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Research article/Araştırma makalesi

Macrofungi biodiversity of Kütahya (Turkey) province

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Abstract

In this study, determination of macrofungi biodiversity of Kütahya province is aimed and 332 species belonging to 57 families, 15 order, 5 classis and 2 divisio were identified from the study area as a consequence of routine field and laboratory studies between 2011 and 2014 years.

Key words: macrofungi, biodiversity, taxonomy, Kütahya, Turkey

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Kütahya yöresi makrofunguslarının biyoçeşitliliği

Özet

Bu çalışmada, Kütahya yöresinde yetişen makrofungların belirlenmesi amaçlanmıştır ve, 2011 ve 2014 yılları arasında yapılan rutin arazi ve laboratuar çalışmaları sonucunda araştırma bölgesinden 57 familya, 15 takım, 5 sınıf ve 2 bölümde dağılım gösteren 332 tür belirlenmiştir.

Anahtar kelimeler: makrofunguslar, biyoçeşitlilik, taksonomi, Kütahya, Türkiye

1. Introduction

The studies on Turkish mycota have been carried out for more than one hundred years (Solak et al., 2015) and nearly 2400 macrofungi species have been documented in the checklists of Turkey (Solak et al., 2007; Sesli and Denchev 2008; Acar et al. 2015; Sesli et al., 2015; Solak et al., 2015; Akata et al. 2016; Doğan and Kurt 2016; Sesli et al. 2016). However, Turkish mycota have not yet been fully determined, and new macrofungi records and checklists of some limited areas have also been published by several researchers as a consequence of routine field and laboratory studies. Prior to this study, Kütahya province was the one of the areas in which macrofungi biodiversity was not determined.

Kütahya province (Figure 1) is located at the junction point of Euro-Siberian, Mediterranean and Irano-Turanian Region and this situation encourages biological diversity. Kütahya has rich vegetation and the forests including *Pinus nigra* J.F. Arnold., *P. brutia* Ten., *P. sylvestris* L., *Q. cerris* L., *Q. coccifera* L., *Cedrus libani* A. Rich., *Juniperus* sp. and *Castanea sativa* Mill. dominating the area. Also, *Pinus nigra* Arnold. subsp. *pallasiana* (Lamb.) Holmboe var. *pyramidata* (Acatay) Yaltirik (known as Ehrami Karaçamı), which is considered as endemic species of the region, is distributed in limited area of Kütahya (Ünaldı, 2004). Similarly, rainy climatic condition of the region throughout the year is suitable for macrofungi growth.

In the present study, therefore, we attempt to determine macrofungi biodiversity of Kütahya province in Turkey.

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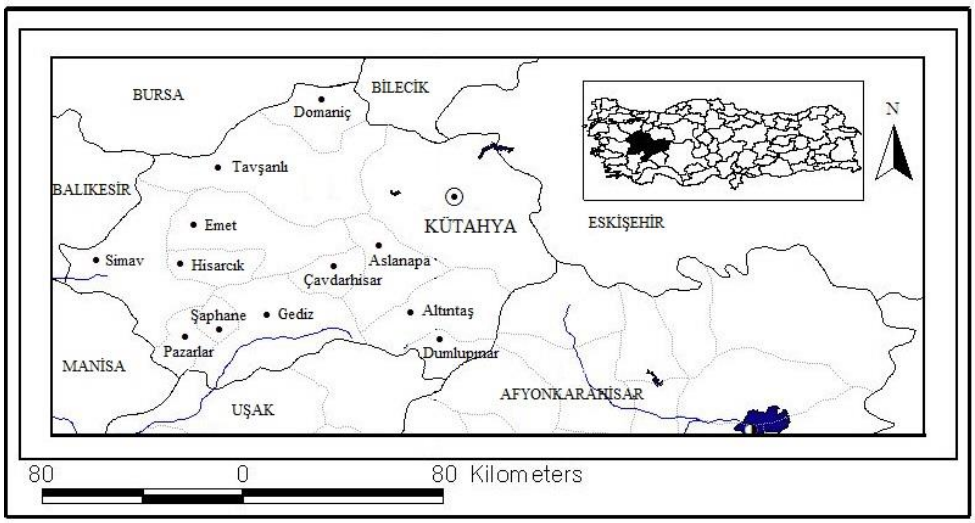

Figure 1. Kütahya province

2. Materials and methods

Specimens of macrofungi were collected from Kütahya province during routine field studies in 2011-2014. The field studies have been conducted to sixty-three different locations. The detailed features such as habitat, altitudes and coordinates of the locations are given below:

1. Çavdarhisar-Tavşanlı road 10th km. (Çavdarhisar), *Pinus nigra*, 1000 m. 39.307283N, 29.573267E
2. Domaniç, Çatalalıç area, *Fagus orientalis – P. nigr*a, 1430 m., 39.857958N, 29.632116E
3. Domaniç, Çubuk area, *P. nigra – Quercus* sp., 900 m., 39.782078N, 29.574031E
4. Domaniç, Domurköy area, *Platanus orinetalis – Populus* sp., 900 m., 39.802078N, 29.634001E
5. Domaniç, Durabey village, *P. nigra – F. orientalis – Quercus* sp., 1050 m., 39.834324N, 29.637105E
6. Domaniç Forest Man. Office, *P. nigra*, 900 m., 39.786894N, 29.582682E
7. Domaniç, Güney village, *P. nigra – C. libani – Populus* sp., 650 m., 39.758046N, 29.548644E
8. Domaniç, Kocayayla area, *F. orientalis – P. nigra*, 1500 m., 39.863081N, 29.658600E
9. Domaniç, Kaşalıç area, *P. nigra*, 1450 m., 39.872776N, 29.650184E
10. Domaniç-Tavşanlı road 20th km, *P. nigra*, 950 m., 39.708647N, 29.542144E
11. Emet, *Pinus brutia*, 750 m., 39.339904N, 29.280805E
12. Emet, Kurt Geçidi area, *P. brutia*, 800 m., 39.337229N, 29.297702E
13. Eski Gediz, *P. nigra*, 680 m., 39.041746N, 29.431453E
14. Gediz, Abide area, *P. brutia*, 660 m., 38.915167N, 29.3013E
15. Gediz, Alikahya village, *P. brutia – Quercus* sp., 630 m., 38.827682N, 29.271850E
16. Gediz-Çavdarhisar road 10th km., *P. nigra*, 650 m., 39.095132N, 29.473499E
17. Gediz, Dedeköy area, *P. nigra – Quercus* sp., 665 m., 38.976124N, 29.439453E
18. Gediz, Gölcük village, *P. brutia*, 636 m., 38.859332N, 29.281316E
19. Gediz, Gümele pond, *Platanus orientalis*, 640 m., 38.928933N, 29.470583E
20. Gediz, Ilıca area, *P. brutia – P. nigra*, 625 m., 38.939459N, 29.255291E
21. Gediz – Kütahya road 20th km. (Gediz), *P. nigra*, 635 m., 39.121085N, 29.528618E
22. Gediz, Murat Mountain, *P. nigra*, 1450 m., 38.965531N, 29.641926E
23. Gediz, Sazak village, *P. nigra – Quercus* sp., 750 m., 39.050711N, 29.364189E
24. Gediz – Simav road 20th km. (Gediz), *P. nigra – Quercus* sp., 630 m., 38.959721N, 29.235607E
25. Gümüş area (Center of Kütahya), *P. nigra*, 1081 m., 39.454137N, 29.747623E
26. Hisarcık, Beyköy village, *P. nigra – Quercus* sp., 780 m., 39.228595N, 29.206731E
27. Hisarcık, Gölcük Mountain, *P. nigra*, 1450 m., 39.160467N, 29.0856E
28. Hisarcık, Günlüce area, *P. nigra*, 900 m., 39.228323N, 29.192137E
29. Hisarcık, Saklar area, *P. nigra – Quercus* sp., 1200 m., 39.211389N, 29.178056E
30. Kütahya-Afyon road 10th km. (Center of Kütahya), *P. nigra*, 1110 m., 39.351390N, 30.056624E
31. Kütahya – Afyon road 25th km. (Center of Kütahya), *Quercus* sp., 1138 m., 39.317233N, 30.064333E
32. Kütahya, Pusan Hatıra Forest (Center of Kütahya), *P. nigra*, 1144 m., 39.196565N, 30.132875E
33. Seyitömer village (Center of Kütahya), *P. nigra*, 1040 m., 39.699533N, 29.878080E
34. Simav, *Castanea sativa – P. nigra*, 970 m., 39.085801N, 28.966575E
35. Simav, Akçakertik Geçidi, *P. nigra – Populus* sp. *– Quercus* sp., 1300 m., 39.115248N, 28.737826E
36. Simav, Aksaz area, *Quercus* sp., 810 m., 39.137097N, 28.754183E
37. Simav, Aksaz Forest Deposit, *P. nigra*, 805 m., 39.136010N, 28.739493E
38. Simav – Balıkesir road 10th km (Simav), *Quercus* sp., 795m., 39.127040N, 28.839079E
39. Simav, Beyce village Graveyard, *P. nigra – Quercus* sp., 819 m., 39.099415N, 28.937507E

