



## Edible macrofungi determined in Gürpınar (Van) district

Ezelhan ŞELEM<sup>1\*</sup>, Ali KELEŞ<sup>1</sup>, İsmail ACAR<sup>2</sup>, Kenan DEMİREL<sup>3</sup>

<sup>1</sup>Yüzüncü Yıl University, Education Faculty, Department of Science and Mathematics Education, Van, Turkey

<sup>2</sup>Yüzüncü Yıl University, Başkale Vocational High School, Department of Organic Agriculture, Van, Turkey

<sup>3</sup>Ordu University, Education Faculty, Department of Science and Mathematics Education, Van, Turkey

\*ezelhaselem@hotmail.com

Received : 17.12.2018  
Accepted : 02.01.2019  
Online : 04.01.2019

## Gürpınar (Van) yöresinde belirlenen yenilebilir makromantarlar

**Abstract:** This study was carried out on wild edible macrofungi samples, collected within the boundaries of Gürpınar (Van) district between 2016 and 2017. As a result of necessary investigations related to macro and micromorphologies of the samples, 36 wild edible macrofungi species belonging to 11 families and 4 orders were determined. Eight of them belong to the phylum Ascomycota and 28 to Basidiomycota. Among the determined taxa *Agaricus bisporus*, *A. campestris*, *A. urinascens*, *Pleurotus eryngii*, *P. ostreatus* and *P. populinus* are collected and consumed by locals. *Pleurotus eryngii* is the only economically important macrofungi in the region.

**Key words:** Biodiversity, edible mushrooms, Eastern Anatolia, Turkey

**Özet:** Bu çalışma 2016 ve 2017 yılları arasında Gürpınar (Van) ilçe sınırları içinde kalan bölgeden toplanan yabani yenilebilir makromantar üzerinde gerçekleştirilmiştir. Örneklerin makro ve mikromorfolojilerine ilişkin gerekli incelemeler sonucunda, 4 ordo ve 11 familyaya ait 36 yenilebilir yabani makromantar türü belirlenmiştir. Bunlardan 8 tanesi Ascomycota bölümüne, 28 tanesi ise Basidiomycota bölümüne aittir. Belirlenen taksonlardan *Agaricus bisporus*, *A. campestris*, *A. urinascens*, *Pleurotus eryngii*, *P. ostreatus* ve *P. populinus* yerel halk tarafından toplanıp tüketilmektedir. Yörede ekonomik öneme haiz tek tür ise *Pleurotus eryngii*'dir.

**Anahtar Kelimeler:** Biyoçeşitlilik, yenilebilir mantarlar, Doğu Anadolu, Türkiye

### 1. Introduction

Turkey is a very rich country in terms of naturally growing macrofungal species, due to its unique flora and climatic conditions (Dündar et al., 2016), and currently comprises more than 2500 macrofungi (Kaya and Uzun, 2018). Fungi are an important group of organism for nature, and have a crucial role in recycling the organic matter. Beside the traditional consumption of naturally growing mushrooms as an important part of human diet, they are also used as a source of bioactive metabolites (Acharya et al., 2018). They are also emphasized by many researchers as valuable food source due to their fatty acid, vitamin, fiber, carbohydrate, protein and mineral contents (Demirbaş, 2001; Owaid et al., 2007; Türkekul, 2017). Because of their medical benefits, mushrooms have been consumed for centuries in many far eastern countries such as China and Japan (Manzi et al., 2001) as well as in many European and American countries (Boa, 2004). The findings of recent studies also indicate that many macrofungi accumulate heavy metals, radioactivity and some other toxic materials in their fruit bodies (Mat, 2000; Isıldak et al., 2004; Soylak et al., 2005; Kalać, 2010; Uzun et al., 2011; Kaya and Bağ, 2013; Korkmaz et al., 2016; Karapınar et al., 2017; Türkmen and Budur, 2018).

