

Myxomycetes Diversity of Batman Province and Hasankeyf District

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ABSTRACT

This study was conducted on samples collected from 13 different localities in the province of Batman and Hasankeyf district between 2017-2019. The samples were consisted of various leaves, bark, decayed plant material and animal waste. All of the samples collected were cultured in moisture chamber technique to develop myxomycetes sporophore. In addition, myxomycetes were collected from natural area on materials. As a result of field and moist chamber collection, 33 taxa obtained and identified belonging to 5 ordo, 7 families and 12 genera and added to mycetozoa of Turkey.

Research Article

Article History

Received : 15.05.2020

Accepted : 18.07.2020

Keywords

Myxomycetes

Taxonomy

Diversity

Batman

Turkey

Batman Şehir Merkezi ve Hasankeyf ilçesinin Myxomycetes Çeşitliliği

ÖZET

Bu çalışma, 2017-2019 yılları arasında Batman ili ve Hasankeyf ilçesindeki 13 farklı yerleşim yerinden toplanan örnekler üzerinde gerçekleştirilmiştir. Örnekler; çeşitli yapraklar, ağaç kabuğu, çürümüş bitki materyali ve hayvan atıklarıdır. Toplanan tüm örnekler üzerinde miksomiset sporoforunu geliştirmek için nem odası tekniğine uygulanmıştır. Ayrıca, miksomisetler doğal alanlarında materyaller üzerinde toplanmıştır. Saha ve laboratuvar çalışmaları sonucunda 5 takım, 7 aile ve 12 cinse ait 33 takson elde edilmiş ve tanımlanmıştır ve Türkiye'nin mycetozoa'sına eklenmiştir.

Araştırma Makalesi

Makale Tarihi

Geliş Tarihi : 15.05.2020

Kabul Tarihi : 18.07.2020

Anahtar Kelimeler

Miksomiset

Taksonomi

Çeşitlilik

Batman

Türkiye

To Cite : Baba H, Altaş B, Sevindik M 2021. Myxomycetes Diversity of Batman City Center and Hasankeyf district. KSU J. Agric Nat 24 (2): 435-441. <https://doi.org/10.18016/ksutarimdog.vi.737714>.

INTRODUCTION

Myxogastria are expressed as plasmodial slime mold and simple eukaryotic creatures that reproduce by spores. They live mainly in wet and damp areas, on decaying vegetable or animal materials, on leaves and wood. In the vegetative stage, myxamoeba or myxoflagellates move. They do not have distinctive shapes and cell walls, are multi-core, one or more spore formations are observed (Everhart and Keller 2008).

The life cycle of myxomycetes is characterized by two different stages, vegetative and generative. In the vegetative phase, plasmodium occurs from the germinated spore, feeds, develops, sometimes with synchronized mitosis, it often turns into a large number of nuclei, spore and generative formation. In the generative phase, it turns into a structure similar to the sportive reproductive structures (fructification) of macrofungi. Identification of myxomycetes is based on the morphological features of these fructifications, which are completely fragile and small (usually less than 2 mm). There are many types of myxomycetes

that can survive in very different habitats by showing a very cosmopolitan spread, as well as some species that can survive in specific habitats (Stephenson 2003).

The number of Myxomycetes defined in the world is about 1045 (Lado, 2005-2021). Turkey is located between mild and subtropical climates and surrounded by sea on three sides. The extension of the mountains and the diversity of the landforms led to the emergence of different climate types. This situation also provide richness in terms of vegetation, fauna, mycota and myxobiota. Myxogastria reported number is 290 in Turkey (Baba and Sevindik, 2019; Baba et al. 2021). There are limited studies only in provinces with some regions (Ocak and Hasenekoğlu, 2003; Yağız and Afyon, 2005; Ergül et al., 2005a; Ergül et al., 2005b; Ergül et al., 2016; Demirel et al., 2006). In this study, myxomycetes of Batman city center and Hasankeyf district (Turkey) were determined. This study considered as first in the Southeast Anatolia Region and in Batman.

MATERIAL and METHOD

Research Area:

Batman is located in Southeast Anatolia Region of Turkey. The northern region and northeast of Batman are high with steep and mountainous, and the southern region is mountainous and rugged. Batman province is located in the north of the province of Muş, Diyarbakır is in the west, Bitlis and Siirt in the east and Mardin in the south of the city (Figure 1). It has an land size of 4.477 km². Batman province is located between 41°10'-41°40' East longitudes and 38°40'-37°50' North latitudes. It has an altitude of 550 meters. Hasankeyf district belongs to Batman province. Its geographic location is 37°41'49" North and 41°29'58" East coordinates. Its land size is about 529 km². The Dicle River, which gives life to the region, also affects the climate of the region. The river ensures that the winter are mild (Alaeddinoglu 2010).

