

## Diversity and Ecology of Myxomycetes from Kütahya and Konya (Turkey) with Four New Records

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### ABSTRACT

In this study, we examined myxomycetes that developed in moist chamber cultures of substrata material collected from Kütahya and Konya provinces in Turkey. We collected bark samples from living trees, plant litter from the ground, standing dead wood or stumps, and downed and decayed wood or bark and placed them in the moist chamber cultures. We identified 36 species belonging to 12 genera of myxomycetes. The species determined are listed, and four new records, *Didymium balearicum* Ing, *Macbrideola oblonga* Pando & Lado, *Paradiacheopsis erythropodia* (Ing) Nann–Bremek. and *Perichaena pedata* (Lister & G. Lister) G. Lister, are added to the mycoflora of Turkey.

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Diversity; new records; moist chamber culture; myxomycetes; Turkey

## 1. Introduction

Myxomycetes, or plasmodial slime moulds, are very common, they occur widely and been recorded throughout the world, and they are well known from temperate forests to alpine and arctic ecosystems [1–5]. Myxomycetes are eukaryotic microorganisms, which occur in association with decaying plant material in terrestrial ecosystems. During the life cycle of a typical myxomycete, there are two vegetative stages comprising uninucleate amoebae (with or without flagella) and multinucleate motile plasmodia, which are influenced greatly by temperature and humidity [2]. Myxomycetes are a small and relatively homogeneous group, and approximately 900 species have been identified [6]. The number of myxomycete species recognised was roughly 422 [2] compared with the most recent estimates of 600 [7] and 925 [8]. Schnittler and Mitchell [9] cited 1012 subgeneric taxa of myxomycetes that have been described as valid, including 866 at the species level, and Lado [10] noted 900 legitimate names for accepted species.

Myxomycetes of Turkey are not known completely [11]. The first accounts of slime moulds in Turkey were described by Lohwag [12], who recorded *Lyogala epidendrum* for the first time in Turkey. Other reports dealing with myxomycetes were also provided [13–30]. Sesli et al. [31] listed a total of 252 species of myxomycetes from Turkey. The present study supplements the checklist with

additional records of myxomycetes obtained from Konya and Kütahya provinces.

## 2. Materials and methods

### 2.1. Study area

This study was performed in Kütahya and Konya provinces. Konya is located between 36°41' and 39°16'N latitude and 31°14' and 34°26'E longitude, where the Konya Closed Basin covers a wide range in the north–south direction in the Central Anatolia region. Therefore, different climatic characteristics are found in Konya, whereas in the south of the basin there is a Mediterranean climate with hot and dry summers and mild rainy winters, the middle and north have a continental climate with cold winters and hot and dry summers. Ilgın is a district of Konya province, and a continental climate prevails in this area. Ilgın is located between 38°16'N and 31°53'E. The elevation of Ilgın is 1,034 m, with an average annual total precipitation of 417 kg/m<sup>2</sup> and annual average temperature of 10.8 °C [32].

Kütahya is located between 39°25'N latitude and 29°58'E longitude in the inner Aegean region. The climate of Kütahya and its surrounding area comprise a transition between that of the Aegean, Marmara and Central Anatolia regions. Thus, in terms of climate and temperature, Kütahya has characteristics of each of the three regions. The temperature conditions in Kütahya are influenced by

the Central Anatolia region, and the rainfall conditions are affected by the Marmara region. The summers are hot and dry, highest temperature is 38.6 °C, and the winters are cold and rainy, lowest temperature is -28.1 °C in this province. The elevation of Kütahya is 969 m, with an annual average temperature of 10.5 °C and average annual total precipitation of 565.4 kg/m<sup>2</sup> [33].

## 2.2. Substrata sampling

We collected samples from dead outer bark of living trees (mostly fruit trees), litter, standing dead wood or stumps and downed and decayed wood or bark from several trees in each of the localities visited in Konya and Kütahya. All of the bark and litter samples were placed in small paper bags and used to prepare moist chamber cultures as described by Stephenson and Stempen [34]. Ilgın district (38°16' 46.32"N, 31°54' 53.90"E) and Aşağıçığıl village (38°02' 58.51"N, 31°51' 48.4321"E) were the sampling localities in Konya province. Bark samples from Konya province were collected from *Pinus nigra* Arn. *Corylus* sp. and *Prunus armaniaca* L. (apricot). Çamlıca street (39°26' 09.00"N, 29°54' 58.59"E), Güveççi (39°26' 38.8507"N, 29°54' 32.52"E), Sofu (39°27' 03.52"N, 29°53' 30.30"E), Demirciören (39°26' 40.19"N, 29°51' 56.49"E) and Dere Köy villages (39°27' 15.80"E, 29°49' 51.18"E) were the sampling localities in Kütahya province. The trees sampled comprised *Prunus domestica* L. (plum), *Prunus cerasus* L. (sour cherry), *Juglans regia* L., *Pyrus* sp. (pear), *Malus domestica* Borkh. (apple), *Malus* sp. (apple), *Pyrus communis* L. (pear) and *Populus* sp. from Kütahya.

