Quercus* sp. twig, locality 26, 27.04.2015, K.11846.

**Pezizales** J. Schröt.

**Ascobolaceae** Boud. ex Sacc.

6. **Ascobolus behnizensis** Kirschst.: On sandy soil, locality 17, 12.09.2015, K.12457 (Uzun and Kaya, 2016).

7. **Ascobolus furfuraceus** Pers.: On decaying dung, locality 17, 20.09.2014, K.9702.

**Helvellaceae** Fr.

8. **Helvella acetabulum** (L.) Quél.: On soil among grass, locality 19, 27.04.2015, K.11837; on soil among leaf litter in *Quercus* sp. forest, locality 8, 05.05.2019, K. 15323.

9. **Helvella latispora** Boud.: On soil under *Quercus* sp., locality 19, 17.05.2015, K.11996.

**Morchellaceae** Rchb.

10. **Morchella deliciosa** Fr.: On soil under *Pinus* sp., locality 17, 28.10.2016, K.13289.

11. **Morchella esculenta** (L.) Pers.: On soil among grasses, locality 17, 28.10.2016, K.13288; on soil among leaf litter, locality 24, 05.05.2019, K. 15325.

**Pezizaceae** Dumort.

12. **Iodophanus carneus** (Pers.) Korf: On decaying dung and decaying newspaper particles, locality 16, 28.05.2014, K.8962.

13. **Peziza fimeti** (Fuckel) E.C. Hansen: On decaying cow dung, locality 25, 27.04.2015, K. 11855.

14. **Terfezia boudieri** Chatin: In soil among *Helianthemum* sp., locality 17, 26.05.2014, K.8956; locality 7, 28.04.2019, K. 15309; locality 12, 28.04.2019, K. 15311; locality 22, 28.04.2019, K. 15322; locality 6, 05.05.2019, K. 15332.

15. **Terfezia claveryi** Chatin: In soil among *Helianthemum* sp., locality 19, 27.04.2015, K.11838; locality 14, 05.05.2019, K. 15333.

**Pyronemataceae** Corda

16. **Genea lobulata** (Mor.-Arr., J. Gómez & Calonge) P. Alvarado & Mor.-Arr.: In soil under *Quercus* sp., locality 25, 05.05.2019, K. 15326.

17. **Inermisia gyalectoides** (Svrček & Kubička) Dennis & Itzerott: On or among mosses, locality 23, 17.03.2017, K.13425.



18. **Octospora axillaris** (Nees) M.M. Moser: On mosses between curb stones, locality 11, 08.12.2017, K.13945.
19. **Octospora musci-muralis** Graddon: On mosses on rocks, locality 25, 15.12.2017, K.13969.
20. **Octospora polytrichi** (Schumach.) Caillet & Moyné: On mosses between curb stones, locality 16, 28.10.2016, K.13287.
21. **Picoa lefebvrei** (Pat.) Maire: In soil among *Helianthemum* sp., locality 19, 27.04.2015, K.11834; 08.05.2015, K.11936.
22. **Scutellinia crinita** (Bull.) Lambotte: On damp and rotten wood under sandy soil, locality 16, 22.03.2017, K.13430.
- Tuberaceae** Dumort.
23. **Tuber nitidum** Vittad.: In soil under *Quercus* sp., locality 25, 05.05.2019, K. 15327.
- Sordariomycetes** O.E. Erikss. & Winka
- Hypocreales** Lindau
- Nectriaceae** Tul. & C. Tul.
24. **Nectria peziza** (Tode) Fr.: On *Populus* sp. stump, locality 21, 02.10.2016, K.13170.
25. **Diatrype stigma** (Hoffm.) Fr.: On dead *Quercus* sp. branches, locality 26, 27.04.2015, K.11849.
- Basidiomycota** R.T. Moore
- Agaricomycetes** Doweld
- Agaricales** Underw.
- Agaricaceae** Chevall.
26. **Agaricus campestris** L.: On soil among grass, locality 16, 18.09.2014, K.9672.; locality 10, 05.05.2019, K. 15337.
27. **Bovista plumbea** Pers.: On soil among grass, locality 15, 28.04.2019, K. 15310.
28. **Calvatia cyathiformis** (Bosc) Morgan: On soil under *Quercus* sp., locality 19, 01.10.2016, K.13144.
29. **Coprinus comatus** (O.F. Müll.) Pers.: On soil among grass, locality 16, 18.09.2014, K.9670; locality 17, 01.06.2017, K.13482; locality 20, 02.11.2019, K. 15339; locality 2, 02.11.2019, K. 15340; locality 11, 10.11.2019, K. 15343.
30. **Cyathus stercoreus** (Schwein.) De Toni: On decaying dung, locality 16, 19.08.2014, K.9341.
31. **Leucoagaricus leucothites** (Vittad.) Wasser: On soil among grass, locality 16, 19.09.2014, K.9671; locality 17, 30.05.2016, K.13070.
32. **Lycoperdon molle** Pers.: On soil in *Quercus* sp. forest, locality 25, 15.12.2017, K.13965.
33. **Mycenastrum corium** (Guers.) Desv.: On soil in *Quercus* sp. forest, locality 18, 01.10.2016, K.13140.
34. **Tulostoma brumale** Pers.: On sandy soil in *Quercus* sp. forest, locality 19, 05.05.2019, K. 15328.

