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Research Article

NEW RECORD OF PARASITIC MACROFUNGUS FROM INDIA

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ABSTRACT
Hypomyces leuteovirens is described and illustrated for the first time from India. It is compared with the allied Indian and extralimital taxa.

Key Words: *Ascomycota, Hypocreaceae, Hypomyces, Macrofungi, Sikkim, Taxonomy*

INTRODUCTION
Species of the genus *Hypomyces* commonly parasitize on different groups of macrofungi in subtropical to subalpine Himalaya. They covers mainly the fertile layers i.e. lamellae (Agarics) or pores (Boletes or Aphyllophorales) and sometimes stipe and pileus of host macrofungi. Recently, while undertaking a macrofungal foray to different parts of the North district of Sikkim (a small Himalayan state covering 0.22% of geographical area of India) by the senior author a large number of macrofungi were collected. After thorough macro- and micromorphological examination of those macrofungi followed by literature study one appeared to be parasitic on members of Russulaceae and reported here as *Hypomyces luteovirens* with its description and supporting illustrations for the first time from India.

MATERIALS AND METHODS
Macromorphological/field characterization was made with the fresh specimens. Field photographs of them were taken with the help of Nikon D300s and Olympus C-5060 (wide zoom) cameras. Colour codes and terms follow Methuen Handbook of Colour (Kornerup and Wanscher, 1978). After recording the macromorphological characters specimens were dried in the sun as well as with a field drier.
Micromorphological characters were noted with the aid of a light microscope: Olympus CX 41 based on the dry samples mounted in a mixture of 3–5 % KOH and phloxin, lactophenol, cotton blue and Melzer's reagent. Measurement of ascospores are recorded based on that of twenty. Ascospores are measured in side view. Measurements of spore-size and length/width ratios (Q) are presented as: minimum–**mean**–maximum. Herbarium name is after Holmgren *et al.*, (1990).

Taxonomic Treatment
***Hypomyces Luteovirens* (Fr.) Tul. & C. Tul.**, Ann. Sci. Nat., Bot., sér. IV, 13 (1860) Figure 1
Fruiting structure (subiculum) white initially, then becoming pastel yellow (1A4), yellowish green (30A6), bile yellow (30C5) and greyish green (30D6–30D5) or often turning ivy green to olive (1F3–1F4), at maturity in combination with dark green to spinach green (30F6, 29F5, 29F4–29E6) or blackish green, growing over the surface of the stipe, lamellae & pileus of host mushrooms, especially species of Russulaceae. Perithecia dark green projected as small pimples/bumps over the lamellae of the host mushroom.
Subicular hyphae 4–5 µm wide, moniliform with chains of cells. Perithecia 410-580 × 250-560 µm, globose, subglobose, ellipsoid to broadly ellipsoid, pyriform or flask-shaped, opening with an ostiole, yellowish green to olive or darker, deeply embedded in the crust with protruding papilla, KOH−; hyphae of perithecial apex 4–5 µm wide, moniliform with distinct constrictions at septa. Asci 88-188 × 5-8 µm, filiform to long cylindrical, thick-walled (wall up to 1.6 µm), bearing 8 spores, with an apical ring (up to 3.6 µm diam.) and pore when mature. Ascospores 35–**40**–47 × 4.4–**5.3**–5.8 µm, narrowly spindle shaped or fusiform (n = 20, Q = 6.80–**7.55**–8.20), rough/minutely warted (under compound microscope), without septa, with frequent vacuoles, apiculate, hyaline; apiculus 6–10 µm long, straight to curved.

