Fungal Diversity

Three taxa of *Phallaceae* in HMAS, China

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Three taxa of *Phallaceae* occurring in China were reported, including a new variety *Phallus costatus* var. *sphaerocephalus*, a recently reconfirmed species *Phallus sulphureus* and a new record to China *Mutinus fleischeri*. All specimens examined were deposited in Herbarium Mycologicum Instituti Microbiologici, Academiae Sinicae (HMAS), Beijing.

Key words: basidiomycetes, *Mutinus fleischeri*, Phallales, *Phallus costatus* var. *sphaerocephalus*, *Phallus sulphureus*, taxonomy.

Introduction

Since 2000, the authors have examined specimens of *Phallaceae* deposited in the Herbarium Mycologicum Instituti Microbiologici, Academiae Siniae (HMAS) over many decades. Three interesting species were discovered and therefore are reprted as follows.

Taxonomy

Phallus costatus (Penz.) Lloyd **var. *sphaerocephalus*** T.H. Li, B. Song & B. Liu, **var. nov.** (Figs.1, 2)

Basidiocarpus juvenilis globosus 2.8 cm diam., rhizomorphi ad basin; *peridium* albidum, griseo-albidum, albo-luteum vel dilute flavidum; basidiocarpus maturus 10-15 cm altus. *Receptaculum* pileo et stipite. *Pileus* globosus, subglobosus vel breviter piriformis, 3.2-4 cm altum. et latus, apice truncates leviter collari, ad superficiem valde reticulates, flavus. *Gleba* olivaceo-fusca, mucilagina, foetida. Indusium rudimentarium vel absens, evanescens, membranaceum, album. *Stipes* 9-14 cm longus, 1.5-3 cm latus, flavidus, delute fulvus vel pallide aurantio-brunneus, spongiosus. *Volva* albida, griseo-albida, albo-lutea vel dilute flavida, 3-5.3 cm alta, 3.5-4 cm lata. *Basidiosporae* cylindricae vel anguste ellipsoideae, 3.5-4 × 1.5-1.7 µm, olivaceo-hyalinae, laeves.

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Unexpanded *basidiocarp* globose, 2.8 cm diam., whitish, greyish-white, yellowish-white to pale yellow, with white rhizomorphes at base; mature *basidiocarp* 10-15 cm high. *Receptacle* composed of a pileus and a stipe. *Pileus* globose, subglobose to short pyriform, 3.2-4 cm diam., lower margin incurved to the stipe, apex relatively rounded to somewhat conical, but slightly reflexed into a yellow disc at the centre, with a thin membrane in the disc but soon perforated, surface obviously reticulate; meshes deep, large or small, polygonal, 3-(5)-7 mm diam., covered with gleba on the surface, yellow where exposed. *Gleba* dark greenish-brown, mucilaginous, foetid. *Stipe* cylindrical to somehow fusoid, subequal to slightly tapering upward at the central portion, tapering nearly the base, nearly as long as the whole basidiocarp or a little shorter, 9-14 cm long, 1.5-3 cm thick, pale yellow-brown to pale orange-brown, hollow, spongiose, wall composed of chambers which are partially open outwards. *Veil* thin, white, evanescent at early stage, sometimes with fragments remaining on the stipe. *Volva* whitish, greyish-white, greyish-yellow white to concolorous with stipe, 3-5.3 cm high, 3.5-4 cm thick. *Basidiospores* cylindrical to long ellipsoid, 3.5-4 × 1.5-1.7 μm, light olivaceous to subhyaline, smooth.

Specimens examined: CHINA, Hunan Province, Yizhang County, 8 Nov. 1978, Changchun Commune Hospital. (HMAS 38170, holotype); Hunan Province, Jingxian County, Nov. 1982, Jingxian Medicine Corporation (HMAS 43765).

