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Clitopilus amygdaliformis, a new species from tropical China

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Abstract—*Clitopilus amygdaliformis* is described and illustrated as new from tropical China. It is characterized by its white to chalk white, small to medium-sized basidioma with an eccentric stipe, absence of pleuro- and cheilocystidia, and broadly amygdaliform to limoniform basidiospores with 5-6 prominent longitudinal ridges and a distinct suprahilar depression. It was regarded as *C. prunulus,* but the latter has a pileus often with somewhat grayish tinge, a central to slightly eccentric stipe, longer and narrower fusiform basidiospores and a temperate habitat.

Key words—taxonomy, *Entolomataceae*, *Agaricales*, *Basidiomycota*

Introduction

The genus *Clitopilus* P. Kumm. (*Entolomataceae*, *Agaricales*) in China has received little study, although a few species, namely *C. apalus* (Berk. & Broome) Petch, *C. crispus* Pat., *C. gigantosporus* M. Zang, *C. hobsonii* (Berk.) P. D. Orton, *C. prunulus*, *C. scyphoides* f. *omphaliiformis* (Joss.) Noordel., have been recorded (Bi et al. 1997, Chang & Mao 1995, Chou 2005, Chou & Chang 2005, Yang 2000, Zang 2001). In this study, collections made from southern parts of China, including Taiwan, were re-examined. It turned out that an undescribed species was collected from the vast regions with tropical and subtropical forests. It is reported herein.

Materials and methods

Specimens were annotated and photographed in the field, dried in an electric drier, and then deposited in herbaria. Herbarium abbreviations follow Holmgren et al. (1990) but with one exception that is not included in Index Herbariorum: HKAS-the Herbarium of Cryptogams, Kunming Institute of Botany, Chinese Academy of Sciences.

Revived tissues were mounted in 5% KOH for microscopic examination. The abbreviation [*n/m/p*] shall mean *n* basidiospores measured from *m* basidiocarps of *p* collections. Dimensions of basidiospores excluding the apiculus are given with notation of the form *(a) b-c (d)*. The range *b-c* contains a minimum of 90% of the measured values. Extreme values *a* and *d* are given in parentheses. Q refers to the length/width ratio of basidiospores; **Q** refers to the average Q of all basidiospores ± sample standard deviation.

Taxonomy

Clitopilus amygdaliformis Zhu L. Yang, **sp. nov.** **Figs. 1-4**

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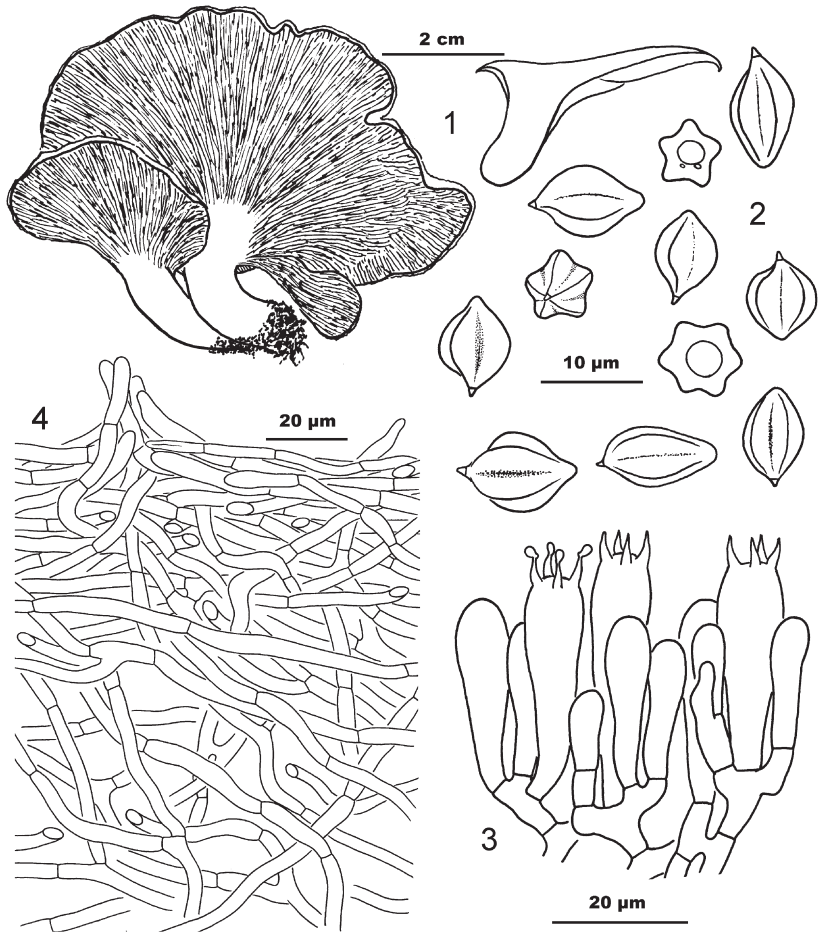
Name misapplied to the present species: *Clitopilus prunulus* sensu W. N. Chou, Fung. Flora Taiwan 3: 987, fig. 25 (2005); non *Clitopilus prunulus* (Scop.: Fr.) P. Kumm., Führ. Pilzk.: 97 (1871).