Gürpınar, where the research was conducted, is a district of Van province in Eastern Anatolian Region of Turkey. The district is the largest one in Turkey with a surface area of 4.063 km<sup>2</sup> (Anonymus, 2018), and surrounded by Central district of Van and Özalp to the north, Gevaş and Çatak to the west, Hakkari to the south and Başkale (Van) to the east (Fig. 1). The research area lies within the Irano-Turanian phytogeographical flora sector. Steppe vegetation is the dominant one in the region with distinct

*Astragalus* L. populations. *Quercus* L., *Pinus* L. and some *Juniperus* L. species form rare and mixed populations at higher elevations (Atalay, 1989). Along stream banks, *Eleagnus* Hill., *Populus* L., *Malus* Mill., *Prunus* L., *Pyrus* L. and *Salix* L. trees form small populations.

The climate of the research area is Mediterranean with an annual rainfall of 281mm and an annual average temperature of 8.1 °C (Bani and Adıgüzel, 2008).

The study aims to determine the edible macrofungal composition and local consumption of them in the region, and to make a contribution to the mycobiota of Turkey.

### 2. Materials and Method

The research material was collected from suitable localities (Table 1) within the boundaries of Gürpınar (Van) district between the years 2016 and 2017. During field studies, macrophotographs of the macrofungi samples were taken at their natural habitats, and the diagnostic, descriptive and ecological characteristics were recorded. Local edibility status of the collected samples were also investigated by asking the local people. Then the samples were transferred to the laboratory. Macroscopic and microscopic measurements and chemical investigations were performed in the laboratory. The specimens were identified by comparing the obtained data with the relevant literature (Moser, 1983; Breitenbach and Kränzlin, 1984-2000; Cappelli, 1984; Buczacki, 1989; Jordan, 1995; Bessette et al., 1997; Kränzlin, 2005; Phillpis, 1991, 2006; Besette et al., 2007; Garnweidner, 2010; Beug et al., 2014; Kuo and Methven, 2014). The determined macrofungi samples are kept in the fungarium of Biology Department, Science Faculty, Van Yüzüncü Yıl University.



Figure 1. Map of the research area (modified from google earth)

### 3. Results

The list of the determined edible taxa, are given together with their habitats, collection localities, collection dates and the personal voucher numbers. The systematics of the taxa are in accordance with Kirk et al. (2008) and Index fungorum (accessed on 10 December 2018).

#### *Ascomycota* Whittaker

##### *Pezizomycetes* O.E. Erikss. & Winka

##### *Pezizales* J. Schröt.

##### *Helvellaceae* Fr.

1. *Helvella acetabulum* (L.) Quéf.: Among needle litter under *Pinus* L. sp. trees, locality 14, 18.5.2015, Şelem 71.
2. *Helvella lacunosa* Afzel: Among leaf litter under *Populus* sp. trees, locality 14, 5.6.2016, Şelem 132.
3. *Helvella leucopus* Pers.: Among leaf litter under *Populus* sp. trees, locality 14, 18.5.2015, Şelem 116.
4. *Paxina queletii* (Bres.) Stangl: Under *Salix* sp. trees, locality 14, 5.10.2016, Şelem 131.

##### *Morchellaceae* Rchb.

5. *Mitrophora semilibera* (DC.) Lév.: Among leaf litter under *Populus* sp. trees, locality 14, 18.05.2015, Şelem 63; under *Salix* sp. trees, locality 6, 05.10.2016, Şelem 172.
6. *Morchella elata* Fr.: Among leaf litter under *Populus* sp. trees, locality 11, 03.06.2016, Şelem 230.
7. *Morchella esculenta* (L.): Pers.: Among leaf litter under *Populus* sp. trees, locality 11, 03.06.2016, Şelem 83; under *Salix* sp. trees, locality 9, 08.05.2015, Şelem 11.
8. *Morchella esculentoides* M. Kuo, Dewsbury, Moncalvo & S.L.Stephenson: Among leaf litter under *Populus* and

*Salix* sp. trees, locality 11, 03.06.2016, Şelem 96.