## 2.3. Moist chamber culture

The moist chambers used consisted of glass Petri dishes (9 cm in diameter) lined with filter paper. The samples were moistened with distilled water. After 24–48 h, any unabsorbed water was decanted. Cultures were kept at room temperature (20 °C–25 °C) in diffuse daylight and examined with a stereomicroscope on a regular basis for a period of up to several months to detect fruiting bodies. When necessary, a small amount of water was added to each culture to maintain the moist conditions. Myxomycete fruiting bodies were noted and recorded each time when the cultures were checked. As soon as the fruiting bodies were considered to be fully mature, the portion of the substrate on which they were located was removed from the moist chamber and air dried.

Identification was based on the keys provided previously [2,7,35–43]. Sporocarps collected from

the moist chambers were preserved as permanent slides using lactophenol or glycerol gelatin.

## 3. Results and discussion

We identified 36 species belonging to 12 genera of myxomycetes from different substrates, especially the bark of living trees, litter bark, wood, and leaf litter. All of the identified species were obtained from moist chamber cultures. The percentages of species belonging to different orders were as follows: *Physarales* (38.9%), *Trichiales* (22.2%), *Liceales* (19.4%), *Stemonitales* (16.7%), and *Echinosteliales* (2.8%). Four new taxa were added to the Turkish myxomycetes flora as new records: *Didymium balearicum* Ing, *Macbrideola oblonga* Pando & Lado, *Paradiacheopsis erythropodia* (Ing) Nann–Bremek, and *Perichaena pedata* (Lister & G. Lister) G. Lister [31].

In the following list, the recorded myxomycetes are arranged alphabetically by genus and then by species. This list includes information regarding the epithet, author, locality, habitat, altitude, collection date, and private herbarium number for each taxon.

### 3.1 List of species

#### 3.1.1. Echinostitales

*Echinostelium minutum* de Bary in Rostafinski Vers. Syst. Mycetozoen (Strassburg): 7, (1873).

**Specimen examined – Turkey:** Kütahya Prov.: Sofu village, altitude 990 m, on bark of living *Prunus domestica*, March 22 2008, Ocak 44, with *Stemonitis herbatica*.

#### 3.1.2. Liceales

*Licea biforis* Morgan J. Cincinnati Soc. Nat. Hist. 15: 131 (1893).

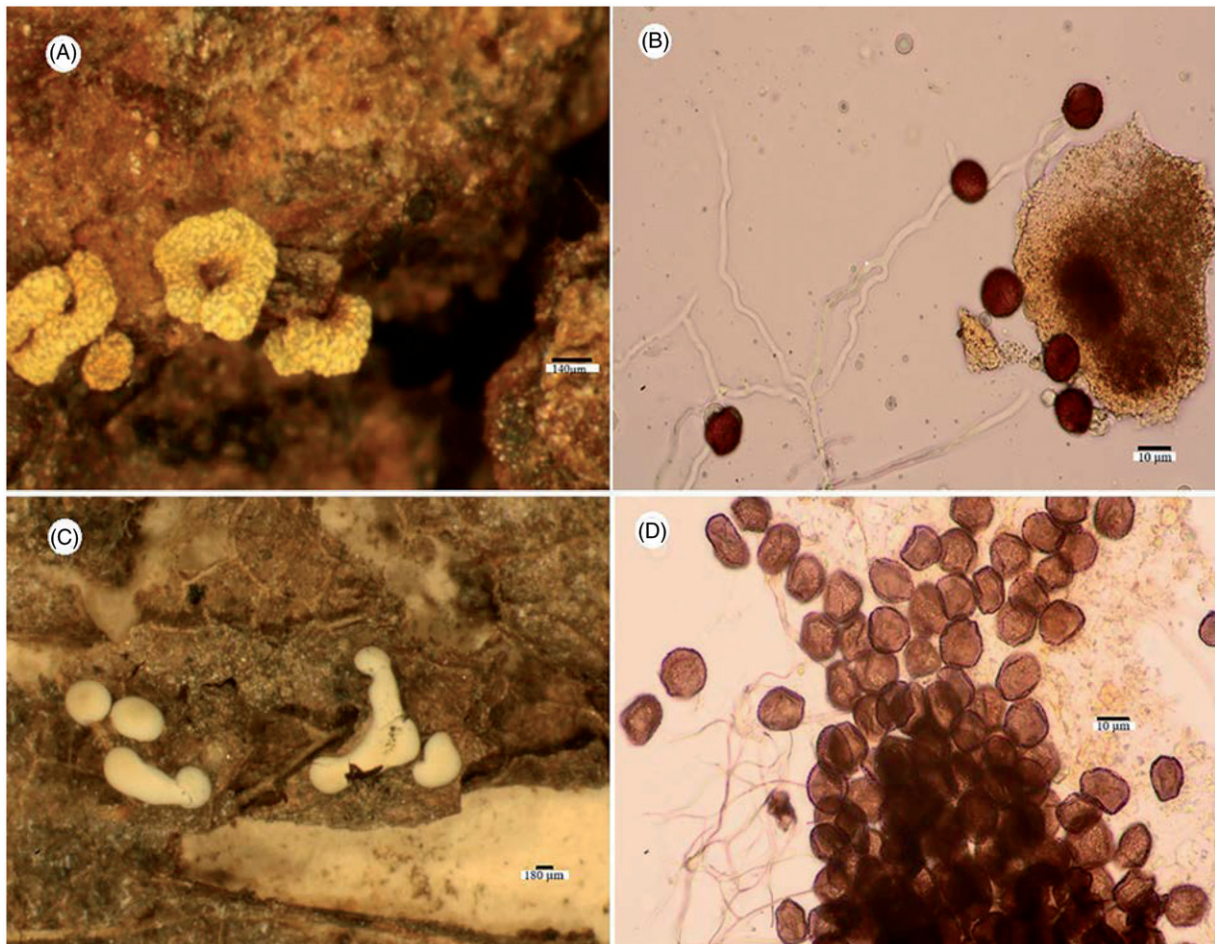
**Specimen examined – Turkey:** Kütahya Prov.: Çamlıca village, altitude 1 025 m, on bark of living *Malus domestica*, March 23 2008, Ocak 7, with *Licea synsporos* and *Trichia contarta*.