40. Simav, Çağlaca area, *Quercus* sp., 980 m., 39.143957N, 28.721911E
41. Simav, Central Graveyard, *Quercus* sp., 972m., 39.092141N, 28.960965E
42. Simav, Demirci village, *Quercus* sp., 900 m., 39.098914N, 28.917085E
43. Simav, Donuzkıran area, *P. nigra,* 820 m., 39.123417N, 28.859983E
44. Simav – Gediz road turnout, *P. brutia,* 700 m., 38.935145N, 29.308367E
45. Simav – Gediz highway 20th km. (Simav), *P. nigra – Quercus* sp., 800 m., 39.061065N, 29.075162E
46. Simav, Gümüşsu area, *P. nigra,* 790 m., 39.140821N, 28.889741E
47. Simav, Kapıkaya village, *Cedrus libani,* 850 m., 39.135394N, 29.036687E
48. Simav, Martılı Plateu, *F. orientalis – P. nigra,* 1510 m., 39.249017N, 28.828133E
49. Simav, Samatköy area, *P. nigra,* 900 m., 39.025731N, 29.000490E
50. Simav – Selendi road 5th km. (Simav), *P. nigra – Abies* sp., 965 m., 39.071891N, 29.035335E
51. Simav, Yenikent, *P. brutia,* 700 m., 38.877658N, 29.289125E
52. Tatahmet village area (Center of Kütahya), Near stream area under *Salix* sp., 1021 m., 39.078767N, 30.212117E
53. Tavşanlı, Dağdemirli village, *P. nigra,* 900 m., 39.537274N, 29.316167E
54. Tavşanlı, Devekayası village, *P. nigra,* 852 m., 39.533529N, 29.605269E
55. Tavşanlı, Karacaören village, *P. nigra,* 865 m., 39.644529N, 29.303737E
56. Tavşanlı – Kütahya road 5th km., *P. nigra,* 1015 m., 39.538196N, 29.557228E
57. Tavşanlı – Kütahya road 10th km., *Quercus* sp., 1018m., 39.530519N, 29.602797E
58. Tavşanlı, Yeniköy area, *P. nigra,* 981 m., 39.620017N, 29.3369E,
59. Tunçbilek – Domaniç road 5th km. (Tunçbilek), *P. nigra – Quercus* sp., 941 m., 39.647316N, 29.492184E
60. Tunçbilek, Küçük village, *C. libani,* 970 m., 39.761424N, 29.551270E
61. Tunçbilek, Kozcağız area, *P. nigra – Quercus* sp., 981 m., 39.700326N, 29.515082E
62. Tunçbilek, Muhacir area, *Populus* sp. – *F. orientalis,* 945 m., 39.685235N, 29.504852E
63. Yoncalı (Center of Kütahya), *P. orientalis,* 1020 m., 39.500733N, 29.854567E

During the field studies, morphological (size, shape, color, smell, taste, color exchanging) and ecological features of specimens were recorded and photographed in their habitat. After the field studies, specimens were brought to the laboratory in suitable conditions. Microscopic characters of the specimens were determined by mounting the specimen in a %3 KOH solution and other solutions such as melzer reagents, cotton blue, acetocarmine and creysl blue analyzing the distinctive features by a microscope (Leica DM750).

The specimens were identified morphologically using the references of Dennis (1981), Breitenbach and Kränzlin (1984-2000), Capelli (1984), Candusso and Lanzoni (1990), Ellis and Ellis (1990), Hansen and Knudsen (1992), Noordeloos (1992), Pegler et al. (1995), Candusso (1997), Ladurner and Simonini (2003), Riva (2003), Neville and Poumarat (2004), Doveri (2007), Knudsen and Vesterholt (2008), Sanchez (2008), Knudsen and Vesterholt (2012) and Christensen and Heilmann-Clausen (2013).

The identified specimens were deposited at the Fungarium of Muğla Sıtkı Koçman University

3. Results

Systematics of the species were given in accordance with Cannon and Kirk (2007) and Index Fungorum (www.indexfungorum.org; accessed in 02 January 2017). The species are listed below.

ASCOMYCOTA Caval.- Sm.
Leotiomycetes O.E. Erikss. & Winka
Helotiales Nannf.
Lachnaceae Raitv.

1. *Lachnum virgineum* (Batsch) P. Karst., 14, 21, Inedible.

Rutstroemiaceae Holst-Jensen, L.M. Kohn & T. Schumach.

2. *Rutstroemia firma*(Pers.) P. Karst., 24, Inedible.

Pezizomycetes O.E. Erikss. & Winka
Pezizales J. Schröt.
Discinaceae Benedix

3. *Discina ancilis* (Pers.) Sacc., 27, 43, Inedible.
4. *Gyromitra esculenta* (Pers.) Fr., 58, Poisonous.
5. *Gyromitra gigas* (Krombh.) Cooke, 43, Poisonous.

Helvellaceae Fr.

6. *Helvella acetabulum* (L.) Quél., 18, 25, 32, 60, Edible.
7. *Helvella atra*J. König, 25, Inedible.
8. *Helvella costifera* Nannf., 32, Unknown.
9. *Helvella elastica* Bull., 21, Inedible.
10. *Helvella ephippium* Lév., 32, Inedible.
11. *Helvella lacunosa*Afzel., 7, 36, 43, 48, Inedible.
12. *Helvella latispora* Boud., 25, Inedible.
13. *Helvella palustris* Peck, 31, Unknown.
14. *Helvella leucomelaena* (Pers.) Nannf., 2, 11, 18, 62, Edible.
15. *Paxina queletii* (Bres.) Stangl, 3, 22, 34, Inedible.

