

## ***Typhula spathulata* – first record from Turkey**

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In the current study, the clavarioid taxon *Typhula spathulata* is reported for the first time from Turkey. It is the first record of the genus *Typhula* in the country. A description of the taxon is given together with microscopic drawings and photographs of the fruitbodies.

**Key words:** biodiversity, taxonomy, *Typhulaceae*, new record, Turkish mycobiota.

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V aktuální studii je poprvé z Turecka uveden clavarioidní taxon *Typhula spathulata*; jde o první záznam o výskytu rodu *Typhula* v této zemi. V práci je uveden popis zmíněné houby, doplněný kresbami mikroskopických struktur a fotografiemi plodnic.

### INTRODUCTION

Turkey hosts a remarkable biodiversity due to its location at the intersection of the Euro-Siberian, Mediterranean and Irano-Turanian phytogeographic areas. Alongside botanical and zoological studies documenting this biodiversity, increasing numbers of studies recording the mycota of the country have been carried out. Mycologists in Turkey have reported approximately 2600 taxa in studies of macrofungus biodiversity, mostly in the past 30 years (Sesli & Denchev 2008, Solak et al. 2015, Akata et al. 2016, Doğan and ÖzTÜRK 2016, Elliott et al. 2016, Güngör & Allı 2016, Kaygusuz et al. 2016, Şen et al. 2016, Çolak et al. 2017).

The genus *Typhula* (Pers.) Fr., member of the *Typhulaceae* family, is represented in the world by over 70 species (Kirk et al. 2008, Hoshino et al. 2009, Olariaga & Salcedo 2009). The generic name is taken from *Typha*, the Latin name for reed-mace, which fruitbodies of this genus resemble (Massee 2015). Members of the *Typhula* genus have fructification organs which are slender, filiform or

clavarioid in shape, and white, yellow, pink, brownish or reddish in colour. Their spores vary from ellipsoid to ovoid in shape and are hyaline with smooth surfaces. They have four or two sterigmata, and in some species clamps can be seen. In many species hairs are found on the stems. Members of this genus typically appear in autumn and are generally saprotrophic, although some are parasitic (Knudsen 1997, Hoshino et al. 2009, Ikeda et al. 2015). In some species of this genus, a sclerotium, described as a resting structure formed from an aggregation of hyphae, can be observed (Ellis & Ellis 1990).

The aim of this study was to add a new genus to the records of macrofungi in Turkey, and to contribute to our knowledge of the biodiversity of the country.

#### MATERIAL AND METHODS

The specimens of *Typhula* sp. were collected from Şile District (Istanbul Province) in 2013. Morphological and ecological characteristics of the samples were noted and photographed in their natural habitats. After field studies, specimens were taken to the laboratory. Microcharacters were observed under oil immersion at a magnification of 1000 $\times$  with a Leica light microscope using Congo Red, 5% KOH and distilled water. Melzer's reagent was used to test the amyloid and dextrinoid reactions. Identification of the specimens was based on Knudsen (1997) and Siepe (1999).

The samples examined in this study were deposited in the personal fungarium of the first author at Pamukkale University (PAMUH). Taxa, family and author citations are quoted according to Kirk et al. (2008), Index Fungorum ([www.indexfungorum.org](http://www.indexfungorum.org)) and MycoBank ([www.mycobank.org](http://www.mycobank.org)).

#### RESULTS

***Typhula spathulata* (Corner) Berthier, Bulletin Mensuel de la Société Linnéenne de Lyon 45: 152, 1976** Figs. 1, 2

- ≡ *Pistillaria spathulata* Corner, Annals of Botany Memoirs 1: 492, 1950.
- *Clavaria spathulata* Peck, Annual Report on the New York State Museum of Natural History 27: 100, 1875 [nom. illeg., later homonym of *Clavaria spathulata* O.F. Müll.].

**Description.** Basidioma 5–8 mm long, clavate in shape and consisting of a clavula and stipe. Clavula 3–4 × 0.7–0.9 mm, creamy white, spatula-like, cylindrical, compressed from two sides, narrowing towards the stipe. Stipe 3–5 × 0.2–0.3 mm in size, cylindrical, straight, creamy white when fresh.



**Fig. 1.** *Typhula spathulata*, fresh basidiomata on natural substrate (OKA 1825). Scale bars = approx. 2 mm. Photo O. Kaygusuz.

Medulla of the clavula comprised of parallel arranged hyphae, 8–12 µm wide, clampless, thin-walled. Hymenium non-gelatinised. Basidiospores 8–10 × 3.0–4.5 µm, amyloid, smooth, elliptical to cylindrical, bean-shaped and depressed on one side, with short apiculus. Basidia 30–35 × 5–8 µm, claviform, with usually four, rarely two sterigmata, without basal clamp.