*Licea castenea* G. Lister J. Bot., Lond. 49: 61 (1911).

**Specimen examined – Turkey:** Kütahya Prov.: Demirciören village, altitude 1 090 m, on bark of living *Prunus domestica*, March 23 2008, Ocak 59, with *Licea minima*, *Licea tenera* and *Perichaena corticalis*.

*Licea kleistobolus* G. W. Martin Mycologia 34 (6): 702 (1942).

**Specimen examined – Turkey:** Kütahya Prov.: Çamlıca village, altitude 1030 m, on bark of living *Prunus cerasus* L., March 23 2008, Ocak 32; Konya



**Figure 1.** (A) Fruiting bodies of *Physarum serpula* observed using a stereomicroscope; (B) microscopic images of spores and lime of *Physarum serpula*; (C) fruiting bodies of *Diderma deplanatum* observed using a stereomicroscope; (D) microscopic images of spores and capillitial thread of *Diderma deplanatum* (scale bars: A = 140  $\mu$ m, B = 10  $\mu$ m, C = 180  $\mu$ m, D = 10  $\mu$ m).

Prov.: Ilgın district centre, altitude 1030 m, on litter under *Pyrus* sp., March 23 2008, Ocak 81.

*Licea minima* Fr. Syst. mycol. (Lundae) 3 (1): 199 (1829).

**Specimen examined** – Turkey: Kütahya Prov.: Çamlıca Street, altitude 1025 m, on decaying bark, March 23 2008, Ocak 17; Demirciören village, altitude 1090 m, on bark of living *Prunus domestica*, March 23 2008, Ocak 59, with *Licea castanea*, *Licea tenera* and *Perichaena corticalis*.

*Licea synsporos* Nann-Bremek. Proc. K. Ned. Akad. Wet., Ser. C, Biol. Med. Sci. 71: 42 (1968).

**Specimen examined** – Turkey: Kütahya Prov.: Sofu village, altitude 990 m, on bark of living *Malus domestica*, March 23 2008, Ocak 47; Çamlıca village, altitude 1025 m, on bark of living *Malus domestica*, March 23 2008, Ocak 7, with *Trichia contorta* and *Licea biforis*.

*Licea tenera* E. Jahn Ber. dt. bot. Ges. 36: 665 (1919).

**Specimen examined** – Turkey: Kütahya Prov.: Demirciören village altitude 1090 m, on bark of living *Prunus domestica*, March 23 2008, Ocak 59, with *Licea castanea*, *Licea minima* and *Perichaena corticalis*.

*Licea variabilis* Schrad. Nov. gen. pl. (Lipsiae): 18 (1797).

**Specimen examined** – Turkey: Kütahya Prov.: Güveşci village, on litter bark under *Juglans regia*, altitude 990 m, March 23 2008, Ocak 40, with *Didymium quitense* and *Perichaena chrysosperma*.