Morchellaceae Rchb.

16. *Mitrophora semilibera* (DC.) Lév., 52, Edible.
17. *Morchella deliciosa* Fr., 18, Edible.
18. *Morchella elata* Fr., 10, Edible.
19. *Morchella esculenta* (L.) Pers., 18, 20, 25, Edible.

Pezizaceae Dumort.

20. *Sarcosphaera coronaria* (Jacq.) J. Schröt., 18, 30, 58, Poisonous.
21. *Peziza arvernensis* Roze & Boud., 2, Inedible.
22. *Peziza depressa* Pers., 11, Edible.
23. *Peziza domiciliana* Cooke, 34, Inedible.
24. *Peziza fimeti* (Fuckel) E.C. Hansen, 18, Unknown.

Pyronemataceae Corda

25. *Geopora sumneriana* (Cooke) M. Torre, 13, 60, Edible.
26. *Geopyxis carbonaria* (Alb. & Schwein.) Sacc., 18, Inedible.
27. *Scutellinia scutellata* (L.) Lambotte, 14, Inedible.

28. *Tarzetta catinus* (Holmsk.) Korf & J.K. Rogers, 5, Inedible.

Sordariomycetes O.E. Erikss. & Winka
Xylariales Nannf.
Diatrypaceae Nitschke
29. *Diatrypella favacea* (Fr.) Ces. & De Not., 5, Inedible.

Xylariaceae Tul. & C. Tul.
30. *Xylaria longipes* Nitschke, 5, Inedible.
31. *Xylaria hypoxylon* (L.) Grev., 5, Inedible.

BASIDIOMYCOTA Whittaker ex Moore
Agaricomycetes Doweld
Agaricales Underw.
Agaricaceae Chevall.
32. *Agaricus arvensis* Schaeff., 26, Edible.
33. *Agaricus comtulus* Fr., 41, Edible.
34. *Agaricus litoralis* (Wakef. & A. Pearson) Pilát, 46, Edible.
35. *Agaricus macrocarpus* (F.H. Møller) F.H. Møller, 53, Edible.
36. *Bovista limosa* Rostr., 27, Edible.
37. *Bovista nigrescens* Pers., 31, 43, Edible.
38. *Bovista plumbea* Pers., 2, 34, 47, Edible.
39. *Bovista pusilla* (Batsch) Pers., 43, Edible.
40. *Coprinus comatus* (O.F. Müll.) Pers., 18, 30, 63, Edible.
41. *Crucibulum leave* (Huds.) Kambly, 43, 58, Unknown.
42. *Cystoderma carcharias*(Pers.) Fayod, 14, 58, Inedible.
43. *Cystoderma fallax* A.H. Sm. & Singer, 43, Inedible.
44. *Cystodermella cinnabarina* (Alb. & Schwein.) Harmaja, 6, 14, 58, Inedible.
45. *Cystodermella granulosa*(Batsch) Harmaja, 24, 58, Inedible.
46. *Lepiota cristata* (Bolton) P. Kumm., 17, 58, Poisonous.
47. *Lepiota ermine* (Fr.) P. Kumm., 34, Poisonous.
48. *Lepiota ignivolvata* Bousset & Joss. ex Joss., 43, Inedible.
49. *Lepiota subgracilis* Wasser, 8, Poisonous.
50. *Leucoagaricus leucothites* (Vittad.) Wasser, 32, Inedible.
51. *Leucoagaricus littoralis* (Menier) Bon & Boiffard, 39, Edible.
52. *Leucocoprinus birnbaumii* (Corda) Singer, 21, Poisonous.
53. *Lycoperdon atropurpureum* Vittad., 32, Unknown.
54. *Lycoperdon lividum* Pers., 14, 24, Edible.
55. *Lycoperdon marginatum* Vittad., 31, Inedible.
56. *Lycoperdon molle* Pers., 43, 46, 58, Inedible.
57. *Lycoperdon nigrescens* Pers., 32, 43, Unknown.
58. *Lycoperdon perlatum* Pers., 43, 54, Edible.
59. *Lycoperdon pyriforme* Schaeff., 25, 34, Edible.
60. *Lycoperdon radicatum* Durieu & Mont., 13, 27, Edible.
61. *Lycoperdon umbrinum* Pers., 15, 43, 49, 59, Edible.
62. *Macrolepiota excoriata* (Schaeff.) Wasser, 2, 23, Edible.
63. *Macrolepiota konradii* (Huijsman ex P.D. Orton) M.M. Moser, 34, Edible.
64. *Macrolepiota mastoidea* (Fr.) Singer, 27, 38, 43, 56, Edible.
65. *Macrolepiota procera* (Scop.) Singer, 3, 24, 43, 58, 59, Edible.
66. *Tulostoma brumale* Pers., 25, Inedible.

Amanitaceae R. Heim ex Pouzar
67. *Amanita argentea* Huijsman, 2, Inedible.
68. *Amanita crocea* (Quél.) Singer, 31, Edible.
69. *Amanita eliae* Quél., 37, Poisonous.
70. *Amanita muscaria* (L.) Lam., 46, Poisonous.
71. *Amanita nivalis* Grev., 43, Poisonous.
72. *Amanita pantherina* (DC.) Krombh, 31, 37, 43, Poisonous.
73. *Amanita phalloides* (Vaill. ex Fr.) Link, 8, Poisonous.
74. *Amanita proxima* Dumée, 20, Poisonous.
75. *Amanita solitaria* (Bull.) Fr., 43, Poisonous.
76. *Amanita vaginata* (Bull.) Lam., 26, 43, Edible.
77. *Amanita verna* (Bull.) Lam., 37, Poisonous.

Bolbitiaceae Singer
78. *Bolbitius titubans* (Bull.) Fr., 39, 48, 57, Inedible.
79. *Conocybe aporos* Kits van Wav., 8, Inedible.
80. *Conocybe blattaria* (Fr.) Kühner, 34, Inedible.
81. *Conocybe filaris* (Fr.) Kühner, 58, Inedible.
82. *Conocybe rickenii* (Jul. Schäff.) Kühner, 18, Inedible.

Cortinariaceae R. Heim ex Pouzar
83. *Cortinarius rigens* (Pers.) Fr., 34, Inedible.
84. *Cortinarius vernus* H. Lindstr. & Melot, 43, Inedible.

Entolomataceae Kotl. & Pouzar
85. *Entoloma corvinum* (Kühner) Noordel., 18, Inedible.
86. *Entoloma hirtipes* (Schumach.) M.M. Moser, 2, Inedible.
87. *Entoloma incanum* (Fr.) Hesler, 31, Inedible.
88. *Entoloma juncinum* (Kühner & Romagn.) Noordel., 43, Inedible.
89. *Entoloma politum* (Pers.) Noordel., 27, Poisonous.
90. *Entoloma subradiatum* (Kühner & Romagn.) M.M. Moser, 36, Inedible.
91. *Entoloma vernum* S. Lundell, 8, 36, 43, Poisonous.

Fistulinaceae Lotsy
92. *Fistulina hepatica* (Schaeff.) With., 34, Edible.

Hydnangiaceae Gäum. & C.W. Dodge
93. *Laccaria bicolor* (Maire) P.D. Orton, 37, Edible.
94. *Laccaria proxima* (Boud.) Pat., 43, Edible.