9. *Morchella prava* Dewsbury, Moncalvo, J.D. Moore & M.Kuo: Among leaf litter under *Populus* and *Salix* sp. trees, locality 11, 03.06.2016, Şelem 94.

#### *Basidiomycota* Whittaker ex Moore

##### *Agaricales* Underw.

##### *Agaricaceae* Chevall.

10. *Agaricus bisporus* (J.E. Lange) Imbach : Among grass in meadow, locality 9, 18.05.2015, Şelem 98.
11. *Agaricus campestris* L.: Among grass in meadow, locality 13, 18.05.2015, Şelem 21.
12. *Agaricus urinascens* (Jul. Schäff. & F.H.Møller) Singer: Among grass in meadow, locality 12, 5.10.2016, Şelem 316.
13. *Bovista plumbea* Pers.: Among grass in meadow, locality 10, 30.05.2017, Şelem 360.
14. *Coprinus comatus* (O.F. Müll.) Pers.: Among grass in meadow, locality 30, 18.05.2015, Şelem 51; locality 19, 03.06.2016, Şelem 248; under *Salix* sp. trees, locality 24, 03.06.2016, Şelem 225.

##### *Hymenogastraceae* Vittad.

15. *Psilocybe coronilla* (Bull.) Noordel. : Among grass in meadow, locality 9, 18.05.2015, Şelem 92; locality 36, 18.11.2015, Şelem 196.

##### *Pleurotaceae* Kühner

16. *Pleurotus eryngii* (DC.) Quéf.: On *Ferula* sp. remains, locality 33, 03.06.2016, Şelem 242; locality 18, 28.06.2017, Şelem 354; locality 1, 13.06.2017, Şelem 365; locality 2, 13.06.2017, Şelem 375; locality 7, 13.06.2017,

Table 1. Macrofungi collection localities

Locality No	Locality name	Coordinates	Altitude
1	Albenek village	N 38° 16.015'; E 43° 37.050'	2022 m
2	Alniak village	N 38° 13.126'; E 43° 42.047'	2502 m
3	Bozyiğit village	N 38° 21.965'; E 43° 34.098'	1845 m
4	Çörekli village	N 38° 21.147'; E 43° 48.146'	2001 m
5	Between Çörekli- Cevizalan villages	N 38° 21.855'; E 43° 48.062'	2025 m
6	Erkaldı village	N 38° 21.842'; E 43° 33.202'	1809 m
7	Giyimli village	N 38° 12.040'; E 43° 47.090'	2322 m
8	Günbaşı village	N 38° 18.300'; E 43° 43.051'	2168 m
9	Gürpınar central county	N 38° 19.820'; E 43° 25.010'	1745 m
10	Gürpınar central county	N 38° 19.534'; E 43° 23.867'	1751 m
11	Around Gürpınar	N 38° 17.929'; E 43° 45.243'	2010 m
12	Güzelsu village	N 38° 18.960'; E 43° 48.130'	1980 m
13	Güzelsu village	N 38° 17.925'; E 43° 48.828'	1996 m
14	Güzelsu village	N 38° 19.303'; E 43° 47.973'	1977 m
15	Güzelsu village, near castle	N 38° 19.139'; E 43° 47.991'	1986 m
16	Hacıköy village	N 38° 18.093'; E 43° 38.100'	2205 m
17	Hamurkesen village	N 38° 20.150'; E 43° 37.650'	1948 m
18	Işıkpınar village	N 38° 19.450'; E 43° 36.840'	2134 m
19	Kırgeçit village	N 38° 11.320'; E 43° 29.884'	2147 m
20	Kırgeçit village	N 38° 11.321'; E 43° 29.884'	2165 m
21	Kuşdağı place	N 38° 14.690'; E 43° 27.380'	1905 m
22	Ortaköy village	N 38° 21.873'; E 43° 38.294'	1910 m
23	Ortaköy village	N 38° 21.734'; E 43° 37.854'	1868 m
24	Örmeli village	N 38° 07.220'; E 43° 30.430'	2231 m
25	Sevindik village	N 38° 18.293'; E 43° 52.059'	2098 m
26	Sevindik village	N 38° 17.972'; E 43° 50.348'	2038 m
27	Taşdöndüren village	N 38° 15.328'; E 43° 48.910'	2031 m
28	Tepegören village	N 38° 21.506'; E 43° 53.276'	2107 m
29	Tutmaç village	N 38° 15.930'; E 43° 42.790'	2401 m
30	Üçgen village	N 38° 22.515'; E 43° 44.693'	2141 m
31	Üçgen village	N 38° 22.363'; E 43° 44.975'	2135 m
32	Yedisalkım village	N 38° 11.012'; E 43° 42.100'	2441 m
33	Yoldüştü village	N 38° 09.710'; E 43° 33.790'	2187 m
34	Yurtbaşı village	N 38° 13.933'; E 43° 47.250'	2108 m
35	Around Zerneke watchhouse	N 38° 21.562'; E 43° 39.162'	1934 m
36	Around Zerneke watchhouse	N 38° 21.676'; E 43° 38.620'	1900 m

