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Gastroboletus thibetanus: a new species from China

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Abstract— *Gastroboletus thibetanus* sp. nov. is reported from Tibet, China. It was collected under *Abies forrestii* var. *smithii* and is characterized by pale green-yellow to coral red basidiomata, a percurrent columella, and relatively large basidiospores.

Key words— *Basidiomycota*, *Boletaceae*, *Boletales*, macrofungi, taxonomy

Introduction

Gastroboletus Lohwag (*Boletaceae, Boletales, Basidiomycota*) is a small genus that is widely distributed in temperate regions (Kirk et al. 2008). It is characterized by hypogeous, sequestrate *Boletus*-like basidiomata that have a poorly developed or absent stipe with irregularly arranged tubes (usually covered by persistent membranes) and elliptical to spindle-shaped, smooth, brown to golden brown spores. Spore dispersal depends primarily on animal mycophagy (Nouhra et al. 2002). *Gastroboletus* has been reported from North and South America, Asia, South Africa, Western Europe, and eastern Australia (Cázares & Trappe 1991; Horak 1977; Lohwag 1926; Nouhra & Castellano 1995; Nouhra et al. 2002; Singer & Smith 1964; Smith & Singer 1959; Trappe & Castellano 2000; Thiers & Trappe 1969; Thiers 1979, 1989; Zang 1995). Thiers (1989) divided *Gastroboletus* sensu lato into several genera to reflect their phylogeny more correctly. Nouhra et al. (2002) provided a comprehensive key to all known *Gastroboletus* species.

Mt. Sejila, which is located in Tibet, China, is geographically isolated due to its high altitude and poor road access. Its fungal flora has been poorly studied, with only a few *Cortinarius* species previously reported (Teng et al. 2011). In an attempt to help rectify this, macrofungal field surveys were carried out in 2012

Figure 1. *Gastroboletus thibetanus* (HMJAU 30001, holotype). A. basidioma; B. vertical section of basidioma, showing gleba and columella. Scale bars = 2 cm.

and 2013. Here we describe a particularly interesting hypogeous sequestrate species, which we propose as *G. thibetanus* sp. nov.

Materials & methods

Specimens were collected at Mt Sejila, Tibet, under *Abies forrestii* var. *smithii*, the dominant species in the coniferous forest with *Larix* and *Picea* and with *Rhododendron* occasionally found in the understory (Xu 1995). The acidic brown soil has a pH of 4.9. All specimens are deposited in the Herbarium of Mycology of Jilin Agricultural University (HMJAU), China. Macroscopic characters were described based on fresh and dried material. Color names follow Kornerup & Wanscher (1978). For light microscopic observations, free-hand sections of the specimens were mounted in 5% KOH solution on glass slides. Forty randomly selected basidiospores were measured under 1000× magnification. The basidiospore surfaces were observed by scanning electron microscope after coating with gold (Bozzolla & Russell 1999).

Taxonomic description

Gastroboletus thibetanus Shu R. Wang & Yu Li, **sp. nov.** Figs 1, 2

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Differs from *Gastroboletus ruber* and *G. molinae* by its larger basidiospores and the absence of cystidia.

Type: China. Tibet, Lenzhi, Mount Sejila, 29°40′22.54″N 94°43′11.20″E, on soil under *Abies forrestii* var. *smithii* Viguié & Gaussen, 26 July 2012, Wang Shu-Rong T10020 (**Holotype**, HMJAU 30001).

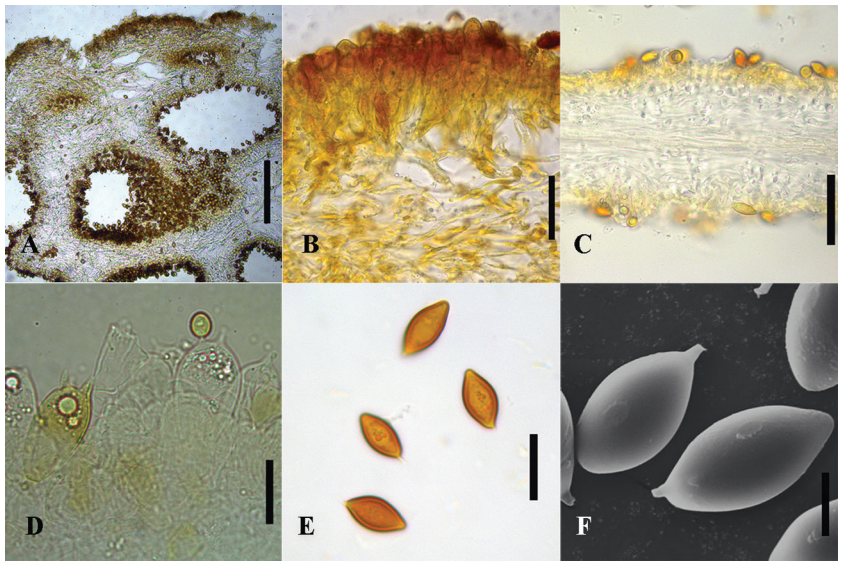

Figure 2. *Gastroboletus thibetanus*. A. vertical section through the peridium and gleba of a basidioma; B. peridial structure; C. parallel hyphae in trama; D. basidia and basidiospores; E. basidiospores, showing yellowish color and thick walls; F. SEM micrograph of basidiospores, showing smooth surface. Scale bars: A = 100 μm; B, C = 50 μm; D, E = 20 μm; F = 5 μm.