Hygrophoraceae Lotsy
95. *Hygrocybe conica* (Schaeff.) P. Kumm., 2, Inedible.
96. *Hygrophorus agathosmus* (Fr.) Fr., 43, 58, Inedible.
97. *Hygrophorus hedrychii* (Velen.) K. Kult, 2, Inedible.
98. *Hygrophorus gliocyclus* Fr., 58, Edible.

Hymenogastraceae Vittad.
99. *Galerina badipes* (Pers.) Kühner, 43, 58, Inedible.
100. *Galerina marginata* (Batsch) Kühner, 2, 43, Poisonous.
101. *Hebeloma candidipes* Bruchet, 2, Inedible.
102. *Hebeloma crustuliniforme* (Bull.) Quél., 43, 58, Inedible.
103. *Hebeloma sinapizans* (Paulet) Gillet, 29, 58, Inedible.
104. *Psilocybe coronilla* (Bull.) Noordel., 46, 60, Inedible.

Inocybaceae Jülich
105. *Crepidotus cesatii* (Rabenh.) Sacc., 24, Inedible.
106. *Inocybe amethystina* Kuyper, 14, Poisonous.
107. *Inocybe bongardii* (Weinm.) Quél., 14, 18, Poisonous.
108. *Inocybe calida* Velen., 42, Poisonous.
109. *Inocybe catalaunica* Singer, 22, 43, Poisonous.
110. *Inocybe cervicolor* (Pers.) Quél., 14, 44, Poisonous.

111. *Inocybe dulcamara* (Pers.) P. Kumm., 44, Poisonous.
112. *Inocybe erubescens* A. Blytt, 53, Poisonous.
113. *Inocybe flocculosa* (Berk.) Sacc., 13, Poisonous.
114. *Inocybe geophylla* (Bull.) P. Kumm., 43, 58, Poisonous.
115. *Inocybe geraniodora* J. Favre, 18, Poisonous.
116. *Inocybe gymnocarpa* Kühner, 22, Poisonous.
117. *Inocybe hirtella* Bres., 43, Poisonous.
118. *Inocybe maculipes* J. Favre, 25, Poisonous.
119. *Inocybe mixtilis* (Britzelm.) Sacc., 3, 10, 31, Poisonous.
120. *Inocybe nitidiuscula* (Britzelm.) Lapl., 14, 15, Poisonous.
121. *Inocybe perbrevis* (Weinm.) Gillet, 43, Poisonous.
122. *Inocybe pseudohiulca* Kühner, 25, Poisonous.
123. *Inocybe queletii* Konrad, 3, Poisonous.
124. *Inocybe rimosa* (Bull.) P. Kumm., 30, 42, Poisonous.
125. *Inocybe taxocystis* (J. Favre & E. Horak) Senn-Irlet, 42, Poisonous.
126. *Inocybe tenebrosa* Quél., 5, Poisonous.
127. *Inocybe vaccina* Kühner, 2, 14, Poisonous.

Incertae sedis

128. *Leucocybe connata* (Schumach.) Vizzini, P. Alvarado, G. Moreno & Consiglio, 25, Inedible.
129. *Panaeolus acuminatus* (Schaeff.) Quél., 32, Poisonous.
130. *Panaeolus guttulatus* Bres., 14, Poisonous.
131. *Panaeolus olivaceus* F.H. Møller, 32, Poisonous.
132. *Panaeolus papilionaceus* (Bull.) Quél., 18, Poisonous.
133. *Panaeolus rickenii* Hora, 43, Inedible.
134. *Panaeolus semiovatus* (Sowerby) S. Lundell & Nannf., 18, Inedible.
135. *Rhizocybe vermicularis* (Fr.) Vizzini, G. Moreno, P. Alvarado & Consiglio, 43, 61, Inedible.

Lyophyllaceae Jülich

136. *Calocybe gambosa* (Fr.) Donk, 2, Edible.
137. *Calocybe gangraenosa* (Fr.) V. Hofst., Moncalvo, Redhead & Vilgalys, 58, Inedible.
138. *Rugosomyces carneus* (Bull.) Bon., 43, Inedible.

Marasmiaceae Roze ex Kühner

139. *Atheniella flavoalba* (Fr.) Redhead, Moncalvo, Vilgalys, Desjardin & B.A.Perry, 58, Inedible.
140. *Baeospora myosura* (Fr.) Singer, 14, 29, 34, 58, Inedible.
141. *Macrocystidia cucumis* (Pers.) Joss., 2, Inedible.
142. *Marasmius epiphyllus* (Pers.) Fr., 34, Inedible.
143. *Marasmius oreades* (Bolton) Fr., 39, 42, 43, 58, Edible.
144. *Marasmius wynnei* Berk. & Br., 2, 17, Inedible.
145. *Megacollybia platyphylla* (Pers.) Kotl. & Pouzar, 2, Edible.

Mycenaceae Overeem

146. *Hemimycena lactea* (Pers.) Singer, 29, Inedible.
147. *Hemimycena pithya* (Fr.) Dörfelt, 27, 34, Unknown.
148. *Mycena abramsii* (Murrill) Murrill, 2, Inedible.
149. *Mycena aetites* (Fr.) Quél., 43, 45, 51, 58, Inedible.
150. *Mycena amicta* (Fr.) Quél., 14, 29, Unknown.
151. *Mycena crocata* (Schrad.) P. Kumm., 2, 9, Edible.
152. *Mycena epipterygia* (Scop.) Gray, 27, 29, 43, 58, Edible.
153. *Mycena flavescens* Velen., 43, 58, Edible.
154. *Mycena galopus* (Pers.) P. Kumm., 14, Inedible.
155. *Mycena leptocephala* (Pers.) Gillet, 43, Inedible.
156. *Mycena metata* (Secr. ex Fr.) P. Kumm., 42, Unknown.
157. *Mycena polygramma* (Bull.) Gray, 58, Inedible.
158. *Mycena pura* (Pers.) P. Kumm., 9, 18, 34, Poisonous.
159. *Mycena rosella* (Fr.) P. Kumm., 58, Inedible.
160. *Mycena rubromarginata* (Fr.) P. Kumm., 14, Unknown.
161. *Mycena seynesii* Quél., 15, 18, 34, Inedible.
162. *Mycena silvae-nigrae* Maas Geest. & Schwöbel., 9, Inedible.
163. *Mycena viridimarginata* P. Karst., 27, Inedible.
164. *Mycena vitilis* (Fr.) Quél., 57, Unknown.
165. *Mycena xantholeuca* Kühner, 56, Inedible.
166. *Mycena laevigata* Gillet, 43, Inedible.
167. *Xeromphalina cauticinalis* (With.) Kühner & Maire, 6, Inedible.

Omphalotaceae Bresinsky

168. *Gymnopus androsaceus* (L.) J.L. Mata & R.H. Petersen, 24, 58, Unknown.
169. *Gymnopus dryophilus* (Bull.) Murrill, 14, 41, 57, 58, Edible.
170. *Gymnopus hariolorum* (Bull.) Antonín, Halling & Noordel., 24, Inedible.
171. *Gymnopus ocior* (Pers.) Antonín & Noordel., 34, 43, Poisonous.
172. *Marasmiellus ramealis* (Bull.) Singer, 25, Inedible.
173. *Rhodocollybia prolixa* (Hornem.) Antonín & Noordel., 43, Inedible.