Pileus 2-8(11) cm latus, convexus vel applanatus, albus vel albidus, siccus, glaber, margine incurva et undulata. Lamellae decurrentes, primo albae deinde pallide roseolae, 3 mm latae. Stipes 1-4(6) × 0.2-1 cm, subcylindricus, albus vel albidus, excentricus, exannultus, albus vel albidus. Caro alba. Basidia 23-36 × 8-10 µm, clavata, hyalina, 4-sporigera. Basidiosporae (7.0) 8.0-11.5 (13.0) × 6.0-8.0 (8.5) µm, in aspectu frontali et obliquo amygdaliformes vel limonformes, porcis longitudinalibus manifestis, in aspectu polari valde angulatis, 5-6 (7) paginulis praeditis. Pleurocystidia et cheilocystidia absentes. Epicutis pilei ex hyphis repentibus cylindricis non-incrustatis composita. Fibulae absentes. Habitatio: terrestris. Holotypus: L.F. Zhang 187 (HKAS 42473), 17 July 2003, Yunnan, China.

Etymology: *amygdaliformis*, amygdaliform, referring to the form of the basidiospores.

Basidiomata (Fig. 1) small to medium. **Pileus** 2-8 (11) cm in diam., convex to plano-convex, often slightly depressed above the stipe, white to chalk white, but with cream colour over disc, slightly viscid when wet, glabrous; margin at first incurved, then straight, often undulate. **Lamellae** decurrent, whitish, then pinkish, crowded, up to 3 mm in height; edge entire and concolorous; lamellulae numerous. **Stipe** 1-4 (6) × 0.2-1 cm, white to whitish, unchanging, usually eccentric, occasionally nearly lateral, subcylindrical, smooth, basal part sometimes with white cottony mycelium. **Annulus** absent. **Context** 2-5 mm in thickness, white, unchanging; odor none or farinaceous; taste mild.

Basidia (Fig. 3) 23-36 × 8-10 µm, clavate, hyaline, 4-spored, rarely 1- or 2-spored; sterigmata 3-4 (5) µm long; no clamps observed on basal septa. **Subhymenium** composed of hyphal segments 3-6 µm in diam. Lamellar trama composed of more or less regularly arranged, branching and anastomosing hyphae 3-12 µm in diam.; oleiferous hyphae rare. **Basidiospores** (Fig. 2) [96/4/3] (7.0) 8.0-11.5 (13.0) × 6.0-8.0 (8.5) µm, Q = (1.07) 1.14-1.54 (1.83) (**Q** = 1.33 ± 0.14), nearly colorless and hyaline, thin- to slightly thick-walled (wall < 0.5 µm thick),



Figs. 1-4: *Clitopilus amygdaliformis* (holotype). 1. Basidiomata; 2. Basidiospores in side view, ventral view and polar view; 3. Subhymenium and hymenium with basidia at different stages of development. 4. Pileipellis and subcutis. Note terminal cells of pileipellis often grouped into fascicles on pileal surface; subcutis composed of irregularly and somewhat loosely arranged hyphae.

amygdaliform to limoniform in side view and often with a distinct suprahilar depression, limoniform to sometimes nearly ovoid in ventral view, strongly angled in polar view, with 5-6 (7) obvious longitudinal ridges; ridegs 1-1.5 µm in height. **Pleurocystidia** and **cheilocystidia** absent. **Pileipellis** (Fig. 4) a cutis composed of more or less radially arranged, repent, colorless and hyaline, non-encrusted filamentous hyphae 2-5 µm in diam.; terminal cells subcylindric,

fusiform or narrowly clavate, 3-7 μm in diam., on pileal surface often grouped into fascicles; subcutis composed of more or less irregularly and somewhat loosely arranged, thin-walled, colorless and hyaline filamentous hyphae 3-6 μm in diam. **Clamps** absent in all tissues.

