

## Newly recorded species of *Inocybe* collected from Liaoning and Inner Mongolia

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**Abstract:** *Inocybe* is a large agaric genus, and the knowledge of the genus is still poorly known in China. In the present paper, three taxa, *I. cervicolor* f. *cervicolor*, *I. geophylla* var. *violacea* and *I. pachypleura*, that have not been recorded are discovered from northeastern China. The detailed descriptions and line drawings are given based on Chinese materials, and a Chinese name was proposed for each of the taxa.

**Key words:** Inocybaceae, taxonomy, morphology

## 采自辽宁和内蒙古的中国丝盖伞属新记录种

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**摘要:** 丝盖伞属 *Inocybe* 是一个较大的属, 目前对中国丝盖伞属真菌的种类和分布知之甚少。在中国丝盖伞科分类学研究过程中, 发现采自东北的 3 个分类群尚未有文献记载, 它们是褐鳞丝盖伞原变型 *I. cervicolor* f. *cervicolor*、土味丝盖伞蓝紫变种 *I. geophylla* var. *violacea* 和厚囊丝盖伞 *I. pachypleura*。根据中国的材料对此 3 种进行了详细描述, 并提供了每个种的线条图和必要的讨论。

**关键词:** 丝盖伞科, 分类, 形态学

### INTRODUCTION

The genus *Inocybe* (Fr.) Fr. was established as a

“tribe” of *Agaricus* by Fries in 1821 and treated as a separate genus in 1863. Macroscopically, the

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members of *Inocybe* are mainly characterized by its fibrillose, often splitting and then rimose, often also scaly or squamulose pileus, adnexed to broadly adnate lamellae usually with paler edge when mature, and an usually fibrillose or pruinose stipe sometimes with a marginately bulbous base. Microscopically, basidiospores of *Inocybe* are smooth, sometimes nodulose, or even spiny. Cystidia are always present and commonly as metuloids, but in some species only with thin-walled cheilocystidia (Singer 1975).

*Inocybe* is an important genus in Agaricales, because many species in the genus are poisonous. *Inocybe jurana*, which was recorded as edible in Europe, was not recorded as edible mushroom in China (Dai & Yang 2008), but one species was recorded as medicine (Dai et al. 2010).

At present, 98 names of *Inocybe* were recorded in Chinese literature. However, the knowledge of *Inocybe* around China is still poorly known (Fan & Bau 2010). During the taxonomic studies on the genus *Inocybe*, three taxa, namely *I. cervicolor* f. *cervicolor*, *I. geophylla* var. *violacea* and *I. pachypleura* were discovered from northeastern China. Detailed descriptions and line drawings are provided based on Chinese materials.

## 1 MATERIALS AND METHODS

The materials examined were collected from Liaoning Province and northeast part of Inner Mongolia. Specimens were deposited in the Mycological Herbarium of Jilin Agricultural University (HMJAU).

Macromorphology is based on field notes of the collections, while micromorphology is observed in 5% KOH, or sometimes 1% Congo Red when needed. The methods of measurements for basidiospores, basidia, cystidia and pileipellis follows Kobayashi (2002, 2009). Dimensions for

basidiospores are given as (a-) b-c (-d). The range b-c contains a minimum of 90% of the measured values (Ge et al. 2010).

## 2 RESULTS

### TAXONOMY

*Inocybe cervicolor* f. *cervicolor*, Enchir. fung. (Paris): 95, 1886. Fig. 1

≡ *Agaricus cervicolor* Pers., Syn. meth. fung. (Göttingen) 2: 325, 1801.

≡ *Inocybe bongardii* var. *cervicolor* (Pers.) R. Heim, Encyclop. Mycol. 1: 388, 1931.

Pileus 15–23mm, conical when young, then convex to plano-convex, umbonate, appressed-squamose with dark brown squamules on the pale brown background, fibrillose. Lamellae brown, slightly thickened, narrowly adnate, ventricose, sub-crowded, up to 3mm broad. Stipe 31–38×2.5–3mm, equal with a swollen base, pale brown in upper part, darker downwards, granulo-scaly, similar to the stipe surface of *Lepiota castanae*, solid. Context soon becoming pinkish or reddish after cutting, conspicuously so at the base of stipe. Smell strong, unpleasant, reminding of musty fish.

