

# New data on larger ascomycetes (discomycetous fungi) in Bulgaria

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**Abstract.** In this article, 16 larger ascomycetes of the orders *Helotiales*, *Rhytismatales* and *Pezizales* are reported for Bulgaria. One of them, *Octospora similis* is a new record for the country. Seven species are of high conservation value and are included in the Red List of Fungi in Bulgaria. Four of them (Critically Endangered and Endangered) are listed also in the *Red Data Book of the Republic of Bulgaria*.

**Key words:** Ascomycota, Bulgaria, *Helotiales*, *Pezizales*, *Rhytismatales*

## Introduction

Discomycetous fungi (*Ascomycota*) are subject of long-term studies in Bulgaria. The current diversity of all taxa within *Helotiales* and *Pezizales* known from the country until the year 2010 and included in earlier publications by different Bulgarian and foreign mycologists was compiled separately as comprehensive review lists by Dimitrova & Gyosheva (2009, 2010). Important new data with notes on the distribution of larger fungi, including discomycetous taxa in Bulgaria, were provided also by Dimitrova (2009), Gyosheva & Georgieva (2009), Gyosheva & Dimitrova (2011), and Assyov & al. (2012).

During field work in various parts of Bulgaria held mainly in 2013–2015 by the authors, the first national record of *Octospora similis* (marked in the text below with an asterisk) was made and supplemented with further new data and localities of 15 rarely recorded taxa.

## Material and methods

The examination of fungi was mostly carried out on fresh specimens. Only two species were studied from

dry specimens after short-time rehydration in water (*Peziza michelii* and *Pseudoplectania sphagnophila*). Sections of the ascoma were mounted in water solutions. Micromorphological characters were observed and measured in water under Olympus BX-41, Amplival and Boeco 180 T-SP LM. The amyloidity test was ascertained by Melzer's reagent. Measurement values of the ascospores are generally presented in the form of minimum-maximum values. Data about the ascospores included in the descriptions of *Neottiella vividula* (Nyl.) Dennis, *Octospora leucoloma* Hedw. var. *leucoloma* and *O. similis* (Kirschst.) Benkert are given as (minimum–) mean ± s (–maximum), Sl/Sw ratio, n, where abbreviations are as follows: s – standard deviation, Sl – spore length, Sw – spore width, n – the number of spores used. Spore measurements were taken further with the help of specialized software for digital images Carnoy 2.0 (©Peter Schols 2001). Identification was confirmed by using the works of Moser (1963), Dissing (1966), Dennis (1968), Breitenbach & Kränzlin (1981), Jacobson & al. (1998), Hansen & Knudsen (2000), and Olariaga & al. (2015). The known distribution of the taxa follows Dimitrova & Gyosheva (2009, 2010), where indicated.

Three taxa of the rare species were provided with descriptions, because all available information was presented only with chorological data in Bulgarian literature. The microphotographs were taken by Olympus E330 and Canon PS A460 digital cameras. All studied specimens are kept in the Mycological Collection of the Institute of Biodiversity and Ecosystem Research, Bulgarian Academy of Sciences, Sofia (SOMF). The threat status follows the Red List of Fungi in Bulgaria (Gyosheva & al. 2006). Names of authors of fungal taxa are abbreviated according to Kirk & Ansell (2004), including its online version derived from the Index Fungorum website.

## Results

### New and rare larger ascomycetes for Bulgaria

#### *Helotiales*

##### *Geoglossaceae*

*Trichoglossum hirsutum* (Pers. : Fr.) Boud. var. *hirsutum* (Plate I, Fig. 1)

**Specimens examined:** Rila Mts, southwestern slope of peak Slavov Vrah, in a spring fen among *Climatium dendroides* (Hedw.) F.Weber & D.Mohr. and *Aulacomnium palustre* (Hedw.) Schwägr., ca 2042 m a.s.l., 07.10.2015, leg. R. Natcheva, det. M. Gyosheva (SOMF 26592).

*Endangered* (EN) species. New record for the Rila Mts. So far known only from Mt Vitosha and Central Rhodopi Mts – Chairski Ezera lakes (Dimitrova & Gyosheva 2010; Assyov & al. 2012; Dimitrova 2015b).

##### *Sclerotiniaceae*

*Ciboria rufofusca* (O. Weberb.) Sacc.

**Specimens examined:** Rila Mts, Rilomanastirska Gora Reserve, in a mixed forest of *Fagus sylvatica* L. and *Abies alba* Mill., on cone scales of fir, ca 1436 m a.s.l., 30.04.2015, leg. & det. M. Gyosheva (SOMF 26593).