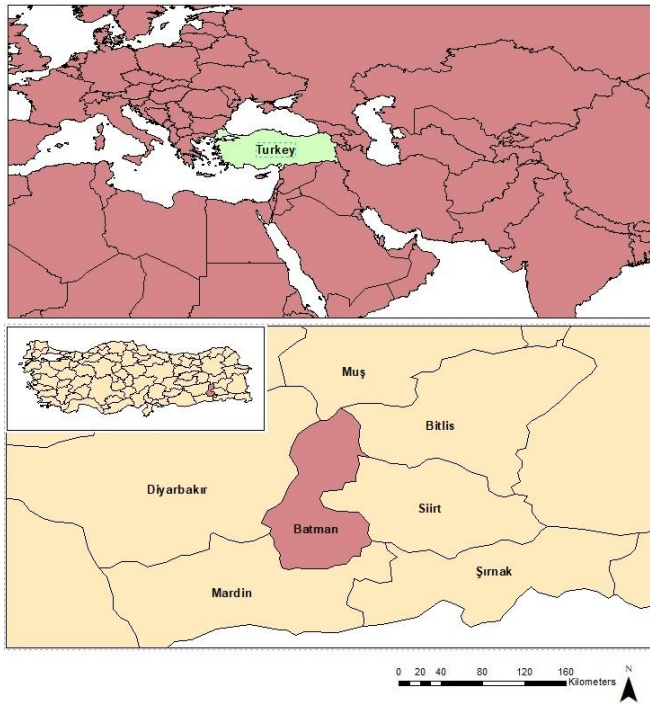


Figure1. Research Area
Şekil 1. Araştırma Sahası

Terrestrial climate is generally dominant in Batman province and Hasankeyf district. The winter season in Batman is cool and rainy and the summer season is hot and dry. Rainfall is high in the form of snow and lowlands in the form of rain. The highest temperatures are experienced in the June-September period and the lowest temperatures in the December-March period. The average annual temperature of Batman is 25 °C, the highest average temperature is 43 °C, the lowest average temperature is between 6 °C. The average annual total precipitation is seen to be 487.5 mm for Batman. Provincial lands are covered with steppes and

do not show richness in terms of vegetation. In high parts, there are forests mixed with oak (*Quercus robur* L.), juniper (*Juniperus communis* L.), plane-tree (*Platanus orientalis* L.) and wild peanut (*Peanuts feram* C.M. Schultz). At lower levels, steppe plants and river-sized, poplar (*Populus* sp.), and willow trees (*Salix* sp.) form natural vegetation (Alaeddinoglu 2010).

Collection and Identification of Samples:

By field trips samples were collected from the different regions of Batman city center and Hasankeyf district, to cover the four seasons of the year during 2017-2019. In field studies, myxomycetes samples were collected with substrate. Tree shells, pieces, leaves, branches, cones, fruit residues such as leaves, branches, cones, fruit residues that do not contain sporophore but are considered to contain myxomycet spores were placed in locked storage bags. The Moist Chamber Culture Technique developed by Gilbert and Martin (1933) was used isolation and identification of the species. Field samples collected in the sporophore stage or obtained from the moist chamber technique were dried in room temperature by laying a two layer of blotter paper in petri dishes and turned into fungarium material (Baba and Tamer, 2007). Identification of myxomycetes were made using Martin and Alexopoulos (1969), Farr (1976), Thind (1977), Farr (1981), Martin et al (1983), Neubert et al (1993, 1995, 2000), Stephenson and Stempen (1994), Alexopoulos et al (1996), Alvarado and Stephenson (2017), Zümre et al. (2019); Baba and Sevindik (2019, 2020) .

RESULT and DISCUSSION

As a result of the field studies conducted around Batman city center and Hasankeyf district in the 2017-2019, a total of 33 species were identified belonging 5 ordo, 7 families and 12 genus. The taxa detected are listed below. In addition, the locality, altitude, substrate, collector number, frequency (F) of species (FC: Field Collection, MC: Moist Chamber technique) density data (D) and were determined respectively. If the ratio of the number of individuals of the species to the total number of individuals was less than 0.5%, it was expressed as rare (R), between 0.5-1.5% uncommon (O), between common 1.5-3% (C) and greater than plenty 3% (A) (Stephenson et al.,1993).

List of species

Eukaryota
Protozoa
Amoebozoa
Mycetozoa
Myxogastria
Echinostellida
Echinosteliaceae

1- *Echinostelium minutum* de Bary

Syn: *Heimerlia hyalina* Höhn.

