



The genus *Blumenavia* (Clathraceae, Phallales)

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Abstract

In this manuscript we present descriptions, comments, illustrations, color photographs and a key to identify the two known species of *Blumenavia*: *B. rhacodes* and *B. angolensis*. Both species occur in Southern Brazil and the presented data are based on recently collected and herbarium specimens. *Blumenavia angolensis* is reported for the first time from the States of Santa Catarina and Rio Grande do Sul (Southern Brazil).

Key words – Gasteromycetes – *Laternea* – lattice stinkhorns – Neotropical fungi – Phallaceae.

Introduction

Blumenavia Möller is a curious clathroid genus described from Southern Brazil at the end of the 19th century (Möller 1895). Its etymology is dedicated to the city Blumenau, where the German naturalist Alfred Möller lived and studied phalloid fungi from 1890 to 1893 (Stafleu & Cowan 1983). This genus is differentiated from other clathroids due to the unique morphology of the receptacle, since the gleba is not spread in the inner surface of the columns (or receptacle) or concentrated in droplets (glebifers). Instead, the gleba is spread on lateral projections and lacerations from the columns, also called ‘wings’ and ‘teeth’ by some authors.

Lloyd (1909) reduced *Blumenavia* to a synonym of *Laternea* Turpin, a position followed by Rick (1929, 1961); however, most authors continued treating the genus independently (Fischer 1933, Dennis 1953, Dring 1980, López et al. 1981, Miller & Miller 1988, Domínguez de Toledo 1995). Recent molecular studies have shown that *Blumenavia* is phylogenetically closely related to *Laternea* (Degreef et al. 2013, Trierveiler-Pereira et al. 2014), but more sequences of both genera must be included in further analysis to clarify their distinction.

To date, four species have been described for the genus: *B. rhacodes* Möller (type species), *B. angolensis* (Welw. & Curr.) Dring (from Africa, but also known from South America), *B. usambarensis* Henn. (from Africa) and *B. toribiotalpaensis* Vargas-Rodr. (from Mexico). Calonge et al. (2007) reduced the latter to a synonym of *B. rhacodes*, and *B. usambarensis* is synonym with *B. angolensis* (Dring 1980).

In Southern Brazil, the two currently accepted *Blumenavia* species are not difficult to find in the field, but since their receptacles are so fragile and ephemeral, especially in *B. angolensis*, they have been considered rare species. The aim of this study is to present full descriptions, comments and illustrations of both species and clearly mark the morphological differences.

Materials & Methods

Field expeditions have been carried in the three States of Southern Brazil (Paraná, Santa Catarina and Rio Grande do Sul) and also specimens from herbaria ICN, FLOR, PACA, MBM, and BPI were consulted (Thiers 2011). Whenever possible, basidiomata were photographed in the field, and later were slowly dried in laboratory using a food dehydrator (at least for 24 hours).

Specimens were examined according to traditional techniques on gasteromycetes taxonomy (Miller & Miller 1988). Colors were coded according to Kornerup & Wanscher (1978).

Results

Blumenavia angolensis (Welw. & Curr.) Dring, *Kew Bull.* 35(1): 53 (1980). Figs 1, 3B
≡ *Laternea angolensis* Welw. & Curr., *Trans. Linn. Soc. London* 26: 286 (1870).
= *Blumenavia usambarensis* Henn., *Bot. Jb.* 33: 37 (1902).

Unexpanded basidiomata ('eggs') not observed. Basidiomata solitary, 4–6 cm high. Volva 0.8–1 cm high × 1–1.5 cm in diam., pale grey (1B1) to brownish grey (5C2), with debris adhered to the surface and a thin mycelial strand attached at the base. Receptacle pure white when fresh (4A3) and light brown (5D5) when dried, fragile, spongy, with pores on the outer surface (pores internally occluded), formed by four columns, united at the apex and free below; columns 0.3–0.8 cm in diam. in the largest dimension; subtriangular to subglobose in transversal section, multi-tubular, composed of 4–5 tubes, not interconnected. Angle between the inner face and outer face of the columns is marked by a line of delicate teeth, which are covered with glebal mass. Gleba gelatinous, olive brown (4F4), fetid. Basidiospores cylindrical, usually attenuate at one side, 4 × 2 µm, smooth, faintly greenish tinted. Volva's exoperidium formed by pseudoparenchymatous hyphae, 25–45 × 15–35 µm in diam., yellowish to hyaline, with large, greenish crystals rosette arrangements inside. Receptacle formed by pseudoparenchymatous hyphae, hyaline, 30–40 × 20–35 µm in diam., globose, subglobose to elongate; lateral projections ('teeth') also pseudoparenchymatous.