Basidiospores (12)13.5–15(16.5)×(5.5)6.0–7.5(8.0)μm, Q=(1.78)1.81–2.34(2.4), yellowish brown, oblong, smooth. Basidia 35–46×8–12μm, narrowly clavate, slender, most with golden contents, bearing 4 strigmata. Cheilocystidia 20–49×9–12μm, clavate to cylindrical, thin-walled, rarely somewhat thick-walled with yellow color, mostly hyaline, occasionally with golden contents or septate. Pleurocystidia absent. Caulocystidia present at the very apex of stipe, 32–55×9–18μm, in clusters, similar to cheilocystidia, but more variable in shape, sometimes even capitate or thick-walled at apex. Pileipellis a cutis of two layers, the upper layer golden yellow, 25μm thick, composed of golden yellow hyphae 4–10μm in diameter, the lower layer

light yellow, up to  $36\mu\text{m}$  thick, composed of subregularly arranged, thin walled hyphae  $5\text{--}14\mu\text{m}$  in diameter. Hymenial trama composed of subregular, almost hyaline, thin walled hyphae  $5\text{--}16\mu\text{m}$  in diameter.

Habitat: Solitary, under mixed forest mainly composed of *Larix* and *Quercus*.

Specimens examined: Liaoning Province: Guanmenshan of Benxi City, Y.G. Fan 6. Sep. 2011,

HMJAU23272.

Distribution: Common in Europe (Kuyper 1986), not frequent in North American (Grund & Stunz 1984) and East Asia (Present study).

Comments: *Inocybe cervicolor* f. *cervicolor* can be easily recognized in the field by its dark brown squamuloses and the contrasting background with pale brown color in pileus. It is very close to *I. bongardii*, and some authors regarded it as

