
Bird's nest fungi from China

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Cyathus lijiangensis and *C. renweii* are species new to science reported in this paper. *Crucibulum parvulum*, *Cyathus crassimurus*, *C. julietae* and *C. triplex* are reported for the first time from China. The new species are illustrated and compared with similar species.

Key words: *Crucibulum*, *Cyathus*, *Nidulariaceae*.

Introduction

In order to complete 'Flora Fungorum Sinicorum. Nidulariaceae', we have studied specimens collected from ten provinces in China. In this paper we describe two new species of Bird's nest fungi in the genus *Cyathus* and provide new records for four species new to China.

Materials and methods

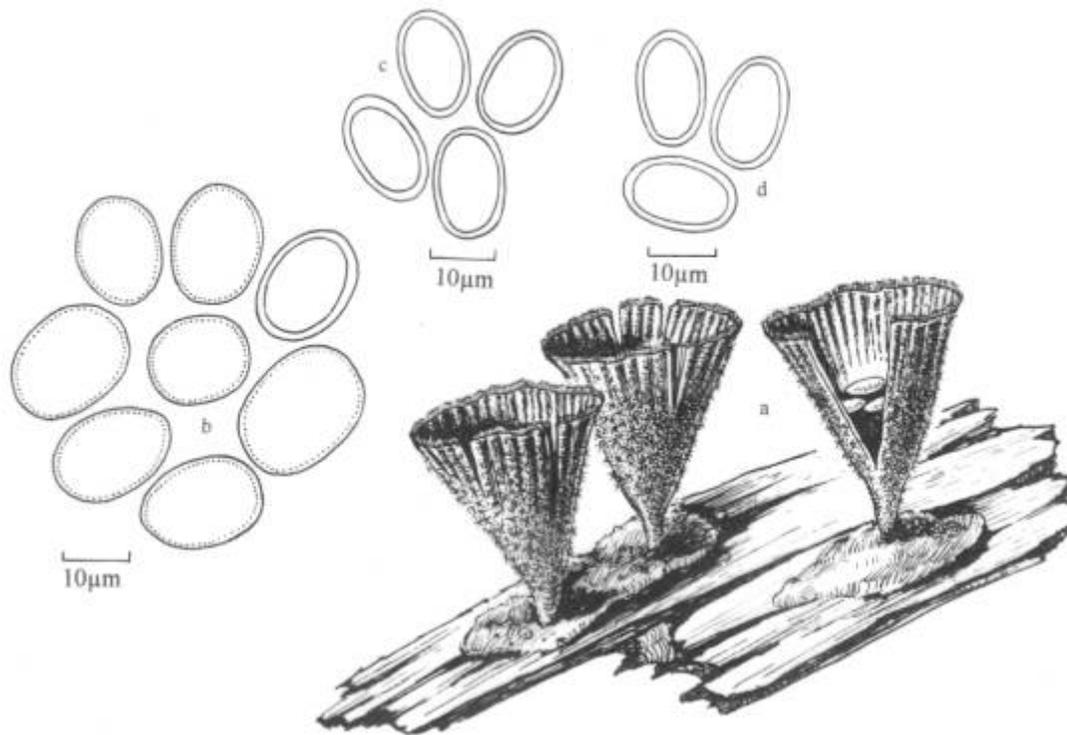
Materials were collected in the field and returned to the laboratory for examination. The peridioles were sliced by hand and examined using a light microscope. Materials are deposited in Mycological Herbarium of Southwest Forestry College (MHSWFC), Kunming, Yunnan, China.

Taxonomy

Cyathus lijiangensis T.X. Zhou & R.L. Zhao, **sp. nov.** (Figs.1a,b)

Peridium anguste tennues obconicum, infundibuliforme, ad orem 6-9 mm altum, 3-6 mm latum, basem valde constrictum, extus pilis fasciculatis conicis obtectum, striatum; intus perspicue plicatum; labium minute fimbriatum, non setosum. *Peridiola* 1.5-2 × 1.5-1.8 mm, cortex simplex, tunica subhyalina vel brunneola. *Sporae* late ellipsoideae, raro ovatae vel subgloboseae, (14-)15.5-18.5(-21) μm longae, 11-15(-16) μm latae, paries sporae 1.5-2 μm crassus.

