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Research Note

Myxomycetes from Erzurum, Bayburt and Gümüşhane Provinces (Turkey)

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Abstract: The myxomycete flora of Erzurum, Bayburt and Gümüşhane provinces was investigated. Thirty-one myxomycete species were isolated in moist chamber culture. *Licea tuberculata* G.W.Martin, *Physarum leucopus* Link and *Didymium crustaceum* Fr. are new records for Turkey.

Key Words: myxomycetes, flora, new records, Turkey

Erzurum, Bayburt ve Gümüşhane'nin Myxomycetes'leri

Özet: Bu çalışmada Erzurum, Bayburt ve Gümüşhane illerinin myxomycetes florası araştırılmıştır. Nemli oda kültüründen 31 myxomycetes türü izole edilmiştir. *Licea tuberculata* G.W.Martin, *Physarum leucopus* Link ve *Didymium crustaceum* Fr. Türkiye için yeni kayıtlardır.

Anahtar Sözcükler: myxomycetes, flora, yeni kayıtlar, Türkiye

Introduction

True slime molds, or myxomycetes, are protists. They occur in moist places, feed on micro-organisms, and have a number of unique biological features. Myxomycetes are cosmopolitan and can be found in a variety of different habitats. They are most common in moist temperate forests; however, they are also found in tropical forests, grasslands, alpine regions, the Arctic and Antarctic and even in deserts. While some species are very widely distributed, others are restricted to certain habitats, or extreme substrates such as dung and cacti (Alexopoulos et al., 1996; Stephenson & Stempen, 2000).

In addition to substrates, moisture and temperature are also important for myxomycetes. There are myxomycete fructifications throughout the year in some northern temperate regions. However, not all species may be found at all times. Some are more abundant in spring, some in the middle of summer and others in early autumn (Alexopoulos et al., 1996).

Myxomycetes have proved to be valuable experimental organisms, not only for mycologists, but also for cytologists, geneticists, molecular biologists, biochemists and biophysicists. They are also ideal tools for experimental studies such as the mitotic cycle, morphogenesis, the chemical changes that govern reproduction, aging and a variety of other questions challenging scientists (Therrien, 1966; Aldrich, 1967; Aldrich & Mims, 1970; Mims, 1972; Collins et al., 1978; Morita & Nishi, 1993; Smith, 1994).

Myxomycetes from Turkey were first extensively published by Harkonen & Uotila (1983), Harkonen (1987) and Lado (1994). So far, however, only 133 species have been reported in Turkey (Ergül & Dülger, 2000; 2002a; 2002b). Thus, the myxomycete flora of Erzurum, Bayburt and Gümüşhane provinces has not been investigated at present. In this study, we performed floristic research to uncover myxomycetes found in these rather unsuitable environments for myxomycete growth.

Description of the research area

The research areas are Erzurum, Bayburt and Gümüşhane provinces. In 1999 and 2000, several excursions in various months were made to the above provinces and samples were collected.

Erzurum is in eastern Anatolia, which has a harsh-continental climate. Its average temperature over 42 years is 6 ºC. In this province, temperatures do not fall below zero from April to November, but from December to March they usually do. The annual rainfall is 447.4 mm (Doğanay et al., 1998).

The majority of land around Erzurum is in natural steppe areas. Grasslands are damaged because of excessive grazing. Only 7% of the whole land area of Erzurum is covered with forest (Doğanay et al., 1998).

The city of Bayburt is in the Bayburt valley at an altitude of 1400-1700 m. The climate in the Bayburt valley and its surroundings has continental characteristics. Its annual average temperature is 7 ºC and its annual rainfall is 434 mm. The dominant vegetation is steppe, excluding small forests composed of pine, oak and juniper trees (Yazıcı, 1995).

The annual average temperature in Gümüşhane and its surroundings is 10 ºC, and its climate has characteristics between the eastern Anatolia and eastern Black Sea region climates. The general vegetation is steppe from the valley basin to higher lands, except for cultivated fields. On higher lands, forests composed of pine, juniper, oak and fir are seen (Özey, 1991).