### 3.1.3. Physarales

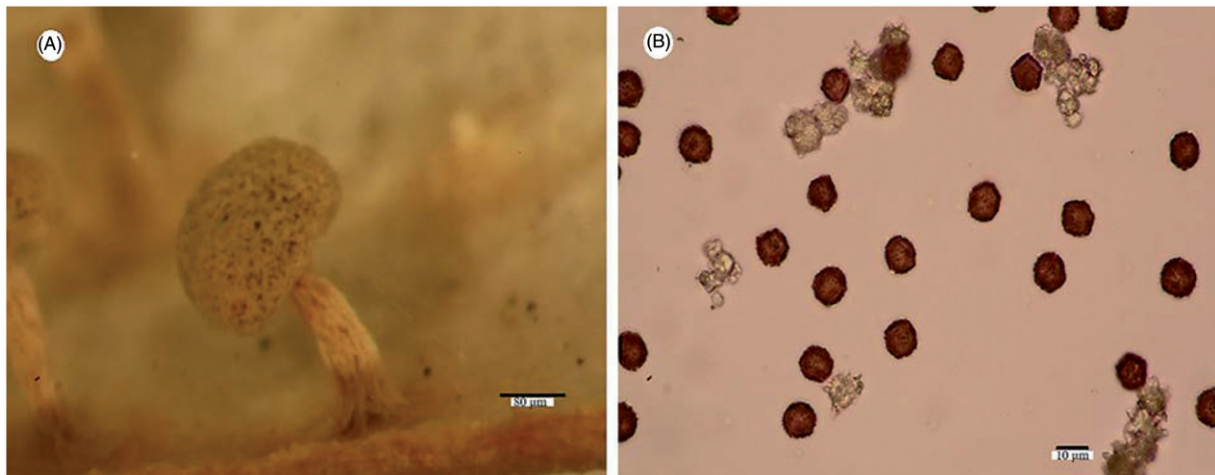
*Badhamia goniospora* Meyl. Bull. Soc. Vaud. Sci. Nat. 56: 66 (1925).

**Specimen examined** – Turkey: Kütahya Prov.: Çamlıca street, altitude 1040 m, on bark of living *Malus domestica*, March 23 2008, Ocak 28; Güveşci village, altitude 990 m, on bark of living *Pyrus communis*, March 23 2008, Ocak 38.

*Physarum bitectum* G. Lister Monogr. Mycetozoa, Edn 2 (London): 78 (1911).

**Specimen examined** – Turkey: Konya Prov.: Ilgın, altitude 1190 m, on litter bark under *Corylus* sp., March 22 2008, Ocak 88, with *Physarum* sp. *Diderma deplanatum* and *Perichaena vermicularis*; Ilgın, Aşağıçığil village, altitude 1240 m, on litter under *Prunus armeniaca*, March 22 2008, Ocak 91, with *Physarum cinereum*.





**Figure 2.** (A) Fruiting bodies of *Didymium balearicum* observed using a stereomicroscope; (B) microscopic images of spores of *Didymium balearicum* and lime crystals (scale bars: A = 80 µm, B = 10 µm).

*Physarum cinereum* (Batsch) Pers. Neues Mag. Bot.1: 89 (1794).

**Specimen examined – Turkey:** Konya Prov.: Ilgın, Aşağıçiğil village, altitude 1240 m, on litter under *Prunus armeniaca*, March 22 2008, Ocak 91, with *Physarum bitectum*; Ilgın, Aşağıçiğil village, altitude 1240 m, on bark of *Pinus nigra*, March 22 2008, Ocak 96 and 97, with *Physarum notabile*.

*Physarum notabile* T. Macbr. N. Amer. Slime-Moulds, Edn 2 (New York): 80 (1922).

**Specimen examined – Turkey:** Konya Prov.: Ilgın, Aşağı Çiğil village, altitude 1245 m, on bark of living *Pinus nigra*, March 22 2008, Ocak 92, 96 and 97, with *Physarum cinereum*; Kütahya Prov.: Demirciören village, altitude 1090 m, on bark of living *Prunus domestica*, March 23 2008, Ocak 63.

*Physarum pusillum* (Berk et M. A Curtis) G. Lister Monogr. Mycetozoa, Edn 2 (London): 64 (1911).

**Specimen examined – Turkey:** Kütahya Prov.: Demirciören village, altitude 1090 m, on bark of living *Prunus cerasus*, March 23 2008, Ocak 66.

*Physarum serpula* Morgan J. Cincinnati Soc. Nat. Hist. 19: 29 (1896) (Figure 1(A,B)).

**Specimen examined – Turkey:** Kütahya Prov.: Çamlıca street, on bark of living *Pyrus communis*, March 23 2008, Ocak 2; Çamlıca Street, 9 km, on bark of living *Malus* sp., altitude 1030 m, March 23 2008, Ocak 36, with *Diderma hemisphaericum*, *Perichaena chrysosperma* and *Arcyria pomiformis*.

**Brief description:** Fruiting body is a plasmodiocarp (or sometimes sporangiate), scattered to crowded, forming lines, rings, or a simple reticulum, the individual fruiting bodies terete, 0.2–0.4 mm in diameter. Hypothallus is membranous, colourless, usually scanty, and often inconspicuous. In this species, the peridium comprises a single layer (but sometimes it appears to comprise two layers when highly calcareous), membranous, fragile, covered

with a dense, uniform crust consisting of closely compacted lime granules, bright or dull yellow to ochraceous, dehiscence irregular. Capillitium dense, consisting of large, angular, branching, pale yellow to white lime nodes connected by short, hyaline threads, the latter sometimes rather broad, the capillitium then appearing somewhat badhamioid. Spores globose, dull black in mass, dark brown by transmitted light, minutely warted, with a paler and smoother area on one side, 10–13 µm in diameter. Plasmodium is greenish yellow at maturity.

