

New data on fungicolous ascomycetes in Bulgaria

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Received: July 27, 2017 ▷ Accepted: September 27, 2017

Abstract. *Hypomyces aurantius* (Ascomycota, Hypocreales, Hypocreaceae), a fungicolous species, is reported for the first time from Bulgaria. It parasitizes on the fruit-bodies of various larger basidiomycetes. A concise description and illustrations of the examined specimen are provided. New chorological data are also reported about *Hypomyces chrysospermus*, growing on the fruit-bodies of boletes.

Key words: Bulgaria, Central Balkan Range, Hypocreaceae, *Hypomyces*, Mt Vitosha

Introduction

The ecological group of fungicolous fungi comprises species from different systematic groups growing on other fungi as parasites or saprobes. Many species of *Hypocreales* Lindau (Ascomycota, Sordariomycetidae) parasitize on the fruit-bodies of various larger basidiomycetes (agarics, boletes, polypores) and ascomycetes (cup fungi, truffles and truffle-like species). These fungi are economically important, because their presence spoils the edible mushrooms. A large number of species growing on fungal fruit-bodies are referred to the genera *Hypomyces* (Fr.) Tul. & C. Tul. and *Hypocrea* Fr. (Hypocreaceae). These fungi occur in sexual and asexual states (Lisiewska 1992; Pöldmaa 1996, 1999; Pöldmaa & al. 1997; Spooner & Roberts 2005; Kirk & al. 2008; Mihál & Blanár 2011). The hypocrealean species with light or brightly-coloured perithecia formed in the subiculum and developing on the fruit-bodies of fungi were usually referred to *Hypomyces* (Pöldmaa 2000). Fungicolous fungi, and especially the ascomycetes among them, are poorly studied in Bulgaria. Only four representatives of *Hypocreales* found on fungal fruit-bodies have been published so far for the country: *Hypomyces viridis* P. Karst. on *Lac-*

tarius deliciosus (L. : Fr.) Gray (Barzakov 1933); *H. chrysospermus* Tul. & C. Tul. on boletes; *Tolypocladium ophioglossoides* (Ehrh. ex J.F. Gmel.) Quandt, Kessler & Spatafora, reported as *Cordyceps ophioglossoides* (Ehrh. ex J.F. Gmel.) Fr., on *Elaphomyces granulatus* Fr. : Fr. (Kuthan & Kotlaba 1981), and *Trichoderma pulvinatum* (Fuckel) Jaklitsch & Voglmayr (under the name of *Hypocrea fungicola* P. Karst.) on *Fomitopsis pinicola* (Sw. : Fr.) P. Karst. (Dörfelt & Müsch 1987).

Hypomyces aurantius has been found by the authors during mycological studies held in 2016 on the territory of Balgarka Nature Park (Trevnenska Mt, Central Balkan Range). This species is reported for the first time from Bulgaria. Furthermore, a new locality of another fungicolous species of this genus, *H. chrysospermus*, was recorded.

Material and methods

The macromorphological features are described on the basis of fresh material. Microscopic examination was carried out on air-dried specimens after rehydration in tap water. Micromorphological characters were observed in water, 3% KOH and aqueous Congo red under Olympus

BX-41, Amplival and Boeco-180/T/SP LM. Amyloidity of the spores was tested with Melzer's reagent. The measurements are given as minimum and maximum values. Spore data measured from 50 ascospores was used. Identification was confirmed after Breitenbach & Kränzlin (1981), Dennis (1968), Hansen & Knudsen (2000), Moser (1963), Phillips (2006), and Pöldmaa (1999). The macro- and microphotographs were taken by Canon PS A460 and Olympus E330 digital cameras. The specimens studied are kept in the Mycological Collection of the Institute of Biodiversity and Ecosystem Research, Bulgarian

Academy of Sciences, Sofia (SOMF). The authors' abbreviations and nomenclature of the fungal species follow Cooper & Kirk (2017).