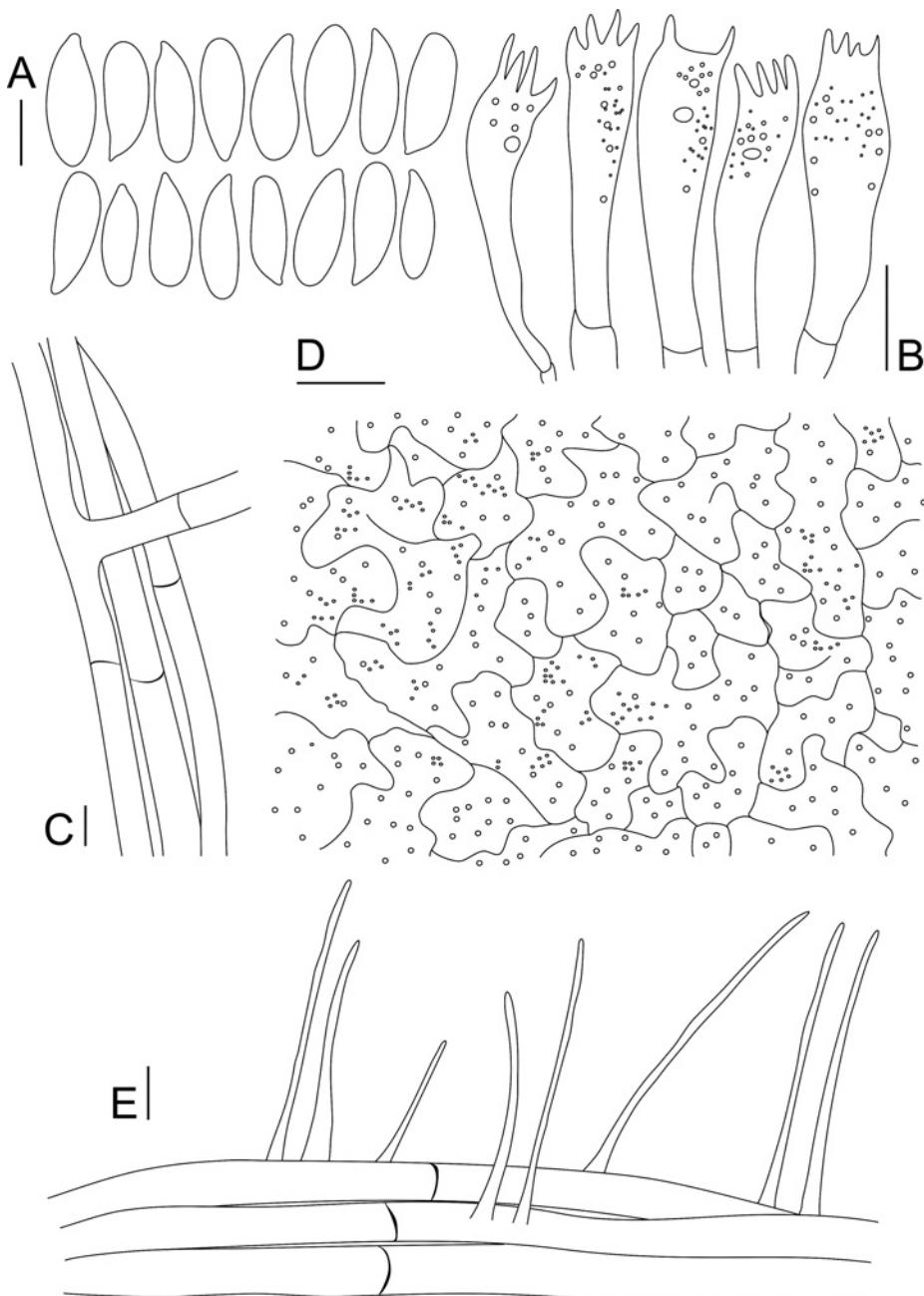
Stipe corticated. Stipe surface comprised of parallel arranged hyphae, 5–10 µm wide, clampless, thin-walled, pale creamy white, sometimes with crystals. Cauline hairs 25–60 µm in length, abundant, conical to cylindrical, sometimes forked, thin-walled, often broad at the base (2–3 µm), narrowing towards the tips (average 1 µm). Crystals of rhomboid shapes present throughout the surface of the basidioma.

Sclerotium non-gelatinised, with an epidermoid layer formed by polygonal to irregularly shaped cells.

**Ecology.** Mainly present at elevations below 100 m, fruiting solitarily on the ground or amongst moss, in deciduous forests, on damp to moist soils, fruiting in the rainy season between late October and early November. Recorded under or in the close vicinity of *Quercus petraea*.

