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*Araştırma Makalesi / Research Article*

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## Macrofungal Biodiversity of Pazar (Tokat) District

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### Abstract

This study was made to determine the macrofungi of Pazar (Tokat) district in 2011. Pazar district located to the west of Tokat province has a transition climate between the Black Sea climate and the Continental climate. After field and laboratory studies, 52 species belonging to 2 divisions, 28 families and 44 genera were identified: 7 taxa belong to Ascomycota and 45 to Basidiomycota. From the identified macrofungi, 27 were edible, 17 inedible, 8 poisonous. *Morchella elata*, *Morchella esculenta*, *Agaricus bisporus*, *Lactarius deliciosus*, *Lepista nuda*, *Marasmius oreades*, *Verpa bohemica* are the species collected and consumed by the local people among the edible fungi.

**Keywords:** Biodiversity, macrofungi, taxonomy, Pazar, Tokat.

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## Pazar (Tokat) İlçesi Makromantar Biyoçeşitliliği

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### Öz

Bu çalışma 2011 yılında Pazar (Tokat) ilçesi makromantarlarını belirlemek için yapılmıştır. Tokat ilinin batısında yer alan Pazar ilçesi Karadeniz iklimi ile İç Anadolu iklimi arasında bir geçiş iklimine sahiptir. Arazi ve laboratuvar çalışmaları sonucunda 2 bölüm, 28 familya ve 44 cins içerisinde dağılım gösteren 52 tür tespit edilmiştir. Bunlardan 7'si Ascomycota, 45'i Basidiomycota bölümlerine aittir. Tespit edilen makromantarların 27'si yenir, 17'si yenmez ve 8'i zehirlidir. *Morchella elata*, *Morchella esculenta*, *Agaricus bisporus*, *Lactarius deliciosus*, *Lepista nuda*, *Marasmius oreades*, *Verpa bohemica* yenen mantarlar içerisinde yöre halkı tarafından toplanmakta ve tüketilmektedir.

**Anahtar kelimeler:** Biyoçeşitlilik, makromantarlar, taksonomi, Pazar, Tokat.

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### 1. Introduction

Fungi play roles in important ecosystem dynamics such as litter decomposition, nutrient cycling, nutrient transport and regulating populations of other organisms. Therefore, It is important to reveal the variation in fungal populations. The major activities of fungi are pathogens (or parasites in another living organism), symbionts (mycorrhizal fungi), and saprophytes. They may be edible, hallucinogenic, medicinal or poisonous [1,2,3].

Pazar (Tokat) district is located to the west of Tokat province surrounded by Artova (Tokat) in the south; Turhal (Tokat) in the northwest; Tokat center in the east, and Zile (Tokat) in the west. Pazar has a transition climate between the Black Sea climate and the continental climate.

The annual average minimum temperature of district is at 1.96°C to 3.55°C and the annual average maximum temperature is at 7.49 to 15.92°C. The annual average rainfall is at 42.97-45.00 mm. The forest area in the district is about 49 km<sup>2</sup> and spreads between 900 to 1650 m. *Pinus nigra* Arnold.

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subsp. *pallasiana* (Lamb.) Holmboe, *Fagus orientalis* Lipsky., *P. sylvestris* L., *Quercus pubescens* Willd., *Q.cerris* L. var. *cerris* L., *Quercus infectoria* Olivier subsp. *infectoria*, *Quercus petraea* (Matt.) Liebl., *Juniperus exelsa* Bieb. are dominant plants in the forest vegetation of district [4,5,6].