Etymology: Referring to Tibet Autonomous Region, where the holotype was collected.

Basidiomata depressed-globose to reniform, 6–40 mm across when dried, 10–48 mm across when fresh, surface smooth, sometimes cracked-areolate on top, "light green-yellow" to "coral red" (1A7–1A8, 9A7–9B7), becoming somewhat grayish yellow with age. Gleba 5–23 mm broad, olive brown (4E5), with empty chambers and a prominent columella, changing bluish on bruising or exposure. Columella 7–15 mm broad, yellow to reddish-brown (2A8, 4A8) when fresh, sordid yellowish when dried, truncate to dendroid, with narrow, radiating branches, extended below as a reddish-brown sterile base, usually arising from yellowish rhizomorphs, changing bluish when bruised or exposed. Odor fruity to mushroomy.

Peridium 60–150 μm thick, yellow-brown. Peridial hyphae 3–18 μm diam., surface smooth, thin-walled, yellowish, more or less appressed, sometimes interwoven, slightly gelatinous to floccose in KOH. Hyphae below peridium 2.0-4.5 μm diam., surface smooth, yellow-brown, thin-walled, loose and subparallel with the peridium. trama olive brown, consisting of loose, subparallel hyphae (2.0–5.0 μm thick). Columellar hyphae 3.0–6.0 μm diam., thick-walled, pale yellow to pale brown, loose and rarely dichotomously branched. Basidia cylindrical, 2–4-spored, 25–36 × 10–14 μm; sterigmata

3.7–5 µm long and 1.5–3 µm thicker at base. Basidiospores ellipsoid, smooth, thick-walled, yellowish in KOH, 11–23.5 × 7.5–12 µm, L/W ratio = 1.64–1.94, Average = 1.80 ± 0.02, symmetrical, basal apiculus prominent. Cystidia and clamp connections not seen.

Habitat: Epigeous or subhypogeous on soil under *Abies forrestii* var. *smithii*.

Additional specimens examined: **CHINA**. **Tibet**, Lenzhi, Mount Sejila, 29°40′22.54″N 94°43′11.20″E, 11 August 2013, coll. Wang Shu-Rong T50457 (HMJAU 30002); 29°40′22.64″N 94°43′10.22″E, 11 August 2013, coll. Wang Shu-Rong T50467 (HMJAU 30005); 29°40′22.50″N 94°43′10.44″E, 4 October 2013, coll. Li Shu T18269 (HMJAU 30006).

Discussion

The combined characters of the pale green-yellow to coral red basidiomata that become bluish on bruising or exposure, percurrent columella, relatively large (11–23.5 × 7.5–12 µm) thick-walled basidiospores, and the absence of cystidia are diagnostic for *G. thibetanus*. *Gastroboletus thibetanus* belongs to *G.* sect. *Gastrosubtomentosi* based on the red overtones of the basidiomata, dry peridial surface, and structure of the peridium (Thiers 1989).

The color and size of *G. thibetanus* basidiomata are somewhat similar to those of *G. ruber* and *G. molinae* reported from U.S.A. (Cázares & Trappe 1991; Nouhra et al. 2002). The two American species differ from *G. thibetanus* by smaller basidiospores (8–20 × 4–6 µm and 11–20 × 5–8 µm, respectively) and the presence of cystidia. In addition, *G. ruber* always occurs in coniferous forests dominated by *Tsuga* spp. (Zeller 1939, Molina et al. 1992) while *G. molinae* is associated with *Quercus chrysolepis* (Nouhra et al. 2002).

Gastroboletus thibetanus also resembles *G. citrinobrunneus, G. dinoffii,* and *G. doii* by tissues that turn blue on bruising or exposure. Both *G. citrinobrunneus* and *G. dinoffii*, reported from California, U.S.A, are readily distinguished by their larger basidiomata and smaller basidiospores (Nouhra & Castellano 1995; Thiers 1979). *Gastroboletus doii* (from New Caledonia) can be differentiated by pale dull brown to ochre basidiomata, presence of cystidia, and a volva (Zang 1995). The type species of *Gastroboletus, G. boedijnii* from China (Lohwag 1926), is easily separated from *G. thibetanus* by the presence of cystidia and smaller (11–14 × 4–5.5 µm) basidiospores (Smith & Singer 1959).

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