Şelem 372; locality 29, 13.06.2017, Şelem 377; locality 32, 13.06.2017, Şelem 374.

17. *Pleurotus ostreatus* (Jacq.) P. Kumm.: On *Populus* sp. stump, locality 14, 18.05.2015, Şelem 54; locality 14, 05.06.2015, Şelem.120; locality 10, 08.11.2015, Şelem 180; locality 10, 18.11.2015, Şelem 211; locality 4, 13.11.2016, Şelem 382; locality 26, 13.11.2016, Şelem 384; on *Salix* sp. stump locality 27, 13.06.2017, Şelem 368; locality 28, 13.06.2017, Şelem 367; locality 34, 13.06.2017, Şelem 371.

18. *Pleurotus populinus* O.Hilber & O.K.Mill.: On *Populus* sp. stump, locality 15, 05.10.2016, Şelem 317.

#### Pluteaceae Kotl. & Pouzar

19. *Pluteus aurantiorugosus* (Trog) Sacc.: On *Populus* sp., stump, locality 6, 19.05.2016, Şelem 338.

20. *Pluteus romellii* (Britzelm.) Sacc.: On *Salix* sp. stump, locality 14, 18.05.2015, Şelem 55; on *Populus* sp. stump, locality 12, 05.10.2016, Şelem. 300.

21. *Volvopluteus gloiocephalus* (DC.) Vizzini, Contu & Justo: Among grass in meadow, locality 9, 18.05.2015, Şelem 109.

#### Psathyrellaceae Vilgalys, Moncalvo & Redhead

22. *Coprinellus disseminatus* (Pers.) J.E. Lange: Around *Populus* and *Salix* sp. trees, locality 15, 18.05.2015, Şelem 28; locality 22, 18.05.2015, Şelem 76; locality 23, 18.11.2015, Şelem 185.

23. *Coprinellus micaceus* (Bull.) Vilgalys, Hopple & Jacq. Johnson: Under *Salix* sp. trees, locality 9, 08.05.2015, Şelem 3; under *Populus* sp. trees, locality 12, 18.05.2015, Şelem 29; locality 30, 03.06.2016, Şelem 225;

locality 31, 03.06.2016, Şelem 227; locality 21, 03.06.2016, Şelem 252; locality 17, 28.06.2017, Şelem 351; locality 8, 28.06.2017, Şelem 353.

24. *Coprinopsis atramentaria* (Bull.) Redhead, Vilgalys & Moncalvo: Around *Populus* sp. stump, locality 14, 05.06.2015, Şelem 126; locality 23, 18.11.2015, Şelem 183; locality 5, 03.06.2016, Şelem 364; around *Salix* sp. stump, locality 15, 18.05.2015, Şelem 39; under *Robinia* sp. tree, locality 22, 21.05.2015, Şelem 88.