Physalacriaceae Corner

174. *Hymenopellis radicata* (Relhan) R.H. Petersen, 2, Inedible.
175. *Mucidula mucida* (Schrad.) Pat., 8, Inedible.
176. *Rhizomarasmius epidryas* (Kühner ex A. Ronikier) A. Ronikier & Ronikier, 14, Inedible.
177. *Rhizomarasmius setosus* (Sowerby) Antonín & A. Urb., 34, Inedible.
178. *Strobilurus tenacellus* (Pers.) Singer, 1, 11, 14, 27, 58, Inedible.

Pluteaceae Kotl. & Pouzar

179. *Pluteus ephebeus* (Fr.) Gillet, 2, Inedible.
180. *Pluteus umbrosus* (Pers.) P. Kumm., 2, Inedible.

Pleurotaceae Kühner

181. *Hohenbuehelia tremula* (Schaeff.) Thorn & G.L. Barron, 43, Edible.
182. *Pleurotus eryngii* (DC.) Quél., 32, 43, Edible.
183. *Pleurotus ostreatus* (Jacq.) P. Kumm., 25, 34, 62, Edible.

Porotheleaceae Murrill

184. *Phloeomana speirea* (Fr.) Redhead, 24, 58, Inedible.

Psathyrellaceae Vilgalys, Moncalvo & Redhead

185. *Coprinellus disseminatus* (Pers.) J.E. Lange, 4, 17, 61, Inedible.
186. *Coprinellus domesticus* (Bolton) Vilgalys, Hopple & Jacq. Johnson, 52, Inedible.
187. *Coprinellus ephemerus* (Bull.) Redhead, Vilgalys & Moncalvo, 18, Inedible.
188. *Coprinellus micaceus* (Bull.) Vilgalys, Hopple & Jacq. Johnson, 32, 39, Inedible.
189. *Coprinellus xanthothrix* (Romagn.) Vilgalys, Hopple & Jacq. Johnson, 57, Inedible.
190. *Coprinopsis canoceps* (Kauffman) Örstadius & E. Larss., 58, Inedible.
191. *Coprinopsis lagopus* (Fr.) Redhead, Vilgalys & Moncalvo, 24, Inedible.

192. *Coprinopsis nivea* (Pers.) Redhead, Vilgalys & Moncalvo, 31, Inedible.
193. *Coprinopsis tigrinella* (Boud.) Redhead, Vilgalys & Moncalvo, 57, Inedible.
194. *Lacrymaria lacrymabunda* (Bull.) Pat., 17, Inedible.
195. *Parasola auricoma* (Pat.) Redhead, Vilgalys & Hopple, 41, Inedible.
196. *Parasola hemerobia* (Fr.) Redhead, Vilgalys & Hopple, 32, Inedible.
197. *Parasola plicatilis* (Curtis) Redhead, Vilgalys & Hopple, 38, Inedible.
198. *Psathyrella bifrons* (Berk.) A.H. Sm., 34, Inedible.
199. *Psathyrella candolleana* (Fr.) Maire, 14, 34, Inedible.
200. *Psathyrella corrugis* (Pers.) Konrad & Maubl., 34, 43, Inedible.
201. *Psathyrella obtusata* (Pers.) A.H. Sm., 8, Inedible.
202. *Psathyrella potteri* A.H. Sm., 43, Inedible.
203. *Psathyrella prona* (Fr.) Gillet, 34, Inedible.
204. *Psathyrella pseudogracilis* (Romagn.) M.M. Moser, 14, 59, Inedible.

Schizophyllaceae Quél.

205. *Schizophyllum commune* Fr., 3, 18, 62, Inedible.

Strophariaceae Singer & A.H. Sm.

206. *Agrocybe paludosa* (J.E. Lange) Kühner & Romagn. ex Bon., 14, 54, 62, Inedible.
207. *Agrocybe praecox* (Pers.) Fayod., 14, 27, 31, 43, Edible.
208. *Cyclocybe cylindracea* (DC.) Vizzini & Angelini, 14, 18, Edible.
209. *Hypholoma fasciculare* (Huds.) P. Kumm., 5, 9, Poisonous.
210. *Kuehneromyces mutabilis* (Schaeff.) Singer & A.H. Sm., 43, Edible.
211. *Leratiomyces squamosus* (Pers.) Bridge & Spooner, 8, 34, 41, Inedible.
212. *Pholiota lucifera* (Lasch) Quél., 34, Inedible.
213. *Protostropharia semiglobata* (Batsch) Redhead, Moncalvo & Vilgalys, 43, Inedible.
214. *Stropharia aeruginosa* (Curtis) Quél., 58, Inedible.
215. *Stropharia caerulea* Kreisel, 43, Inedible.

Tricholomataceae R. Heim ex Pouzar

216. *Bonomyces sinopicus* (Fr.) Vizzini, 54, 59, Edible.
217. *Clitocybe bresadolana* Singer, 39, 45, Edible.
218. *Clitocybe gibba* (Pers.) P. Kumm., 31, 36, 41, Edible.
219. *Clitocybe infundibuliformis* (Schaeff.) Quél., 9, Edible.
220. *Clitocybe odora* (Bull.) P. Kumm., 14, 43, 58, Edible.
221. *Clitocybe vibecina* (Fr.) Quél., 31, Inedible.
222. *Lepista nuda* (Bull.) Cooke, 21, 25, 31, 43, 60, Edible.
223. *Lepista personata* (Fr.) Cooke, 43, Edible.
224. *Leucopaxillus giganteus* (Quél.) Singer, 34, 37, Edible.
225. *Melanoleuca cognata* (Fr.) Konrad & Maubl., 24, 27, 43, Edible.
226. *Melanoleuca exscissa* (Fr.) Singer, 37, Edible.
227. *Melanoleuca graminicola* (Velen.) Kühner & Maire, 8, 43, 58, Edible.
228. *Melanoleuca grammopodia* (Bull.) Murrill, 59, Edible.
229. *Melanoleuca humilis* (Pers.) Pat., 58, Edible.
230. *Melanoleuca melaleuca* (Pers.) Murrill, 13, 26, 43, Edible.
231. *Melanoleuca paedida* (Fr.) Kühner & Maire, 43, Edible.
232. *Melanoleuca schumacheri* (Fr.) Singer, 39, Edible.
233. *Melanoleuca strictipes* (P. Karst.) Jul. Schäff., 34, Edible.
234. *Melanoleuca stridula* (Fr.) Singer, 21, 59, Edible.
235. *Melanoleuca subalpina* (Britzelm.) Bresinsky & Stangl, 43, Edible.
236. *Melanoleuca substrictipes* Kühner, 37, Edible.
237. *Myxomphalia maura* (Fr.) Hora, 58, Inedible.
238. *Resupinatus applicatus* (Batsch) Gray, 5, Unknown.
239. *Tricholoma acerbum* (Bull.) Vent., 14, Inedible.
240. *Tricholoma batschii* Gulden, 14, 58, 60, Inedible.
241. *Tricholoma caligatum* (Viv.) Ricken, 20, Inedible.
242. *Tricholoma focale* (Fr.) Ricken, 27, 43, Edible.
243. *Tricholoma gausapatum* (Fr.) Quél., 43, 58, Edible.
244. *Tricholoma scalpturatum* (Fr.) Quél., 14, Inedible.
245. *Tricholoma stans* (Fr.) Sacc., 8, Inedible.
246. *Tricholoma terreum* (Schaeff.) P. Kumm., 8, 16, 27, 30, 43, Edible.
247. *Tricholoma ustaloides* Romagn., 43, Inedible.
248. *Tricholoma virgatum* (Fr.) P. Kumm., 43, Inedible.
249. *Tricholomopsis decora* (Fr.) Singer, 43, Inedible.
250. *Tricholomopsis rutilans* (Schaeff.) Singer, 43, Inedible.