Methods

The samples were collected in a systematic manner from collection localities, chosen randomly from the provinces. However, they were distributed rather equally among various altitudes, throughout roadsides, woodlands and steppe areas.

During the visits to the above regions, the bark and wood of decaying stumps, the bark of living trees, decaying leaves, pieces of fallen twigs, the humus layer on the soil, and decaying needles and cones were collected and put in moist chamber culture so that myxomycetes could grow (Martin & Alexopoulos, 1969; Lakhanpal & Mukerji, 1981).

As mounting medium, Amman's lactophenol, Hoyer's, Hantsch's fluid, KOH 3% solution and water were used. The samples were preserved in the first three media without changing any of their physiological properties (Farr, 1981; Martin et al., 1983).

Results and Discussion

Samples were collected from 27 locations on nine trips to Erzurum, Bayburt and Gümüşhane on different dates and they were examined in the laboratory.

As a result of determinations of myxomycetes, which grew in moist chamber culture, 31 species were isolated. The species list and number of samples, localities and substrates are shown in Table 1.

A fairly good flora was found in the study area despite climatic difficulties and geographic conditions.

Because of the climatic conditions and relatively shorter fructification time, no myxomycetes, with fruiting bodies, were collected from natural habitats in Erzurum, Bayburt or Gümüşhane provinces.

There are some species restricted to Erzurum; they are *Licea tuberculata* G.W.Martin, *Licea tenera* E.Jahn, *Trichia decipiens* (Pers.) T.Macbr., *T. botrytis* (J.F.Gmel.) Pers. *Physarum auriscalpium* Cooke, *P. cinereum* (Batsch) Pers., *P. leucopus* Link, *P. pusillum* (Berk & M.A.Curtis) G.Lister, *Didymium crustaceum* Fr., *D. squamulosum* (Alb. & Schwein) Fr. and *Comatricha lurida* Lister. These species were generally found on the bark and rotten logs of *Populus* L. sp., *Salix* L. sp. *Licea tuberculata* (on pieces of twig), *Trichia decipiens* (on mixed litter). *Physarum leucopus* and *Physarum pusillum* (on bark of *Populus* sp.), *Didymium crustaceum* (litter under Rosa canina L.) and *Comatricha lurida* (on bark of *Salix* sp.) are observed only in single samples (Table 1). The species seen only in Gümüşhane and Bayburt provinces are *Licea castanea* G.Lister, *Licea denudescens* H.W.Keller & T.E.Brooks (on bark of *Salix* sp.), *Arcyria cinerea* (Bull.) Pers., *A. nutans* (Bull.) Grev., *A. versicolor* W.Pill. *Badhamia panicea* (Fries) Rostaf (on bark of *Populus* sp.), *B. foliicola* Lister (on bark of *Populus* sp. and *Salix* sp.), *Stemonitis hyperopta* Meyl., *Comatricha nigra* (Pers.) Schroet and *Enerthenema papillatum* (Pers.) Rostaf. (on bark of *Pinus sylvestris* L.). These species were also observed only in single samples except for *B. foliicola* (Table 1).

The substrates on which myxomycetes were found, are various. We observed that myxomycetes grow especially on the barks of pines, poplars and willows. Besides these, fructifications were found on the bark of various fruit trees, fallen leaves, cones, pieces of twig, and humus masses. This is a normal occurrence also seen in the literature (Harkonen & Ukkola, 2000; Stephenson 1988).