Habitat – growing on wood and other plant debris, on forest litterfall.

Known distribution – Tropical: Africa (Angola – Welwitsch & Currey 1870; São Tomé – Degreeef et al. 2013) and South America (Brazil – Meijer 2006).

Material examined – Brazil, State of Paraná, Antonina, Reserva Natural do Rio Cachoeira, 17 Aug 2005, A.A.R. de Meijer 4339 (MBM); Santa Catarina, Florianópolis, Unidade de Conservação Desterro, 9 Nov 2013, A.C. Magnago 816 (FLOR 51619); State of Rio Grande do Sul, São Francisco de Paula, FLONA de São Francisco de Paula, 8 Feb 2014, C.R. Alves 143 (ICN 177268); *ibid.*, 13 Apr 2014, A.C. Magnago 1049 (ICN 177269).

Blumenavia rhacodes Möller, *Bot. Mitt. Trop.* 7: 57 (1895). Figs 2, 3A
= *Blumenavia toribiotalpaensis* Vargas-Rodr., in Vargas-Rodriguez & Vázquez-García, *Mycotaxon* 94: 8 (2006) [2005]

Unexpanded basidiomata ('eggs') globose to depressed globose, 1.5–3.5 cm diam., dirty white, grayish (2B1) to black. Basidiomata solitary or in small groups, 9–13 cm high. Volva 2.5–3.5 cm high, with the same morphological features as the immature stages. Receptacle formed by three to five robust columns that are free at the base and united above, columns 1–2 cm in diam. in the largest dimension, pastel yellow (1A4) to pale yellow (1A3), with a spongy texture and some larger pores on the outer surface (but pores are internally occluded); trapezoid in transversal section, multi-tubular, composed of 8–10 tubes, not interconnected, with the widest tube on the adaxial face. Gleba mucilaginous, olive (2F5), fetid, spread on lateral projection or lacerations of the receptacle's columns. Basidiospores cylindrical, usually attenuate at one side, 3.5–4.5 × 1–1.5 µm, smooth, faintly greenish tinted. Volva's exoperidium formed by pseudoparenchymatous hyphae, up to 70 µm in diam., yellowish to hyaline, many of them with large crystals rosette arrangements inside; endoperidium formed by hyaline hyphae, simple septate, thin-walled.

Receptacle formed by pseudoparenchymatous hyphae, up to 40 μm in diam., hyaline; lateral projections also pseudoparenchymatous.

Habitat – on rotten wood inside forest and shady places.

Known distribution – Neotropical: Southern Brazil (Möller 1895, Rick 1929, Trierveiler-Pereira et al. 2014), Northeastern Brazil (Rodrigues & Baseia 2013, as *B. angolensis*), Argentina (Domínguez de Toledo 1995), and Mexico (López et al. 1981, Vargas-Rodríguez & Vázquez-García 2005, Calonge et al. 2007).

Material examined – Brazil, State of Rio Grande do Sul, São Leopoldo, 1906, J. Rick (PACA-FR 12550); *ibid.*, 1907, J. Rick (PACA-FR 12552); *ibid.*, J. Rick (BPI 703249); Porto Alegre, Morro Santana, 17 May 2011, L. Trierveiler-Pereira 230 (ICN 176968); *ibid.*, 31 May 2011, L. Trierveiler-Pereira 247 (ICN 176969); *ibid.*, Campus da Universidade Federal do Rio Grande do Sul, 01 Apr 2014, E.P. Fazolino 164 (ICN 177266); *ibid.*, 02 Apr 2014, E.P. Fazolino 165 (ICN 177267); Mexico, Jalisco, Talpa de Allende, 10 Sep 2002, Vargas-Rodríguez et al. 240 (BPI 870955, type of *Blumenavia toribiotalpaensis*).