The fungus was reported previously from a single locality in Bulgaria: Rila Mts, Borovets Locality (Dimitrova & Gyosheva 2010).

*Mitrula paludosa* Fr. : Fr. (Plate I, Fig. 2)

**Specimens examined:** Vitosha region, Mt Vitosha, west-northwest of Edelvais chalet, in a fen,

1656 m a.s.l., 01.08.2013, leg. & det. R. Natcheva (SOMF 26594); Rila Mts, above Belitsa town, in a fen, 1735 m a.s.l., 10.07.2015, leg. N. Velev, det. M. Gyosheva (SOMF 26595).

*Critically Endangered* (CR) species, so far reported from Mt Vitosha and Rila Mts (Dimitrova & Gyosheva 2010; Gyosheva & Dimitrova 2011; Petrova & Denchev 2015b).

#### *Rhytismatales*

##### *Cudoniaceae*

*Spathularia flava* Pers. : Fr. (Plate I, Fig. 3)

**Specimens examined:** Western Balkan Range, Chuprene Reserve, near Gorski Ray chalet, in *Picea abies* (L.) Karst. forest, ca 1500 m a.s.l., 03.07.2014, leg. R. Natcheva, det. M. Gyosheva (SOMF 26596); Central Rhodopi Mts, Kupena Reserve, in a beech forest, 1318 m a.s.l., 01.07.2014, leg. & det. D. Stoykov (SOMF 26597).

*Near Threatened* (NT) species known from the Central Balkan Range, Mt Vitosha, Rila Mts, and Central Rhodopes (Alexandrov 1970; Hinkova 1958; Gyosheva & Denchev 2000; Denchev & al. 2006; Assyov & al. 2012).

*Spathularia rufa* Schmidel (Plate I, Fig. 4)

**Specimen examined:** Rila Mts, Generalska Pusya locality, above the village of Raduil, under *Picea abies*, 1355 m a.s.l., 02.07.2009, leg. & det. M. Gyosheva (SOMF 26598).

The fungus is known from a single locality in Bulgaria: Western Rhodopi Mts – Beglika Reserve (Denchev & al. 2006; Dimitrova 2006), in coniferous forest.

#### *Pezizales*

##### *Caloscyphaceae*

*Caloscypha fulgens* (Pers. : Fr.) Boud. (Plate I, Figs 5-6)

**Specimens examined:** Rila Mts, Rilomanastirska Gora Reserve, in a mixed forest of *Fagus sylvatica* and *Abies alba*, on soil among mosses, ca 1440 m a.s.l., 30.04.2015, leg. & det. M. Gyosheva (SOMF 26599); Parangalitsa Reserve, in a spruce forest, among mosses, ca 1500 m a.s.l., 26.05.2015, leg. & det. M. Gyosheva (SOMF 26600).

Reported previously in Bulgaria from the Eastern Rila Mts, Pirin Mts and Western Rhodopes (Denchev & al. 2006; Dimitrova & Gyosheva 2009).

***Helvellaceae******Helvella lactea* Boud.**

**Specimen examined:** Sofia region, near Elin Pelin town, on soil under *Populus* sp., 05.05.2014, leg. T. Nedorin, det. M. Gyosheva (SOMF 26601).

*Critically Endangered* (CR) species, earlier known only from Mt Vitosha (Dimitrova & Gyosheva 2009; Petrova & Denchev 2015a).

***Pezizaceae******Peziza michelii* (Boud.) Dennis**

**Specimen examined:** Central Balkan Range, Balgarka Nature Park, above Stanchov Han village, on soil, 10.06.2013, leg. Y. Marinov, det. M. Gyosheva (SOMF 26602).

*Endangered* (EN) species. Reported so far from the Southern Black Sea Coast, Western Balkan Range and Rila Mts (Dimitrova & Gyosheva 2009; Dimitrova 2015a).

***Plicaria endocarpoides* (Berk.) Rifai**

**Specimen examined:** Vitosha region, Mt Vitosha, Bistrishko Branishte Reserve, in a fireplace, on soil among mosses, ca 1780 m a.s.l., 12.05.2014, leg. T. Nedorin, det. M. Gyosheva (SOMF 26603).

The species has been reported earlier in an open-air fireplace only from Mt Vitosha (Dimitrova & Gyosheva 2009).

