

A new species of *Hypoderma* and description of *H. rubi* (Ascomycota) from China

by

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With 10 figures

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Abstract: Two species of *Hypoderma* are reported from China. *H. urniforme*, found on twigs of *Rhododendron* sp. in Yunnan province, is described as a new species. It is characterized by urniform, intraepidermal ascomata, well-developed red-brown lips, and ellipsoidal to long ellipsoidal ascospores with irregular gelatinous sheaths. For the other species, *H. rubi* on *Cunninghamia lanceolata* in Anhui province, a detailed description and illustrations are provided.

Key words: Ericaceae, Rhytismatales, Taxodiaceae, taxonomy.

Introduction

Johnston (1990) revised the genus *Hypoderma* and enumerated nine key characteristics thought to be important for species in this genus. To avoid erecting too many new genera within the Rhytismatales, however, Hou & Piepenbring (2006) assigned some species to this genus that differ morphologically from the species of *Hypoderma* sensu Johnston (1990).

Up to now, ten *Hypoderma* species are reported in China (Hou & Piepenbring 2006, Hou et al. 2005, Liang et al. 2005, Lin et al. 2004, Tai 1979). Hou & Piepenbring (2006) provided a key to *Hypoderma* species for China. In continuation of studies on Rhytismatales in Yunnan and Anhui provinces of China, two further species of *Hypoderma* were found. One species occurring on living twigs of *Rhododendron* sp. has intraepidermal ascomata, atypical for species of *Hypoderma* sensu Johnston (1990),

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but similar to some *Hypoderma* species reported by Hou & Piepenbring (2006). Therefore, it is also placed in the genus *Hypoderma* and described here as new. The other known species, *H. rubi* (Pers.) DC. ex Chev. on needles of *Cunninghamia lanceolata* (Lamb.) Hook., is described in detail and illustrated in this paper for the first time for China.

Materials and methods

Sections of different thickness of ascomata were made by hand using a razor blade. Microscopic preparations were made in water, Melzer's reagent, 5% KOH, or 0.1% (w/v) cotton blue in lactic acid. For the observation of ascomatal outlines in vertical section, sections were mounted in lactic acid or cotton blue with pretreatment in water. Gelatinous sheaths surrounding ascospores and paraphyses were observed in water or cotton blue in lactic acid. Ascospore contents are drawn based on observations in water.