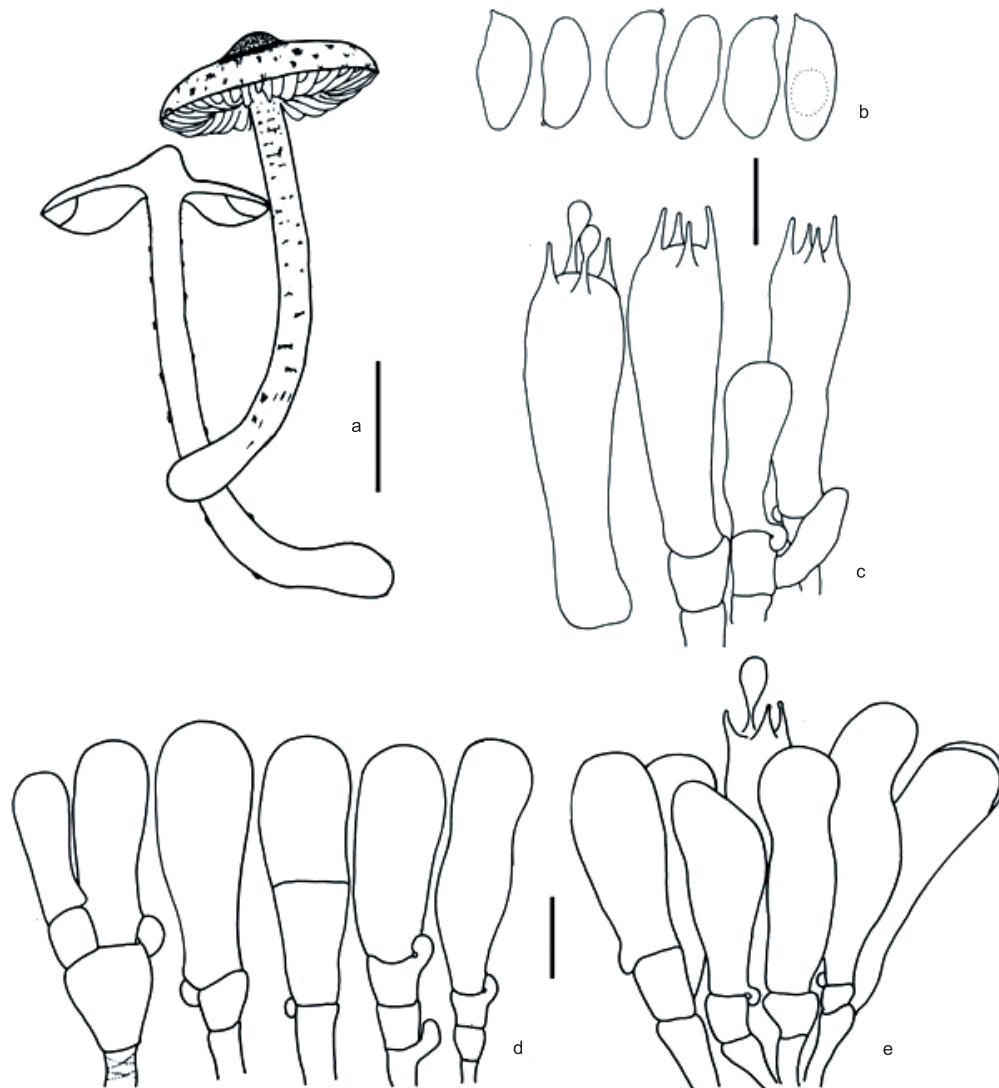


Fig. 1 *Inocybe cervicolor*. a: Basidiomata; b: Basidiospores; c: Basidia; d: Cheilocystidia; e: Caulocystidia mixed with basidia. Scale bars: a=10mm; b, c, d, e=10 $\mu\text{m}$ .

*I. bongardii* var. *cervicolor*. They can hardly distinguished except for the macroscopic characters and smelling (Breitenbach & Kränzlin 2000).

The materials collected from northeastern China shows that the basidiospores are slightly longer and narrower than the European materials. For the spores of *I. cervicolor* f. *cervicolor*, Kuyper (1986) gives  $(10.0)10.5\text{--}14.5(15)\times(6.0)6.5\text{--}8.0(8.5)\mu\text{m}$ ,  $Q=1.6\text{--}2.0$ , while Kobayashi (2002) gives  $(11.0)12.4\text{--}15\times 6.0\text{--}8.8\mu\text{m}$ ,  $Q=1.6\text{--}1.9$ . But other characters coincide well with the European materials.

***Inocybe geophylla* var. *violacea*** (Pat.) Sacc., Syll. fung. (Abellini) 5: 785, 1887. Fig. 2

≡ *Agaricus geophyllus* var. *violaceus* Pat., Tab. Anal. Fung. 6: 21, 1886.

Pileus 11–15mm, conical when young, then convex, plano-convex to appanate, with an indistinct umbo at the centre or hardly to distinguish, slightly incurved then young, deep lilac, discoloring to very pale lilac with age, persistently ochraceous around the centre, smooth, silky, viscid when moist in age. Cortina present in young specimens, disappeared soon. Lamellae sub-crowded, 