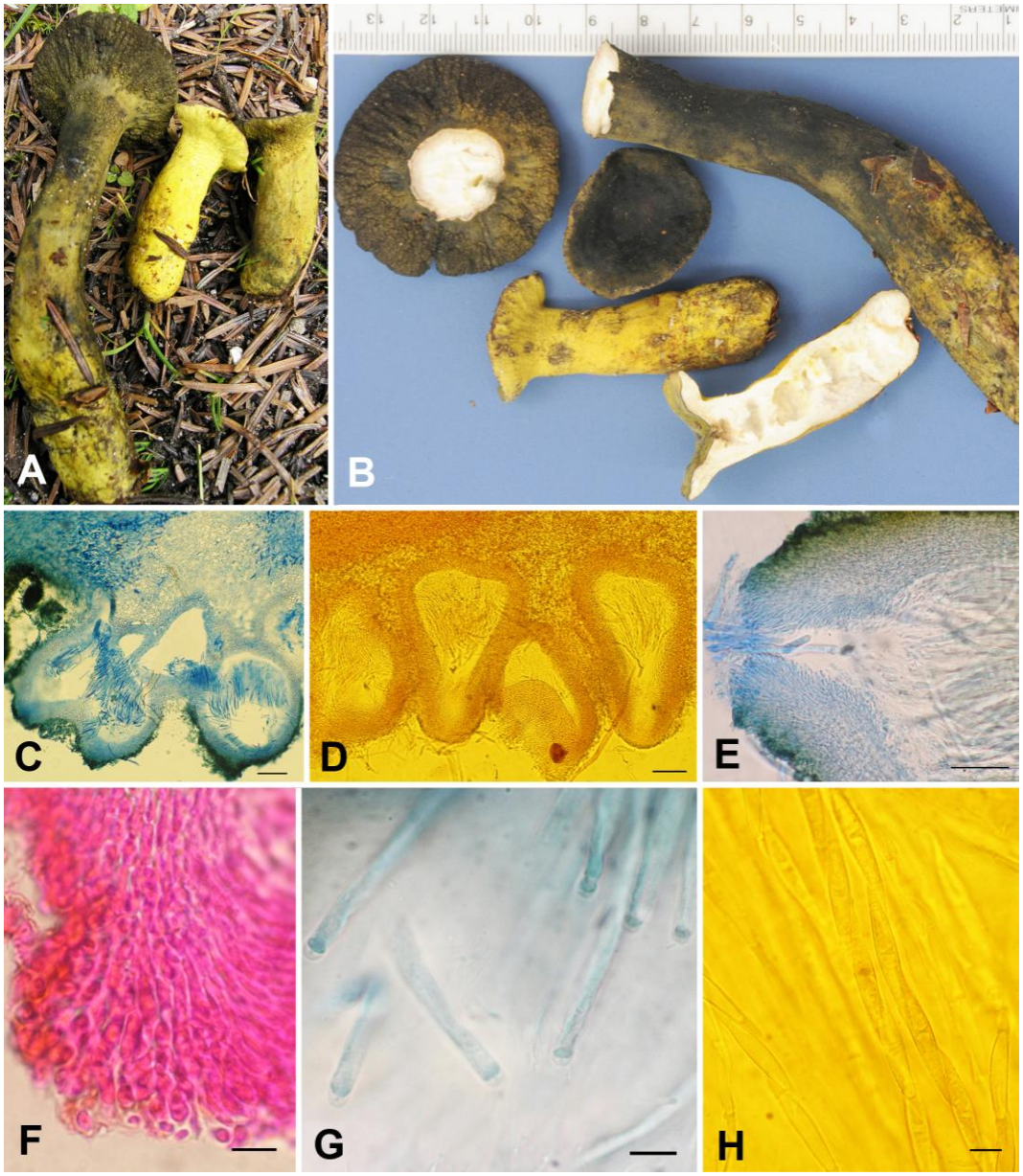

Figure 1: Macro- and micromorphological details of *Hypomyces luteovirens* (from KD 13-052). A: Fresh fruiting structures growing over specimens of Russulaceae (host) on their habitat. B : Parasitic infection over the surface of lamellae, stipe and pileus of the host specimen. C & D: Perithecia of different shapes in cotton blue & Melzer's reagent. E: Arrangement of asci towards perithecial apex. F: Moniliform hyphae of perithecial apex. G: Tips of mature asci showing apical rings and pores. H: Chains of spindle-shaped or fusiform ascospores in Melzer's reagent showing vacuoles. Bars: C & D = 100 µm, E = 50 µm, F, G & H = 10 µm.

Specimen examined: INDIA, Sikkim, North district, Shingba Rhododendron Sanctuary, alt. 3252 m, N27°44'19.5"E88°44'25.9", under *Abies densa*, subalpine mixed forest (broad-leaf and coniferous), 27 July 2013, K. Das, KD 13-052, (CAL). Distribution: North America, Europe, Japan and India (Asia).

Notes*:* *Hypomyces luteovirens* is also known as *Sphaeria luteovirens* Fr., Kongl. Vetensk. Akad. Handl. 38: 251 (1817); *Hypocrea luteovirens* (Fr.) Fr., Summa Veg. Scand.: 383 (1849) and *Peckiella luteovirens* (Fr.) Maire, Ann. Mycol. 9: 318 (1911). Its common name is Russula-mold. It belongs to the family Hypocreaceae under Ascomycota.

Hypomyces luteovirens can easily be identified by the distinct coloration (yellowish green to dark green or blackish green) of its subiculum on the host specimens, long unicellular (aseptate) ascospores and presence of moniliform hyphae in subiculum and perithecial apex (Rogerson and Samuels, 1994). Macro- and micromorphological features of Indian collections agree with that of American collections. But, in the Americal materials, the perithecia are comparatively narrow (380–485 × 180–290 µm) and apicules of ascospores are comparatively short (2.4–7.3 µm) than those of present collection (Rogerson & Samuels 1994).

Hypomyces lactifluorum (Schwein.) Tul. & C. Tul. (never reported from India) and *Hypomyces chrysospermus* Tul. & C. Tul. (also reported from Sikkim, India) partly resemble the present species. Though *Hypomyces lactifluorum* (the Lobster mushroom) also grows on the different species of *Russula* and *Lactarius* it can easily be distinguished in the field from *H. luteovirens* by its bright yellow coloration (Miller and Miller, 2006) whereas, *H. chrysospermus* (Bolete-mold) parasitizes over various species of Boletes and can be separated from the species in discussion by its golden yellow to reddish brown coloration (Bessette *et al.*, 1997; Das, 2009). Another close but host specific species *Hypomyces lithuanicus* Heinr.-Norm (reported from North America and Europe) growing only on *Lactarius torminosus* (Schaeff.) Gray (Russulaceae) is KOH+ (subiculum and perithecial apex turning reddish in KOH) as mentioned by Rogerson and Samuels (1994). Moreover, *H. luteovirens* is micromorphologically distinct with its moniliform hyphae in subiculum and perithecial apex.

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