Habit, habitat, distribution and season — Single or groups, on soil in broad-leaved (*Lithocarpus*, *Ternstroemia*) or coniferous (*Pinus*) forests; China (Taiwan and Yunnan). July to August.

COLLECTIONS EXAMINED—**China**, Yunnan Province, Baoshan Municipality, Bawan, alt. 2100m, 17.VII.2003, L.F. Zhang *187* [holotype, HKAS *42473*]. Taiwan Province, Nantou County, Yuanfeng, 24°.07′N, 121°.14′E, alt. 2750m, 20.VII.1999, W.N. Chou *CWN 4390* [TNM-F *13317*, as *C. prunulus* by Chou (2005)]; ibid, 24°.07′N, 121°.13′E, alt. 2800m, 10.VIII.2000, W.N. Chou and Y.P. Yen *CWN 4757* [TNM-F *14390*].

Comments—*Clitopilus amygdaliformis* is characterized by its white to chalk white, small to medium-sized basidioma with an eccentric stipe, absence of pleuro- and cheilocystidia, and broadly amygdaliform to limoniform basidiospores with 5-6 prominent longitudinal ridges and a distinct suprahilar depression. It should be placed in *Clitopilus* section *Clitopilus* due to its well developed stipe and large basidiospores with less than 7 prominent longitudinal ridges (Singer 1986).

In section *Clitopilus* five species, namely *C. griseobrunneus* T.J. Baroni & Halling, *C. lignyotus* Hongo, *C. prunulus*, *C. paxilloides* Noordel. and *C. quisquiliaris* (P. Karst.) Noordel., have been recognized (Baroni & Halling 2000). *Clitopilus griseobrunneus*, originally described from Costa Rica, differs from C. *amygdaliformis* by its brown to grayish brown pileus, the usually central stipe, much longer basidiospores, and dark brown incrusted hyphae in the pileipellis with subcapitate terminal elements (Baroni & Halling 2000). *Clitopilus lignyotus*, originally described from Japan, differs from C. *amygdaliformis* by its grayish brown to blackish brown pileus, the usually central stipe, and much narrower basidiospores (Hongo 1954). *Clitopilus paxilloides*, originally described from Norway, has a stouter, thicker-fleshed basidioma with a grey-brown pileus with strongly involute margin or grey-brown spots on the pileus surface, a grey-brown to greyish stipe, narrower basidiospores with higher Q (1.45-2.1), and strongly encrusting pigment in the pileipellis (Noordeloos 1993). *Clitopilus prunulus*, originally described from Europe, usually has a pileus with somewhat grayish tinge, a central or only slightly eccentric stipe, longer and narrower fusiform basidiospores with 5-8 longitudinal ridges and size of 9-13 × 4-6.5 (8) μm with much higher Q (1.3-2.0) (Hansen & Knudsen 1992, Noordeloos 1988, 1993, Pegler & Young 1971, 1975, Yang 2000). Furthermore, *C. prunulus* is distributed in northern temperate regions. *Clitopilus quisquiliaris* is only known from Nordic regions of Europe and differs from *C. amygdaliformis* by its

reddish brown pileus, smaller basidiospores, and habit of growing on enriched soils (Hansen & Knudsen 1992, Noordeloos 1981, 1993).

In the field in tropical China, *C. amygdaliformis* may be confused with *C. apalus* var. *apalus*, *C. crispus* and *C. orientalis* T.J. Baroni & Watling, all of which were originally described from tropical south East Asia and South Asia, and found in tropical China, and *C. apalus* var. *macrosporus* T.J. Baroni & Watling, originally described from Uganda, Africa. However, all these taxa posses much smaller basidiospores with lower but more (7-12) longitudinal ridges. Furthermore, *C. apalus* usually has smaller basidiomata, *C. crispus* has radially arranged fine ridges on the pileus with a subfimbriate margin, and *C. orientalis* has cheilocystidia (Baroni & Watling 1999, Pegler 1977, 1986, Singer 1978). *Clitopilus chalybescens* T.J. Baroni & Desjardin, described from Thailand (Baroni et al. 2001), differs from *C. amygdaliformis* by its grayish blue discoloration of the infundibuliform pileus and the central stipe with age, subcapitate pileocystidia and significantly smaller ellipsoid basidiospores with 8-10 longitudinal ridges.

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