2.5–3.5mm broad, grayish white at first, brown in age, narrowly adnate. Stipe 22–32×1.5–1.8mm, equal, slightly swollen at the base; deep lilac, ochraceous toward the base, fibrillose, pruinose at apex, solid. Context spermatic odor, white in pileus, 1–2mm thick, fleshy, pale in the upper part of stipe, yellowish in the lower part, shiny.

Basidiospores  $(8)8.5\text{--}10(10.5)\times(4.5)5.0\text{--}6.0(6.5)\mu\text{m}$ ,  $Q=(1.51)1.55\text{--}1.87(1.89)$ , smooth, brown, subamygdaliform, with obtuse apex. Basidia 22–28×8–9μm, clavate, fusiform to utriform, sometimes nearly cylindrical, with a pedicel or truncate base. Cheilocystidia 42–68×12–17μm,

yellow, thick-walled (up to 2–3mm thick), with crystals at apex, mostly hyaline inside, rarely with yellowish contents; clamp connections present at the base. Paracystidia present, 16–26×7–10.5μm, clavate, thin-walled, hyaline, not abundant, Pleurocystidia similar to cheilocystidia, 40–66×10–19μm; Caulocystidia 50–68×10–22μm, at the very apex only, descending to 1/8<sup>th</sup> of the stipe, similar to cheilocystidia, but more variable in shape, yellowish-walled, paler than cheilocystidia, some with a very long pedicel. Cauloparacystidia present among caulocystidia, 18–24×5–13μm, abundant, thin-walled, clavate; Pileipellis a cutis, up to 64μm thick, composed of subregularly arranged, thick-walled, hyaline hyphae 4.5–13μm in diameter.