Taxonomy

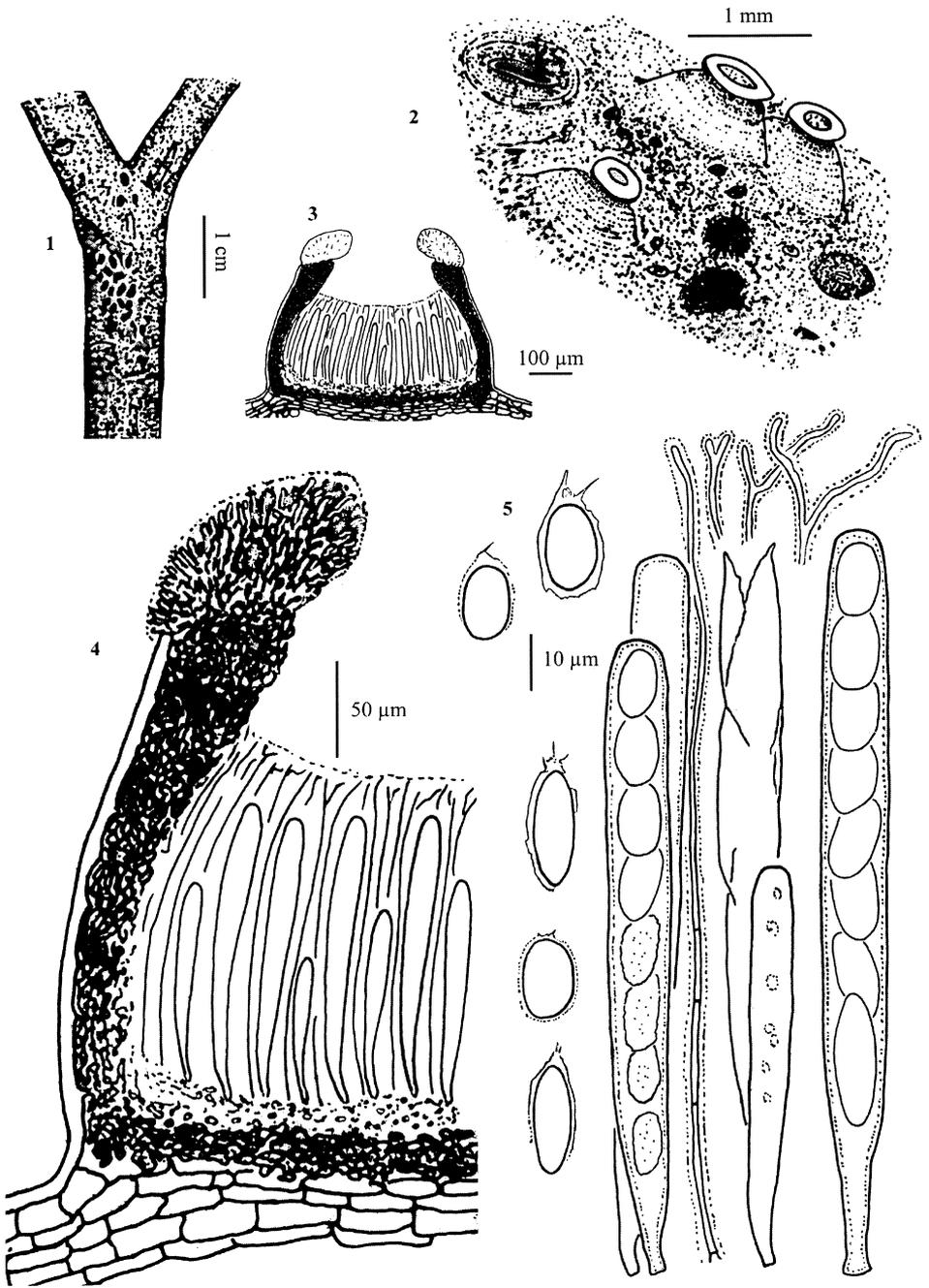
Hypoderma urniforme C.L.Hou & M.Piepenbr., sp. nov. Mycobank MB 510022
Figs 1-5

ETYMOLOGY: *urniformis* = urniform; referring to the ascomatal shape.

Ascomata 400-800 × 350-550 μm, nigra, e superficie urniformia vel elliptica, utrinque acuta, intraepidermalia; paraphyses filiformes; asci 100-150 × 10-15 μm, cylindrici; ascosporae 14-20 × 7-10 μm, ellipsoideae vel parum oblongae, tunica gelatinosa irregulari inclusae.

TYPES: On *Rhododendron* sp. (Ericaceae). China, Yunnan province, Lijiang, Baishui, alt. ca. 3000 m, 25 July 2001, C.L.Hou, M.Piepenbring, R.Kirschner, and Z.L.Yang 147a (Holotype, HMAS), 147d (Paratype, HMAS).