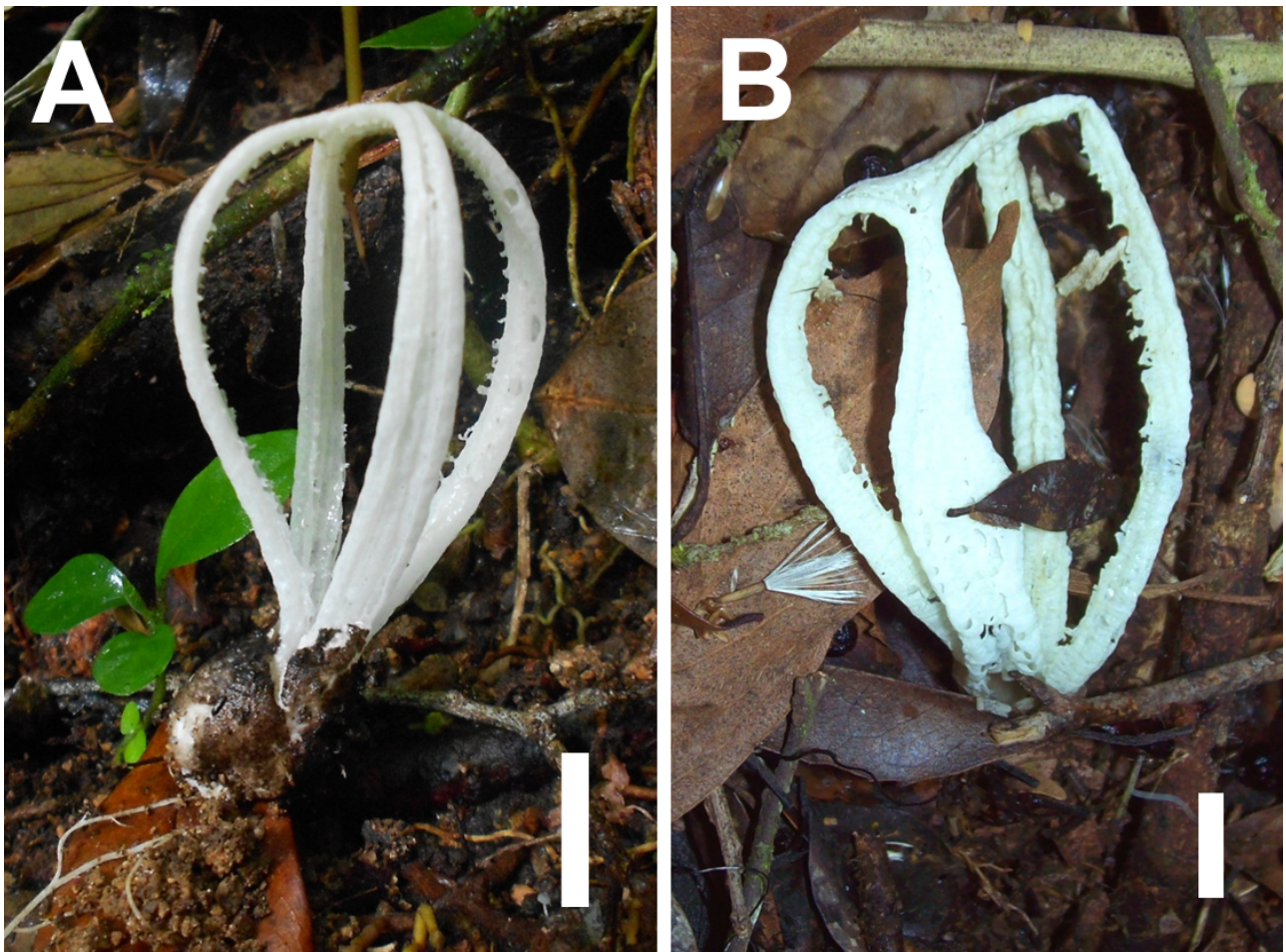


Figure 1 – *Blumenavia angolensis* in situ. A Specimen FLOR 51619. B Specimen ICN 177268. – Bars = 1 cm. Photograph A by A.C. Magnago.

Discussion

The two *Blumenavia* species can be differentiated due to size and coloration of basidiomata. *Blumenavia rhacodes* has more robust, large basidiomata (up to 13 cm high), while *B. angolensis* is fragile and small (up to 6 cm). Moreover, the first has yellowish, robust columns (1–2 cm in diam.) and the latter has pure white (when fresh), narrower columns. In both species, the columns might be separated at the apex when the basidiome is old (also depicted by Degreef et al. 2013).

There are descriptions of *B. rhacodes* having orange columns, but probably they refer to misidentifications of *Clathrus columnatus* Bosc. According to our field experience, *Blumenavia*

species are never orange. One collection of *B. rhacodes* from Trinidad was reported to have a white receptacle (Dennis 1953), so we cannot ascertain its identity, especially because measurements of receptacle and columns were not provided.