Specimen examined: Turkey: Batman Province, Zorköy, altitude 532 m, on wood, 01.11.2017, Altaş 265, F/4, MC, D/C.

Liceida

Liceaceae

2- *Licea kleistobolus* G.W. Martin

Syn: *Kleistobolus pusillus* C. Lippert

Orcadella pusilla (C. Lippert) Hagelst.

Specimen examined: Turkey: Batman Province, Zorköy, altitude 528 m, on wood and bark of *Vitis vinifera* L., 23.10.2017, Altaş 267, F/2, MC, D/O.

3- *L. pescadorensis* Chao H. Chung & C.H.Liu.

Specimen examined: Turkey: Batman Province, Yeniköy, altitude 530 m, on bark of *V. vinifera* L., 02.06.2018, Altaş 39, F/1, MC, D/O.

4- *L. scyphoides* T.E. Brooks & H.W. Keller

Syn: *Licea tanzanica* Ukkola, Härk. & Gilert,

Specimen examined: Turkey: Batman Province, Zorköy, altitude 532 m, leaf litter, 23.10.2017, Altaş 268, F/1, MC, D/O.

Reticulariaceae

5- *Reticularia lycoperdon* Bull

Syn: *Enteridium lycoperdon* (Bull.) M.L. Farr

Fuligo lycoperdon (Bull.) Schumach.

Specimen examined: Turkey: Batman Province, Yeniköy, altitude 530 m, on *Salix* sp. trunk, 02.01.2017, Baba 264, F/1, FC, D/O.

Trichiida

Arcyriaceae

6- *Arcyria cinerea* (Bull.) Pers.

Syn: *Arcyria albida* Pers.

Stemonitis cinerea (Bull.) J.F. Gmel.

Trichia cinerea Bull.

Specimen examined: Turkey: Batman province, Hasankeyf, altitude 485 m, on wood, 14.05.2018, Altaş, 10, F/1, MC, D/O.

7- *Perichaena pedata* (Lister & G. Lister) Lister ex E. Jahn

Syn: *Perichaena variabilis* var. *pedata* Lister & G. Lister,

Specimen examined: Turkey: Batman province, Yeniköy, altitude 530 m, on leaf litter, 19.05.2018, Altaş, 260, F/1, FC, D/O.

8- *P. vermicularis* (Schwein) Rostaf

Syn: *Ophiotheca vermicularis* (Schwein.) Masee

Physarum vermiculare Schwein.

Specimen examined: Turkey: Batman province, Zorköy, altitude 532 m, on wood of *V. vinifera* L. 23.10.2017, Altaş, 263, Hasankeyf, altitude 485 m, on wood, 01.01.2017, Altaş, 250, F/2, MC, D/O.

Physarida

Didymiaceae

9- *Didymium annulisporum* H.W. Keller & Schokn

Specimen examined: Turkey: Batman Province, altitude 570 m, on leaf, 01.10.2017, Altaş 23, on bark, 02.06.2018, Altaş 13, Atatürk park, altitude 580 m, on leaf, 01.10.2017, Altaş, 26, High school, altitude 552 m, on leaf litter, 24.02.2018, Baba 87, Cemetery, altitude 575 m, on fallen twigs, 02.06.2018, Altaş 119, Hasankeyf, altitude 478 m, on twigs, 07.10.2017, Altaş 68, F/7, FC- MC, D/A.

10- *D. bahiense* Gottsb.

Syn: *Didymium bahiense* var. *microsporum* Hochg.,

Specimen examined: Turkey: Batman Province, Atatürk park, altitude 580 m, on leaf litter, 15.11.2017, Baba 24, F/1, MC, D/O.

11- *D. difforme* (Pers.) Gray

Syn: *Chondrioderma difforme* (Pers.) Rostaf.

Diderma difforme Pers.

D. nitens Klotzsch

Physarum difforme (Pers.) Link

Specimen examined: Turkey: Batman Province, altitude 590 m, on leaf litter, 01.10.2017, Altaş 15, Atatürk park, altitude 580 m, on leaf litter, 03.01.2018, Baba 25, High school, altitude 552 m, on leaf litter, 24.01.2018, Altaş, 233, Yeniköy, altitude 530 m, on rash wood, 19.05.2018, Altaş 230, School, altitude 530 m, on rash wood, 24.02.2018, Altaş 98, Hasankeyf town, altitude 480 m, on rash wood, leaf, bark and filter paper, 07.10.2017, Altaş 12, 19, 21, 30, Balpınar, altitude 536 m, on rash grape, 26.10.2017, Altaş, 32, Zorköy altitude 530 m, on rash wood and leaf, 01.11.2017, Altaş, 20, 31, Bıçakçı, altitude 569 m, on plastic petri dishes, 02.06.2018, Altaş, 34, F/46, FC-MC, D/A.

