



## A new species of *Physarum* (Physaraceae) from Turkey

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A new species of *Physarum*, identified herein as *P. karamanicum*, developed on debris branches of *Cedrus libani* collected from the Sarıveliler district of Karaman province in Turkey and applied a moist chamber technique. *P. karamanicum* is morphologically similar to *P. globuliferum*, *P. auripigmentum*, and *P. tenerum* but is distinguished by sporotheca, stalk, capillitium, and spore features. The new species is characterized by a greenish-gray, globose sporotheca, light brown at the bottom, the remainder yellowish-cream colored stalk, triangular, convex quadrilateral nodes and pale-yellow capillitium, prominent spiny and groups of blunt warts spores, greenish gray peridium. Description of the new species, photographs (light microscope, stereo microscope, and scanning electron microscope), and a key to the closest morphologically related species of the genus are provided.

**Key words:** Mycetozoa, slime mold, taxonomy

### Introduction

Myxomycetes, also called Mycetozoa or slime molds, are ameoboid protists that have been considered a particular group of fungi for many years. *Physarum* (Physaraceae, Physarales) is the largest genus among plasmodial slime molds (Stephenson *et al.* 2020). *Physarum* was established by Persoon in 1794, and 162 taxa have been reported worldwide (Lado 2005–2023). In Turkey, 45 taxa have been recorded (Sesli *et al.* 2020, Baba *et al.* 2021, Eroğlu 2021, Baba & Sevindik 2022). Of these, *P. album*, *P. cinereum*, *P. auriscalpium*, and *P. viride* are among the most detected species in Turkey (Baba & Sevindik 2019).

The genus is characterized by the capillitium, a network of hyaline tubules connecting calcareous nodes, lime in peridium, capillitium, and the stalk in the form of amorphous granules, the spores dark in mass (Martin & Alexopoulos 1969). Like other representatives of the Physaraceae, the species of *Physarum* produce a dark brown to black spore mass, and the spores are usually covered by warts and spines (Ronikier & Lado 2013).

Most species of *Physarum* are associated with decaying wood or ground litter. Still, some species are corticolous and inhabit the bark surface of living trees and lianas, and a few are coprophilous (Stephenson *et al.* 2020). In addition, species of the genus commonly inhabit dung, grass litter, and other vegetable substrates (Vlasenko *et al.* 2019). Specimens for study can be obtained as fruiting bodies developed in the field under natural conditions or cultured in the laboratory (Stephenson & Rojas 2017) with moist chamber techniques (Gilbert & Martin 1933).

After a detailed examination of a sample and comparison with all the described species from the genus (Lado 2005–2023), I concluded that the Sarıveliler-Karaman (Turkey) material represents a distinct undescribed species, which I designate here as *P. karamanicum*.

### Materials and methods

The new species material was collected from Sarıveliler-Karaman (Turkey) in 2015. Sarıveliler is located south of Turkey's Central Anatolian Region, on the Taşeli Plateau, which covers the Göksu basin on the southern slopes of the Central Taurus Mountains. The samples collected were applied the moist chamber technique in the laboratory. The materials were examined under the stereo microscope, and the developing samples were glued to the cardboard with its substrate.

Morphological studies. Microscopic examination was carried out in 3% KOH and distilled water. About 50 spores, ornamentation measurements, and capillitium features were made an oil immersion objective under a Leica DM750 light microscope. The characteristics and measurements of the sporocarps were examined under Leica S8APO and Olympus SZ61 stereo microscopes. Approximately 20 sporocarps of each collection were measured. A detailed study of morphological features images was prepared with ZEISS EVO LS10 scanning electron microscope at the Advanced Technology Research

and Application Center, Selçuk University, Konya, Turkey. The specimens are deposited in the Mushroom Application and Research Center Fungarium, Selçuk University, Konya, Turkey (KONF).