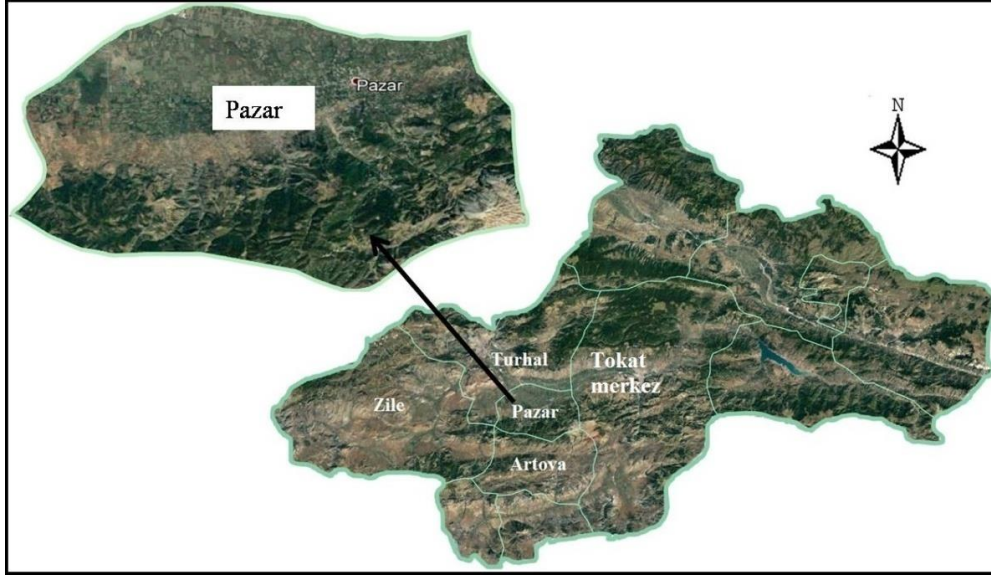


Figure 1. Map of the study area

Many studies have been conducted on Turkish mycobiota. However, not all of the fungal diversity from different parts of Turkey has been determined. Until now, 2158 macrofungi species were recorded for Turkish mycota [7]. Some of the systematic studies carried out in recent years in Turkey are [8-29]. Studies on determining the diversity of macrofungi in the research area were made by [30] and he detected 11 species of macrofungi. The aim of our study is to determine the diversity of macrofungi of district and contribute for Turkish mycota.

## 2. Materials and Methods

Macrofungal specimens were collected during field trips in Pazar (Tokat) district in 2011. Morphological and ecological characteristics of the specimens were photographed and recorded Then the data of macroscopic and microscopic measurement of samples were obtained using light microscope. Some reagents (KOH 5%, congo red, lactofenol stain) were used for identification. Specimens were identified with the literature [31,32,33,34,35,36,37,38,39,40,41]. The herbarium specimens were deposited at Gaziosmanpaşa University, Faculty of Science, Department of Biology, Tokat, Turkey.

## 3. Results

The systematics of the taxa were given in accordance with [42]. The taxa were listed in alphabetical order with accession numbers, locality, collection date and habitat.

### Ascomycota Whittaker

#### Helvellaceae Fr.

##### 1. *Helvella acetabulum* (L.) Quél.

Bağlarbaşı village, on burnt ground in mixed forest, 40° 14' 149" N, 36° 13' 058" E, 815 m, 18.04.2011, Bemiray 29, Edible (when cooked).

##### 2. *Helvella leucomelaena* (Pers.) Nannf.

Dereköy village, on sandy soil among moss, 40° 14' 445" N, 36° 14' 481" E, 848 m, 05.04.2011, Bemiray 13, Poisonous.

#### Morchellaceae Rchb.

##### 3. *Morchella elata* Fr.

Dereçaylı village, among short grass in coniferous forest, 40° 14' 574" N, 36° 17' 424" E, 1113 m, 18.04.2011, Bemiray 36, Edible.

**4. *Morchella esculenta* (L.) Pers.**

Dereköy village, on chalky soil in the open area of coniferous forest, 40° 14' 440" N, 36° 14' 454" E, 878 m, 16.04.2011, Bemiray 16, Edible.

**5. *Verpa bohemica* (Krombh.) J. Schröt.**

Tepeçaylı village, under *Pinus sylvestris*, 40° 14' 067" N, 36° 15' 358" E, 1055 m, 14.04.2011, Bemiray 14, Edible.

**Pezizaceae Dumort.**

**6. *Sarcosphaera coronaria* (Jacq.) J. Schröt.**

Dereköy village, among clusters under coniferous in mixed forest, 40° 14' 435" N, 36° 14' 463" E, 867 m, 19.04.2011, Bemiray 55, Poisonous.