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Figs. 1a-b. *Cyathus lijiangensis*. **a.** Basidiocarps. **b.** Basidiospores. **Figs. 1c-d.** Basidiospores of *C. helenae* (**c.** from holotype; **d.** from isotype).

Basidiocarp narrowly obconic or funnel-shaped, 6-9 mm high and 3-6 mm wide at the mouth, contracted at base and forming a short stalk, outer surface of peridium grey, greyish-black to black, covered with greyish-white hair and narrow tufts, strongly plicate externally and internally, lip minutely fimbriate but not setose (Fig.1a). *Peridioles* depressed, round or broadly ellipsoid, 1.5-2 × 1.5-1.8 mm, cortex single, tunica sub-colourless to brownish. *Basidiospores* broadly ellipsoid, some ovoid or subglobose, (14-)15.5-18.5(-21) × 11-15(-16) µm, L = 17.85 µm, W = 13.66 µm, Q = 1.31 (n = 48/2), thin-walled or 1.5-2 µm thick (Fig.1b).

Habitat: on a chopped down trunk on the ground at a farm.

Holotype: CHINA, Yunnan Province, Lijiang County May 2000, Yongzhi Pan (MHSWFC 21081); *Paratype,* *ibid.* May 1999 Kari Korhonen (MHSWFC 20771).

Notes: This new species belongs to the *striatus*-group (Brodie, 1975, 1984). It resembles *Cyathus helenae* H.J. Brodie in the size and shape of its spores (Figs. 1c-d). We have studied the holotype (DAOM 200384) and isotype (DAOM 200384a) of *C. helenae* and the spores are broadly ellipsoid, 13-16(-18.5) × 8.5-10.5 µm, L = 15.54 µm, W = 9.97 µm, Q = 1.56 (n = 57/4)

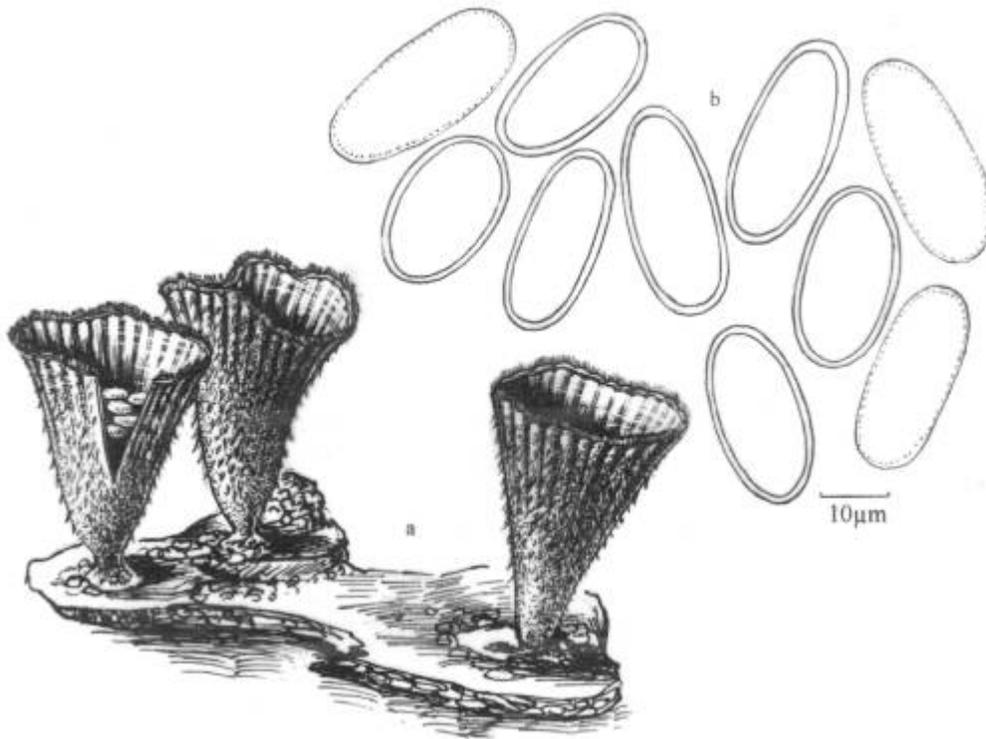


Fig. 2. *Cyathus renweii*. **a.** basidiocarps. **b.** basidiospores.