12- *D. dubium* Rostaf.

Syn: *Didymium wilczekii* Meyl.,

Specimen examined: Turkey: Batman province, Hasankeyf, altitude 476 m, on rash bark, 07.10.2017, Altaş, 22, Zorköy, altitude 530 m, on rash wood, 23.10.2017, Altaş, 266, Cemetery, altitude 575 m, on decaying twigs and leaf, 21.04.2018, Altaş 138, 142, F/4, MC, D/O.

13- *D. megalosporum* Berk. & M.A. Curtis

Syn: *Didymium fulvellum* Masee,

Didymium discoideum K.S. Thind & H.S. Sehgal,

Specimen examined: Turkey: Batman province, altitude 582 m, on plastic petri dishes, 02.06.2018, Altaş, 50, Hasankeyf, altitude 476 m, on rash leaf, 01.01.2017, Altaş, 67, Hasankeyf town, altitude 478 m, on the bark and wood body, 07.10.2017, Altaş, 70, High school, altitude 552 m, on rash leaf, 12.03.2018, Altaş, 69, F/6, FC-MC, D/O.

14- *D. melanospermum* (Pers.) T. Macbr.

Syn: *Cionium farinaceum* Link

Diderma melanospermum (Pers.) Fr.

Didymium farinaceum Schrad.

Physarum farinaceum (Schrad.) Pers.

P. melanospermum Pers.

Trichia farinacea (Schrad.) Poir.

Specimen examined: Turkey: Batman province, Balpınar village, altitude 540 m, on litter grape remains, 26.10.2017, Altaş, 32, F/1, MC, D/O.

15- *D. squamulosum* (Alb. & Schwein.) Fr & Palmquist.

Syn: *Cionium squamulosum* (Alb. & Schwein.) Spreng.

Diderma squamulosum Alb. & Schwein.

Didymium effusum Link

Physarum effusum Link

Specimen examined: Turkey: Batman province, altitude 577 m, on filter paper, 02.06.2018, Altaş, 51, High school, altitude 552 m, on rash and wood body, 06.02.2017, Altaş 33 K, Cemetery, altitude 575 m, on leaf and plastic petri dishes, 02.01.2018, Baba 139, Esentepe, altitude 650 m, on rash wood, 02.06.2018, Altaş 253, Hasankeyf, altitude 480 m, on rash thorn bush, School, altitude 490 m, on rash leaf, 17.05.2018, Altaş 64, School, altitude 490 m, on leaf litter, filter paper, and plastic petri dishes, 22.03.2018, Bıçakçı village, altitude 570 m, on leaf litter and wood, 02.06.2018, Altaş 270, 9, 97, 104, F/48, N- MC, D/A.

16- *D. trachysporum* G. Lister

Specimen examined: Turkey: Batman province, Hasankeyf district, altitude 482 m, on leaf litter, 07.10.2017, Altaş, 66, F/1, FC, D/O.

Physaraceae

17- *Badhamia dubia* Nann.-Bremek.

Specimen examined: Turkey: Batman Province, Cemetery, altitude 575 m, on pine cone, 02.01.2018, Altaş, 133, F/1, MC, D/O.

18- *B. foliicola* Lister

Syn: *Badhamia alpina* G. Lister

Specimen examined: Turkey: Batman Province, altitude 575 m, plastic petri dishes, 25.04.2018, Altaş, 5, Hasankeyf, altitude 485 m, on litter thorns, 01.01.2017, Altaş 74, F/4, FC-MC, D/C.

19- *B. panicea* (Fr) Rostaf.

Syn: *Physarum paniceum* Fr.

Specimen examined: Turkey: Batman province, High school, altitude 552 m, on plant debris, 14.05.2018, Altaş, 84, Hasankeyf, altitude 485 m, on litter bark, 01.01.2017, Altaş 73, F/2, FC-MC, D/O.

20- *Fuligo septica* F.H. Wigg.

Syn: *Aethalium septicum* (L.) Fr.

A. septicum (L.) Fr. f. *septicum*

A. septicum (L.) Fr. var. *septicum*

F. septica (L.) F.H. Wigg. f. *septica*

F. varians Sommerf.

Mucor septicus L.

Reticularia septica (L.) With.