Results

***Hypomyces aurantius* (Pers.) Fuckel**, Jb. Nassau. Ver. Naturk., 23-24: 183 (1870) Plate I, Figs 1-6.

Perithecia (160-) 220–280 (-300) × (130-) 210–250 (-265) μm (n=20), globose or pear-shaped, surface

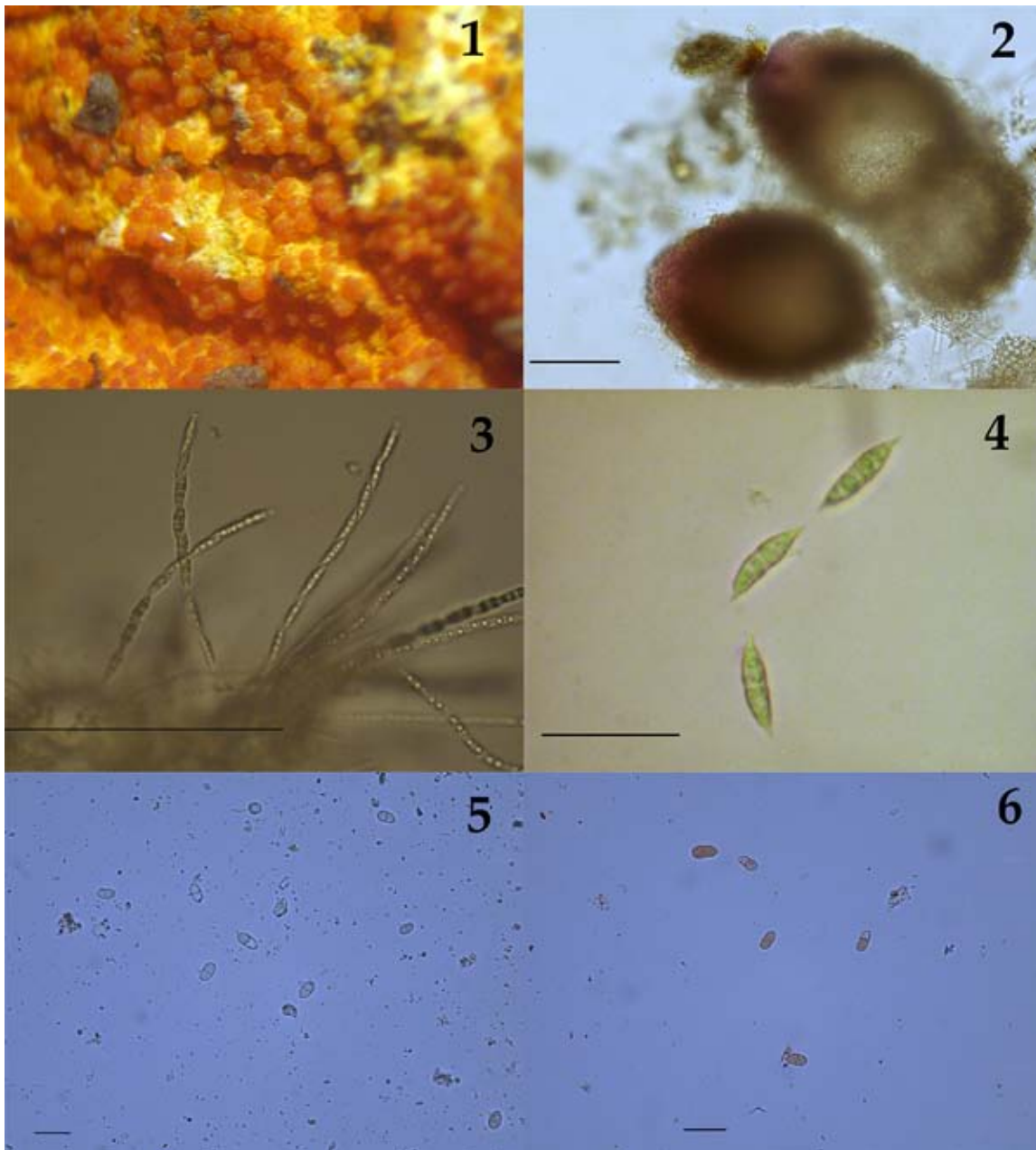


Plate I. *Hypomyces aurantius*: **Fig. 1.** Perithecia and subiculum *ex situ*. **Fig. 2.** Perithecia in 3% KOH. **Fig. 3.** Asci. **Fig. 4.** Ascospores. **Fig. 5.** Conidia. **Fig. 6.** Conidia in Congo red. Scale bars: Figs 2-3 = 120 μm; Figs 4-6 = 25 μm.

smooth, bright-orange to orange-reddish, purple-red in KOH. **Subiculum** cottony on the host surface, golden-yellow to orange. **Asci** (95-) 120–140 × (5-) 6–7 (-8) μm (n=5), cylindrical, 8-spored. **Paraphyses** absent. **Ascospores** (16-) 17.5–27 × (4-) 4.5–5.5 (-6) μm , length/width ratio 3.8–5.4 (mean \pm 1stdev = 4.3 \pm 0.3), uniseriate, fusiform, pointed at both ends, often slightly curved, finely warted, with one median septum, hyaline, inamyloid.

Asexual counterpart described in *Cladobotryum* Nees (Pöldmaa 1999, 2000; Hansen & Knudsen 2000). **Conidia** 12–15 × (7-) 7.5–11 μm , broadly ellipsoid, 1-septate, hyaline.

Habitat. The species is widespread in different forest communities. It grows on old basidiomata of fungi from *Polyporales* Gaüm. and *Hymenochaetales* Oberw. (*Bjerkandera adusta* (Willd. : Fr.) P. Karst., *Cerrena unicolor* (Bull. : Fr.) Murrill, *Fomes fomentarius* (L. : Fr.) Gillet, *Fomitopsis betulina* (Bull. : Fr.) B.K. Cui, M.L. Han & Y.C. Dai, *F. pinicola* (Sw. : Fr.) P. Karst., *Phaeolus