(Figs. 1c,d); as compared to 12-14 μm long and 15-19 μm wide in the protologue by Brodie (1966) and 15-19 \times 12-14 μm (Brodie, 1975). *Cyathus montagnei* Tul. is in the same group and is similar to *C. lijiangensis*, but the spores of the former are narrower [20 \times 12 μm , Brodie (1975)] and the basidiocarps are 8-10 mm high and 8 mm wide at mouth, while those of *C. lijiangensis* are narrowly obconic, and only 3-6 mm wide at mouth.

***Cyathus renweii* T.X. Zhou & L.Z. Zhao, sp. nov.** (Fig. 2)

Peridium obconicum, poculiforme, ore 8-10 mm altum, 5-6 mm latum, pavula 2 mm lato, extus brunneum, pilis faciculatis et nodulis obtectum, prope orem infirme plicatum, intus valde plicatum, labium minute fimbriatum non setosum. *Peridiola* 2 mm diametro, rotunda, cortex simplex, tunica 20-25 μm crassa. *Sporae* ellipsoideae, elongiate ellipsoideae, raro ovatae, (18-)21-31(-34.5) μm longae, 10.5-13.5(-16) μm latae; Paries sporae tenuis vel incrassatus.

Basidiocarp obconic or cup-shaped, 8-10 mm high and 5-6 mm wide at mouth, emplacement small (about 2 mm diam.) or not obvious. *Outer surface of peridium* brownish, clothed with yellowish to yellowish-pink hairs and narrow tufts, weakly plicate only near the mouth, inner greyish, strongly plicate (1-2 per mm), lip fimbriate, not setose (Fig. 2a). *Peridioles* depressed,

Table 1. Comparisons of the features among new species and similar known species in *Striatus*-group.

Scientific names	Size of fruit bodies (high × wide of mouth) (mm)	Spore shape	Spore size (μm)	Thickness of episore (μm)
<i>Cyathus striatus</i>	7-10 × 6-8	Clearly ellipsoid, slightly narrow at the end	18-20 × 8-10	Thick
<i>C. lijiangensis</i>	6-9 × 3-6	Broadly ellipsoid, some ovoid or subglobose	(14.0-)15.5-18.5(-21) × 11-15(-16) Q = 1.31	1.8-2
<i>C. montagnei</i>	8-10 × 8	Ellipsoid	20 × 12	
<i>C. helenae</i>	7 × 5-6 (from Brodie) 6-7.5 × 5-6 (from type)	Ovoid to sphaeroid slightly narrow at the end	15-19 × 12-14 13-16(-18.5) × 8.5-10.5 Q = 1.56	1.5 (occasionally thicker) 1.5-2.5
<i>C. renweii</i>	8-10 × 5-6	Ellipsoid to elongate-ellipsoid, rarely ovoid	(18-)21-31(-34.5) × 10.5-13.5(-16.5) Q = 2.02	Thin or slightly thicker
<i>C. hirtulus</i>	10-13 × 5-10	Ellipsoid, cylindrical, some slightly curved	18-25.5(-29) × 7.5-9(-11)	2
<i>C. yunnanensis</i>	6-9 × 6-7	Broadly ellipsoid to subglobose	14.5-22.5(-26) × 10.5-18(-20)	1.8-2.5

(*C. striatus*, *C. montagnei*, *C. helenae* from the descriptions by Brodie (1975); *C. helenae*, *C. hirtulus*, *C. yunnanensis* from the type studied by authors)

round, 2 mm diam., greyish, cortex single, tunica brown, 20-25 μm thick. Spores ellipsoid to elongate-ellipsoid, rarely ovoid, (18-)21-31(-34.5) × 10.5-13.5(-16) μm, L = 26.6 μm, W = 13.2 μm, Q = 2.02 (n = 83/3), exospore thin or slightly thicker (Fig. 2b).

Habitat: on remnant stakes in the woods.

Holotype: CHINA, Hunan Province, Tianpingshan Hill, Badagongshan National Nature Reserve (MHSWFC 21406); *Paratype*, *ibid.*, Oct. 2001, Lizhong Zhao (MHSWFC 21381).