Specimen examined: Turkey: Batman province, Dilek village, altitude 625 m, on plastic petri dishes, 02.06.2018, Altaş, 192, F/1, MC, D/O.

21- *Physarum album* (Bull.) Chevall.

Syn: *Mucor albus* (Bull.) Sobol.

Sphaerocarpus albus Bull.

Stemonitis alba (Bull.) J.F. Gmel.

Tilmadoche alba (Bull.) T. Macbr.

Trichia alba (Bull.) Raeusch.

Specimen examined: Turkey: Batman province, Hasankeyf town, altitude 485 m, on rash wood, 14.05.2018, Baba, 77, F/1, MC, D/O. Baba, 77

22- *P. cinereum* (Batsch) Pers.

Syn: *Badhamia cinerea* (Batsch) J. Kickx

Didymium cinereum (Batsch) Fr.

Lignydidium cinereum (Batsch) Kuntze

Lycoperdon cinereum Batsch,

Specimen examined: Turkey: Batman province, Bıçakçı village, altitude 570 m, on litter thorns and fallen twigs, 02.06.2018, Altaş, 61, F/2, FC, D/O.

23- *P. leucophaeum* Fr. & Palmquist

Syn: *Physarum nutans* subsp. *leucophaeum* (Fr.) G. Lister

P. nutans var. *leucophaeum* (Fr.) Lister

Tilmadoche leucophaea (Fr.) Fr.

Specimen examined: Turkey: Batman province, High school, altitude 552 m, on leaf litter, 17.05.2018, Altaş, 8, F/1, MC, D/O.

24- *P. leucopus* Link

Syn: *Didymium leucopus* (Link) Fr.

D. squamulosum var. *leucopus* (Link) Berl.

Lignydidium leucopus (Link) Kuntze

Specimen examined: Turkey: Batman province, Cemetery, altitude 575 m, on decaying bark, 21.04.2018, Altaş, 131; Yeniköy, altitude 530 m, on wood, 19.05.2018, Altaş, 261, F/4, MC, D/C.

25- *P. notabile* Macbr.

Syn: *Didymium connatum* Peck,

Physarum connatum (Peck) G. Lister

Specimen examined: Turkey: Batman province, Yeniköy, altitude 530 m, on bark, 02.06.2018, Altaş, 30; Hasankeyf, altitude 485 m, on wood, 07.10.2017, Altaş, 28, F/2, MC, D/O.

26- *P. robustum* (Lister) Nann-Bremek

Syn: *Physarum nutans* var. *robustum* Lister,

Specimen examined: Turkey: Batman province, altitude 575 m, on leaf litter, 01.10.2017, Altaş, 17; Cemetery, altitude 575 m, on leaf litter, 02.01.2018, Altaş, 140; Hasankeyf, altitude 485 m, on wood, 14.05.2018, Altaş, 11; School, altitude 497 m, on leaf litter, 10.11.2017, Altaş, 7, F/4, MC, D/O.

27- *P. verum* Sommerf.

Syn: *Badhamia verna* (Sommerf.) Rostaf.

Physarum styriacum Gottsb.,

Specimen examined: Turkey: Batman province, Yeniköy, altitude 530 m, on fallen twigs, 19.05.2018, Altaş, 215, F/1, MC, D/O.

28- *P. viride* (Bull.) Pers.

Syn: *Physarum nutans* var. *viride* (Bull.) Fr.

P. nutans β *viride* (Bull.) Fr.

P. viride (Bull.) Pers.

P. viride (Bull.) Pers. f. *viride*

Sphaerocarpus viridis Bull.

Stemonitis viridis (Bull.) J.F. Gmel.

Tilmadoche mutabilis Rostaf. var. *mutabilis*

T. viridis (Bull.) Sacc.

T. viridis (Bull.) Sacc. var. *viridis*

Trichia viridis (Bull.) Raeusch.

Specimen examined: Turkey: Batman province, Bıçakçı village, altitude 567 m, on leaf litter, 02.06.2018, Altaş, 271, F/1, FC, D/O.

Stemonitida

Stemonitidaceae

29- *Comatricha ellae* Hark.

Syn: *Comatricha nannengae* Härk.,

Specimen examined: Turkey: Batman province, High school, altitude 552 m, on wood, 06.02.2017, Altaş, 231, F/1, MC, D/O.

30- *C. laxa* Rostaf.

Syn: *Stemonitis laxa* (Rostaf.) Masee

Specimen examined: Turkey: Batman province, Atatürk park, altitude 580 m, on pine cone, 01.10.2017, Altaş 27, F/1, MC, D/O.

31- *C. nigra* (Pers. ex J.F.Gmel.) J.Schröt.