**Pyronemataceae Corda**

**7. *Geopora sumneriana* (Cooke) M. Torre**

Pazar center, under cedar, 40° 15' 028" N, 36° 16' 598" E, 833 m, 14.04.2011, Bemiray 15, Inedible.

**Basidiomycota R.T. Moore**

**Agaricaceae Chevall.**

**8. *Agaricus bisporus* (J.E. Lange) Imbach**

Dereköy village, in grass, 40° 14' 101" N, 36° 14' 549" E, 835 m, 27.04.2011, Bemiray 73, Edible.

**9. *Bovista nigrescens* Pers.**

Dereköy village, among grass, 40° 14' 097" N, 36° 14' 556" E, 773 m, 19.04.2011, Bemiray 58, Edible.

**10. *Coprinus comatus* (O.F. Müll.) Pers.**

Bağlarbaşı village, on soil in short grass, 40° 14' 155" N, 36° 13' 045" E, 840 m, 19.04.2011, Bemiray 59, Edible.

**11. *Tulostoma brumale* Bertero**

Bağlarbaşı village, on sandy soil among moss, 40° 14' 159" N, 36° 13' 031" E, 860 m, 18.04.2011, Bemiray 37, Inedible.

**Bolbitiaceae Singer**

**12. *Bolbitius titubans* (Bull.) Fr.**

Ballica village, among grass in rich or manured grasslands, 40° 13' 225" N, 36° 17' 313" E, 992 m, 05.05.2011, Bemiray 90, Inedible.

**13. *Conocybe percincta* P.D. Orton**

Ballica village, on bare soil and rotting straw in mixed forest, 40° 13' 215" N, 36° 17' 303" E, 962 m, 05.05.2011, Bemiray 91, Inedible.

**Boletaceae Chevall.**

**14. *Boletus aereus* Bull.**

Ovacık village, under broad-leaved trees, especially oak, 40° 12' 205" N, 36° 16' 303" E, 1305 m, 01.05.2011, Bemiray 80, Edible.

**15. *Boletus edulis* Bull.**

Ovacık village, under the oak-tree in mixed forest, 40° 12' 225" N, 36° 15' 303" E, 1378 m, 29.04.2011, Bemiray 79, Edible.

**Cantharellaceae J. Schröt.**

**16. *Cantharellus cibarius* Fr.**

Ovacık village, among leaf under oak-tree, 40° 12' 215" N, 36° 16' 303" E, 1287 m, 18.04.2011, Bemiray 32, Edible.

**17. *Cantharellus ferruginascens* P.D. Orton**

Ballica village, on chalk soils in mixed forest, 40° 13' 006" N, 36° 17' 062" E, 1009 m, 01.05.2011, Bemiray 82, Edible.

**Diatrypaceae Nitschke**

**18. *Diatrype disciformis* (Hoffm.) Fr.**

Üzümören village, on branch of oak-tree, 40° 14' 050" N, 36° 11' 416" E, 784 m, 18.04.2011, Bemiray 34, Inedible.

**Diplocystidiaceae Kreisel**

**19. *Astraeus hygrometricus* (Pers.) Morgan**

Dereçaylı village, on sandy soil in mixed forest, 40° 14' 006" N, 36° 17' 062" E, 1073 m, 18.04.2011, Bemiray 43, Inedible.

**Hymenogastraceae Vittad.**

**20. *Hypholoma fasciculare* (Huds.) P. Kumm.**

Dereköy village, in dense clusters of coniferous trees, 40° 14' 089" N, 36° 14' 548" E, 864 m, 18.04.2011, Bemiray 54, Poisonous.

**21. *Psilocybe cyanescens* Wakef.**

Dereköy village, among herbaceous plants, 40° 14' 442" N, 36° 14' 451" E, 811 m, 27.04.2011, Bemiray 71, Poisonous.

**22. *Psilocybe coronilla* (Bull.) Noordel.**

Üzümören village, among grasses, 40° 14' 044" N, 36° 11' 443" E, 841 m, 01.05.2011, Bemiray 81, Inedible.