Notes: The new species belongs to the *striatus*-group. The large, ellipsoid to elongate-ellipsoid spores (usually 21-31 × 10.5-13.5 μm) are the main distinguishing characteristics. In contrast, the spores of *Cyathus striatus* (Huds.) Pers. are typically ellipsoid and usually 13-24 × 8-12 μm, obviously smaller than those of the new species. The peridium is also wider than in *C. renweii*, which is usually 8-15 mm high and 5-9(-12) mm wide at mouth, the inside and outside are dark-brown, the plicates are long, and the lip setose are dark brown. In the same group, two other species with large spores resemble the new species, but the spores of *Cyathus yunnanensis* B. Liu & Y.M. Li are

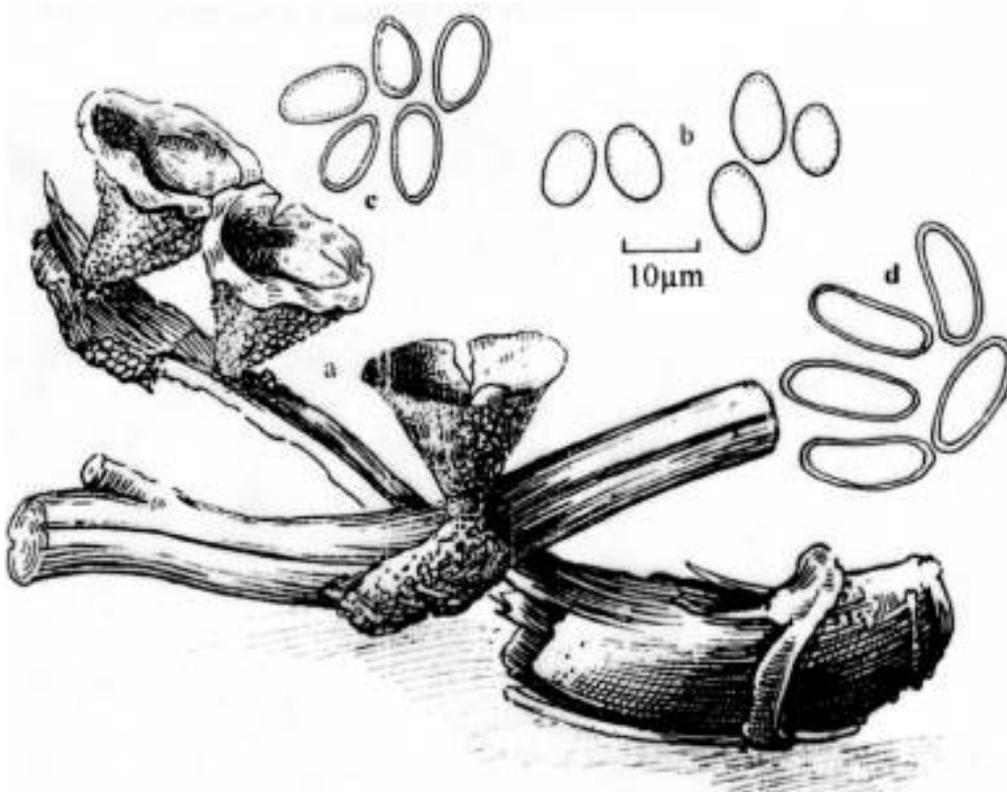


Fig. 3. *Crucibulum parvulum* a. Basidiocarp b-c. Basidiospores (c. from holotype) d. Basidiospores of *C. cyathiforme* (from holotype).

broadly ellipsoid to subglobose, $14.5-22.5(-26) \times 10.5-18(-20) \mu\text{m}$; *Cyathus hirtulus* B. Liu & Y.M. Li has ellipsoid, cylindrical spores, some of which are slightly curved in the form of allantospores, $18-25.5(-29) \times 7.5-9(-11) \mu\text{m}$, and its basidiocarp and peridioles are larger than those of *C. renweii*, and have setae around the lip. The holotypes of both species have been studied by us.

New Chinese records

Four new Chinese records (Teng, 1963; Tai, 1979; Ren and Zhou, 1992; Zhou and Ren, 1994; Chen *et al.*, 2003) are as follows.