**Ecology and Distribution:** On decaying wood and bark, dead leaves, and other types of plant debris. It is known to occur in North America [2], South America [36], and New Zealand [44].

**Comments:** This species is morphologically quite similar to *Physarum decipiens*, and there is a doubt that the two species have been confused with each other [45]. However, *P. serpula* usually can be distinguished based on the more highly calcareous peridium. Neither of the species appears to be particularly common.

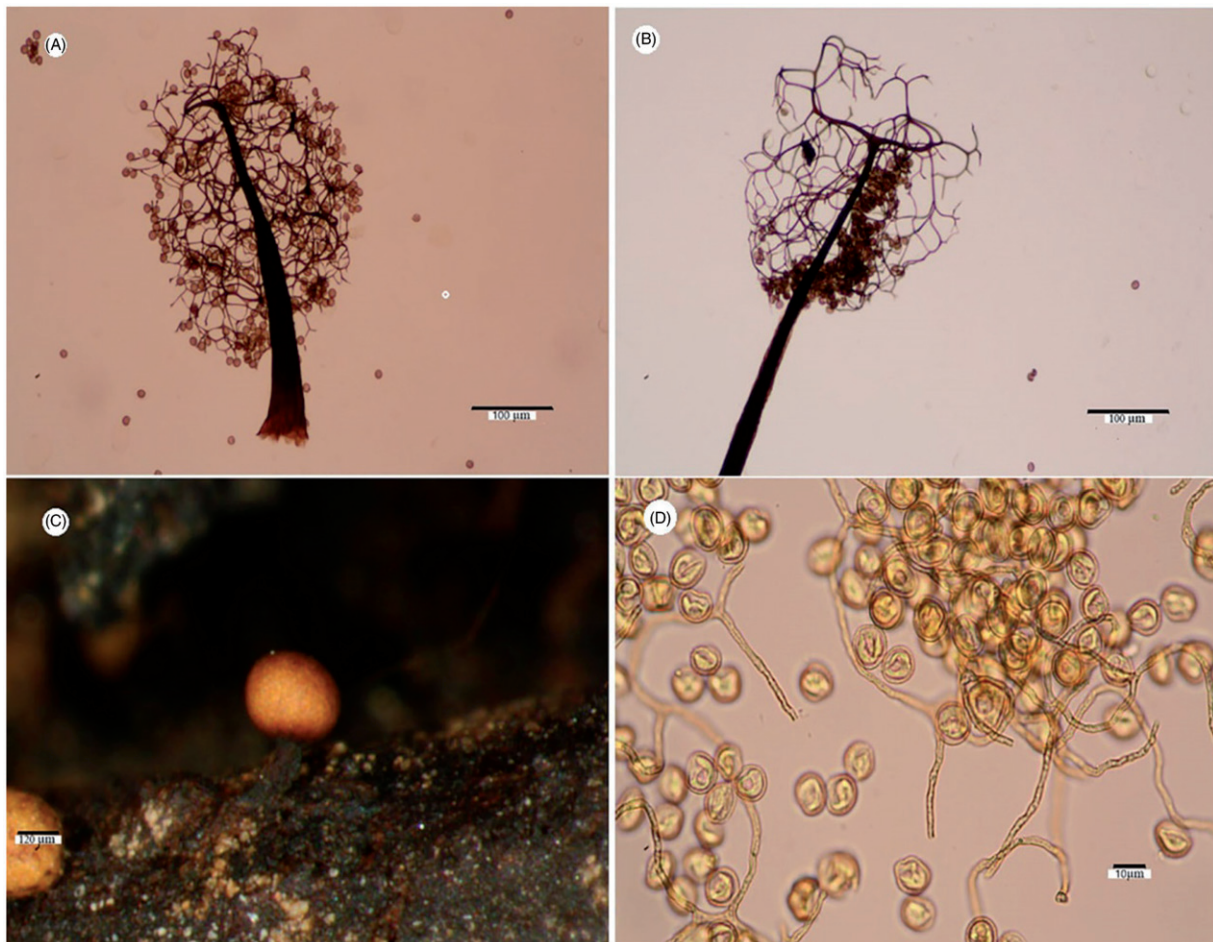
### 3.1.4. *Physarum* sp

**Specimen examined – Turkey:** Konya Prov.: Ilgın, altitude 1190 m, on litter bark under *Corylus* sp., March 22 2008, Ocak 88, with *Physarum bitectum*, *Diderma deplanatum* and *Perichaena vermicularis*.

*Diderma deplanatum* Fr. (Figure 1(C,D)) Syst. Mycol. (Lundae) 3 (1): 101 (1829).

**Specimen examined – Turkey:** Kütahya Prov.: Çamlıca Street, 9 km, altitude 1030 m, on litter leaf under *Prunus cerasus*, March 23 2008, Ocak 34; Konya Prov.: Ilgın, altitude 1190 m, on litter bark under *Corylus* sp., March 22 2008, Ocak 88, with *Physarum* sp., *Physarum bitectum* and *Perichaena vermicularis*.

