



Protostropharia luteonitens (Basidiomycota, Agaricales): new to China

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Abstract

Protostropharia luteonitens is characterized by its pointedly papillate pileus, the large dark basidiospores, 2- spored basidia and absence of chrysocystidia. It is known from North America, Europe and Asia (Japan). In this paper, *P. luteonitens* is reported for the first time from China. This species is presented here with a full description, colour photographs, and line drawings.

Key words – Morphological characteristics – Strophariaceae – taxonomy

Introduction

The genus *Protostropharia* Redhead, Moncalvo & Vilgalys 2013 had been treated as Subgenus *Stercophila* (Romagn. ex Noordel.) Noordel. 2011 or Sect. *Stercophila* (Romagn.) Sing. 1936 subordinated to genus *Stropharia* (Fr.) Quél 1872. Redhead et al. (2013) separated the genus *Protostropharia* from *Stropharia* by the formation of astrocystidia rather than acanthocytes on mycelium including that at the bases of basidiomes and in cracks and pockets within the dung substrate, as well as based on phylogenetic study of Moncalvo et al. (2002) and Walther et al. (2005).

Index fungorum (2017) documented nine species namely *Protostropharia alcis* (Kytöv.) Redhead 2013, *P. arctica* (Kytöv.) Redhead 2014, *P. dorsipora* (Esteve-Rav. & Barassa) Redhead 2014, *P. islandica* (Kytöv.) Redhead 2014, *P. luteonitens* (Fr.) Redhead 2014, *P. ochraceoviridis* (García Mon.) C. Hahn 2014, *P. ovalispora* Y.W. Wang & S.S. Tzean 2015, *P. semiglobata* (Batsch) Redhead, Moncalvo & Vilgalys 2013 and *P. tuberosa* (H.C. Beardslee) Redhead 2014 with *P. semiglobata* as the type.

Protostropharia semiglobata, *P. dorsipora* and *P. ovalispora* have been reported from China (Bao 2014, Wang & Tzean 2015) and among them, *P. ovalispora* was originally described from China. In this paper, we report *P. luteonitens* for the first time from China based on macro- and micro-morphological characteristics.

Materials & Methods

Macro-morphological features were described based on fresh materials and documented by photographs. Fungal material was dried using an electric drier and deposited in the herbarium of the International Fungal Research and Development Centre (IFRDC), Research Institute of Resource Insects, Chinese Academy of Forestry. Color designations (e.g. 4A5; Buff-Yellow) were from Kornerup & Wanscher (1981). Microscopic features were described from dried material mounted in 5% KOH, Congo red, or water, measured and illustrated under a compound microscope (Nikon 80i or E800). Terminology and methodology for descriptions see Ma et al. (2014).

Results

Taxonomy

Protostropharia luteonitens (Fr.) Redhead, Index Fungorum 148: 1 (2014)

Figs. 1–2

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Pileus 10–25 mm diameter, conic and brownish yellow (4B4, oac716) when young, then subconic to hemispheric and beige or straw yellow (3A3; oac814), pointedly papillate in centre, often slightly sulcate or striate at margin, shiny when dry, surface smooth, context whitish (1A1, oac909) and relatively hardish. Lamellae adnate, about 4 mm high, close or subdistant, pale gray (1B1, oac907) when young, then becoming yellowish brown (4B5, oac791) with purple tinge, edges serrulate and remaining whitish. Stipe 25–40 mm × 1.0–3.0 mm, cylindrical, nearly concoloured with that of pileus, stuffed to hollow, fragile; surface covered with white floccose scales; base of stipe with white mycelium, sometimes shaped pseudosclerotium; often with annuliform zone in upper half; context yellowish (1A2, oac900) to brownish (4B4, oac797), whitish (1A1, oac909) towards the surface. Odor mild.