Tubariaceae Vizzini

251. *Tubaria conspersa* (Pers.) Fayod., 24, 25, 56, Inedible.
252. *Tubaria furfuracea* (Pers.) Gillet, 24, 29, 34, 58, Inedible.
253. *Tubaria romagnesiana* Arnolds, 8, 57, Inedible.

Auriculariales J. Schröt

Auriculariaceae Fr.

254. *Exidia glandulosa* (Bull.) Fr., 27, 43, Inedible.

Boletales E.-J. Gilbert

Boletaceae Chevall.

255. *Boletus erythropus* Pers., 2, Edible.
256. *Imleria badia* (Fr.) Vizzini, 2, Edible.
257. *Xerocomellus chrysenteron* (Bull.) Šutara, 36, Edible.
258. *Xerocomellus porosporus* (Imler ex G. Moreno & Bon) Šutara, 2, Inedible.

Diplocystidiaceae Kreisel

259. *Astraeus hygrometricus* (Pers.) Morgan, 11, 36, 40, 47, Inedible.

Gomphidiaceae Maire ex Jülich

260. *Chroogomphus helveticus* (Singer) M.M. Moser, 14, 25, 32, 34, 43, Edible.
261. *Chroogomphus rutilus* (Schaeff.) O.K. Mill., 27, 43, 58, Edible.
262. *Gomphidius glutinosus* (Schaeff.) Fr., 58, Edible.

Paxillaceae Lotsy

263. *Paxillus involutus* (Batsch) Fr., 23, 32, Poisonous.

Rhizopogonaceae Gäum. & C.W. Dodge

264. *Rhizopogon luteolus* Fr. & Nordholm, 9, 43, 58, Edible.
265. *Rhizopogon roseolus* (Corda) Th. Fr., 3, 14, 20, 25, 43, 58, Edible.

Sclerodermataceae Corda

266. *Pisolithus arhizus* (Scop.) Rauschert, 14, 43, 58, Inedible.

Suillaceae Besl & Bresinsky

267. *Suillus bellinii* (Inzenga) Kuntze, 14, 59, Edible.
268. *Suillus bovinus* (Pers.) Roussel, 5, 27, Edible.
269. *Suillus boudieri* (Quél.) Marchand, 15, Edible.

270. *Suillus collinitus* (Fr.) Kuntze, 8, 12, 14, 27, 28, 55, 58, Edible.
271. *Suillus granulatus* (L.) Roussel, 2, 8, 43, Edible.
272. *Suillus luteus* (L.) Roussel, 27, 43, 58, Edible.

Tapinellaceae C. Hahn
273. *Tapinella panuoides* (Batsch) E.-J. Gilbert, 43, Inedible.

Cantharellales Gäum.
Clavulinaceae Donk
274. *Clavulina rugosa* (Bull.) J. Schröt., 43, Edible.

Hydnaceae Chevall.
275. *Hydnum rufescens* Pers., 22, Edible.

Geastrales K. Hosaka & Castellano
Geastraceae Corda
276. *Geastrum quadrifidum* DC. ex Pers., 62, Inedible.
277. *Geastrum fimbriatum* Fr., 14, 15, 22, 25, Inedible.
278. *Geastrum pectinatum* Pers., 3, 29, 59, Inedible.
279. *Geastrum saccatum* Fr., 8, 21, 30, Inedible.
280. *Geastrum triplex* Jungh., 26, 29, Inedible.

Gloeophyllales Thorn
Gloeophyllaceae Jülich
281. *Gloeophyllum abietinum* (Bull.) P. Karst., 20, 43, Inedible.
282. *Gloeophyllum trabeum* (Pers.) Murrill, 30, Inedible.

Gomphales Jülich
Gomphaceae Donk
283. *Ramaria flava* (Schaeff.) Quél., 53, Edible.

Hymenochaetales Oberw.
Hymenochaetaceae Donk
284. *Fuscoporia torulosa* (Pers.) T. Wagner & M. Fisch., 15, Inedible.
285. *Hymenochaete rubiginosa* (Dicks.) Lév., 2, 35, Inedible.
286. *Phellinus hartigii* (Allesch. & Schnabl) Pat., 2, 39, Inedible.
287. *Phellinus igniarius* (L.) Quél., 43, 52, 63, Inedible.
288. *Porodaedalea pini* (Brot.) Murrill, 14, Inedible.

Incertae sedis
289. *Trichaptum abietinum* (Dicks.) Ryvarden, 43, Inedible.
290. *Trichaptum fusco-violaceum* (Ehrenb.) Ryvarden, 2, 56, 58, Inedible.

Schizoporaceae Jülich
291. *Schizopora paradoxa* (Schrad.) Donk, 36, Inedible.

Polyporales Gäum.
Fomitopsidaceae Jülich
292. *Rhodofomes roseus* (Alb. & Schwein.) Vlasák, 19, Inedible.
293. *Laetiporus sulphureus* (Bull.) Murrill, 16, 52, Edible.
294. *Phaeolus schweinitzii* (Fr.) Pat., 43, Inedible.

Ganodermataceae Donk
295. *Ganoderma adspersum* (Schulzer) Donk, 43, Inedible.
296. *Ganoderma lucidum* (Curtis) P. Karst., 34, Inedible.

Meruliaceae Rea
297. *Bjerkandera adusta* (Willd.) P. Karst., 51, Inedible.

Polyporaceae Fr. ex Corda
298. *Cerrena unicolor* (Bull.) Murrill, 17, Inedible.
299. *Cerioporus leptocephalus* (Jacq.) Zmitr., 8, Inedible.
300. *Cerioporus varius* (Pers.) Zmitr. & Kovalenko, 2, Inedible.
301. *Fomes fomentarius* (L.) J. Kickx f., 9, 19, 34, 63, Inedible.
302. *Lentinus arcularius* (Batsch) Zmitr., 43, 58, Inedible.
303. *Lentinus brumalis* (Pers.) Zmitr., 8, Inedible.
304. *Lentinus substrictus* (Bolton) Zmitr. & Kovalenko, 5, 13, 58, Inedible.
305. *Leptoporus mollis* (Pers.) Quél., 43, Inedible.
306. *Polyporus tuberaster* (Jacq. ex Pers.) Fr., 52, Inedible.
307. *Trametes versicolor* (L.) Lloyd, 22, 26, 34, Inedible.

Sparassidaceae Herter
308. *Sparassis crispa* (Wulfen) Fr., 8, Edible.