25. *Psathyrella candolleana* (Fr.) Maire: Around *Populus* and *Salix* sp. trees, locality 14, 05.06.2015, Şelem 123; locality 14, 05.06.2015, Şelem 173.

#### *Strophariaceae* Singer & A.H.Sm.

26. *Agrocybe dura* (Bolton) Singer: Among grass in meadow, locality 16, 28.06.2017. Şelem 361.

27. *Agrocybe pediades* (Fr.) Fayod: Among grass in meadow, locality 36, 18.05.2015, Şelem 72.

28. *Agrocybe praecox* (Pers.) Fayod: Among grass in meadow, locality 14, 05.06.2015, Şelem 58.

29. *Cyclocybe cylindracea* (DC.) Vizzini & Angelini: On *Populus* sp. stump, locality 11, 05.10.2016, Şelem 268.

30. *Pholiota aurivella* (Batsch) P. Kumm.: On *Salix* sp. stump, locality 3, 18.11.2015, Şelem 210; locality 10, 18.11.2015, Şelem 214; locality 14, 05.10.2016, Şelem 288; locality 25, 13.11.2016, Şelem 383.

#### *Tricholomataceae* Lotsy

31. *Melanoleuca brevipes* (Bull.) Pat.: Among grass in meadow, locality 14, 18.05.2015, Şelem 52; among grass under *Populus* sp. trees, locality 10], 19.05.2016, Şelem 326.

32. *Melanoleuca cognata* (Fr.) Konrad & Maubl.: Among grass under *Salix* sp. tree, locality 12, 05.10.2016, Şelem 309.

33. *Pseudoclitocybe cyathiformis* (Bull.) Singer: Among grass in meadow, locality 22, 18.11.2015, Şelem 193.

34. *Lepista personata* (Fr.) Cooke: Among grass in meadow, locality 20, 03.06.2016, Şelem 247.

#### *Boletales* E.-J.Gilbert

##### *Suillaceae* Besl & Bresinsky

35. *Suillus collinitus* (Fr.) Kuntze : Among needle litter under *Pinus* sp. trees, locality 35, 18.11.2015, Şelem 192.

#### *Polyporales* Gäum

##### *Polyporaceae* Fr. ex Corda

36. *Cerioporus squamosus* (Huds.) Quél.: On *Populus* sp. stump, locality 15, 18.05.2015, Şelem 356.

#### 4. Discussions

As a result of this study, 36 wild edible macrofungi taxa belonging to 11 families, 4 orders and 2 classes were determined within the boundaries of Gürpınar district. Eight of the determined species belong to Ascomycota and 28 belong to Basidiomycota. Though 36 edible

macrofungi exist in the region, it is found that only six of them are collected and consumed in the region (Table 2). This benefit rate (%16.6) seems to be smaller than the average benefit rate of naturally growing wild edible mushrooms in Turkey (Table 3).

**Table 2.** Locally consumed taxa and their local names

Scientific name	Local name
<i>Agaricus bisporus</i>	Çayır mantarı
<i>Agaricus campestris</i>	Çayır mantarı
<i>Agaricus urinascens</i>	Çayır mantarı
<i>Pleurotus eryngii</i>	Heliz mantarı
<i>Pleurotus ostreatus</i>	Kavak mantarı
<i>Pleurotus populinus</i>	Kavak mantarı

Among the determined edible species, *Pleurotus eryngii* is the most preferable one due to its delicious taste and the belief that it is good for indigestion. It is also important for its economic potential. Especially in May and June this fungus is collected and sold in public bazaars and markets. It had a price of 50 Turkish liras per kilogram in 2018.

Collection and consumption of the members of the genus *Agaricus* L. also common in the region with the name meadow mushroom (çayır mantarı). *Coprinopsis atramentaria* was also determined in the region. Normally this mushroom is an edible one, but if it is consumed with alcohol, it becomes poisonous due to the interaction of coprine with alcohol (Michelot, 1992).