Pileipellis an ixocutis, 15–200 µm thick, hyaline, made up of creeping, interwoven, colourless to dark yellowish, 1–5 µm wide filamentous hyphae; subpileipellis yellowish brown in KOH, composed of interwoven, tubular to inflated tubular, 4–16 µm wide hyphae, the wall of hyphe sometimes incrustated with some blackish material. Stipitipellis also an ixocutis, 15–100 µm thick, composed of interwoven, hyaline, colourless to dark yellowish, 2–5 µm filamentous wide hyphae, the wall of hyphe smooth or rough. Subhymenium subcellular, composed of irregular vesicular cells. Hymenophoral trama subregular to interwoven, with cylindrical hyphae 2–13 µm diam, hyaline, colourless to dark yellowish, wall smooth or sometimes slightly rough. Basidia 28–37.5 × (9–)10.5–15.5 µm, hyaline and colourless, subcylindric to clavate, 2-spored and 1-spored, rarely 3-spored, sterigmata (2–)3–7(–8) µm. Basidiospores (108/3/1) (13.5–)14.5–20(–25) × (8–)9–12.5(–16) × (7.5–)8.5–12.5 µm, ellipsoid or subellipsoid in face view, $Q = (1.4–)1.5–1.7(–1.8)$, $Q = 1.59 \pm 0.08$; ellipsoid or subellipsoid in side view, $Q = (1.3–)1.5–1.8(–1.9)$, $Q = 1.65 \pm 0.10$, purplish brown in water, yellowish brown in KOH, dark purplish brown in deposit; wall smooth, thick (1–1.5 µm) and complex, with distinct 1.5–3 µm wide, often slightly eccentric in side view apical germ pore. Cheilocystidia 20–35 × (4–)5–9(–11) µm, hyaline and colourless, occasionally yellow-brownish, cylindric, cylindric-clavate, clavate to sublageniform, often with a rounded apex. Caulocystidia abundant, 18–63 × 3.5–8(–10.5) µm, hyaline, colourless to yellow-brownish, cylindric, sometimes clavate or sublageniform, often more or less flexuous. Clamp connections abundant.

Known distribution – Known from North America, Europe and Asia (Japan) (Guzmán 1983, Stamets 1996, Noordeloos 2011), found for the first time in Yunnan Province, southwest China.

Habitat – Growing scattered to gregarious on soil of a meadow close to a river where cattles and horses have grazed in summer.

Material examined – CHINA, Yunnan Province: Zhaotong, Zhaoyang district, Tiaodun river of Dashanbao, 27°24'37.6"N, 103°17'34.5"E, elevation 3132 m, 30 Aug 2011, Tao Ma and Xiao-Fei Ling, ZY029 (IFRD415163).

Discussion

Protostropharia luteonitens is characterized by its pointedly umbonate pileus, glutinous pileus and stipe, the annulus or annular zone on stipe, sometimes with a pseudosclerotium of the stipe (Cléménçon & Roffler 2003), as well as large dark basidiospores, 2-spored basidia and absence of chrysocystidia. *Protostropharia luteonitens* is morphologically similar to *P. semiglobata* and *P. dorsipora* because of the morphologically similar basidiocarps, but *P. luteonitens* can be easily separated from *P. semiglobata* and *P. dorsipora* by the pointedly umbonate pileus, 2-spored basidia and absence of chrysocystidia. Among the species of the genus *Protostropharia*,

P. islandica also doesn't have chrysocystidia, but it has stout basidiocarps, 4-spored basidia and smaller basidiospores (Kytövuori 1999, Noordeloos 2011).

Protostropharia luteonitens mostly has 2-spored basidia only, sometimes it also has 4-spored basidia (Kytövuori 1999), while Guzmán (1983) recorded *P. luteonitens* with 4-spored, or 1-2-spored basidia. Specimens of *P. luteonitens* from Yunnan, southwest China has 2- and 1-spored larger basidia than previously recorded specimens from other regions of the world (Kytövuori 1999, Guzmán 1983).



Fig. 1 – *Protostropharia luteonitens* A Basidiospores. B Basidia. C Cheilocystidia. D Caulocystidia. E–G Basidiocarps in the field. Scale bars: A–D = 10 μ m.