**Fomitopsidaceae Jülich**

**23. *Fomitopsis pinicola* (Sw.) P. Karst.**

Üzümören village, on log of oak-tree, 40° 14' 050" N, 36° 11' 416" E, 731 m, 19.04.2011, Bemiray 60, Inedible.

**Geastraceae Corda**

**24. *Geastrum fimbriatum* Fr.**

Üzümören village, on soil among leaf litter in *Pinus sylvestris* forest, 40° 14' 043" N, 36° 11' 456" E, 744 m, 18.04.2011, Bemiray 44, Inedible.

**Gomphidiaceae Maire ex Jülich**

**25. *Chroogomphus rutilus* (Schaeff.) O.K. Mill.**

Bağlarbaşı village, on soil among leaf in mixed forest, 40° 13' 141" N, 36° 13' 054" E, 933 m, 08.05.2011, Bemiray 92, Edible.

**Incertae sedis**

**26. *Panaeolina foenisecii* (Pers.) Maire**

Dereköy village, in pastureland, 40° 14' 089" N, 36° 14' 547" E, 890 m, 18.04.2011, Bemiray 46, Poisonous.

**Inocybaceae Jülich**

**27. *Inocybe geophylla* (Bull.) P. Kumm.**

Üzümören village, on pathsides in mixed forest, 40° 14' 131" N, 36° 12' 054" E, 808 m, 08.05.2011, Bemiray 93, Poisonous.

**28. *Inocybe rimosa* (Bull.) P. Kumm.**

Dereköy village, under the broad-leaved tree in mixed forest, 40° 14' 106" N, 36° 14' 500" E, 817 m, 08.05.2011, Bemiray 100, Poisonous.

**Marasmiaceae Roze ex Kühner**

**29. *Marasmius oreades* (Bolton) Fr.**

Balıca village, among grasses in the open area, 40° 13' 228" N, 36° 17' 352" E, 1019 m, 27.04.2011, Bemiray 75, Edible.

**Omphalotaceae Bresinsky**

**30. *Gymnopus dryophilus* (Bull.) Murrill**

Bağlarbaşı village, among needle litters, 40° 14' 145" N, 36° 13' 056" E, 932 m, 08.05.2011, Bemiray 102, Edible.

**Physalacriaceae Corner**

**31. *Armillaria mellea* (Vahl) P. Kumm.**

Bağlarbaşı village, around the stumps of oak-tree, 40° 14' 141" N, 36° 13' 054" E, 883 m, 18.04.2011, Bemiray 47, Edible (when cooked).

**32. *Hymenopellis radicata* (Relhan) R.H. Petersen**

Bağlarbaşı village, on rotten stump in mixed forest, 40° 13' 106" N, 36° 14' 590" E, 1046 m, 16.05.2011, Bemiray 119, Inedible.

**Pleurotaceae Kühner**

**33. *Pleurotus eryngii* (DC.) Quél.**

Dereköy village, on soil among grasses on decaying remains of *Eryngium*, 40° 14' 106" N, 36° 14' 550" E, 928 m, 01.05.2011, Bemiray 83, Edible.

**Polyporaceae Fr. ex Corda**

**34. *Cerioporus squamosus* (Huds.) Quél.**

Ocaklı village, on beech stump, 40° 15' 231" N, 36° 18' 461" E, 1092 m, 18.04.2011, Bemiray 48, Edible.

**35. *Lentinus brumalis* (Pers.) Zmitr.**

Dereköy village, fallen deciduous branches lying on soil, 40° 14' 437" N, 36° 14' 471" E, 807 m, 16.04.2011, Bemiray 17, Inedible.

**Psathyrellaceae** Vilgalys, Moncalvo & Redhead

**36. *Coprinellus disseminatus*** (Pers.) J.E. Lange

Ocaklı village, massed distinctively on stumps of *Quercus* sp. 40° 14' 467" N, 36° 18' 087" E, 979 m, 19.04.2011, Bemiray 62, Edible.

**37. *Coprinellus micaceus*** (Bull.) Vilgalys, Hoppole & Jacq. Johnson

Ballica village, on of *Quercus* sp. stump, 40° 13' 252" N, 36° 17' 304" E, 1035 m, 18.04.2011, Bemiray 50, Edible.