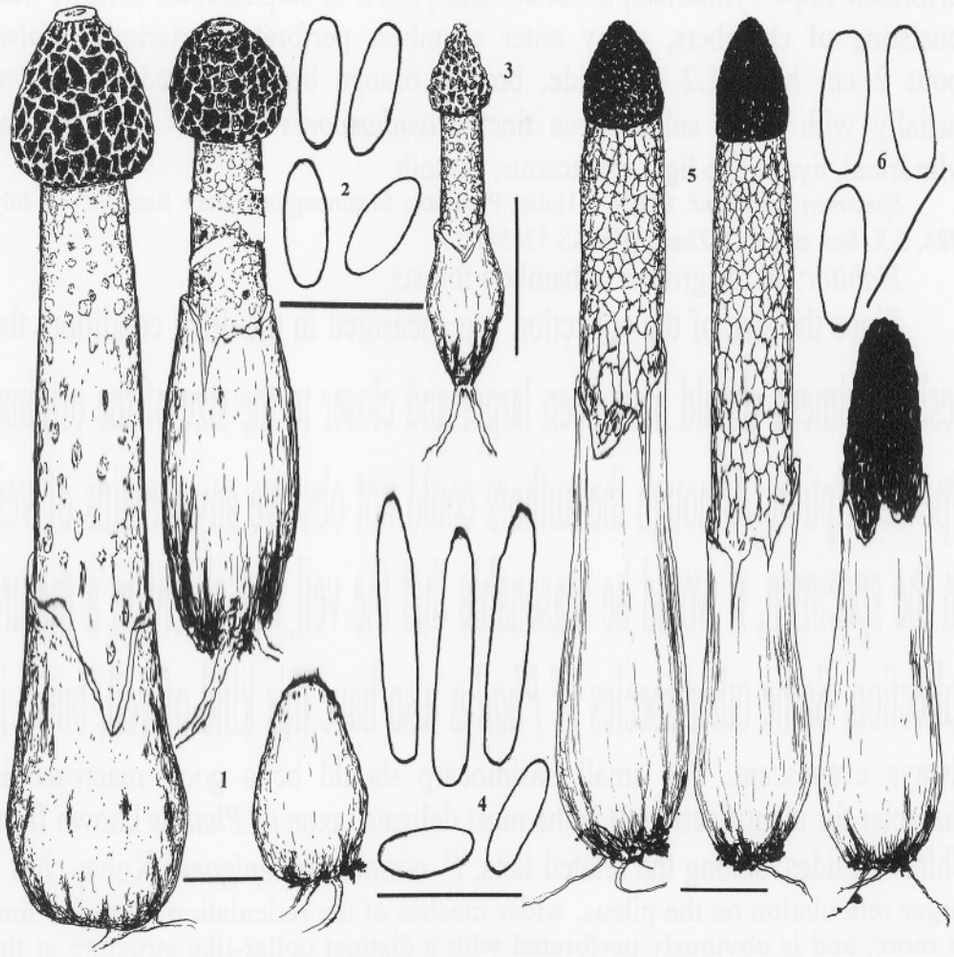
Habitat: on the ground in forests.

This variety is similar to the known varieties of *P. costatus* (Penz.) Lloyd, possessing a yellow pileus of which there is a reflexed disc at the centre and deep reticulation on the surface, but it is distinctive from the latter by its globose pileus. The other varieties have some individual characters (Kobayasi, 1938; Chou, 1954; Liu, 1984) which are different from those of the present variety: *P. costatus* var. *costatus* grows on decayed wood; *P. costatus* var. *dailingensis* Chou has a more obvious reflexed pendulous margined disc at pileus apex; and *P. costatus* var. *epigaeus* Kobay. possesses a much larger reflexed disc at the pileus apex. In addition, the new variety seems to be stouter, larger and firmer. The specimens were originally labeled as '*Phallus impudicus* L.', but the latter should have had a white receptacle.

Phallus sulphureus Lohw., Symbolae Sinicae 2: 53 (1937). (Figs. 3, 4)

References: Liu, B., Nova Hedw., 76: 48. 1984; Fan, L., Liu, B. and Liu, Y.H., Nova Hedw., 108: 11. 1994; Yuan, M.S. and Sun, P.Q., Sichuan Mushrooms: 612. 1995; Shao, L.P., Xiang, C.T, Forest Mush. China: 592. 1997.

This species was first described by Lohwag (Fan *et al.*, 1994; Yuan and Sun, 1995; Shao and Xiang, 1997), but this description was questioned for a



Figs. 1-6. *Phallaceae* in HMAS. **1, 2.** *Phallus costatus* var. *sphaerocephalus*. **1.** Basidiocarps. **2.** Basidiospores. **3, 4.** *Phallus sulphurous*. **3.** Basidiocarp. **4.** Basidiospores. **5, 6.** *Mutinus fleischeri*. **5.** Basidiocarps. **6.** Basidiospores. Bars: 1, 3, 5 = 2 cm; 2, 4, 6 = 5 µm.

long time and discussed by some Chinese mycologists since the type specimen was lost and new identical collections had not been discovered. Liu and Bau (1982) suspected that this species could be *P. costata* var. *epigaeus* Kobay., but Zang and Ji (1984) considered that it should be an independent species similar to *P. tenuis* (Fisch.) Ktze. The type locality was in Yunnan Province, China. According to the old information, its main characters were as follows.