Habitat: Growing under broad-leaved forest.

Specimens examined: Inner Mongolia: Daqinggou Nature Reserve of Tongliao City, T. Bau & Y.G. Fan, 19 Sep. 2011, HMJAU 23273.

Distribution: Europe (Heim 1931), East Asia [Ikeda 2005, as “*Inocybe geophylla* var. *violacea* (Pat.) Heim.”], not frequent.

Comments: Kuyper (1986) synonymized *Inocybe geophylla* var. *violacea* with *Inocybe geophylla* var. *lilacina*. Such concept could not accept in the present study. Based on the Chinese materials, we found that *Inocybe geophylla* var. *violacea* differs from *I. geophylla* var. *lilacina* by relatively smaller basidiomata, indistinct umbo and deep lilac color in the main part of pileus and stipe. *Inocybe lilacina* f. *violacea* was firstly proposed with very limited description based on materials collected from Japan. It is characterized by the purple color for the entire basidiomata (Kobayasi 1952), and it seems to be same with *Inocybe geophylla* var. *violacea* (Pat.) Sacc.

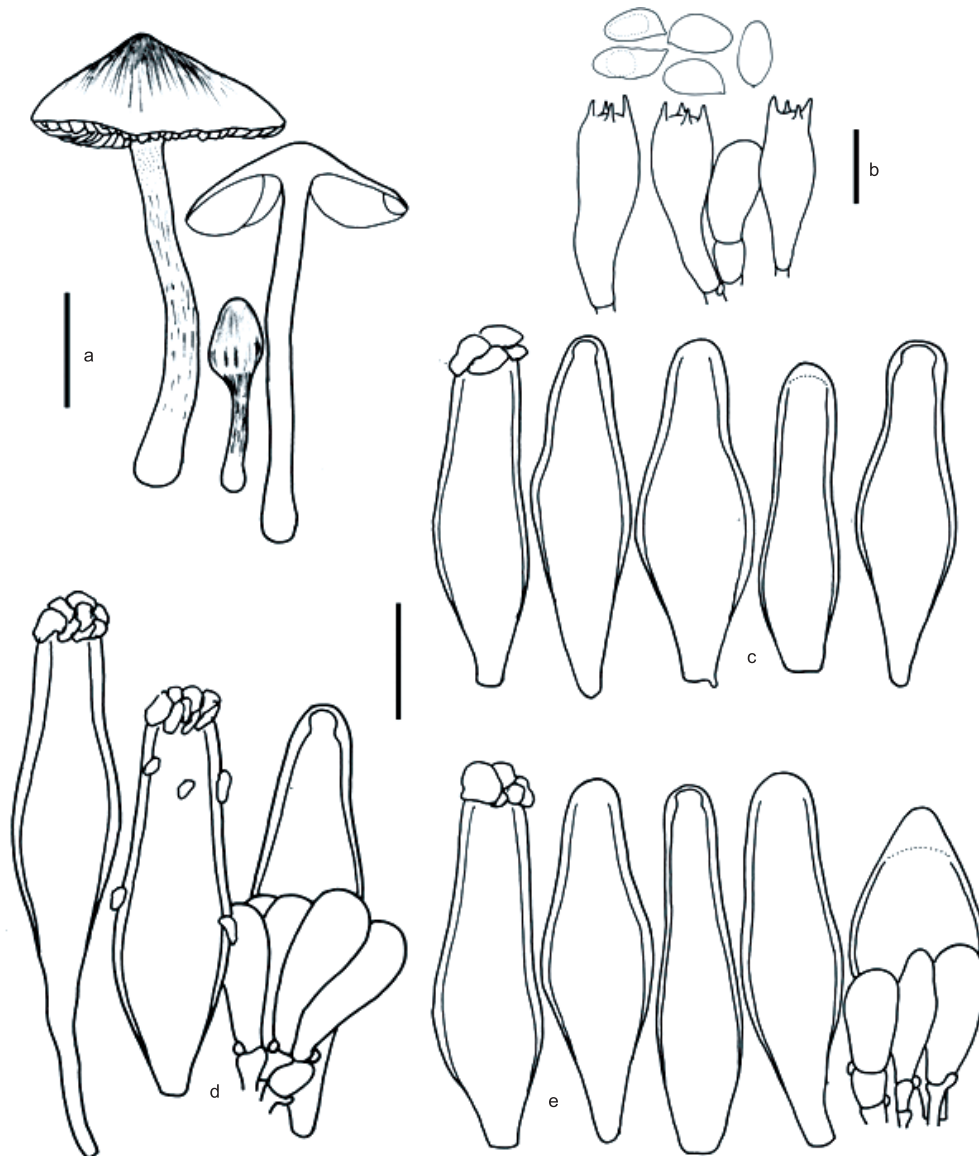


Fig. 2 *Inocybe geophylla* var. *violacea*. a: Basidiomata; b: Basidia and basidiospores; c: Pleurocystidia; d: Caulocystidia and cauloparacystidia; e: Cheilocystidia and paracystidia. Scale bars: a=10mm; b=10 $\mu$ m; c, d, e=20 $\mu$ m.

*Inocybe pachypleura* Takah. Kobay., Nova Hedwigia, Beih. 124: 74, 2002. Fig. 3

Basidiomata small; Pileus ochraceous, 9–11mm broad, smooth, convex, paler around the centre, rimulose to somewhat rimose at margin. Lamellae grayish white, narrowly adnate, crowded, edge farinaceous; Stipe 28–35 $\times$ 4–5mm, equal, pinkish,

white towards the marginate base, up to 7mm at the base, pruinose through the entirely length; Context spermatic, in pileus white, thin, 0.5–1mm at mid-radius, 2.5–3.5mm at the centre, pinkish in stipe, striate, white toward the base.

Basidiospores (6.8)7–8(9) $\times$ (5)5.5–6.5(7) $\mu$ m, Q=(1.16)1.23–1.36(1.45), brown, nodulose.

Basidia 23–29×8–10 $\mu\text{m}$ , slender, clavate, with 2 or 4 sterigmata, up to 5 $\mu\text{m}$ . Cheilocystidia 42–61×13–18 $\mu\text{m}$ , thick-walled, pale yellow to lightly yellowish, fusiform to ovoid, abundant, some with a pedicel, some with truncate or rounded base; clamp connections present at the base.

Paracystidia 10–16×4–9 $\mu\text{m}$ , obovoid to clavate, almost hyaline. Pleurocystidia 45–72×17–22 $\mu\text{m}$ , similar to cheilocystidia, some with a pedicel, rarely with a truncate base. Caulocystidia in clusters, descending to the base of the stipe, 49–71×15–20 $\mu\text{m}$ , thick-walled, ventricose with a