**Brief description:** Sporocarps are curved or ring-shaped plasmodiocarps scattered or in small groups,



**Figure 3.** (A) Microscopic images of spores and capillitial thread *Macbrideola oblonga*; (B) microscopic images of spores and capillitial thread of *Paradiacheopsis erythropodia*; (C) fruiting bodies of *Perichaena pedata* observed using a stereomicroscope; (D) microscopic images of spores and capillitial thread *Perichaena pedata* (scale bars: A and B = 100 µm, C = 120 µm, D = 10 µm).

pulvinate, sessile, 1–1.5 mm diameter, white or pale creamcoloured. Peridium double, the outer layer smooth, crustose, brittle, thick, the inner layer membranous, iridescent, and deep orange below. Columella is either lacking or represented by a broad convex or thickened orange-brown base. Capillitium comprises dark purple, simple or sparsely branched threads, often bearing spiny or nodular enlargements. Spores are rather dark yellow-brown, spinulose, (9–) 9.5–10 (–13) µm diameter.

**Distribution:** China, Europe, India, Japan, New Zealand, North America and Taiwan.

**Comments:** Resembles *D. effusum* in terms of the outer appearance but is more plasmodiocarpous and has darker spores. Spores of this species are dark brown to blackish brown in mass, whereas spores in *D. effusum* are pale brown [46]. Spore diameter of our species is larger than the spore diameter in the original description.

***Diderma donkii*** Nann.–Bremek. Proc. K. Ned. Akad. Wet., Ser. C, Biol. Med. Sci. 76: 482 (1973).

**Specimen examined – Turkey:** Konya Prov.: Ilgın, Aşağı Çiğil, alt 1245 m, on bark of living *Pinus nigra*, March 22 2008, Ocak 92.

***Diderma hemisphaericum*** (Bull) Hornem. Fl. Danic.(33): 13 (1829).

**Specimen examined – Turkey:** Kütahya Prov.: Çamlıca Street, 9 km, altitude 1030 m, on bark of living *Malus* sp., March 23 2008, Ocak 36, with *Arcyria pomiformis*, *Pysarum sepula* and *Perichaena chrysosperma*.

***Didymium balearicum*** Ing (Figure 2(A,B)) Stapfia 73: 94 (2000)

**Specimen examined – Turkey:** Kütahya Prov.: Sofu village, altitude 990 m, on litter leaf under *Populus* sp., March 23 2008, Ocak 46.

**Brief description:** Sporangiate, stalked, 0.8–1.0 mm total height. Sporotheca subglobose with a wide but shallow umbilicus, lemon yellow, 0.8 mm diameter. Hypothallus calcareous, furrowed, pale lemon fading to white. Stalk lemon to pale ochraceous, up to 0.6 mm high, thick, furrowed, netted at the base, tapered upwards, thickly encrusted with

calcareous material, the lumen filled with crystalline material. Peridium brown, transparent, covered with a thick powder of yellow, stellate crystals, with numerous rays, 16–18 µm diameter. Columella subglobose, calcareous, lemon yellow. Capillitium of hyaline, flexuous threads with few branches or cross-connections. Spore-mass blackish brown. Spores dark yellow-brown, globose, evenly warty, 10–11 µm diameter.

**Ecology and Distribution:** The species has not been previously recorded in Turkey. This species is rare and only recorded previously in Spain. *Didymium balearicum* is known only from alarge original collection from a thick pile of leaf litter inside the hollow trunk of an ancient olive tree, Balearic Islands (Spain) [47].

**Comments:** The most distinctive character of *Didymium balearicum* is lemon yellow sporangia, and it is very similar to *Didymium squamulosum* [47].

*Didymium difforme* (Pers) Gray Nat. Arr. Brit. Pl. (London) 1: 571 (1821).

**Specimen examined – Turkey:** Konya Prov.: Ilgın, altitude 1100 m, on decaying wood of *Pinus nigra*, March 22 2008, Ocak 77, with *Didymium squamulosum*.

*Didymium quitense* (Pat) Torrend, Brotéria, Sér. Bot. 7: 90 (1908).

**Specimen examined – Turkey:** Kütahya Prov.: Güveşci village, altitude 990 m, March 23 2008, on litter bark under *Juglans regia*, Ocak 40, with *Perichaena chrysosperma*.

*Didymium squamulosum* (Alb. & Schwein.) Fr. Symb. Gasteromyc. (Lund) 3: 19 (1818) [1817].

**Specimen examined – Turkey:** Konya Prov.: Ilgın, altitude 1100 m, on decaying wood of *Pinus nigra*, March 22 2008, Ocak 77, with *Didymium difforme*.

### 3.1.5. *Stemonitales*

*Macbrideola cornea* (G. Lister et Cran) Alexop. Mycologia 59 (1): 112 (1967).

**Specimen examined – Turkey:** Konya Prov.: Ilgın, altitude 1190 m, on bark of living *Pinus nigra*, March 22 2008, Ocak 74.

*Macbrideola dubia* Nann.-Bremek. & Y. Yamam. Proc. K. Ned. Akad. Wet., Ser. C, Biol. Med. Sci. 93 (3): 270 (1990).