***Pyronemataceae******Lamprospora crouanii* (Cooke) Seaver (Plate II, Fig. 15)**

**Ascomata** up to 3 mm in diameter, disc-shaped, hymenium orange, orange-reddish, margin dentate, outer surface paler, light-orange, pruinose. **Asci** cylindrical, 8-spored. **Paraphyses** straight, with granular contents. **Ascospores** up to 13–16 µm in diameter, uniseriate, unicellular, round, smooth, hyaline, ornamented with a reticulum, bearing 5–8 meshes, with a single large oil drop.

**Habitat.** On sandy soil, among low-growing mosses (*Tortula* spp., etc.), winter-spring (Moser 1963; Dennis 1968; Hansen & Knudsen 2000).

**Specimen examined:** Pirin Mts, Tisata Reserve, on sandy soil among mosses, *Weissia condensa* (Voit) Lindb., 10.05.2014, leg. R. Natcheva, det. D. Stoykov & M. Gyosheva (SOMF 26604).

This species has been recorded only once in Bulgaria from Mt Vitosha (Dimitrova & Gyosheva 2009).

***Neottiella vivida* (Nyl.) Dennis (Plate II, Figs 9–10)**

**Ascomata** up to 8–10 mm in diameter, disc-shaped, hymenium smooth, orange, margin finely fimbriate, outer surface paler, whitish, with septate, pointed, hyaline hairs towards the tip; the basis buried in the ground. **Asci** (110–) 140–175 (–220) × 17–18.5 (–20) µm, 8-spored. **Paraphyses**, cylindrical, slightly clavate at the apex, up to (4.5–) 5–6 (–7.5) µm, with orange guttules. **Ascospores** (18.5–) 22.46±2.13 (–28.5) × (10.0–) 13.14±1.23 (–16.0) µm, (1.4–) 1.70±0.25 (–2.1), n=100, broadly ellipsoid, warted, hyaline, with a single large oil drop.

**Habitat.** On sandy soil, in groups among mosses (*Polytrichum* spp.), autumn-winter (Moser 1963; Dennis 1968; Hansen & Knudsen 2000).

**Specimen examined:** Mt Western Sredna Gora, above Gabra village, in a pine plantation, on sandy soil among *Polytrichum piliferum* Hedw., ca 950 m a.s.l., 15.10.2014, leg. & det. M. Gyosheva (SOMF 26605).

Reported so far from Sofia region (above Lokorsko village) and Mt Vitosha (Dimitrova & Gyosheva 2009).

***Octospora leucoloma* Hedw. var. *leucoloma* (Plate II, Figs 11–12)**

**Ascomata** up to 2–3 mm in diameter, disc-shaped, hymenium smooth, yellowish-orange to orange, margin finely fimbriate, dentate, outer surface pale-ochraceous to orange, tomentose; underside mycelium attached to the substratum. **Asci** 125–140 (–160) × (12–) 15–16 (–17) µm, cylindrical, 8-spored. **Paraphyses** clavate, with yellow content. **Ascospores** (21.2–) 23.55±0.97 (–25.5) × (8.6–) 10.23±0.68 (–12.3) µm, (1.9–) 2.30±0.17 (–2.8), n=50, uniseriate, ellipsoid to broadly ellipsoid-fusoid, smooth, hyaline, with a single large oil drop.

**Habitat.** In groups, on sandy soil among *Bryum argenteum* Hedw., *B. dichotomum* Hedw. and other mosses, winter-spring (Dennis 1968; Dennis & Itzert 1973; Jacobson & al. 1998; Hansen & Knudsen 2000; Eckstein & Eckstein 2009).

**Specimen examined:** Valley of Struma River, above Razhdak village, in the vicinities of Petrich town, on sandy soil among mosses (*Pleuridium acuminatum* Lindb.), ca 227 m a.s.l., 08.04.2013, leg. R. Natcheva, det. D. Stoykov (SOMF 26606).