Syn: *Comatricha obtusata* Preuss,

Comatrichoides nigra (Pers.) Hertel,

Stemonitis atrofusca β *nigra* Pers.

S. nigra Pers. ex J.F. Gmel.

S. obtusata Fr.

S. ovata var. *atrofusca* (Pers.) Alb. & Schwein.

S. ovata var. *nigra* (Pers. ex J.F. Gmel.) Pers.

Specimen examined: Turkey: Batman province, Atatürk park, altitude 580 m, on pine cone, 25.04.2018, Altaş, 29, F/1, MC, D/O.

32- *Lamproderma arcyrioides* (Sommerf.) Rostaf

Syn: *Lamproderma violaceum* Rostaf.

L. violaceum var. *arcyrioides* (Sommerf.) Torrend

Stemonitis arcyrioides Sommerf.

S. violacea Fr.

Specimen examined: Turkey: Batman province, High school, altitude 552 m, on leaf litter, 24.01.2018, Altaş, 75, F/6, FC, D/A.

33- *Stemonitopsis amoena* (Nann.-Bremek.)

Syn: *Comatricha amoena* Nann.-Bremek.

Specimen examined: Turkey: Batman province, Hasankeyf, altitude 485 m, on twigs, 14.05.2018, Altaş, 11, F/2, MC, D/O.

Within the scope of this study conducted in Batman Central and Hasankeyf district, a total of 33 species belonging to 5 ordo, 7 families and 12 genus were determined. 702 substrate samples were collected from the research area and used to prepare moist chamber cultures in the laboratory. A total of 163 myxomycete recorded. Overall, 114 (70%) of these samples were obtained with the moist chamber technique. 49 species (30%) were from field collection. It is known that myxomycetes are mostly invisible and the collection rate in the land is low. In a study conducted in the forests of Istanbul, Belgrade, 251 myxomycete were recorded and only 71 of them were collected from the natural environment (Oran et al., 2006). In another study, 23% (7) of the species defined from İzmir were obtained from the natural environment and 77% (23) of them were from moist chamber culture studies (Oskay and Tüzün 2015). In other study, 7 of the samples identified from Hatay province were obtained from their natural habitats and 115 from moist chamber culture (Baba and Doğan 2018). The vast majority of the species obtained in this study were also obtained in the laboratory from the moist chamber culture.

In this study, 33 taxa belonging to 7 different families were obtained. Considering the distribution of these families, genus numbers were as follows *Echinosteliaceae* (1), *Liceaceae* (3), *Reticulariaceae* (1), *Arcyriaceae* (3), *Didymiaceae* (8), *Physaraceae* (12) and *Stemonitidaceae* (5). Among these, *Physaraceae*, *Didymiaceae*, *Stemonitidaceae* families contain 25 out of 33 taxa. These percentages of the related ordo and families are in line with the studies conducted in Turkey (Yağız and Afyon, 2005; Ergül and Akgül, 2011; Oskay and Tüzün., 2015; Baba, et al., 2019). The genus and species numbers detected in this research field are represented by *Didymium* 8, *Physarum* 8, *Badhamia* 3, *Comatricha* 3, *Licea* 3, *Perichaena* 2, *Arcyria* 1, *Echinostelium* 1, *Fuligo* 1, *Lamproderma* 1, *Reticularia* 1, *Stemonitopsis* 1 species.

In this study, only one species of the genus *Echinostelium* was determined. It was observed that this sample was less common in previous studies (Oran et al., 2006; Demirel et al., 2006; Yağız and Afyon, 2006; Baba et al., 2018). In this study, species of the genus *Didymium* and *Physarum* were found the most. In previous studies, it was also more common to examples of this breed in the world and Turkey. The world and the most common of the species known in Turkey, *Didymium* (world: 93, Turkey: 23) and *Physarum* (World: 149, Turkey: 38) is located within the genus (Baba and Sevindik, 2019; Lado, 2020).

According to the results, the ratio of the number of species to the number of genera (S/G) is used as an indicator of taxonomic diversity. The low rate of this rate indicates that the taxonomic diversity is high, and the high rate is the indication that the taxonomic

diversity in the study is low (Stephenson et al., 1993). In this study, S/G ratio is 2.75. It was calculated as 2.24 for Southeast India and 4.13 for North America, in temperate or tropical regions S/G value has been reported to be between 2.2 and 4.6 (Stephenson and Stempen, 2000). In studies conducted in Turkey, the S/G ratio of 2.3 (Baba, 2015), 1.8 (Baba and Zümre, 2015), 2.7 (Baba et al., 2016), 2.38 (Baba and Atay 2019), 2.42 (Baba and Arslan 2017), 2.66 (Baba and Doğan 2018) and 2.04 (Baba et al 2019).