**38. *Coprinopsis atramentaria*** (Bull.) Redhead, Vilgalys & Moncalvo

Ballica village, on the ground near bases of *Quercus* sp., 40° 13' 228" N, 36° 17' 358" E, 1162 m, 19.04.2011, Bemiray 63, Poisonous.

**39. *Lacrymaria lacrymabunda*** (Bull.) Pat.

Bağlarbaşı village, on soil among grasses near roadside, 40° 13' 471" N, 36° 13' 504" E, 916 m, 29.04.2011, Bemiray 77, Edible.

**40. *Parasola plicatilis*** (Curtis) Redhead, Vilgalys & Hoppole

Tepeçaylı village, among deciduous leave in short grasses area under trees, 40° 13' 524" N, 36° 15' 144" E, 1305 m, 18.04.2011, Bemiray 51, Inedible.

**41. *Psathyrella candolleana*** (Fr.) Maire

Ballica village, among decaying leaves under broad-leaved tree, 40° 13' 197" N, 36° 17' 366" E, 1021 m, 16.04.2011, Bemiray 18, Inedible.

**Pyronemataceae** Corda

**42. *Scutellinia scutellata*** (L.) Lambotte

Bağlarbaşı village, on moist soil, 40° 13' 292" N, 36° 14' 393" E, 1043 m, 16.04.2011, Bemiray 19, Inedible.

**Rhizopogonaceae** Gäum. & C.W. Dodge

**43. *Rhizopogon luteolus*** Fr.

Dereköy village, in sandy soil in *Pinus sylvestris* forest, 40° 14' 111" N, 36° 14' 547" E, 835 m, 08.05.2011, Bemiray 118, Edible.

**Russulaceae** Lotsy

**44. *Lactarius deliciosus*** (L.) Gray

Bağlarbaşı village, on calcareous soil under conifer, 40° 14' 101" N, 36° 13' 537" E, 798 m, 16.04.2011, Bemiray 21, Edible.

**Schizophyllaceae** Qué. l.

**45. *Schizophyllum commune*** Fr.

Dereçaylı village, attached to stump of deciduous tree, 40° 14' 570" N, 36° 17' 029" E, 1075 m, 16.04.2011, Bemiray 20, Inedible.

**Stereaceae** Pilát

**46. *Stereum hirsutum*** (Willd.) Pers.

Ballica village, on stump of broad-leaved trees, 40° 13' 197" N, 36° 17' 366" E, 1110 m, 16.04.2011, Bemiray 22, Inedible.

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

**47. *Protostrophia semiglobata*** (Batsch) Redhead, Moncalvo & Vilgalys

Üzümören village, among grasses on dung, 40° 14' 034" N, 36° 11' 443" E, 852 m, 16.04.2011, Bemiray 23, Inedible.

**Tricholomataceae** Lotsy

**48. *Clitocybe fuligineipes*** Métrod

Üzümören village, among grasses, 40° 13' 044" N, 36° 11' 433" E, 970 m, 20.04.2011, Bemiray 65, Edible.

**49. *Lepista nuda*** (Bull.) Cooke

Bağlarbaşı village, on soil in mixed forest, 40° 13' 346" N, 36° 14' 523" E, 1084 m, 16.04.2011, Bemiray 24, Edible (when cooked).

**50. *Lepista personata*** (Fr.) Cooke

Ocaklı village, around cedar tree, 40° 15' 224" N, 36° 18' 580" E, 1117 m, 02.05.2011, Bemiray 84, Edible.

**51. *Melanoleuca arcuata*** (Bull.) Singer

Üzümören village, on soil among pine needle, 40° 14' 045" N, 36° 11' 412" E, 782 m, 25.04.2011, Bemiray 68, Edible.

**52. *Tricholoma terreum*** (Schaeff.) P. Kumm.

Üzümören village, on calcareous soil under *Pinus sylvestris*, 40° 14' 045" N, 36° 11' 412" E, 832 m, 18.04.2011, Bemiray 53, Edible.