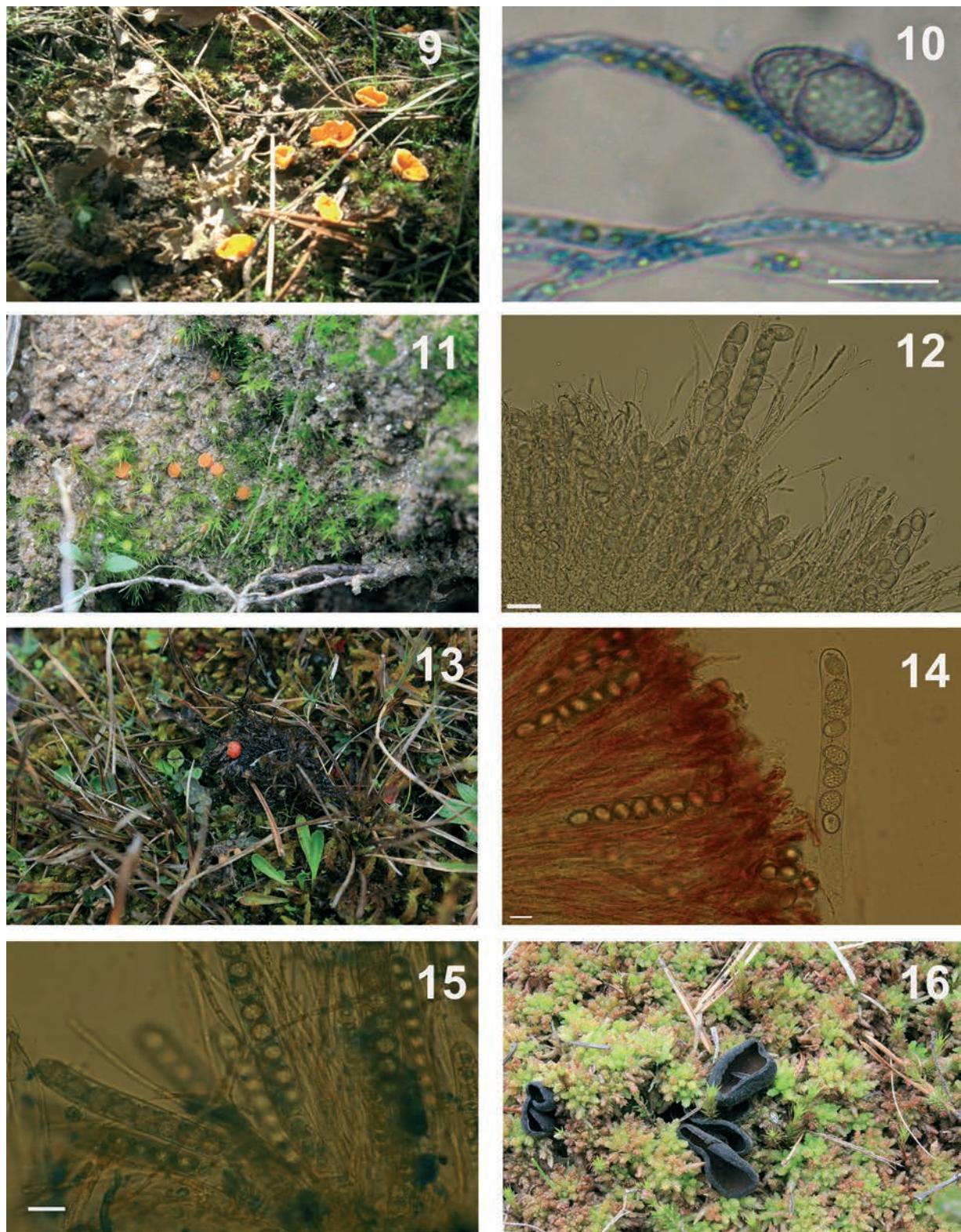
This species was reported so far for Bulgaria from the Western Balkan Range, Rila Mts and Eastern Rhodope Mts (Dimitrova & Gyosheva 2009).

## Plate I.



**Fig. 1.** *Trichoglossum hirsutum* var. *hirsutum* – ascocarpi in situ; **Fig. 2.** *Mitrula paludosa* – ascocarpi in situ; **Fig. 3.** *Spathularia flavidula* – ascocarpi in situ; **Fig. 4.** *S. rufa* – ascocarpi in situ; **Fig. 5.** *Caloscypha fulgens* – ascocarpi in situ; **Fig. 6.** *C. fulgens* – mature ascocarpi in situ; **Fig. 7.** *Otidea alutacea* – ascocarpi ex situ; **Fig. 8.** *O. onotica* – ascocarpi in situ.

## Plate II.



**Fig. 9.** *Neottiella vivida* – ascomata in situ; **Fig. 10.** *N. vivida* – paraphyses and ascospore (scale bar = 15 µm); **Fig. 11.** *Octospora leucoloma* var. *leucoloma* – ascomata in situ; **Fig. 12.** *O. leucoloma* – ascospores and paraphyses (scale bar = 20 µm); **Fig. 13.** *Octospora similis* – ascomata in situ; **Fig. 14.** *O. similis* – ascus and part of the hymenium (scale bar = 15 µm); **Fig. 15.** *Lamprospora crouanii* – ascospores and paraphyses (scale bar = 15 µm); **Fig. 16.** *Pseudoplectania sphagnophila* – ascomata in situ.