Though regarded as edible, *Helvella acetabulum*, *H. lacunosa*, *Morchella prava* and *Pholiota aurivella* should not be consumed unless cooked. Among them *H. acetabulum*, *H. lacunosa*, *Paxina queletii* and *P. aurivella* may cause gastrointestinal distress or gastric upset following ingestion (Gücin et al., 2000). Since it liquifies at maturity, *Coprinus comatus* should be consumed when young and still white. Likewise, *Pholiota aurivella* and *Cerioporus squamosus* should also be consumed when young, before the fruit bodies become hard and ligneous.

*Pluteus aurantiorugosus* is an attractive mushroom and could be regarded as suspicious due to its red to yellowish colour, but it is used for food in Mexico and Malaysia (Boa, 2004).

Wild edible mushrooms are among the most valuable non-wood forest products and have been collected and consumed by people for thousands of years (Boa, 2004). But, it should be avoided to eat naturally growing mushrooms if the edibility is not definitely known.

#### Acknowledgments

Authors would like to thank Yüzüncü Yıl University Research Projects Presidency (FYL-2016-5213) for its financial support.

**Table 3.** Local consumption percentages of wild edible mushrooms in some regions of Turkey (modified from Kaya, 2018)

Reseachs	Number of edible taxa	Local consumption	
		taxa number	%
Demirel (1996)	27	5	18,52
Yıldız and Ertekin (1997)	22	8	36,36
Solak et al. (1999)	49	26	53,06
Gezer (2000)	48	13	27,08
Demirel et al. (2002)	21	2	9,52
Demirel et al. (2003)	60	6	10
Demirel et al. (2015)	47	7	14,89
Kaya et al. (2012)	25	5	23,09
Atila and Kaya (2013)	32	7	17,71
Keleş et al. (2014)	59	6	10,17
Akata et al. (2014)	60	9	15
Uzun et al. (2015)	54	7	12,97
Kaya (2015)	40	6	12
Akata et al. (2016)	46	4	8,7
Uzun et al. (2017)	45	15	33,33
		Average	19,2