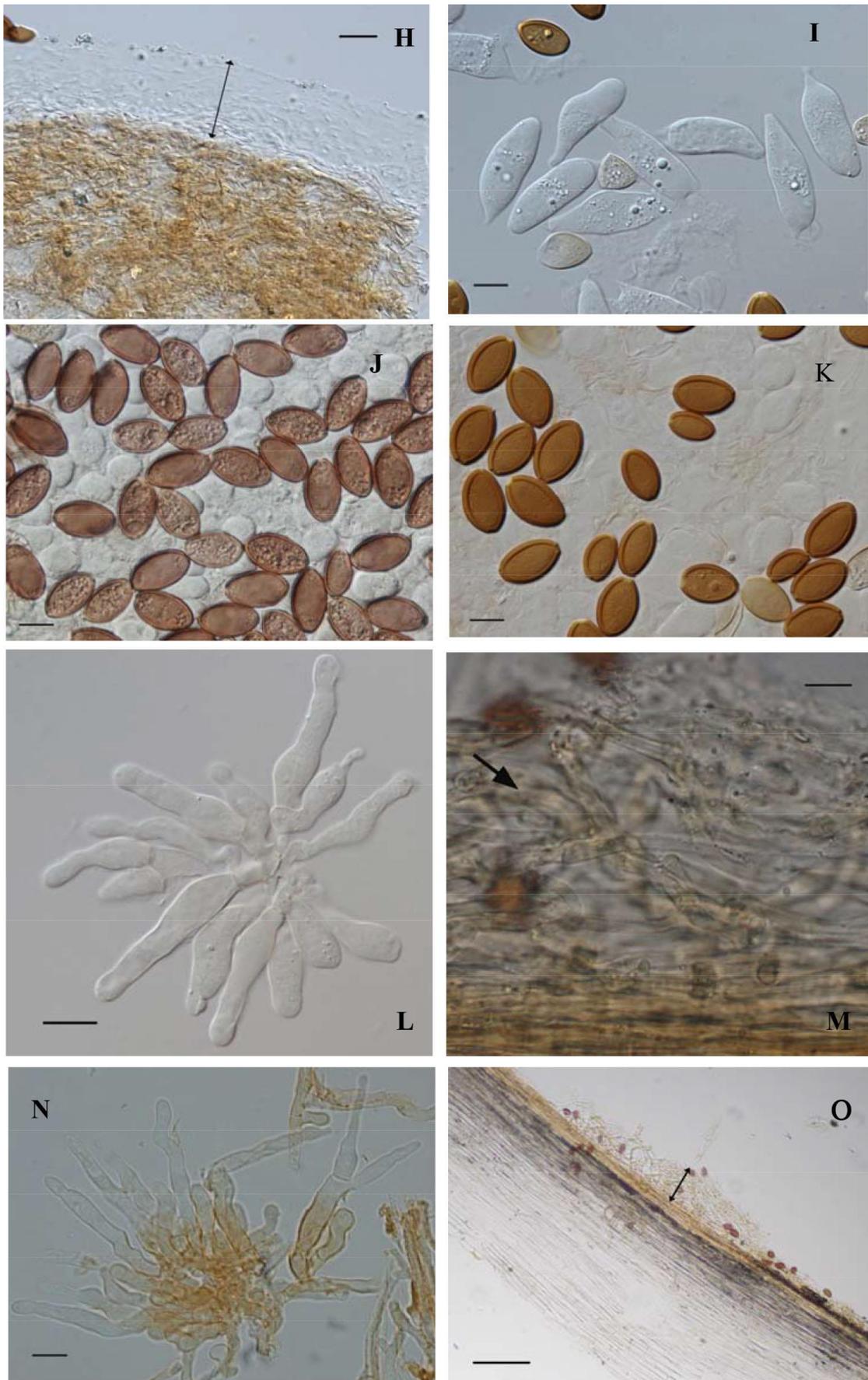


Fig. 2 – *Protostropharia luteonitens* H Pileipellis 400×. I Basidia 1000×. J Basidiospores mounted in water, 1000×. K Basidiospores in KOH, 1000×. L Cheilocystidia 1000×. M Stipitipellis 1000×. N Caulocystidia 1000×. O Stipitipellis 100×. Scale bars: I–N = 10 μm. H = 20 μm. O = 100 μm.

Protostropharia luteonitens is widely distributed throughout the Northern temperate zones, but it seems to be rare or very rare in its range (Guzmán 1983, Kytövuori 1999, Noordeloos 2011). This is the first report of *P. luteonitens* from China, which seems to be very rare in Yunnan Province, in four years of collection throughout Yunnan Province, we only found one specimen of *P. luteonitens* at 3132 m altitude.

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