#### 4. Discussion and Conclusion

As a result of the field and laboratory studies, 52 taxa belonging to 2 divisions, 28 families and 44 genera were identified. 7 taxa belonged to *Ascomycota*, and the remaining 45 taxa belonged to *Basidiomycota* divisions. Of these, 27 were edible, 17 inedible, 8 poisonous (Figure 2).

Distribution of determined species to family was given in Figure 3. Most of the determined species belong to the families *Psathyrellaceae* (6 taxa-11.3%), *Tricholomataceae* (5 taxa-9.4%), *Agaricaceae* (4 taxa- 7.5%). Although 27 of identified macrofungi are edible. Only seven of these (*Morchella elata*, *Morchella esculenta*, *Agaricus bisporus*, *Lactarius deliciosus*, *Lepista nuda*, *Marasmius oreades*, *Verpa bohemica*) are collected and consumed by local people.

The results obtained in this study are showed similarities when compared with studies conducted in neighboring regions. These studies and the similarity percentages are given in Table 1. According to this, the highest similarity percentage was found 48.7% in the study conducted by Türkekul and Yıldız (2010) in Artova (Tokat) district. Also the lowest similarity percentage was found 11.5% in the study conducted by Aktaş (2006) in Amasya district. The similarity percentages with other studies in neighboring regions were 16.4% (Türkekul and Işık 2016a, Yozgat); 28.8% (Türkekul 2003, Tokat); 37.2% (Türkekul and Zülfükaroğlu 2010, Çamlıbel-Tokat); 26.8% (Türkekul and Işık 2016b, Bozatalan-Tokat); 17.1% (Pekşen and Karaca 2003, Samsun) respectively.