## References

- Acharya K, Ghosh S, Biswas R (2018). Total phenolic contents and antioxidant effects of infusion and decoction from *Lepista sordida* (Schumach.) Singer. *Fabad Journal of Pharmaceutical Sciences* 43(1): 17-24.
- Akata I, Uzun Y, Kaya A (2014). Macromycetes determined in Yomra (Trabzon) district. *Turkish Journal of Botany* 38: 999-1012.
- Akata I, Uzun Y, Kaya A (2016). Macrofungial diversity of Zigana Mountain. *Biological Diversity and Conservation* 9(2): 57-69.
- Anonymus (2018). Gürpınar Kaymakamlığı. <http://www.gurpinar.gov.tr/ilcemiz-taniyalim/> [accessed 10 December 2018].
- Atalay İ (1994). Türkiye Coğrafyası. İzmir: Ege Üniversitesi Basımevi.
- Atila OY, Kaya A (2013). Macromycetes of Sarız (Kayseri - Turkey) district. *Biological Diversity and Conservation* 6(2): 50-54.
- Bani B, Adıgüzel N (2008). Flora of an important plant area: Çatak valley I - (Çatak-Pervari) Van, Turkey. *Flora Mediterranea* 18: 11-63.
- Besette AE, Roody WC, Besette AR, Dunaway DL (2007). *Mushrooms of the Southeastern United States (first edition)*. Syracuse-New York: Syracuse University Press.
- Besette AE, Besette AR, Fischer DW (1997). *Mushrooms of Northeastern North America, Hong Kong*: Syracuse University Press.
- Beug M, Besette AE, Besette AR (2014). *Ascomycete Fungi of North America. A Mushroom Reference Guide*. Texas-USA: University of Texas Press.
- Boa E (2004). *Wild edible fungi: a global overview of their use and importance to people*. NonWood Forest Products, No. 17, Rome: FAO, Forestry Department.
- Breitenbach J, Kränzlin F (1984). *Fungi of Switzerland, Vol. 1*. Lucerne: Verlag Mykologia.
- Breitenbach J, Kränzlin F (1991). *Fungi of Switzerland, Vol. 3*. Lucerne: Verlag Mykologia.
- Breitenbach J, Kränzlin F (1995). *Fungi of Switzerland, Vol. 4*. Lucerne: Verlag Mykologia.
- Breitenbach J, Kränzlin F (2000). *Fungi of Switzerland, Vol. 5*. Lucerne: Verlag Mykologia.
- Buczacki S (1989). *Fungi of Britain and Europe*. Glasgow: William Collins and Sons Ltd.
- Cappelli A (1984). *Fungi Europaei I. Agaricus*. Saronno-Italia: Liberia editrice Biella Giovanna..
- Demirbaş A (2001). Concentrations of 21 Metals in 18 species of mushrooms growing in the East Black Sea Region. *Food Chemistry* 75: 453-457.
- Demirel K (1996). Van Yöresi Makrofungusları. *Tr. J. of Botany*, 20: 165-169.
- Demirel K, Kaya A, Uzun Y (2003). Macrofungi of Erzurum Province. *Turkish Journal of Botany* 27: 29-36.
- Demirel K, Uzun Y, Akçay ME, Keleş A, Acar İ, Efe V (2015). Van Yöresi Makromantarlarına Katkılar. *Mantar Dergisi* 6(2): 12-23.
- Demirel K, Uzun Y, Kaya A (2002). Macrofungi of Ağrı Province. *Turkish Journal of Botany* 26: 291-295.
- Dündar Ö, Demircioğlu H, Özkaya O, Dündar B (2016). Kültür mantarlarının muhafazası ve kalite özellikleri üzerine yapılan araştırmalar. *Turkish Journal of Agriculture: Food Science And Technology* 4(3): 150-154.
- Garnweidner E (2010). *Mushrooms and Toadstools of Britain and Europe*. London: Harper Collins.