Density of each of the 33 taxa in 163 myxomycete record gives the degree of abundance of the taxa. Abundance estimates of the species are based on the ratio of the species to the total number of samples (Stephenson et al., 1993). Considering the abundance of samples, 24 of 33 species were found between 0.5-1.5% and rare (O), 4 of them between 1.5-3% and common (C), 5 of them were larger than 3% and abundant (A). Among the species obtained, *Didymium annulisporum*, *D. difforme*, *D. megalosporum*, *D. squamulosum* and *Lamproderma arcyrrioides* were detected in almost all stations as abundant species. The reason for this may be that these species are cosmopolitan and their ecological tolerance is high. *D. squamulosum* was determined as the densest species with 48 record in 6 locations. The altitude value of the related sample has been found in different locations and different substrates. Apart from that, *D. difforme* (46) is the densest species after *D. squamulosum*.

CONCLUSION

As a result of the studies, 33 taxa belonging to 5 ordo, 7 families and 12 genera were determined and contributed to mycetezoa of Batman and Turkey. A total of 163 myxomycete recorded, 114 (70%) of were obtained with the moist chamber technique and 49 species (30%) are field collection. Among these, *Physraceae*, *Didymiaceae*, *Stemonitidaceae* families contain 25 out of 33 taxa. In this study, species of the genus *Didymium* and *Physarum* were found the most. Considering the abundance of samples, 24 of 33 species were found between 0.5-1.5% and rare (O), 4 of them between 1.5-3% and common (C), 5 of them were larger than 3% and abundant (A). In this study, S/G ratio is 2.75 and this rate indicates that the taxonomic diversity of myxobiota in Batman province is high.

Acknowledgment

This study was supported by Mustafa Kemal University Scientific Research Projects Commission (Project No: 18.YL.014).

Contribution of Authors

The authors declare that they have contributed equally to the article.

Conflict of Interest

Article authors declare that there are no conflicts of interest among them.

REFERENCES

- Alaeddinoglu F 2010. The Functional Characteristics and Primary Problems of the Batman City. Eastern Geographical Review 15(24): 20-42.
- Alexopoulos CJ, Mims CW, Blackwell M 1996. Introductory Mycology, 4.th Edition, John Wileyand Sons Inc., New York.
- Alvarado C, Stephenson S 2017. Myxomycetes: Biology, Systematics, Biogeography and Ecology Academic Press, p 474, USA.
- Baba H, Tamer AÜ 2007. A study on the Myxomycetes in Manisa. Ot Sistematik Botanik Derg 14(2): 179-196.
- Baba H 2015. Investigation of Myxomycetes diversity on Kuseyr Mountain; Three new records in Hatay/Turkey. Fresen Environ Bull 24(11):4077-4086.
- Baba H, Zümre M 2015. Myxomycetes of Alan Plateau (Hatay). The Journal of Fungus 6(1): 1–9.
- Baba H, Zümre M, Gelen M 2016. An Investigation on North Adana (Turkey) Myxomycetes. Chiang Mai Journal of Science 43(1): 54-67.
- Baba H, Arslan Ç 2017. Myxomycetes of North Amanos Mountains (Hatay/Turkey). Biological Diversity and Conservation 10(3): 88-95
- Baba H, Doğan Y 2018. Investigation of Myxomycetes (Myxomycota) in South Amanos Mountains (Hatay-Turkey), Celal Bayar University Journal of Science 14(3): 277-284
- Baba H, Gelen M, Sevindik M 2018. Taxonomic investigation of myxomycetes in Altınözü, Turkey. Mycopath 16(1): 23-31.
- Baba H, Atay M 2019. Myxomycetes of Kumlu and Reyhanlı districts of Hatay/Turkey province. Biological Diversity and Conservation 12(2): 41-50.
- Baba H, Cennet E, Sevindik M 2019. Investigation of Myxomycetes (Myxomycota) in Kırıkhan (Hatay Province). Commun Fac Sci Univ Ank Series C 29(2):160-169.
- Baba H, Sevindik M 2019. Mycetezoa of Turkey (Checklist). Mycopath 17(1):1-14.
- Baba H, Sevindik M 2020. Myxomycetes of Eşmişek Plateau (Kırıkhan-Hatay). Kahramanmaraş Sütçü İmam Üniversitesi Tarım ve Doğa Dergisi 23(4): 917-923.
- Baba H, Gündoğdu F, Sevindik M 2021. Myxomycetes biodiversity in Gaziantep Province (Turkey) with four new records. Phytotaxa 478(1): 105-118.
- Demirel G, Kaşık G, Öztürk C 2006. Myxomycetes of Kestel Forest (Kadınhanı, Konya). Turkish Journal of Botany 30: 441–447.
- Ergül CC, Akgül H 2011. Myxomycete diversity of Uludağ national park, Turkey. Mycotaxon 116:479.