Ascomata on living stems or twigs, not associated with pale areas or zone lines. In surface view ascomata 400-800 × 350-550 μm, elliptical, opening by a longitudinal split, strongly raising above the substrate surface in the region of the split, crock-like, or almost flat, widely elliptical when young. Lips present, reddish brown, hard, embedded in gelatinous sheaths. Entire surface of the ascomata black, shiny. In median vertical section ascomata intraepidermal, covering stroma up to 70-90 μm thick near the centre of the ascomata, extending to the basal stroma, consisting of an outer layer of host cuticle and remains of epidermal cells which are filled with brown, thick-walled ellipsoidal fungal cells, and an inner layer of dark brown, thick-walled, somewhat disorganized textura epidermoidea. Lip cells with several branches, reddish brown, 60-90 μm long. Excipulum absent. Basal stroma well developed, slightly concave, 30-45 μm thick, composed of one layer of dark brown, thick-walled, textura angularis. Subhymenium composed of textura intricata, 10-15 μm thick. Paraphyses up to 170 μm long, filiform, branched or unbranched at the apex, covered in a thick gelatinous sheath. Asci ripening sequentially, 100-150 × 10-15 μm, cylindrical, apex truncate, almost without a stalk, J-, without circumapical thickening, 8-spored. Ascospores arranged in a single row, 14-20 × 7-10 μm, ellipsoidal in the upper part of asci and slightly long ellipsoidal in the lower part, hyaline, aseptate, with small guttules in 5% KOH but invisible in water, with a thin, often irregular gelatinous sheath.



Figs. 1-5. *Hypoderma urniforme* on *Rhododendron* sp. 1. Part of a living twig bearing ascomata. 2. Ascomata as seen under a dissecting microscope. 3. Ascoma in vertical section. 4. Detail of an ascoma in vertical section. 5. Paraphyses, young ascus, mature asci with or without ascospores, and liberated ascospores with gelatinous sheaths.

Structures resembling conidiomata of Rhytismatales in areas near the ascomata. In surface view elliptical, 120-160 μm diam., black, opening by round ostioles. Conidiogenous cells and conidia not observed.

DISTRIBUTION: *H. urniforme* is only known from the type locality.

NOTES: Three *Hypoderma* species are known on *Rhododendron* spp., namely *H. rhododendri-mariesii* Y.R.Lin & S.J.Wang, *H. shiqii* C.L.Hou & M.Piepenbr., and *H. cuspidatum* C.L.Hou & M.Piepenbr. *H. rhododendri-mariesii* is close to the type species of the genus, *H. rubi* (Pers.) DC. ex Chev., with long-stalked, clavate asci with cylindric-fusiform ascospores (Lin et al. 2004). *H. shiqii* has ascomata without lips and clavate asci with bifusiform ascospores (Hou & Piepenbring 2006). The intraepidermal ascomata and almost cylindrical asci with ellipsoidal to slightly long-ellipsoidal ascospores of this new taxon are somewhat similar to *H. cuspidatum*. However, *H. cuspidatum* has ascomata with more or less cuspidate ends, no lips, as well as simple, unbranched paraphyses (Hou & Piepenbring 2006), while *H. urniforme* often has crock-like ascomata at maturity, well-developed, reddish brown lips, and often branched paraphyses. The placement of *H. urniforme* in *Hypoderma* has to be confirmed by molecular data.

Crock-like ascomata of *H. urniforme* are reminiscent of those of *Lophodermium sphaerioides* (Alb. & Schwein.) Rehm and *L. pyrolae* Parmelee (Johnston 1988). *Lophodermium* species, however, have filiform ascospores, while *H. urniforme* has ellipsoidal to slightly long-ellipsoidal ascospores.

H. urniforme often occurs together with *Hypoderma shiqii*, *Nematococcomyces rhododendri* C.L.Hou et al., and *H. cuspidatum*.

Hypoderma rubi (Pers.) DC. ex Chev., J. Phys. Chim. Hist. Nat. Arts 94: 31, 1822.