#### Specimen examined

Turkey. Istanbul Province, Şile District, near Saklı Lake, 67 m above sea level, in the close vicinity of *Quercus petraea*, on wet soil among mosses, 23 November 2013, leg. & det. O. Kaygusuz (OKA 1825 in PAMUH).



**Fig. 2.** *Typhula spathulata*, line drawings of microcharacters (all from OKA 1825). A – basidiospores; B – basidia; C – hyphae; D – epidermoid cells; E – caulin hairs. Scale bars = 5 µm (A), 10 µm (B–E). Del. O. Kaygusuz.

## DISCUSSION

The *Typhulaceae* are a family of fungi in the *Agaricales* order, containing six genera [*Lutypha* Khurana, K.S. Thind & Berthier, *Macrotyphula* R.H. Petersen, *Pistillaria* Fr., *Pistillina* Quél., *Sclerotium* Tode (*Sclerotium* was established as an anamorphic genus, comprising anamorphs of different fungi, but its type species *Sclerotium complanatum* Tode is a synonym of *Typhula placorrhiza* subsp. *complanata* De Bary), and *Typhula* (Pers.) Fr.], and 229 species (Kirk et al. 2008). Only two taxa of this family had so far been reported in Turkey: *Macrotyphula contorta* (Holmsk.) Rauschert [syn.: *Clavariadelphus fistulosus* (Holmsk.) Corner] and *M. juncea* (Alb. & Schwein.) Berthier (Sesli & Denchev 2008, Solak et al. 2015, Sesli et al. 2016). *Macrotyphula* species differ from members of *Typhula* in the fact that they do not develop from sclerotia, and their fruiting bodies are considerably larger (10–30 cm) (Ellis & Ellis 1990).

According to the literature, *Typhula* species grow on branches of various deciduous trees and shrubs, such as *Acer*, *Alnus*, *Cytisus*, *Fraxinus*, *Juglans*, *Populus*, *Quercus*, *Salix*, *Rubus*, *Syringa* and *Ulmus* (Knudsen 1997, Siepe 1999, Shiryaev & Kotiranta 2007, Gafforov & Hoshino 2015). In Turkey, *T. spathulata* was found on soil with moss in close vicinity of *Quercus petraea*.

The knowledge of the biogeographical distribution of *Typhula* species is limited. To date it has been reported from North America, Europe and Asia (from the Middle East to the Far East) (Gafforov & Hoshino 2015). However, it has been indicated that investigations into world-wide distribution patterns of *Typhula* species should focus on regions including areas from Chile and Argentina to the South Sandwich Islands, Tasmania, South New Zealand and the Antarctic Peninsula, and also in countries like Russia, Latvia, Lithuania, Belarus, Ukraine, Armenia, Georgia, Kazakhstan and Mongolia (Millett 1999). Millett also mentioned Turkey as an area of potential distribution of *Typhula* species.

*Typhula* spp. have been reported to be widely distributed in habitats that are constantly or seasonally covered with snow and/or ice between the Middle East and Central Asia (Gafforov & Hoshino 2015). A world-wide distribution pattern of the *Typhula* species was reported to range from latitudes between approximately 35° and 65° (Millett 1999). In our study *T. spathulata* is reported from the Şile District in Istanbul Province, which is located in this range (41°35' N, 29°07' E).

Morphological species delimitation in *Typhula* is generally clear, but *Typhula* species can be overlooked because some species show a high host specificity (Gafforov & Hoshino 2015). *Typhula spathulata* grows on branches of deciduous trees distinguishing it in habitat from *T. graminum* P. Karst., which grows on dead grasses, and *T. ishikariensis* S. Imai, which grows as a parasite on living grasses.

Microscopically, *T. spathulata* can be easily distinguished from the species *T. crassipes* Fuckel and *T. lutescens* Boud. by its amyloid spores. In addition, *T. spathulata* is different from *T. crassipes*, *T. lutescens* and *T. ishikariensis*, in which clamps are present. Similarly, the taxa *T. quisquiliaris* (Fr.) Henn. and *T. olivascens* Berthier can easily be distinguished from *T. spathulata* because they have clamps and are observed on ferns (Knudsen 1997).

## CONCLUSION

In this study, *Typhula spathulata* (Corner) Berthier, a clavarioid member of the *Typhulaceae* (Basidiomycota), collected in the Şile District of Istanbul Province, Turkey, is reported. According to the current literature (Sesli & Denchev 2008, Solak et al. 2015) it is the first record from Turkey. With this study, *Typhula* has been added to the mycota of Turkey at the genus level, and the number of genera in the *Typhulaceae* family has risen to two. Further investigations into *Typhula* species from different geographical areas would help us understand the world-wide evolution of the species.

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