schweinitzii* (Fr. : Fr.) Pat., *Panus* spp., *Phellinus* spp., *Trametes* spp., etc.), and on wood-decaying agarics: *Flammulina velutipes* (Curtis : Fr.) Singer, *Pleurotus ostreatus* (Jacq. : Fr.) P. Karst. This species has been reported by Mihál & Blanár (2011) also on the basidiomata of boletes. The fungus usually occurs in both morphs. The sexual morph has been recorded from June to October, while the asexual morph from April to November (Dennis 1968; Pöldmaa 1999; Hansen & Knudsen 2000).

Specimens examined: Bulgaria: Central part of the Balkan Range, Trevnenska Mt, Balgarka Nature Park, above the Balgarka Forestry Center, on old basidiomata of *Cellulariella warnieri* (Durieu & Mont.) Zmitr. & Malysheva (= *Lenzites warnieri* Durieu & Mont.), in a mixed deciduous forest, ca 1231 m a.s.l., 21.06.2016, leg. & det. M. Gyosheva, D. Stoykov (SOMF 29755). Both morphs are observed on the collected specimens.

Note. Data about the ascospores of *H. aurantius* given by Dennis (1968) and Hansen & Knudsen (2000) generally agree with those of the Bulgarian specimen. *Hypomyces viridigriseus* K. Pöldmaa & Samuels has been described from North America on *Phellinus laevigatus* (P. Karst.) Bourdot & Galcin (Pöldmaa & al. 1997). It has also two-celled ascospores, but the subicular hyphae and perithecium are KOH (-). *Hypomyces orthosporus* K. Pöldmaa with bicellular spores has been described in Estonia (Pöldmaa 1996) and also possesses KOH (-) subiculum and perithecia. The microscopic features (asci, spores and conidia) of *H. aurantius* (our collection), *H. orthosporus* and *H. viridigriseus* are compared in Table 1.