Crucibulum parvulum H.J. Brodie, Can. J. Bot. 48: 848, 1969. (Fig. 3)

Peridium obconic, small, 2-4 mm high and 1.5-4.5 mm wide at mouth, gradually contracting towards the base (Fig.3a). *Peridioles* small, 0.5-1.2 mm in diam., cortex single and tunica thick (25-55 μm). *Spores* ellipsoid, broadly ellipsoid, $6.5-9(-11) \times 5-5.5 \mu\text{m}$ (Fig. 3b).

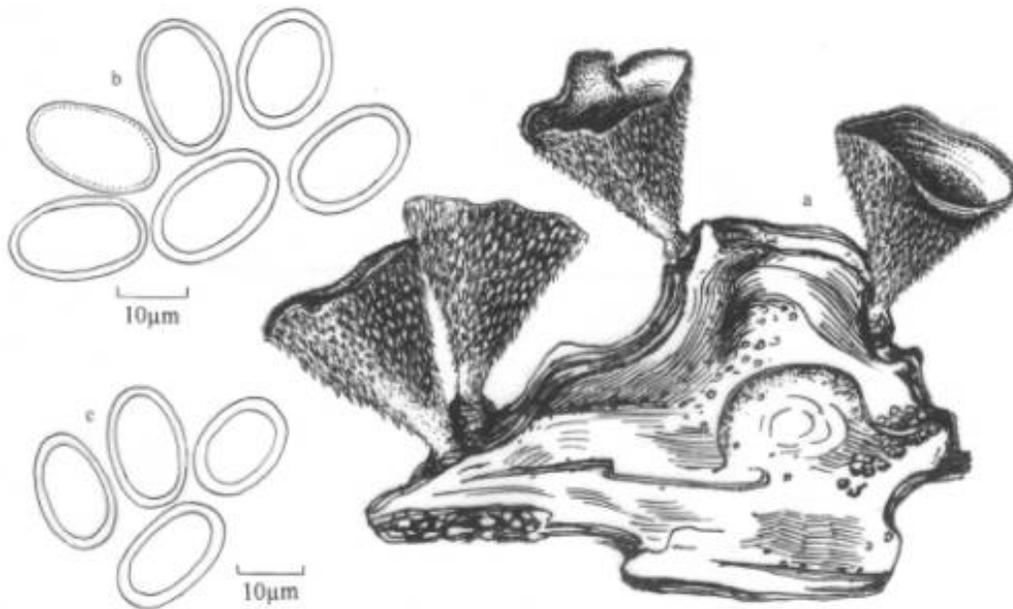


Fig. 4. *Cyathus crassimurus*. a. Basidiocarps. b-c. Basidiospores. (c. from holotype).

Distribution: Canada, China, USA.

Specimens examined: CHINA, Yunnan, Gaoligong Mountain National Nature Reserve, altitude 3000 metres, July 1999, Baojun Gao and Shaolin Zhang (MHSWFC 21031, MHSWFC 21034).

Notes: We have studied the holotype of *Crucibulum parvulum* (Brodie Herbarium 67017, collected in Alberta, Canada), whose basidiocarp and peridiole have the same characteristics as that observed in our specimen. Its spores are ellipsoid, $8-11 \times 4-5.5 \mu\text{m}$ (Fig. 3c), though $7-8 \times 4-5 \mu\text{m}$ in the protologue by Brodie (1969). Another species of genus *Crucibulum*, *C. cyathiforme* H.J. Brodie is similar to *C. parvulum* with its obconic peridium, but its peridium is comparatively larger (up to 8 mm high), peridioles are up to 2.5 mm diam., and spores are cylindrical, some are slightly curved on one side and $11-14.5(-17.5) \times 5-6(-8) \mu\text{m}$ (Fig. 3d; Brodie, 1971b). The holotype (DAOM200167) has been studied.

Cyathus crassimurus H.J. Brodie, Can. J. Bot. 49: 1609, 1971. (Fig. 4)

Basidiocarp broad-obconic, 3-6.5 mm high and 3-7 mm wide at mouth, exterior smooth, covered with hairs aggregated into tufted nodules, inner surface smooth, too. *Lip* hispidulous, brown to dark brown (Fig.4a). *Peridioles* 1-2 mm diam., cortex single and tunica up to 50 µm thick. *Spores* broadly ellipsoid, $(11-15-21(-22) \times 9-13(-14) \mu\text{m}$, thick-walled (2-3.5 µm) (Fig. 4b).