**Specimen examined – Turkey:** Konya Prov.: Ilgın, Aşağıciğil village, altitude 1240 m, on bark of living *Pinus nigra*, March 22 2008, Ocak 89, with *Macbrideola oblonga*.

*Macbrideola oblonga* Pando & Lado Mycotaxon 31 (2): 302 (1988) (Figure 3(A)).

**Specimen examined – Turkey:** Konya Prov.: Ilgın, Aşağıciğil village, altitude 1240 m, on bark of

living *Pinus nigra*, March 22 2008, Ocak 89, with *Macbrideola dubia*.

**Brief description:** Sporocarps scattered, 0.4–0.9 mm tall. Hypothallus wide, reddish. Stalk tapered, 16%–25% of the total height, reddish, translucent at the base, opaque above, indistinctly longitudinally striate, sometimes filled with rather inconspicuous, almost translucent, irregular lumps. Sporothecae mostly ellipsoidal, rarely subglobose or cylindrical, burnt umber, 0.2–0.45 mm diameter. Peridium remaining as a transparent, red-brown collar. Columella reaching almost to the apex of the sporotheca. Capillitium arising from along the length of the columella, dichotomously branched, ending free or united near the surface, small sporocarps with few or no anastomoses, rather thick, brown, hardly attenuated outwards, free ends blunt, slightly swollen or clubshaped. Spore-mass brown. Spores globose, pale brown, 10.5–11.5 (–12.5) µm diameter, densely, regularly verrucose.

**Ecology and Distribution:** The species has not been previously recorded in Turkey. *Macbrideola oblonga* was recorded on the bark of living *Pinus nigra* in moist chamber cultures. This species is considered to be rare but was commonly found in moist chamber cultures of bark from the desert of Western Kazakhstan [48].

**Comments:** The oblong shape of the sporotheca and the presence of free spores differentiate this species.

*Stemonitis herbatica* Peck Ann. Rep. N.Y. St. Mus. nat. Hist. 26: 75 (1874) [1873].

**Specimen examined – Turkey:** Kütahya Prov.: Sofu village, altitude 990 m, on bark of living *Prunus domestica*, March 22 2008, Ocak 44, with *Echinostelium minutum*.

*Paradiacheopsis erythropodia* (Ing) Nann–Bremek. Proc. K. Ned. Akad. Wet., Ser. C, Biol. Med. Sci. 70 (2): 209 (1967) (Figure 3(B)).

**Specimen examined – Turkey:** Kütahya Prov.: Çamlıca Street, 9 km, altitude 1030 m, on bark of living *Prunus domestica*, March 23 2008, Ocak 37.

**Brief description:** Sporocarps solitary or scattered, stalked, erect, total height 0.8–0.9 mm. Sporothecae brown, globose, 0.3 mm diameter. Peridium evanescent, brown when present. Hypothallus absent or insignificant. Stalk up to 0.6 mm high, slender, red-brown, translucent, fibrous, tapered upwards into the sporotheca to form the columella. Columella branches 2–3, with rounded wart-like swellings. Capillitium red-brown, not translucent, red-brown, very lax, the ultimate threads stiff and branched dichotomously but neither anastomosed nor forming a peripheral net. Spore-mass brown. Spores globose, greyish brown, 9–10 µm diameter, evenly verruculose.



**Comments:** The species has not been previously recorded in Turkey.

***Paradiacheopsis microcarpa*** (Meyl) D. W. Mitch and Ing in Ing *The Myxomycetes of Britain and Ireland, An Identification Handbook* (Slough): 194 (1999).

**Specimen examined – Turkey:** Kütahya Prov.: Çamlıca Street, on bark of living *Malus* sp., altitude 1030 m, March 23 2008, Ocak 3.

### 3.1.6. Trichiales

***Arcyria cinerea*** (Bull) Pers. Syn. Meth. Fung. (Göttingen) 1: 184 (1801).

**Specimen examined – Turkey:** Konya Prov.: Ilgın, Aşağıçığıl village, 5 km, altitude 1240 m, on bark of living *Pinus nigra*, March 22 2008, Ocak 85.

***Arcyria pomiformis*** (Leers) Rostaf. Śluzowce Monogr. (Paryz): 271 (1875) [1874].

**Specimen examined – Turkey:** Kütahya Prov.: Çamlıca Street, 9 km, on bark of living *Malus* sp., altitude 1030 m, March 23 2008, Ocak 36, with *Physarum sepula*, *Diderma hemisphaericum* and *Perichaena chrysosperma*

***Perichaena chrysosperma*** (Curr) Lister Monogr. Mycetozoa (London): 196 (1894).

**Specimen examined – Turkey:** Kütahya Prov.: Çamlıca Street, 9 km, on bark of living *Malus* sp., altitude 1030 m, March 23 2008, Ocak 36, with *Physarum sepula*, *Diderma hemisphaericum* and *Arcyria pomiformis*; Kütahya, Güveşçi village, altitude 990 m, on litter bark under *Juglans regia*, March 23 2008, Ocak 40, with *Licea variabilis* and *Didymium quitense*.