Hypomyces chrysospermus Tul. & C. Tul.

Specimen examined: Vitosha region, Mt Vitosha, Bistrishko Branishte Biosphere Reserve, on old fruit-body of *Boletus* sp., in a spruce forest, ca 1662 m a.s.l., 04.10.2016, leg. & det. M. Gyosheva, D. Stoykov (SOMF 29756).

Comment. This species has been often recorded on boletes in Bulgaria and was published earlier only once in the country under the name of *Sepedonium chrysospermum* (Bull.) Fr., on the territory of Ropotamo Reserve, Southern Black Sea Coast (Kuthan & Kotlaba 1981).

Note. Our specimen includes a second yellow powdery asexual morph (Dennis 1968; Hansen & Knudsen 2000; Phillips 2006). Asexual spores (aleuri-spores) are about 10–15 (-20) μm in diam., globose, verrucose, thick-walled, lemon-yellowish (Fig. 7). A third sexual reddish-brown (the final, pimple) stage was noticed on the host surface also, but without asci and ascospores.

Acknowledgements. This work is carried out within the framework of the project 'Taxonomy, conservation and sustainable use of fungi'.

Table 1. *Hypomyces aurantius*, *H. orthosporus* and *H. viridigriseus* – comparative data.

Author	Specimen	Asci (μm)	Spores (μm)	Conidia (μm)
SOMF 29755	(95-) 120–140 × (5-) 6–7 (-8)	(16-) 17.5–27 × (4-) 4.5–5.5 (-6); finely warted, ends acute	12–15 × (7-) 7.5–11; 1-septate, broadly ellipsoid	
Pöldmaa (1996)	100–140 × 4–6	19–24 × 4–5; finely verrucose, ends acute	12–24 × 4–6, 1-septate, cylindrical to slightly fusiform	
Pöldmaa & al. (1997)	100–140 × 7–8	(14-) 17–19 (-30) × (4-) 4.5–6 (-7.5); smooth to minutely verrucose	(15-) 17.5–28.5 (-32.5) × 7–10 (-11); 1–3-septate, ellipsoid, cylindric or clavate	

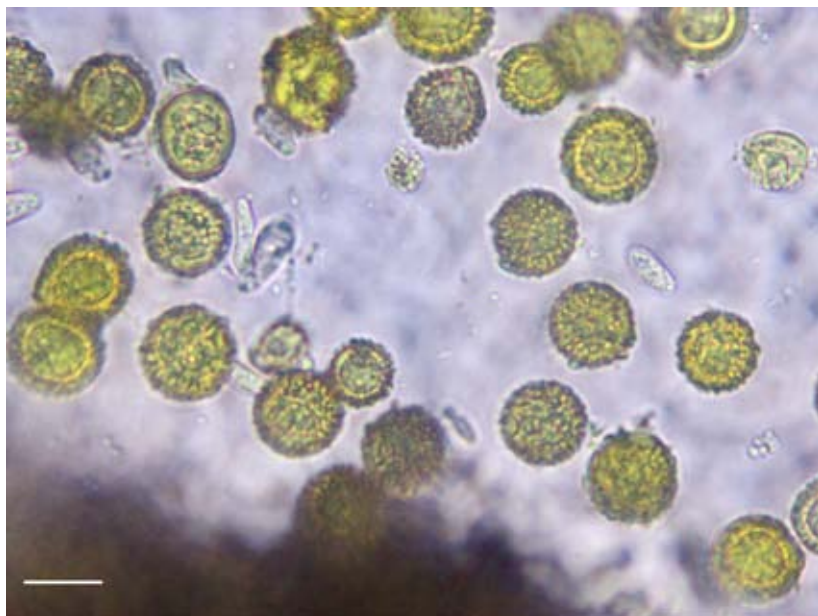


Fig. 7. *Sepedonium chrysospermum* - aleurio-spores. Scale bar = 15 μ m.

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