**Bolbitiaceae** Singer

35. **Conocybe apala** (Fr.) Arnolds: On manured soil among grass, locality 17, 01.06.2017, K. 13480; locality 3, 05.05.2019, K. 15335.

36. **Conocybe deliquescens** Hauskn. & Krisai: On soil among grass, locality 16, 15.08.2014, K.9334; locality 20, 10.11.2019, K. 15342.

**Chromocyphellaceae** Knudsen

37. **Chromocyphella muscicola** (Fr.) Donk: On moss under *Quercus* sp., locality 25, 15.12.2017, K.13966.

**Incertae Sedis**

38. **Panaeolina foenicisii** (Pers.) Maire: On soil among grass, locality 16, 30.05.2016, K.13071; locality 17, 01.06.2017, K.13468.

39. **Panaeolus ater** (J.E. Lange) Kühner & Romagn. ex Bon: On manured soil, locality 16, 28.05.2014, K.8961; locality 10, 05.05.2019, K. 15336.

40. **Panaeolus fimicola** (Pers.) Gillet: On manured soil, locality 16, 01.06.2017, K.13479; K.13481.

**Inocybaceae** Jülich

41. **Inocybe lacera** (Fr.) P. Kumm.: On soil among grass, locality 16, 08.10.2017, K.13791.

**Marasmiaceae** Roze ex Kühner

42. **Marasmius epodius** Bres.: On soil among grass, locality 16, 19.09.2014, K.9680.

**Omphalotaceae** Bresinsky

43. **Gymnopus dryophilus** (Bull.) Murrill: On soil among leaf litter under *Quercus* sp., locality 25, 15.12.2017, K.13960.

**Pleurotaceae** Kühner

44. **Pleurotus dryinus** (Pers.) P. Kumm.: On *Populus* sp. stump, locality 21, 02.10.2016, K.13159.

45. **Pleurotus ostreatus** (Jacq.) P. Kumm.: On *Populus* sp. stump, locality 21, 02.10.2016, K.13166; on *Salix* sp. stump, locality 11, K. 15344.

**Pluteaceae** Kotl. & Pouzar

46. **Pluteus cervinus** (Schaeff.) P. Kumm.: On *Populus* sp. stump, locality 21, 02.10.2016, K.13163.

47. **Pluteus granularis** Peck: On *Populus* sp. stump, locality 21, 02.10.2016, 02.10.2016, 13161.

48. **Volvariella pusilla** (Pers.) Singer: On soil among grasses, locality 16, 19.09.2014, K.9679.

**Psathyrellaceae** Vilgalys, Moncalvo & Redhead

49. **Coprinellus disseminatus** (Pers.) J.E.Lange: On damp soil, locality 1, 29.05.2016, K.13061.

50. **Coprinellus micaceus** (Bull.) Vilgalys, Hopple & Jacq. Johnson: On decaying *Populus* sp. stump, locality 17, 30.05.2016, K.13067; locality 28, 05.05.2019, K. 15334.