## Taxonomy

*Physarum karamanicum* Eroğlu, *sp. nov.* Fig. 1

Mycobank no.: MB 848092

**Etymology:**—referring to Karaman where the specimens were collected.

**Description:**—Sporocarps in small groups, stalked, 0.5–0.6 mm total height. Sporotheca greenish-gray, globose, 0.3–0.4 mm in diam. Stalk the same thickness everywhere, roughened, rugose, calcareous, brittle, light brown at the bottom, and the remainder is yellowish-cream colored, one-half of or more of the total height of the sporocarp. Hypothallus light brown, vascular. Columella short, same color as the stalk, light clavate. Peridium consists of a single layer, membranous, greenish-gray, covered pale greenish yellow with prominent lime deposits. Capillitium densely reticulates, nodes triangular, convex quadrilateral, or rounded, filled with pale greenish yellow globose lime granules, internodes colorless, long, and non-calcareous. Spores dark brown in mass, brown under LM, globose, 8–10 µm diam., and prominent spiny warts, with the ornamentation formed by groups of blunt warts in some places. Plasmodium unknown.

**Type:**—TURKEY. Karaman: Sariveliler, 36°41'35.82"N, 32°32'14.95"E, 1641m, on living barks of *Cedrus libani* A. Richard, 14 November 2015, GE 94 (**Holotype** KONF GE 94; **Isotype** KONF 688).

**Distribution:**—Found on living barks of *C. libani* cultured in a moist chamber only from Karaman, Sariveliler.

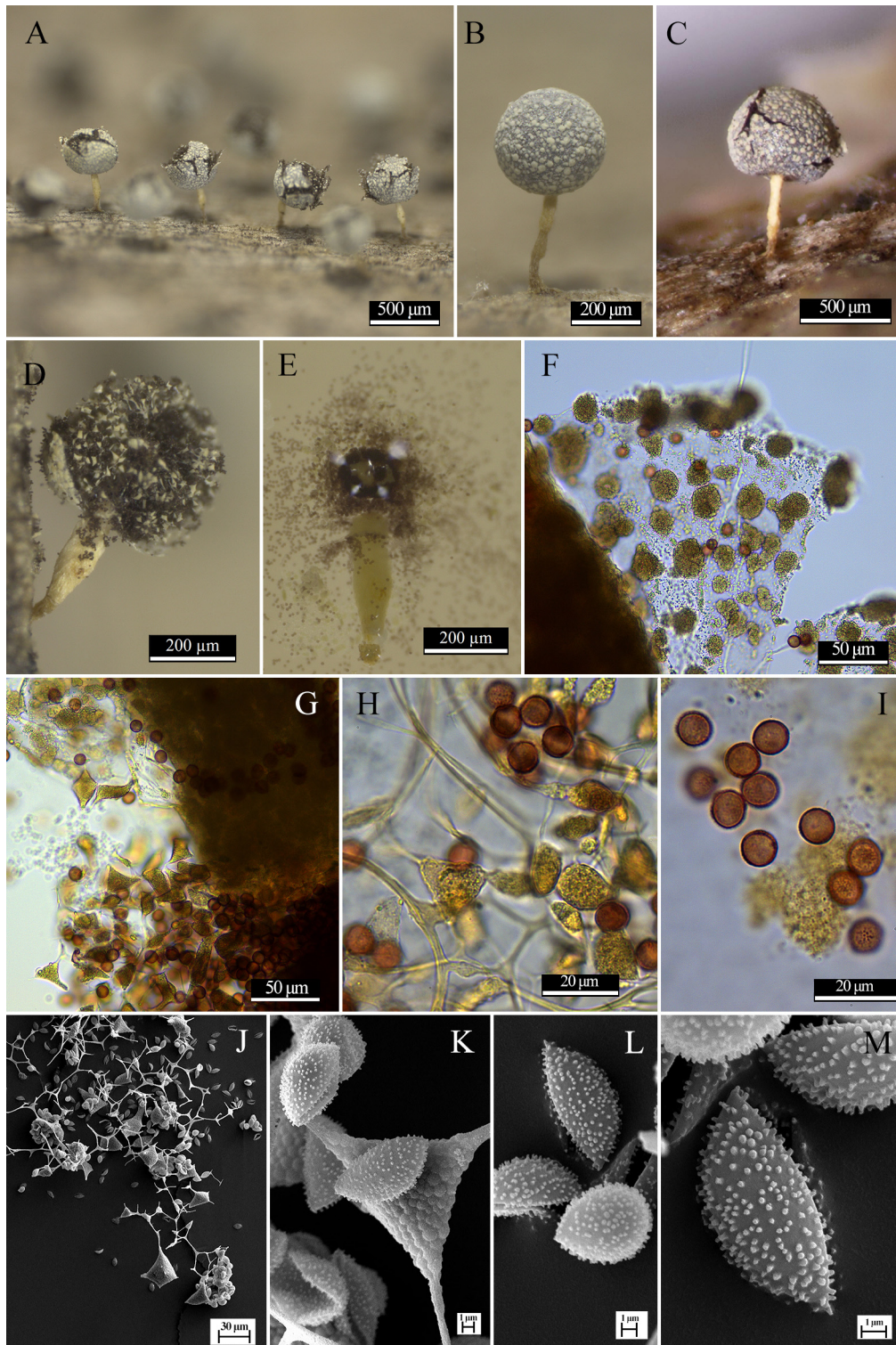
Key to *Physarum karamanicum* and related species (Adapted from the *Physarum* genus key by Stephenson (2021)).