- Gezer K (2000). Contributions to the Macrofungi Flora of Antalya Province. Turkish Journal of Botany 24: 293-298.
- Gücin F, Işiloğlu M, Kaya A (2000). Türkiye’de Zehirli Mantarlar. In: Mat A (ed.) Türkiye’de Mantar Zehirlenmeleri Zehirli Mantarlar. İstanbul: Nobel Tıp Kitabevleri Ltd., pp 9-150.
- Index Fungorum (2018). <http://www.indexfungorum.org/names/Names.asp> / [10 December 2018].
- Işıldak Ö, Turkekul İ, Elmastaş M, Tuzen M (2004). Analysis of heavy metals in some wild-grown edible mushrooms from the middle black sea region, Turkey. Food Chemistry 86(4): 547-552.
- Jordan M (1995). The Encyclopedia of Fungi of Great Britain and Europe. UK: David and Charles Book Co.
- Kalač P (2010). Trace element contents in European species of wild growing edible mushrooms: A review for the period 2000-2009. Food Chemistry 122(1): 2-15.
- Karapınar HS, Uzun Y, Kılıçel F (2017). Mineral contents of two wild morels. Anatolian Journal of Botany 1(2): 32-36.
- Kaya A (2015). Contributions to the Macrofungal Diversity of Atatürk Dam Lake Basin. Turkish Journal of Botany 39: 162-172.
- Kaya A (2018). Edible Macrofungi Determined in Adıyaman Province (Turkey). International Eurasian Conference on Science, Engineering and Technology (EurasianSciEnTech 2018), November 22-23, 2018 Ankara, Turkey. Proceeding book pp. 461-467.
- Kaya A, Bağ H (2013). Mineral contents of some wild ascomycetous mushrooms. Asian Journal of Chemistry 25: 1723-1726.
- Kaya A, Demirel K, Uzun Y (2012). Macrofungal diversity of Araban (Gaziantep/Turkey) district. Biological Diversity and Conservation 5(3): 162-166.
- Kaya A, Uzun Y (2018). New contributions to the turkish ascomycota. Turkish Journal of Botany 42: 644-652.
- Keleş A, Demirel K, Uzun Y, Kaya A (2014). Macrofungi of Ayder (Rize/Turkey) high plateau. Biological Diversity and Conservation 7(3): 177-183.
- Kirk PM, Cannon PF, Minter DW, Stalpers JA (2008). Dictionary of the Fungi. 10th ed. Wallingford, UK: CAB International.
- Korkmaz ME, Açar O, Kaya A, Emsen B, Uzun Y (2016). Measurement of gross alpha and beta activities in mushroom samples. Cumhuriyet University Faculty of Science Science Journal 37(4): 325-328.
- Kränzlin F (2005). Fungi of Switzerland, Vol. 6. Lucerne: Verlag Mykologia.
- Kuo M, Methven SA (2014). Mushrooms of the Midwest. Chicago: University of Illinois Press.
- Manzi P, Aguzzi A, Pizzoferrato L (2001). Nutritional Value of Mushrooms Widely Consumed in Italy. Food Chemistry 73: 321-325.
- Mat A (2000). Türkiye’de Mantar Zehirlenmeleri ve Zehirli Mantarlar. İstanbul: Nobel Tıp Kitabevleri Ltd.
- Michelot D (1992). Poisoning by *Coprinus atramentarius*. Natural Toxins 1(2): 73-80.
- Moser M (1983). Keys to Agarics and Boleti. Stuttgart: Gustav Fischer Verlag.
- Owaied MN, Muslat MM, Abed IA (2017). Farklı kompostlarda üretilen *Agaricus bisporus* X25 mantarlarının protein ve ortodihidrik fenol içerikleri. Gıda 42(3): 324-328.
- Phillips R (2006). Mushrooms. London: Pan Macmillan.
- Phillips R, Foy N, Kibby G (1991). Mushrooms of North America. USA: Little Brown and Co.
- Solak MH, Işiloğlu M, Gücin F, Gökler İ (1999). Macrofungi of İzmir Province. Turkish Journal of Botany 23: 383-390.
- Soylak M, Saraçoğlu S, Tuzen M, Mendil D (2005). Determination of trace metals in mushroom samples from Kayseri, Turkey. Food Chemistry 92(4): 649-652.
- Turkekul İ (2017). Yenebilen ve ekonomik değeri olan *Ramaria flavobrunnescens*= Gelinparmağı Mantarının vitamin C, E ve yağ asidi bileşenlerinin belirlenmesi. Kahramanmaraş Sütçü İmam Üniversitesi Doğa Bilimleri Dergisi 20(1): 16-19.
- Türkmen M, Budur D (2018). Heavy metal contaminations in edible wild mushroom species from Turkey’s Black Sea region. Food chemistry 254: 256-259.
- Uzun Y, Acar İ, Akçay ME, Kaya A (2017). Contributions to the macrofungi of Bingöl, Turkey. Turkish Journal of Botany 41: 516-534.
- Uzun Y, Gençcelep H, Kaya A, Akçay ME (2011). The mineral contents of some wild edible mushrooms. Ekoloji 80: 6-12.
- Uzun Y, Kaya A, Karacan İH, Kaya ÖF, Yakar S (2015). Macromycetes determined in İslahiye (Gaziantep/Turkey) district. Biological Diversity and Conservation 8(3): 209-217.
- Yıldız A, Ertekin AS (1997). Contributions to The Macrofungal Flora of Diyarbakır, Turkish Journal of Botany 21: 119-122.

---

**Cite this article:** Şelem E, Keleş A, Acar İ, Demirel K (2019). Edible macrofungi determined in Gürpınar (Van) district. Anatolian Journal of Botany 3(1): 7-12.