- Ergül CC, Dülger B, Oran RB, Akgül H 2005a. Myxomycetes of the western Black Sea Region of Turkey. *Mycotaxon* 93: 362
- Ergül CC, Dülger B, Akgül H 2005b. Myxomycetes of Mezit stream valley of Turkey. *Mycotaxon* 92: 239-242
- Ergül CC, Akgül H, Oran RB 2016. New records of Mycetozoa taxa from Turkey. *Oxidation Communications* 39(2): 1615-1623.
- Everhart SE, Keller HW 2008. Life history strategies of corticolous myxomycetes: the life cycle, plasmodial types, fruiting bodies, and taxonomic orders. *Fungal Diversity* 29: 1-16.
- Farr ML 1976. *Flora Neotropica*. Monograph No:16. N.Y. Bot. garden.
- Farr ML 1981. *True Slime Molds*. Wm. C. Brown Comp., p. 132, Dubuque Iowa.
- Gilbert HC, Martin GW 1933. Myxomycetes found on the bark of living trees. *Iowa Iowa Stud Nat Hist* 15(3): 3-5.
- Lado, C 2005-2021. An on line nomenclatural information system of Eumycetozoa. Real Jardín Botánico, CSIC. Madrid, Spain. <https://eumycetozoa.com> (date when consulted).
- Lado C 2020. An online nomenclatural information system of Eumycetozoa. Real Jardín Botánico, CSIC. Madrid. Last updated, March 04, 2020 <http://www.nomen.eumycetozoa.com>
- Martin GW, Alexopoulos CJ 1969. *The Myxomycetes*. University of Iowa press, p. 560, Iowa City.
- Martin GW, Alexopoulos CJ, Farr ML 1983. *The Genera of Myxomycetes*. Univ. of Iowa Pres., p. 438, Iowa City.
- Neubert H, Nowotny W, Baumann K 1993. *Die Myxomyceten (Band I)*. Karlheinz Baumann Verlag Gomaringen.
- Neubert H, Nowotny W, Baumann K 1995. *Die Myxomyceten (Band II)*. Karlheinz BaumannVerlag Gomaringen.
- Neubert H, Nowotny W, Baumann K, Marx H 2000. *Die Myxomyceten (Band III)*. Karlheinz BaumannVerlag Gomaringen.
- Ocak İ, Hasenekoğlu I 2003. Myxomycetes from Erzurum, Bayburt and Gümüşhane Provinces. *Turk J Bot* 27: 223-226.
- Oran RB, Ergül CC, Dülger B 2006. Myxomycetes of Belgrad Forest (Istanbul). *Mycotaxon* 97: 183-187.
- Oskay M, Tüzün Ö 2015. Determination the myxobiota of Kemalpaşa and surrounding (İzmir). *Celal Bayar Univ J Sci* 11:59-68.
- Stephenson SL, Stempen H 2000. *Myxomycetes: A handbook of slime molds*. Portland.Oregon: Tim Press
- Stephenson SL, Kalyanasundaram I, Lakhanpal TN 1993. A comparative biogeographical study of myxomycetes in the mid-Appalachians of eastern North America and two regions of India. *Journal of Biogeogr* 20: 645-657.
- Stephenson SL 2003. *Fungi of New Zealand Vol. 3: Myxomycetes of New Zealand*. Hong Kong: Fungal Diversity Press. 238 p.
- Stephenson SL, Stempen H 1994. *Myxomycetes: A Handbook of Slime Molds*. Timber Press, Portland, Oregon, USA.
- Thind KS 1977. *The Myxomycetes of India*. I.C.A.R., p.702, New Delhi.
- Yağız D, Afyon A 2005. A study on the myxomycetes of Seydişehir (Konya) District. *Afyon Kocatepe Üniversitesi Fen Bilimleri Dergisi* 5(1): 55-60.
- Yağız D, Afyon A 2006. Myxomycete flora of Derebucak (Konya) and Akseki (Antalya) districts in Turkey. *Mycotaxon* 96: 257-260
- Zümre M, Baba H, Sevindik M 2019. Investigation of myxomycetes in Selcen Mountain (Turkey) and its close environs. *Eurasian Journal of Forest Science* 7(3): 284-292.