Russulales Kreisel ex P.M. Kirk, P.F. Cannon & J.C. David
Russulaceae Lotsy
309. *Lactarius decipiens* Quél., 43, Inedible.
310. *Lactarius deliciosus* (L.) Gray, 43, Edible.
311. *Lactarius salmonicolor* R. Heim & Leclair, 50, Edible.
312. *Lactarius sanguifluus* (Paulet) Fr., 28, 50, 58, Edible.
313. *Lactarius quieticolor* Romagn., 43, 50, Inedible.
314. *Russula aquosa* Leclair, 43, Inedible.
315. *Russula curtipes* F.H. Møller & Jul. Schäff., 58, Edible.
316. *Russula decipiens* (Singer) Bon, 42, Inedible.
317. *Russula delica* Fr., 43, 50, Edible.
318. *Russula integra* (L.) Fr., 43, Edible.
319. *Russula postiana* Romell, 42, Inedible.
320. *Russula rosea* Pers., 58, Edible.
321. *Russula risigallina* (Batsch) Sacc., 43, Edible.
322. *Russula sanguinea* Fr., 6, 43, Inedible.
323. *Russula solaris* Ferd. & Winge, 28, Poisonous.
324. *Russula vinosa* Lindblad, 43, Edible.
325. *Russula xerampelina* (Schaeff.) Fr., 14, Edible.

Stereaceae Pilát
326. *Stereum ochraceoflavum* (Schwein.) Sacc., 8, Inedible.
327. *Stereum hirsutum* (Willd.) Pers., 13, 34, 35, 43, 58, Inedible.

Thelephorales Corner ex Oberw.
Bankeraceae Donk
328. *Boletopsis leucomelaena* (Pers.) Fayod, 20, Edible.
329. *Hydnellum suaveolens* (Scop.) P. Karst., 26, Inedible.
330. *Sarcodon glaucopus* Maas Geest. & Nannf., 20, Inedible.

Thelephoraceae Chevall.
331. *Thelephora terrestris* Ehrh., 58, Inedible.

Dacrymycetes Doweld
Dacrymycetales Henn.
Dacrymycetaceae J. Schröt.
Dacrymyces variisporus McNabb, 8, 33, 43, Inedible.

4. Conclusions and discussion

In the current study, we aimed to determine the macrofungi biodiversity of Kütahya province. After the field and laboratory studies, 332 macrofungi species belonging to 2 divisio, 5 classis, 15 order and 57 families, have been identified. Also, 10 species are given as Incertae sedis (8 of them belong Agaricales order while 2 of them are

Hymenochaetales) because their taxonomic position are not clear and they have not been categorized in any families. Distributions of these species to families and classis are given in Figure 2.

Donuzkıran (Simav) and Yeniköy (Tavşanlı) are the richest area with respect to macrofungi biodiversity (Table 2). Some animal farms are located in Donuzkıran, and so the soil is fertilized by animal droppings. We think that these fertilizers cause higher the fungal diversity. Similarly, local people grow animals in the vicinity of Yeniköy area. Besides of this, it is showed that Kütahya province is in general quite rich in terms of macrofungi diversity.

Macrofungi species were evaluated by ecological niche in the field studies. According to these results, it was found that 90 species (27.10 %) are mycorrhizal, 168 species (50.60 %) are saprobe and 7 species (2.10 %) are parasitic only (Figure 3). Furthermore, 27 species were identified as both saprobe and parasitic, since these species can grow on dead and alive substrates enabling them to behave as saprobe or parasitic. However, ecological niches of 40 species (12.04 %) were not determined, because they were found on the ground among the plant debris and their substrates could not clearly be observed.

Macrofungi plays key roles in the ecosystems. Kütahya has a rich and strong forest ecosystem due possibly to the help of these macrofungi. Because, we found that the most of identified macrofungi are saprobe (51%) and mycorrhizal (27%) (Figure 3). Saprobe species play critical roles in the breakdown and recycling of plant debris especially cellulose and lignin (Deacon, 2006). Thus, macrofungi cause an increase in the level of soil nutrition, which results in encouraging the growth of plants. Also, mycorrhizal species support plant growth by supplying inorganic nutrition (Deacon, 2006). Both saprobe and mycorrhizal species support plant growth and healthy forests. Therefore, we can conclude that Kütahya may have a rich forest ecosystem due to rich macrofungal diversity.

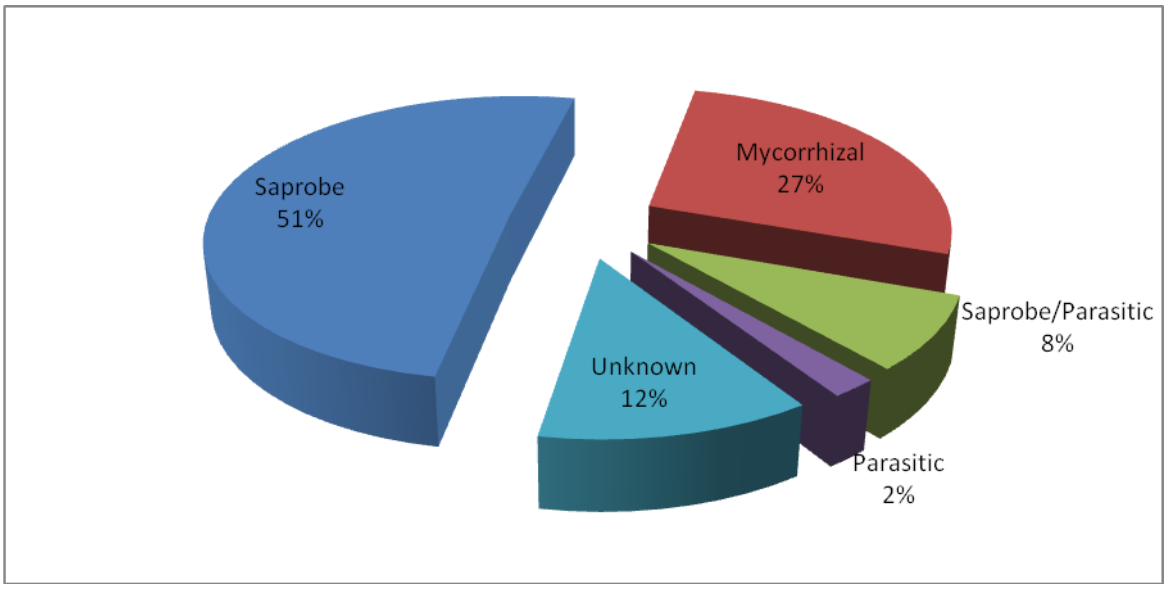

Figure 3. Percentage of the species by ecological niche

While 98 species are edible, 171 of them are inedible. 49 speciesspeciesare poisonous (Figure 4). Although 98 species are edible, only twelve species (*Agaricus litoralis, Choorogomphus rutilus, Hohenbuehelia tremula, Macrolepiota procera, Morchella deliciosa, M. elata, M. esculanta, Lactarius deliciosus, L. salmonicolor, L. sanguifluus, Lycoperdon perlatum, T. terreum*) are recognized and consumed by local people. The members of *Morchella* known as "dübecik, kuzu göbeği", *A. litoralis* as "kızılcamantar", *C. rutilus* as "ebe espiti", *H. tremula* as "kulak mantarı", *M. procera* as "dedebölük", *L. perlatum* as "paflak", *T. terreum* as "kara kafa" and the members of *Lactarius* as "espit". Similarly, *Morchella* sp. and *Lactarius* sp. are sold in the local bazaar. But a fatal mushroom poisoning has been observed after consuming *Amanita proxima* and the patient was reported dead. Also, some *Amanita* species were eaten by five local people. So, we also point out that mushroom poisoning could, at times, be an important health problem for the local people living in Kütahya.