1. Sporangium stalked, stalk usually clearly defined and supporting the sporotheca .....2
1. Sporangium typically sessile but sometimes with a weak, strand-like stalk .....*P. albescens*
2. Stalk relatively long, usually more than three times the diameter of the sporotheca .....3
2. Stalk relatively short, often no more than about the diameter of the sporotheca .....4
3. Stalk erect, non-calcareous, usually dark brown below and pale yellow above .....*P. viride*
3. Stalk slender, calcareous, pale yellow .....*P. tenerum*
4. Sporangia white, rarely pale gray; nodes white .....*P. globuliferum*
4. Sporangia not white, pale gray, and nodes then usually yellow .....5
5. Columella absent, capillitium nodes small, rounded, abundant .....*P. auripigmentum*
5. Columella present, capillitium nodes triangle, convex quadrilateral and rounded .....*P. karamanicum*

## Discussion

The most distinctive characteristics of the new species are the greenish-gray sporotheca and light brown at the bottom, and the remainder is yellowish-cream colored (Fig. 1A–C). Capillitium is quite prominent in the triangular, convex quadrilateral, or rounded nodes, filled with pale greenish yellow globose lime granules, internodes colorless, long (Fig. 1D, G, H, J, K). Columella is light clavate (Fig. 1E). Covered pale greenish yellow with prominent lime deposits on the peridium (Fig. 1F). The spores, 8–10 µm diam. prominent spiny warts, with ornamentation, formed by groups of blunt warts in some places (Fig. 1I, L, M).

*Physarum karamanicum* is morphologically very similar to *P. globuliferum* (Bull.) Pers. (Martin & Alexopoulos 1969, Nannenga-Bremekamp 1991, Stephenson 2021) and *P. auripigmentum* G.W. Martin (Martin & Alexopoulos 1969). However, it can easily distinguish morphologically by the pale greenish-yellow lime deposits in the peridium of *P. karamanicum* the height of the stalk is one-half of the total height of the sporocarp, and the color of the stalk is light brown at the bottom, the remainder is yellowish-cream colored. Although the sporocarps of *P. tenerum* Rex and *P. viride* (Bull.) Pers are yellow (Stephenson 2021), but they differ in that their stalks are long. *P. karamanicum* is close to *P. auripigmentum* in its capillitium, but its capillitium morphology easily distinguishes the new species. The capillitium nodes of *P. auripigmentum* are small, rounded, and abundant (Martin & Alexopolulos 1969), but the capillitium nodes of *P. karamanicum* are triangle, convex quadrilateral, and not small. The most obvious difference is that the spore ornaments of *P. karamanicum* have spiny warts and groups of blunt warts in some places. Due to the differences in macroscopic and microscopic features of *P. karamanicum*, it can be easily distinguished from other *Physarum* species.



**FIGURE 1.** *Physarum karamanicum* (holotype): A,B,C. Sporocarp (SM), D,E. Sporocarp and columella (SM), F. Peridium (LM), G,H. Capillitium and spores (LM), I. Spores (LM), J,K. Capillitium and spores (SEM), L,M. Spores (SEM).

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