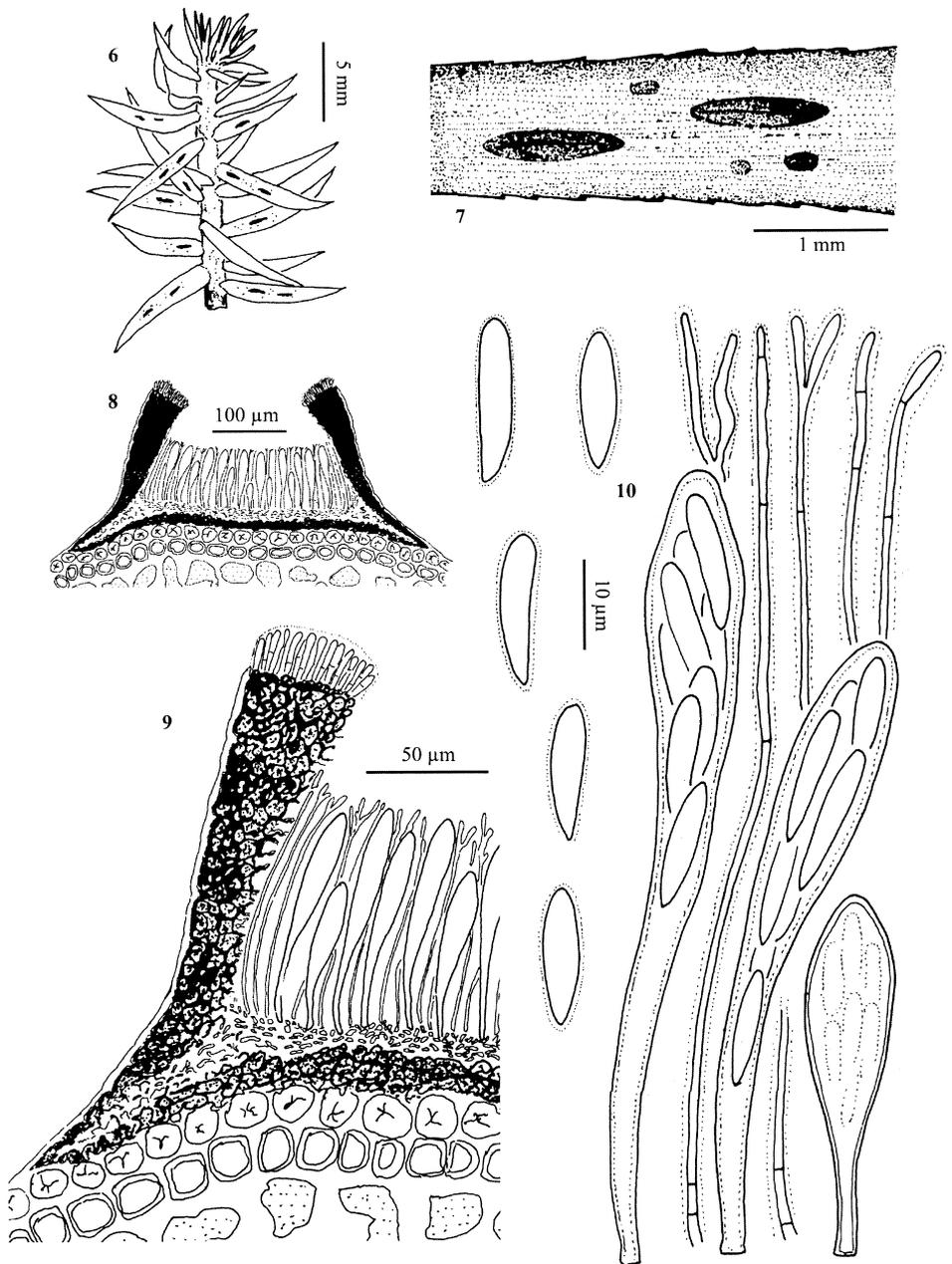
Figs 6-10

≡ *Hysterium rubi* Pers., Obs. Mycol. 1: 84, 1796.

Hypoderma virgultorum DC., in Lam. & DC., Fl. Fr. 6: 165, 1815; nom. illeg. (Art. 63 [now Art. 52]), fide Cannon & Minter (1986).

LECTOTYPE: On *Rubus* sp. 'Hb. Pers. mis Chaill.' '*Hysterium rubi* Pers. S. 100' Herb. Pers. 910258-738 (L - neotype of *Hysterium rubi* Pers., fide Cannon & Minter 1986).