Distribution: China, USA.

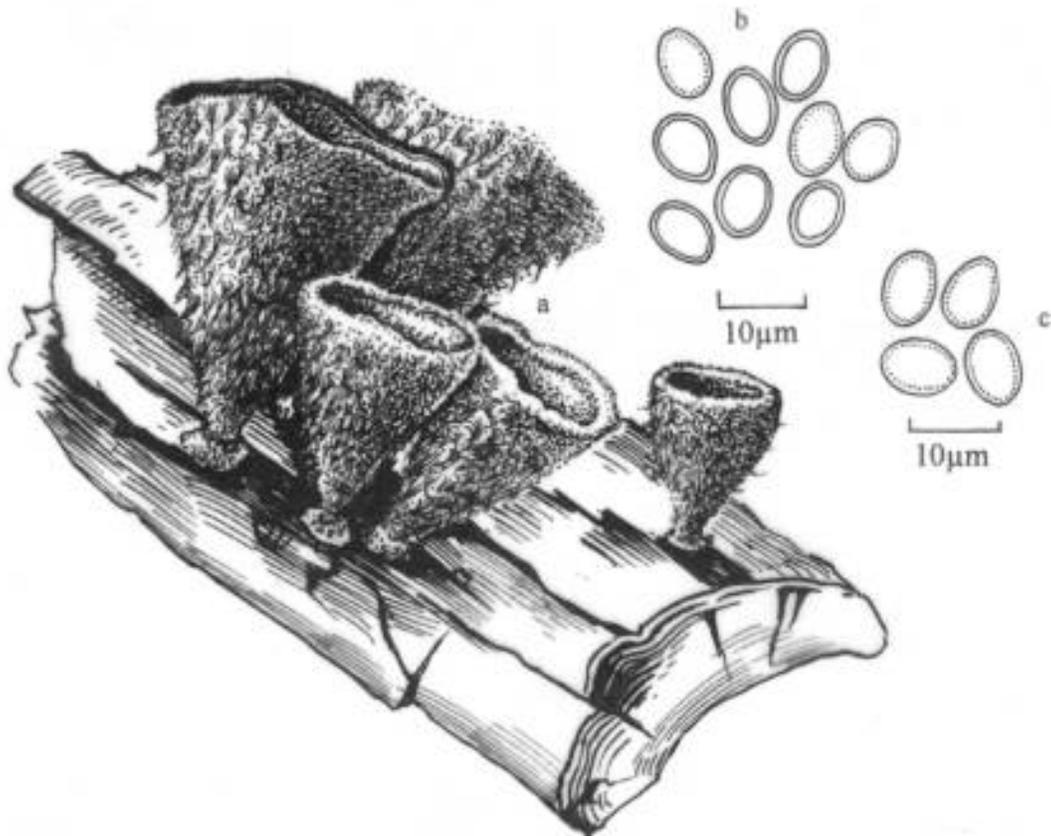


Fig. 5. *Cyathus julietae*. **a.** Basidiocarps. **b-c.** Basidiospores. (c. from holotype).

Specimens examined: CHINA, Neimonggol, Hailaer (MHSWFC 21145); Yunnan, Yingjiang, Tongbiguan Nature Reserve (MHSWFC 21584); Guizhou (MHSWFC 20764).

The species belongs to the *gracilis* group. The holotype (DAOM 200372, Island of Hawaii) has been studied: peridium 5 mm high and 5-6 mm wide at the mouth; short, brown setae around lip, viz. mouth beset with stiff brown hairs (Brodie, 1971a), peridioles 1-1.5 mm diam.; spores broadly ellipsoid (14-)16-19 × 10-12(-13) µm (Fig. 4c).