**Notes.** According to Benkert (1998b), *O. leucoloma* var. *leucoloma*, along with the 4-spored taxon *O. leucoloma* var. *tetraspora* (Fuckel) Benkert, have been assumed to parasitize on *Bryum argenteum*. Eckstein & Eckstein (2009: 226) listed *O. leucoloma* as obligate parasite on *Bryum argenteum* and *B. dichotomum*.

\**Octospora similis* (Kirschst.) Benkert (Plate II, Figs 13-14)

**Ascomata** up to 2 mm in diameter, hemisphaerical, orange-reddish, margin and outer surface paler. **Ascii** up to  $250-260 \times 15-16 \mu\text{m}$ , 8-spored, cylindrical. **Paraphyses** up to  $5-6 \mu\text{m}$  at the top, clavate, straight or curved towards the apex. **Ascospores** (15.0-)  $17.9 \pm 1.48$  (-20.0)  $\times$  (11.0-)  $13.3 \pm 1.11$  (-15.0)  $\mu\text{m}$ , (1.2-) 1.34±0.1 (-1.5), n=50, broadly ellipsoid to sub-globose, hyaline, with a large, central guttule, warted.

**Habitat.** On soil, solitary or in groups, among mosses *Bryum* spp., *Ceratodon* spp., *Pohlia* spp., autumn (Dennis & Itzerott 1973; Jacobson & al. 1998; Hansen & Knudsen 2000).

**Specimen examined:** Rila Mts, on the southwestern slope of peak Slavov Vrah, in a spring fen, on decaying plant debris, among mosses *Warnstorffia exannulata* (Schimp.) Loeske, and *Carex* sp., ca 2043 m a.s.l., 07.10.2015, leg. R. Natcheva, det. M. Gyosheva & D. Stoykov (SOMF 26591).

**Note.** The size of ascospores derived from our material conforms with the data given in Benkert (1998a). According to Currah & Davey (2006), *O. similis* (Kirschst.) Benkert infects the rhizoids of the *Bryum* species.

*Otidea alutacea* (Pers.) Massee (Plate I, Fig. 7)

**Specimen examined:** Eastern Forebalkan, Staro Selo village, on soil, in a pine plantation, close to several very young oak individuals, 18.10.2015, leg. & det. D. Stoykov (SOMF 26608).

*Vulnerable* (VU) species, earlier known in Bulgaria from the Danube Plain, Balkan Range, Vitosha region (Mt Vitosha), and Rila Mts (Dimitrova & Gyosheva 2009).

*Otidea onotica* (Pers. : Fr.) Fuckel (Plate I, Fig. 8)

**Specimen examined:** Rila Mts, above Govedartsi village, Mokrata Polyana locality, in a coniferous forest (*Picea abies*, *Pinus sylvestris* and *Abies alba*), among *Hylocomium splendens* (Hedw.) Schimp., ca

1200 m a.s.l.m., 19.09.2014, leg. & det. D. Stoykov & M. Gyosheva (SOMF 26609).

*Vulnerable* (VU) species, so far known in Bulgaria from the Black Sea Coast, Vitosha region, West Frontier Mts (Mt Osogovska), Pirin Mts, Rila Mts (Parangalitsa Reserve, Borovets locality), and Rhodopi Mts (Dimitrova & Gyosheva 2009).

### Sarcosomataceae

*Pseudoplectania sphagnophila* (Pers. : Fr.) Kreisel (Plate II, Fig. 16)

**Specimen examined:** Western Rhodopi Mts, Chairski Ezera locality, on a peat island in lake Kadireviya Gyol, among *Sphagnum magellanicum* Brid., ca 1433 m, 02.06.2013, leg. R. Natcheva & D. Ivanova, det. M. Gyosheva (SOMF 26607).

The species was reported only once for Bulgaria, from the Central Rhodopi Mts, near Smolyanski Ezera locality and Lednitsa Cave (Dimitrova & Assyov 2004; Dimitrova & Gyosheva 2009).

**Note.** The examined material shows no significant difference, as compared to the data published by Dimitrova & Assyov (2004: 2), e.g. paraphyses up to 3  $\mu\text{m}$ , ascii at about  $190-220 \times 11.5-13 \mu\text{m}$ , ascospores (9.5-) 10-11.5 (-12)  $\mu\text{m}$ .

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