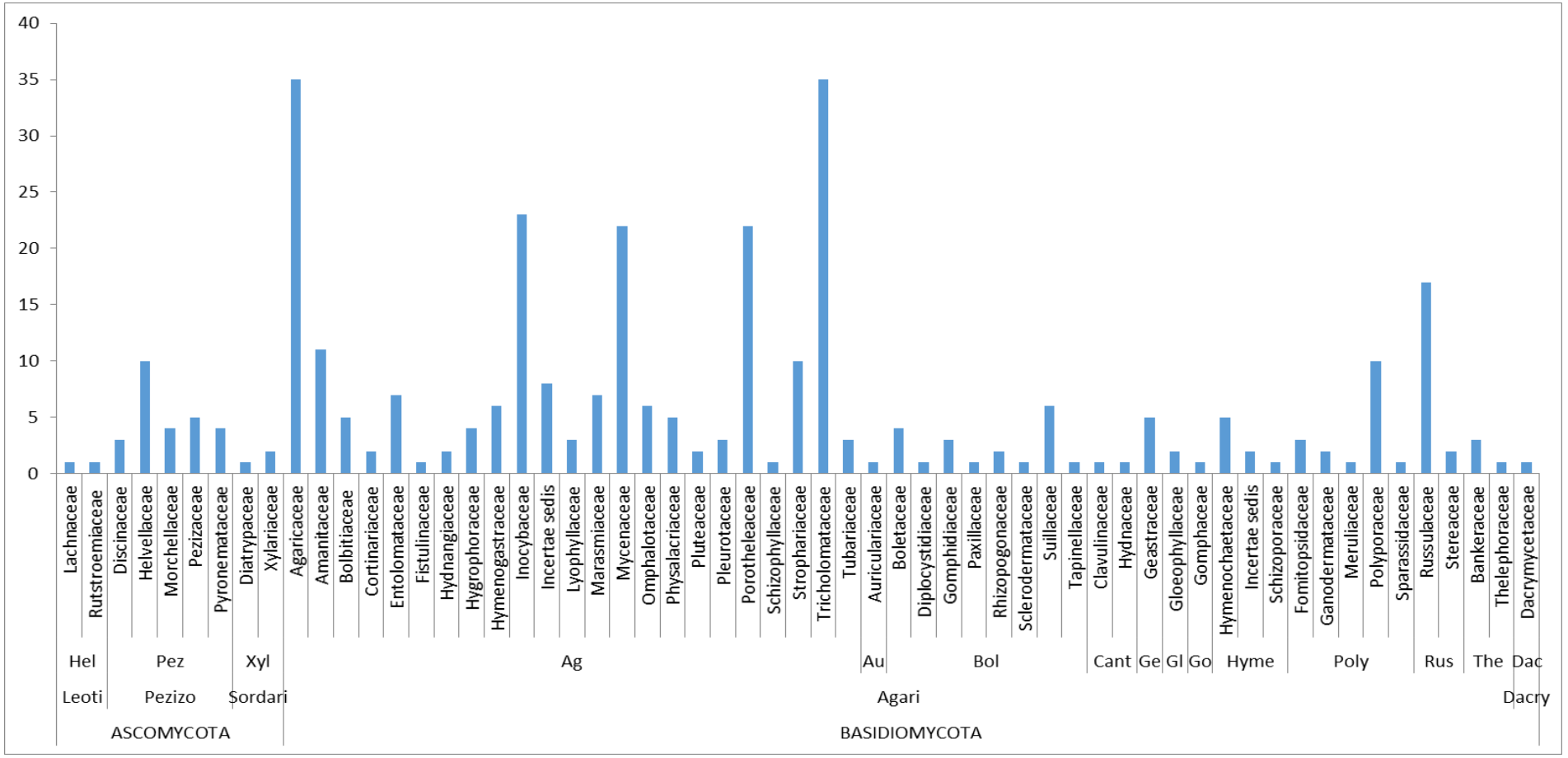

Figure 2. Distribution of species to families and classis (Hel: Helotiales, Pez: Pezizales, Xyl: Xylariales, Ag: Agaricales, Au: Auriculariales, Bol: Boletales, Cant: Cantharellaes, Ge: Geastrales, Gl: Gloeophyllales, Go: Gomphales, Hyme: Hymenochaetales, Poly: Polyporales, Rus: Russulales, The: Thelephorales, Dac: Dacrymycetales, Leoti: Leotimycetes, Pezizo: Pezizomycetes, Sordari: Sordariomycetes, Agari: Agaricomycetes, Dacry: Dacrymycetes).

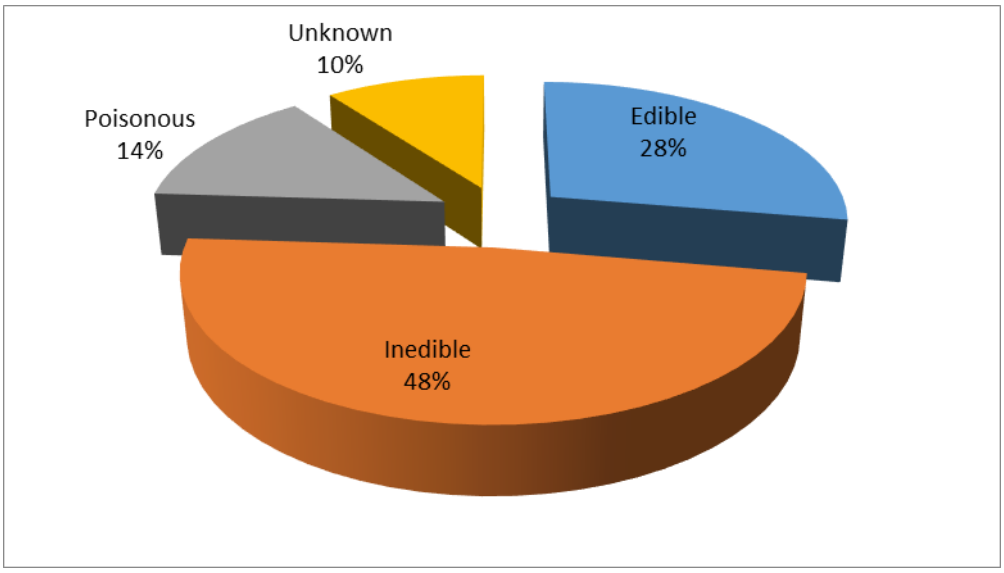

Figure 4. Edibility percentage of species

The species determined in this study reflect similarity to those of the other studies conducted in its environs and similarity percentages between this study and others are given in Table 1. Relatively high level of agreement between the studies may be due to similar climate and vegetation. In addition, it is shown that the similar species are cosmopolite, so they grow in different habitats.

Table1. Similarity percentages of study area and its environs

	Number of identical species	Total species	Similarity percentage (%)
Yamaç et al. (2007)	11	15	73
Oskay and Kalyoncu (2006)	23	34	67.64
Solak and Yılmaz (2002)	17	36	47.22
Yılmaz et al. (2003)	14	24	58.33
Köstekçi et al. (2005)	48	77	62.33
Türkoğlu and Yağız (2012)	45	100	45
Şen et al. (2014)	30	48	62.5

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