Cyathus julietae H.J. Brodie, Svensk Bot.Tidskr. 61: 94, 1967. (Fig. 5)

Peridium broadly obconic, 5-8 mm high and 4.5-9 mm wide at mouth, outside not plicate, covered with yellowish, shaggy, down pointing tufts, inside smooth. *Peridioles* (1.5-)2-3 × 1.5-2 mm, cortex single and tunica thin. *Spores* broadly ellipsoid, ovoid, rarely subglobose (4.5-)7-10.5(-11) × (4-)5-6.5(-7) µm (Figs. 5a,b). We have studied the type of *C. julietae* (DAOM 200436), fruid body 6-7 mm high, 7-8 mm wide at mouth. *Peridioles* 2 × 1.5-1.8 mm. *Spores* broadly ellipsoid, ovoid, (5.5-)7-9 × 5-6 µm (Fig. 5c).

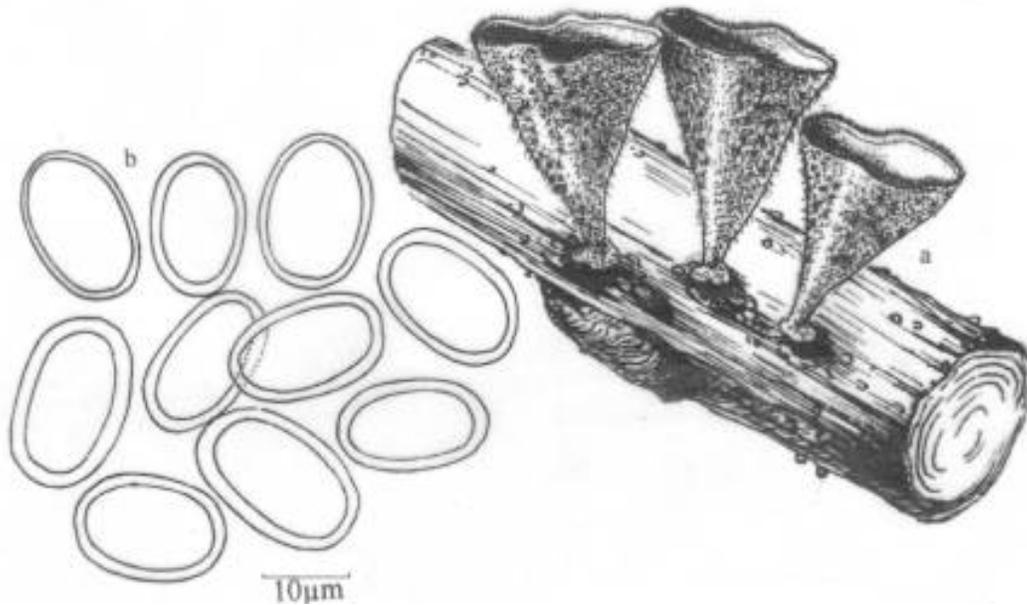


Fig. 6. *Cyathus triplex*. **a.** Basidiocarps. **b.** Basidiospores.

Distribution: China, Jamaica.

Specimens examined: CHINA, Guangdong (HMIGD 8457), Sichuan (MHSU 600, HMAS 28076) and Yunnan (HMSA 02750, 20154, 27021).

The species resembles *Cyathus pallidus* Berk & M.A. Curtis in its smooth peridium, covered with shaggy, downward-pointing tufts and broadly ellipsoid spores. It is distinguished from the latter, however, by its larger peridium, straighter walls and subglobose, smaller spores. The spores of *C. pallidus* are $7.5-15 \times 4-8.5 \mu\text{m}$ and the fruitbody is 5-7 mm high and 5-7 mm wide at the mouth (Brodie, 1975).

Cyathus triplex Lloyd, Myc. Writ. 2 (Nidulariaceae) 223, 1906. (Fig. 6)

The species belongs to *triplex* group (Brodie, 1975). *Basidiocarps* dark, contracted at base and forming a short stalk, fimbriate lip. *Peridioles* with cortex duplex and tunica, spores mostly broadly ellipsoid, large, (12)14.5-21(-22.5) \times (8)10.5-13.5(-16) μm (Figs. 6a,b).

Distribution: China, Philippines, Thailand, USA, West Indies, Venezuela.

Specimens examined: CHINA, Beijing (MHSWFC21009, 21077); Hunan (MHSWFC 21397, 21401, 21416, 21418, 21420); Guangdong (HMIGD6108); Hainan (HKAS 29345); Sichuan (MHSWFC20768); Yunnan (MHSWFC20032, 20033); Taiwan (MHSWFC21485).

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