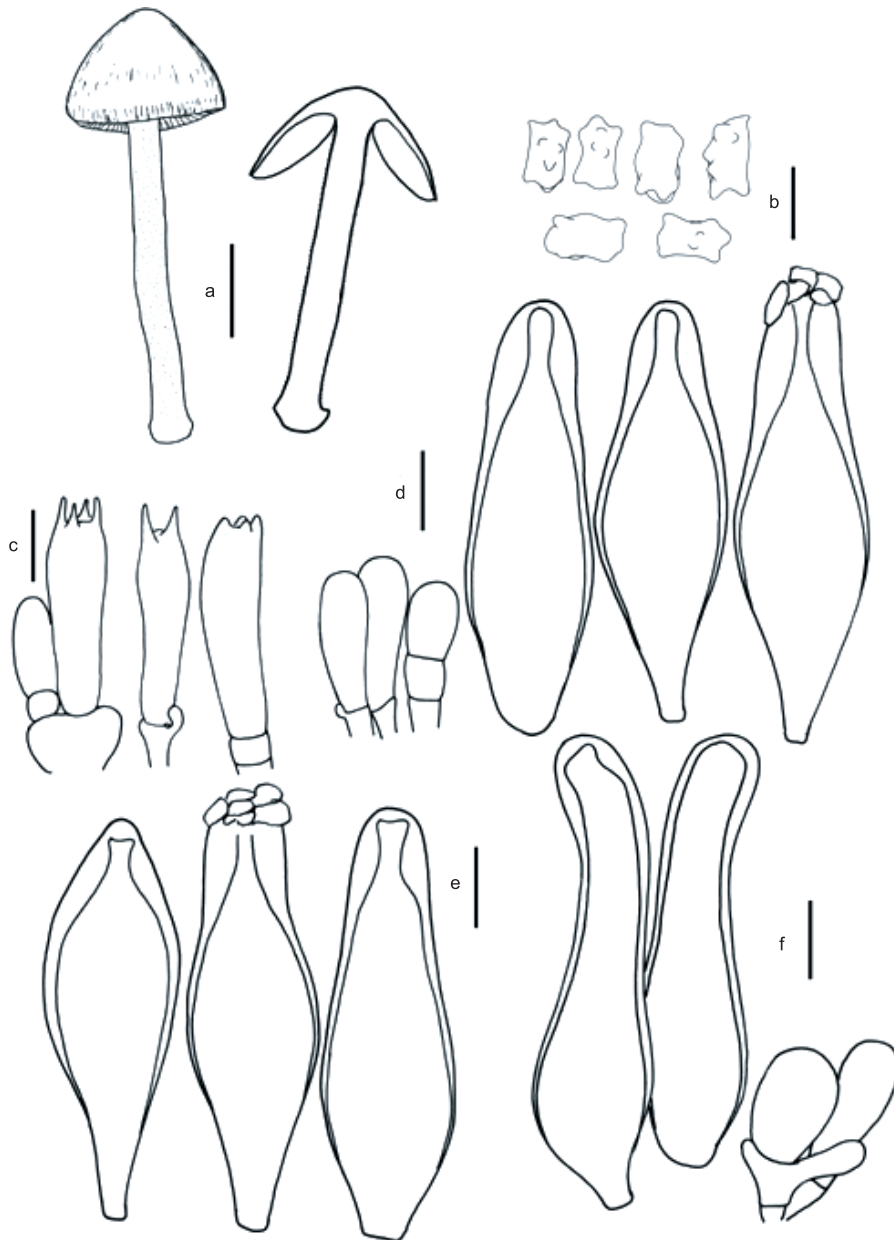


Fig. 3 *Inocybe pachypleura*. a: Basidiomata; b: Basidiospores; c: Badidia; d: Cheilocystidia and paracystidia; e: Pleurocystidia; f: Caulocystidia and cauloparacystidia. Scale bars: a=10mm; b, c, d, e, f=10 $\mu\text{m}$ .



long neck and rounded to short pedicellate base. Cauloparacystidia, 29–48×15–19µm, clavate to obovoid, hyaline, abundant. Pileipellis a cutis of two layers, the upper layer composed of regularly to subregularly arranged, thin-walled to incrustated, yellow hyphae 5–10µm in diameter; the lower layer composed of square-celled hyphae 17–25µm in diameter.

Habitat: Solitary in mixed broad-leaved forest.

Specimens examined: Liaoning Province: Guanmenshan of Benxi City, Y.G. Fan 7. Sep. 2011, HMJAU 23274.

Distribution: Japan (Kobayashi 2002), China (Present study).

Comments: *Inocybe pachypleura* was described from Japan recently, it is characterized by ovoid to obvoid pleurocystidia and square cells in the lower layer of the pileipellis (Kobayashi 2002). However, some of the hymenial cystidia with a short pedicel was observed in the present study, except for this point, the Chinese material collected from Liaoning Province coincides well with the original description.

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