Table 1. The species of myxomycetes in the research area, their sample number, localities, and substrates.

taxa	sn	localities	substrates
Arcyria cinerea (Bull.) Pers.	1	1f	bark c
A. nutans (Bull.) Grev.	1	1a	bark c
A. pomiformis (Leers) Rostaf.	3	1a, 2d, 2f	bark c, litter c
A. versicolor W.Phill.	1	1a	bark c
Badhamia foliicola Lister	2	1c, 1d	bark d, wood
B. macrocarpa (Ces.) Rostaf.	3	1c, 2e	bark d
B. panicea (Fries) Rostaf.	1	1d	bark d
Badhamiopsis ainoae (Yamash.) T.E.Brooks & H.W.Keller	4	1b, 1c, 2e, 2g	bark d
Comatricha lurida Lister	1	2e	bark d
C. nigra (Pers.) Schroet.	1	1a	bark c
Dictydium cancellatum (Batsch.) T.Macbr.	5	1c, 2d, 2e, 2f	bark c, bark d, litter m, wood
Didymium crustaceum Fr.	1	2b	litter d
D. quitense (Pat.) Torrend	9	1b, 1c, 2e, 2g	litter d
D. squamulosum (Alb. & Schwein.) Fr.	2	2e	litter d
Echinostelium minutum de Bary	3	1a, 1d, 2f	litter c, litter m
Enerthenema papillatum (Pers.) Rostaf.	1	1a	bark c
Licea castanea G.Lister	1	1b	bark d
L. denudescens H.W.Keller & T.E.Brooks	1	1b	bark d
L. tenera E.Jahn	2	2e	bark d
L. tuberculata G.W.Martin	1	2e	litter m
Perichaena corticalis (Batsch) Rostaf.	3	1b, 1c, 2g	bark d
P. vermicularis (Schwein.) Rostaf.	2	1b, 2g	bark d
Physarum auriscalpium Cooke	3	2e	bark d, litter d
P. cinereum (Batsch) Pers.	5	2e	bark d, wood
P. leucopheum Fr.	2	1b, 2e	bark d
P. leucopus Link	1	2e	bark d
P. notabile T.Macbr.	6	1b, 2a, 2b, 2c, 2e	bark d, litter d
P. pusillum (Berk. & M.A.Curtis) G.Lister	1	2g	bark d
Stemonitis hyperopta Meyl.	1	1a	bark c
Trichia botrytis (J.F.Gmel.) Pers.	2	2d, 2f	bark c, litter c
T. decipiens (Pers.) T.Macbr.	1	2f	litter m

Abbreviations: sn = sample number bark c = coniferous bark; bark d = deciduous bark; litter c = coniferous litter; litter d = deciduous litter; litter m = mixed litter, needle, cone, fallen broad leaves; wood = coniferous wood or deciduous wood.

1. Gümüşhane and Bayburt provinces.

a. Trabzon-Gümüşhane road, Gümüşhane province border, b. Gümüşhane Akçakale district c. Gümüşhane, Akçahisar d. Gümüşhane-Bayburt road Bayburt province border.

2. Erzurum province.

a. Pasinler district, Porsuk Göleti surroundings, b. Çat district, district centre, c. Karayazı district, d. Oltu district, Oltu Forest, e. Olur district Taşlıçay village, f. Şenkaya district, Şenkaya Forest, g. Bayburt-Aşkale road, about 6 km from Aşkale.

Dictydium cancellatum (Batsch.) T.Mabr. grew on almost every substrate. On the other hand, rare species such as *Arcyria cinerea*, *Physarum pusillum* and *Didymium crustaceum* were only found on certain substrates (Table 1). We observed that the species of *Didymium* Schrad. grow on leaf litter. Although this species-substrate relation is regarded as a reflection of ecological and physiological characteristics, these species are also found on different substrates (Stephenson & Stempen, 2000).

In our study, we observed that most of the species prefer bark to litter and wood in moist chamber culture. Surface conditions, pH, water-retention capacity and nutrient content of bark are the factors that influence the preference for bark. Furthermore, growing myxomycetes on coniferous barks is more luxurious because coniferous barks are more acidic than broad-leaved trees barks (Stephenson & Stempen, 2000).

In conclusion, there is a fairly rich myxomycete flora in our research area. The species obtained in our study are similar to those obtained from similar environments in different parts of the world. There are some new records for Turkey. These are *Licea tuberculata*, *Physarum leucopus*, and *Didymium crustaceum* (Ergül & Dülger, 2000; 2002b).

As myxomycete research is very limited in Turkey, new records and new taxa are likely to be found in future studies.

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