51. **Coprinellus silvaticus** (Peck) Gminder: On decaying *Quercus* sp. stump, locality 18, 01.10.2016, K.13145.
52. **Coprinopsis atramentaria** (Bull.) Redhead, Vilgalys & Moncalvo: On soil among grasses, locality 16, 21.10.2016, K.13284.
53. **Coprinopsis lagopus** (Fr.) Redhead, Vilgalys & Moncalvo: On manured soil among grasses, locality 16, 20.09.2014, K.9689.
54. **Coprinopsis nivea** (Pers.) Redhead, Vilgalys & Moncalvo: On decaying cow dung in oak forest, locality 18, 01.10.2016, K.13143; on decaying cow dung, locality 11, 10.11.2019, K. 15345.
55. **Coprinopsis stangliana** (Enderle, Bender & Gröger) Redhead, Vilgalys & Moncalvo: On manured soil among grasses, locality 17, 01.06.2017, K.13476.
56. **Lacrymaria lacrymabunda** (Bull.) Pat.: On soil among grasses, locality 21, 02.10.2016, K.13171.
57. **Parasola auricoma** (Pat.) Redhead, Vilgalys & Hopple: On manured soil among grasses, locality 16, 28.05.2014, K.8963.
58. **Psathyrella candolleana** (Fr.) Maire: On damp soil among grasses, locality 1, 29.05.2016, K.13063; 05.05.2019, K. 15338; locality 20, 10.11.2019, K. 15341.
59. **Psathyrella typhae** (Kalchbr.) A. Pearson & Dennis: On decaying *Typha* sp. stem (İleri et al., 2019).
- Schizophyllaceae** Quéél.
60. **Schizophyllum amplum** (Lév.) Nakasone: On dead *Populus* sp. twigs, locality 21, 02.10.2016, K.13156.
61. **Schizophyllum commune** Fr.: On decaying *Pinus* sp. branches, locality 16, 28.10.2016, K.13291; on decaying *Populus* sp. stump, locality 28, 28.04.2018, K. 15308.
- Strophariaceae** Singer & A.H. Sm.
62. **Agrocybe dura** (Bolton) Singer: On soil among grasses, locality 16, 15.09.2014, K.9666.
63. **Agrocybe molesta** (Lasch) Singer: On soil among grasses, locality 16, 30.05.2016, K.13068; locality 17, 01.06.2017, K.13469.
64. **Agrocybe paludosa** (J.E. Lange) Kühner & Romagn. ex Bon: On soil among grasses, locality 16, 01.06.2017, K.13478.
65. **Agrocybe pediades** (Fr.) Fayod: On soil among grasses, locality 16, 03.05.2016, K.12937.
66. **Agrocybe vervacti** (Fr.) Singer: On soil among grasses, locality 16, 30.05.2016, K.13069; locality 17, 01.06.2017, K.13467.
67. **Cyclocybe cylindracea** (DC.) Vizzini & Angelini: Around *Populus* sp. stump, locality 21, 02.10.2016, K.13162; locality 4, 09.05.2016, K.12939.
- Tubariaceae** Vizzini
68. **Tubaria furfuracea** (Pers.) Gillet: On soil among grasses in *Quercus* sp. forest, locality 27, 15.12.2017, K.13968.
- Boletales** E.-J. Gilbert
- Diplocystidiaceae** Kreisel
69. **Astraeus hygrometricus** (Pers.) Morgan: On soil in *Quercus* sp. forest, locality 19, 27.04.2015, K.11836; locality 25, 05.05.2019, K. 15330.
- Rhizopogonaceae** Gäum. & C.W. Dodge
70. **Rhizopogon roseolus** (Corda) Th. Fr.: In soil under *Pinus* sp., locality 4, 09.05.2016, K.12945.
- Sclerodermataceae** Corda
71. **Pisolithus arhizus** (Scop.) Rauschert: On soil among grass, locality 17, 28.11.2019, K. 15346.
- Suillaceae** Besl & Bresinsky
72. **Suillus collinitus** (Fr.) Kuntze: On soil among grass under *Pinus* sp., locality 16, 28.10.2016, K.13292.
- Geastrales** K. Hosaka & Castellano
- Geastraceae** Corda
73. **Geastrum fimbriatum** Fr.: On soil among grasses, under *Quercus* sp., locality 25, 15.12.2017, K.13951.
- Hymenochaetales** Oberw.
- Hymenochaetaceae** Donk
74. **Inonotus hispidus** (Bull.) P. Karst.: On *Fraxinus* sp. trunk, locality 10, 12.09.2015, K.12458.
75. **Phellinus igniarius** (L.) Quéél.: On *Salix* sp. trunk, locality 21, 02.10.2016, K.13157.
- Polyporales** Gäum.
- Fomitopsidaceae** Jülich
76. **Fomes fomentarius** (L.) Fr.: On *Populus* sp. stump, locality 21, 02.10.2016, K.13164.
77. **Laetiporus sulphureus** (Bull.) Murrill: On *Salix* sp. trunk, locality 21, 02.10.2016, K.13158.
- Ganodermataceae** Donk
78. **Ganoderma lucidum** (Curtis) P. Karst.: On *Corylus* sp. stump, locality 16, 28.10.2016, K.13290.
- Polyporales** Gäum.
- Polyporaceae** Fr. ex Corda
79. **Lentinus tigrinus** (Bull.) Fr.: On *Populus* sp. stump, locality 21, 02.10.2016, K.13160; on *Salix* sp. stump, locality 13, 01.10.2016, K.13152.
80. **Trametes trogii** Berk.: On *Populus* sp. stump, locality 13, 01.10.2016, K.13151.
- Russulales** Kreisel ex P.M. Kirk, P.F. Cannon & J.C. David
- Peniophoraceae** Lotsy
81. **Peniophora aurantiaca** (Bres.) Höhn. & Litsch.: On dead *Quercus* sp. twigs, locality 25, 15.12.2017, K.13964; locality 26, 27.04.2015, K.11847.
82. **Peniophora quercina** (Pers.) Cooke: On dead *Quercus* sp. twigs, locality 25, 27.04.2015, K.11847.