Peridium brown or reddish-brown. *Basidiocarps* foetid, up to 5 cm high. *Receptacle* sulphureous to orange, wall composed of 2-3 layers of chambers. *Pileus* reticulate, with fragments of a veil consisting of pseudoparenchymatous tissue in the inner side of pileus. *Volva* brown. *Basidiospores* hyaline, cylindrical, 4 × 1.5 µm.

Recently, a collection with characters identical to the original species definition was discovered, which confirmed the existence of the species. It was listed as '*Phallus tenuis*?' in the field notes and labeled as '*Phallus impudicus* L.' Measurements of dried specimens were as follows:

Basidiocarp small, 4 cm tall, sulphureous except the brown volva and dark olivaceous brown gleba. *Pileus* conical, 1.2 cm high, 1 cm wide, sulphureous, partially covered with dark olivaceous brown gleba, reticulate; meshes obvious but small, (0.5-)1-1.5 mm wide, polygonal; apex not or hardly

perforated. *Stipe* cylindrical, about 0.8 cm, yellow to sulphureous, hollow, wall consisting of chambers, many outer chambers perforated exteriorly. *Volva* about 2 cm high, 1.2 cm wide, brown, orange brown to reddish-brown, partially with some sulphureous tinct. *Basidiospores* 3.6-4 × 1.1-1.5 μm, cylindrical, hyaline to light olivaceous, smooth.

Specimen examined: CHINA, Hubei Province: Shennongjia Nature Reserve. 16 July 1984, S.X. Sun and X.Q. Zhang (HMAS 57454).

Habitat: on the ground in bamboo forests.

Since the size of the collection was measured in the dried condition, the fresh specimens should have been larger and closer to the size of the original type description. Although the authors could not observe any remains of veil on the specimen, it would be reasonable that the veil was absent in a mature collection. Some other species of *Phallus* also have this kind of veil, but it is always evanescent. The small basidiocarp should be a good macroscopic character for identification. It is the most delicate taxon of *Phallus* known from China. Besides, among the related taxa, *P. costata* var. *epigaeus* Kobay. has a larger reticulation on the pileus, wider meshes of the reticulation up to 3-5 mm or more, and is obviously perforated with a distinct collar-like structure at the apex; the volva of *P. tenuis* (Fisch.) Ktze. is white to whitish rather than brown; while *P. impudicus* L.: Pers. has a white receptacle.

Mutinus fleischeri Penz, Ann. Jard. Bot. Buitenzorg 16: 137 (1899).(Figs. 5, 6)

Unexpanded basidiocarp ovate, 2-2.5 cm high, 1.2-1.5 cm diam., with white rhizomorphes at base. mature basidiocarp 7-15 cm high. *Receptacle* as a stipe, hollow; glebiferous part distinctly defined from the sterile portion, slightly thickened, conical, 1.2-1.8 cm high, occupying only 1/8 to 1/6 of the whole length of the receptacle, 1-1.2 cm wide at lower margin, covered with some small hemisphaerical tubercles, pointed at apex, without perforation or hardly with one. *Stipe* cylindrical, 4-10 cm from the lower margin of glebiferous part to the upper margin of the volva, about 1 cm thick, equal to slightly tapering downwards, pink, hollow, spongiose, wall composed of closed chambers. *Volva* long, 3.5-5 cm high, 1.5-2.3 cm wide, white. *Basidiospores* cylindrical to long ellipsoid, 4-4.6 × 1.5-1.8 μm, hyaline to light olivaceous, smooth.

Specimens examined: CHINA, Guangxi Autonomous Region, Longlin County, 1600 m 19 and 23 Oct. 1957, L.W.Xu, No.500, 513, HMAS 23782; HMAS 23783.

Habitat: Growing on the ground in a bamboo forest.

Mutinus fleischeri was originally described in Java, Indonesia. This discovery in China is the first record for the country. The species is easily recognized by its fertile area. The glebiferous part is distinctly defined from the sterile portion, slightly thickened, short, occupying only 1/8 to 1/6 of the length

of the receptacle, with small hemisphaerical tubercles, pointed at the apex, without perforation or hardly with one. These characters are different from those of any other known species by the genus including *M. bambusinus* (Zoll.) Fisch. The distinctive character of its short spore-bearing portion was often stressed by former mycologists (Lloyd, 1909; Boedijn, 1932). The specimens examined were misidentified as '*Mutinus bambusinus* (Zoll.) Fisch.' before the authors' re-examination.

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