Ascomata on both surfaces of needles fallen on the ground, scattered, sparse, occasionally associated with zone lines. In surface view, ascomata brown to dark brown, shiny, long elliptical to slightly fusiform, 700-2000 \times 300-400 μm , raising above the surface of the substrate, opening by a single longitudinal split. Perimeter line not differentiated. Lips present, brown. In median vertical section ascomata subcuticular, 200-250 μm deep. Covering stroma up to 40-55 μm thick near the centre of the ascomata, becoming thinner towards the edges, extending to the basal stroma, consisting of an outer layer of host cuticle and an inner layer of dark brown textura epidermoidea. Lip cells hyaline, 2-25 \times 2-3 μm , often 1-septate, embedded in gelatinous sheaths. Excipulum absent. Basal stroma medium- to well-developed, composed of textura epidermoidea. Subhymenium 8-15 μm thick, composed of textura intricata. Paraphyses 130-150 \times 1-2 μm , filiform, not swollen, septate, often branched at the apex, the entire paraphyses covered by gelatinous sheaths, not forming an



Figs. 6-10. *Hypoderma rubi* on *Cunninghamia lanceolata*. 6. Ascomata on needles as seen with a hand lens. 7. Ascomata and conidiomata as seen under a dissecting microscope. 8. Ascoma in vertical section. 9. Detail of an ascoma in vertical section. 10. Paraphyses, young ascus, mature asci with ascospores, and liberated ascospores with gelatinous sheaths.

epithecium. Asci ripening sequentially, 60-100 × 10-12.5 µm, clavate, with a 20-45 µm long stalk, thin-walled, round or truncate at the apex, J-, without circumapical thickening, discharging spores through a small apical hole, 8-spored. Ascospores 14-18 × 3.5-4.5 µm, fusiform to slightly cylindric, tapering slightly to a round apex and more conspicuously to the acute base, aseptate, hyaline, with a thin gelatinous sheath.

Structures resembling conidiomata of Rhytismatales scattered on both sides of needles. In surface view conidiomata 260-400 × 160-200(-260) µm, elliptical to long-elliptical, slightly brown to brown, opening by one round ostiole. In vertical section conidiomata subcuticular. Conidia not seen.

SPECIMEN EXAMINED: On *Cunninghamia lanceolata* (Taxodiaceae). China, Anhui province, Jingde, Yunle, ca. 400 m alt., 20 March 2001, C.-L.Hou 368 (HMAS).

KNOWN HOST SPECIES: *Cunninghamia lanceolata* and a wide host spectrum including angiosperms and gymnosperms (Powell 1974).

KNOWN DISTRIBUTION: This species is widely distributed in Australia, Europe, the Indian subcontinent and North America (Powell 1974). In China, it is known from the Anhui and Hunan provinces (Tai 1979).

NOTES: Powell (1974) considered that the type species, *Hypoderma rubi*, has a wide host spectrum. He also treated the species *H. thujae* Durrieu on *Thuja occidentalis* L. (Cupressaceae) as a synonym of *Hypoderma rubi*. The present collection is morphologically similar to *H. rubi* described by Cannon & Minter (1986) and Johnston (1990). Therefore we primarily place it in *H. rubi*.

There are five Rhytismataceous species on *Cunninghamia lanceolata* (Hou 2000). The shape of the asci and ascospores of the material we collected is somewhat similar to *Ploioderma handelii* (Petrakii) Y.R.Lin & C.L.Hou. *P. handelii*, however, has subepidermal ascomata without lips, septate ascospores, and usually occurs on cones (Lin & Hou 1994).

In China, Tai (1979) described *H. commune* (Fr.) Duby on an unknown herbaceous plant. Powell (1974) treated *H. commune* as a synonym of *H. rubi*. There is no detailed information about this record for China, so it cannot be conclusively discussed.

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