### Stereaceae Pilát

83. *Stereum hirsutum* (Willd.) Pers.: On dead *Quercus* sp. stump, locality 9, 05.05.2019, K. 15324.

### Dacrymycetaceae J. Schröt.

84. *Dacrymyces capitatus* Schwein.: On dead *Quercus* sp. twigs, locality 26, 27.04.2015, K.11841.

### Discussions

A list of 84 macromycete taxa were presented from Karadağ and its close environs. The list comprises 25 *Ascomycota* (18 *Pezizales*, 4 *Helotiales*, 1 *Hypocreales*, 1 *Patellariales*, 1 *Xylariales*) and 59 *Basidiomycota* (43 *Agaricales*, 5 *Polyporales*, 4 *Boletales*, 3 *Russulales*, 2 *Hymenochaetales*, 1 *Dacrymycetales*, 1 *Geastrales*). Among the determined families, the most crowded one was found to be *Psathyrellaceae* with 11 taxa, which is followed by *Agaricaceae*, *Pyronemataceae*, *Strophariaceae* and *Pezizaceae* with 9, 7, 6 and 4 taxa respectively. The most crowded first three genera were found to be *Agrocybe* Fayod (5), *Coprinopsis* P.Karst. (4) and *Coprinellus* P. Karst. and *Octospora* Hedw. (3).

According to the literatural data, 25 of the determined taxa are edible. It constitutes about the %29.76 of the total taxa, but regional consumption is limited almost to the *Terfezia* (Tul. & C.Tul.) Tul. & C.Tul. species with the Turkish name "Dolaman or domalan". During spring, *T. boudieri* and *T. claveryi* are heavily collected from the region especially from the step areas

between Dinek, Kilbasan and Madenşehir villages. *Pleurotus ostreatus* was found to be another taxon which are collected and consumed by locals. Fifty three (%63.10) of the determined taxa are inedible and 6 (%5.95) are more or less poisonous. But no poisoning incidents were reported from the region.

Among the determined taxa, 50 are terricolous, 25 are lignicolous, 5 are bryophilous and 3 are coprophilous. Six of them were also determined to be hypogeous or semihypogeous.

Except *T. boudieri* (Doğan and Öztürk, 2006), all the taxa are new for the region. *Psathyrella typhae* and *Ascobolus behntziensis* have the first and the only locality in Turkey (Uzun and Kaya, 2016; İleri et al., 2019), while *Pluteus granularis*, *Genea lobulata* and *Scutellinia crinita* had the second localities in Turkey, from the region.

The determined taxa were also compared with the studies carried out in close environs and some similarities were observed. These studies and the similarity percentages are given in Table 2. The reason for this similarity may be the common climate and vegetation.

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Table 2. Similarity percentages of neighbouring studies with Karadağ and its close environs

	# of Identical taxa	Total taxa	Similarity (%)
Afyon (1996)	12	41	29.27
Aktaş et al. (2003)	19	74	25.68
Doğan et al. (2007)	21	95	22.11
Doğan and Öztürk (2006)	31	202	15.35
Kaşık et al. (2000)	9	33	27.27
Kaşık and Öztürk (2000)	10	47	21.28
Öztürk et al (2001)	11	72	15.28

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