***Perichaena corticalis*** (Batsch) Rostaf. Śluzowce Monogr. (Paryz): 293 (1875) [1874].

**Specimen examined – Turkey:** Kütahya Prov.: Demirciören village, altitude 1090 m, on bark of living *Prunus domestica*, March 23 2008, Ocak 59, with *Licea minima*, *Licea tenera* and *Licea castanea*.

***Perichaena pedata*** (Lister & G. Lister) G. Lister J. Bot., Lond. 75: 326 (1937) (Figure 3(C,D)).

**Specimen examined – Turkey:** Kütahya Prov.: Demirciören village, altitude 1,090 m, on decaying barklitter, March 23 2008, Ocak 54.

**Brief description:** Fructifications sporangiate, scattered, solitary, occasionally two in a cluster with sporangia united, 0.75–0.95 mm in total height. Sporangia stipitate, globose to subglobose, pale yellowish to orange brown, 0.3–0.6 mm in diameter. Stalks erect, cylindrical, stout, roughened, dark brown to black, 0.45–0.60 mm high. Peridium single, membranous, with deposition of granular matter. Hypothallus inconspicuous. Capillitium comprising yellow threads, the threads scarcely branched, with occasional bulbous expansions, prominently marked with spines or minute scattered warts, 3–5 µm in

diameter. Spores orange yellow in mass, pale yellowish by transmitted light, globose to subglobose, minutely warted, 9.5–10.0 µm in diameter. Plasmodium not observed.

**Distribution:** America, Europe and Asia (Japan and Taiwan).

**Comments:** The species has not been previously recorded in Turkey. The sporangia of this species and those of *Hemitirchia minor* are similar in shape and colour. They both have stalked sporangia [49]. The capillitial threads of *H. minor* bear faint spiral bands [41,50]. In addition, the spiral bands were not found by microscopic observation in our specimens.

***Perichaena vermicularis*** (Schwein) Rostaf. *Gewächse des Fichtelgebirg's*: 34 (1876).

**Specimen examined – Turkey:** Konya Prov.: Ilgın, on litter under *Corylus* sp., March 22 2008, Ocak 88, with *Physarum* sp., *Diderma deplanatum* and *Physarum bitectum*.

***Trichia alpina*** (R. E Fr) Meyl. Bull. Soc. Vaud. Sci. Nat. 53: 460 (1921).

**Specimen examined – Turkey:** Kütahya Prov.: Çamlıca vilage, altitude 1050 m, on bark of living *Prunus domestica*, March 23 2008, Ocak 23.

***Trichia contorta*** (Ditmar) Rostaf. Śluzowce Monogr. (Paryz): 259 (1875) [1874].

**Specimen examined – Turkey:** Kütayha Prov.: Çamlıca vilage, altitude 1025 m, on bark of living *Malus domestica*, March 23 2008, Ocak 7, with *Licea synsporos* and *Licea biforis*.

Most of the species were detected on the bark of living trees. The genera *Echinostelium* and *Licea* were characteristic in the bark habitat. The species of *Echinostelium* and *Paradiacheopsis* were among the first to appear in culture. However, some *Licea* species and the large myxomycetes with a phanero-plasmodia, particularly members of the Physarales, which could take three months to develop plasmodia and produce spores. It is likely that some of these are contaminants and not true members of the corticolous assemblage, but instead they may be opportunistic species that are normally found on dead wood or leaf litter [3]. Physarales species were found on both bark and litter in the present study.

Most of the myxomycetes were found on the bark of living *Prunus* spp., *Malus* spp. and *Pinus nigra*. The bark of the trunk and branches of trees are important habitats for numerous species. Many of these species are known only from the bark of living trees, and they frequently possess protoplasmodia, which seems to be an adaptation, possibly neotenous, for survival in potentially unpromising environments [3]. Keller and Braun [43] reported that the greatest diversity of corticolous myxomycetes occurred on *Juniperus virginiana* L. (Eastern Red Cedar), *Ulmus americana* L. (American Elm),

*Malus* (apple) orchards and on species of *Vitis* (grapevines). The bark of these species acts like a sponge, which rapidly absorbs water and stays moist for longer periods, thereby facilitating colonisation by many species. In the present study, 9 of 36 species were found on conifer (*Pinus nigra*) bark and the remaining 27 species on the bark of angiosperms. But there is no clear correlation between the tree species or the position of the sample on a tree and the myxomycete number on the tree. Peterson [51] found slightly lower numbers on coniferous trees, whereas Härkönen [52] found no difference between the bark of conifers and angiosperms in terms of myxomycete productivity, although some tree species were clearly richer than others. Stephenson [53] reported similar numbers on conifers and deciduous trees.

Our new records increase the number of published records of corticolous myxomycetes in Turkey. The myxomycete flora is poorly known in Turkey, therefore, it is likely that this number will increase as further surveys are undertaken.

### Disclosure statement

No potential conflict of interest was reported by the authors.

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