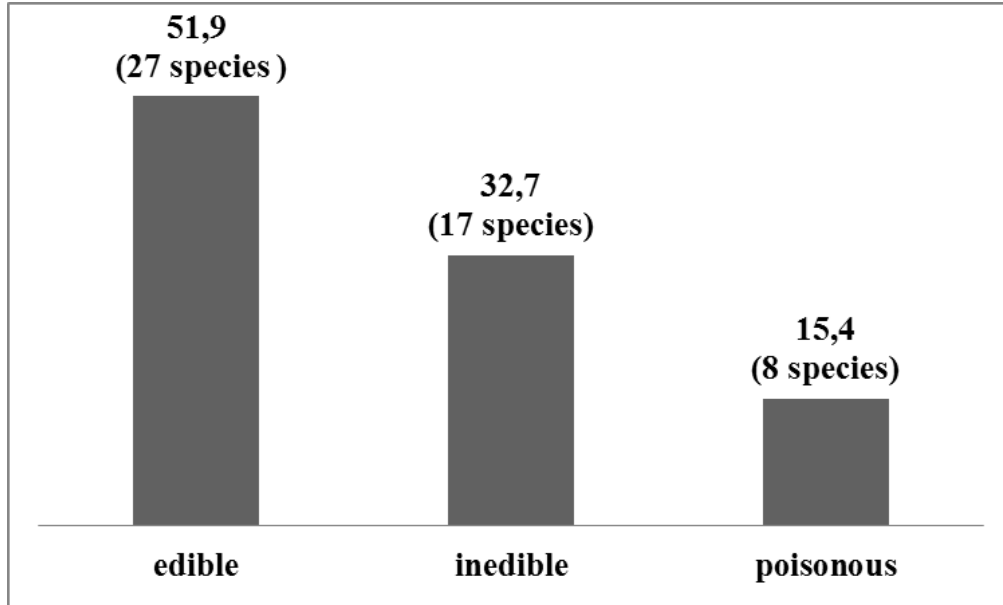
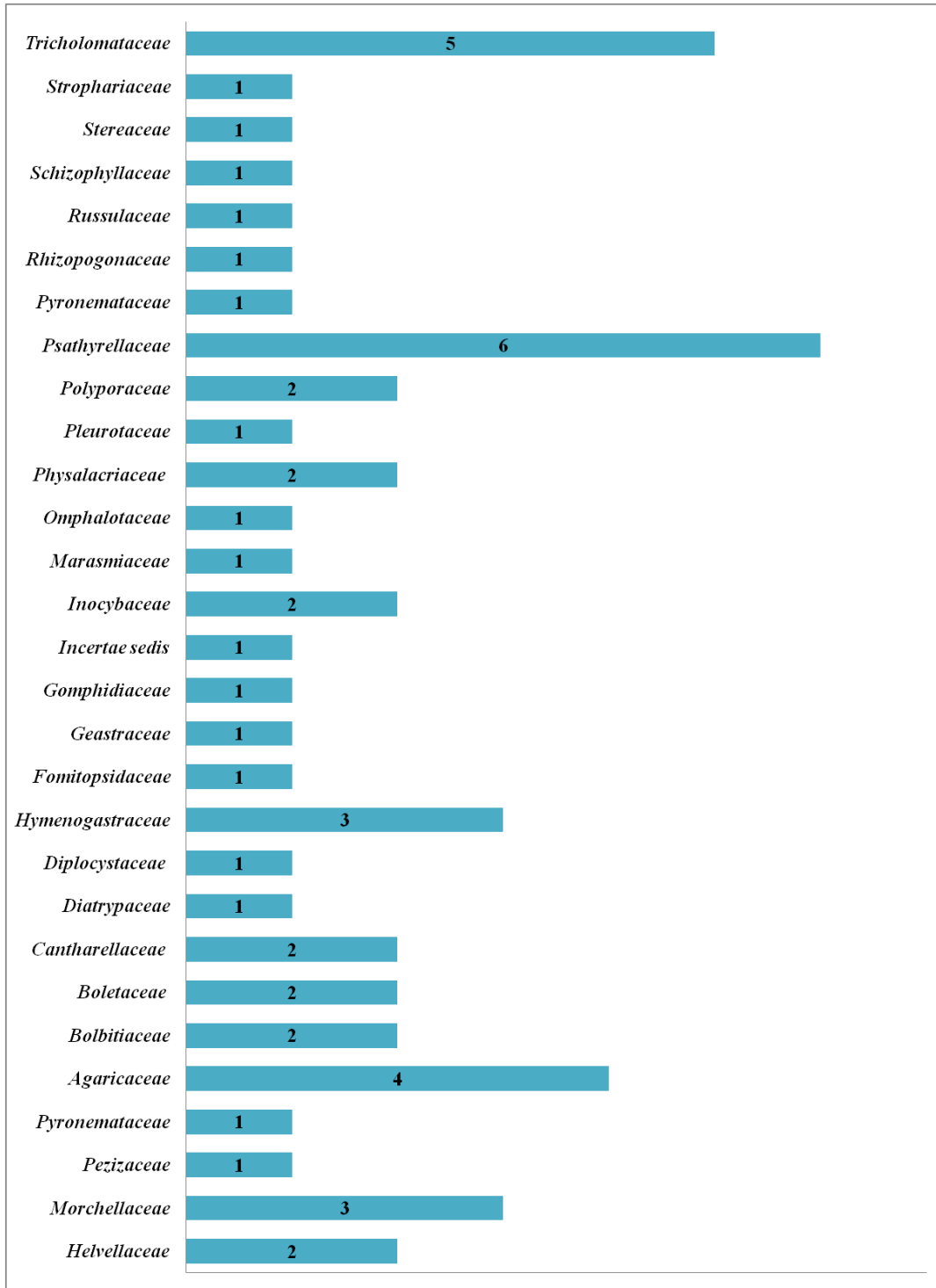


Figure 2. Edibility percentage of taxa



**Figure 3.** The distribution of the taxa and their families

**Table 1.** Similarity percentages of neighboring studies with Pazar (Tokat) basin

References	Study Area	Number of identical taxa	Total taxa	Similarity percentage (%)
[16]	Yozgat	32	195	16.4
[30]	Tokat	17	59	28.8
[43]	Tokat	19	51	37.2
[44]	Tokat	19	39	48.7
[45]	Tokat	22	82	26.8
[46]	Samsun	29	169	17.1
[47]	Amasya	35	303	11.5

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