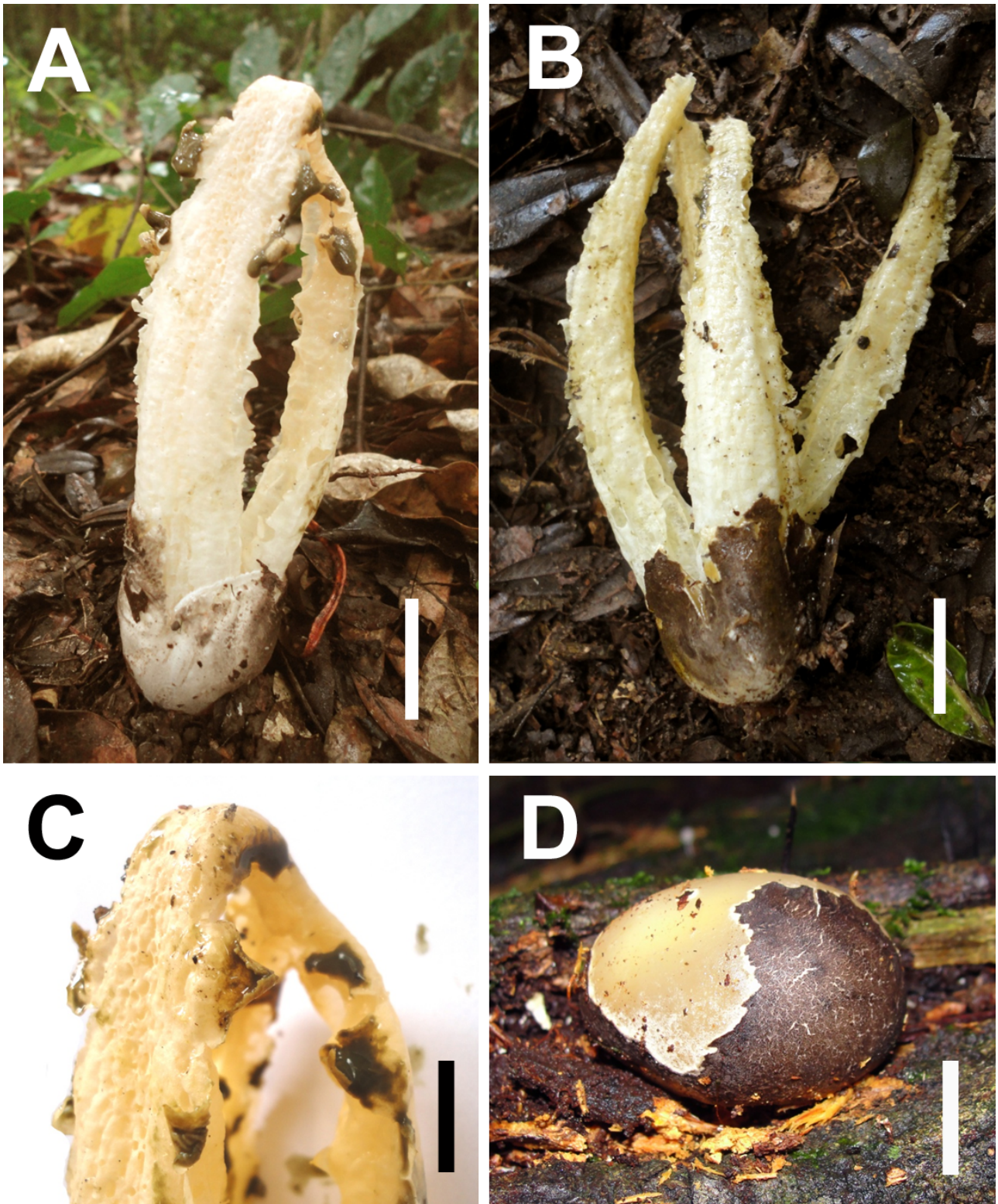


Figure 2 – *Blumenavia rhacodes*. A Basidiome *in situ* (ICN 177266). B Old basidiome with columns detached at the apex (ICN 177267). C Detail of the columns' apex (ICN 177266). D Immature basidiome about to expand (ICN 176968). – Bars A–B = 2 cm; C–D = 1 cm. Photographs A–C by E.P. Fazolino.

After our experience of observing several basidiomata in the field, we can ascertain that morphological features that are not constant and should not be taken into account to separate *Blumenavia* species are: color of immature basidiomata and/or volva, and distribution of the gleba.

In both species the immature stages might be whitish, grayish or blackish (note whitish volva in Fig. 2A and blackish volva in the Figs. 2B and 2D). More commonly the eggs are initially white, and then they become dark and cracked.

The gleba might be distributed all along the columns, but it might not be present when the basidiomata are found (maybe the receptacle is too young, or the gleba was wash out or removed by insects). We have seen typical specimens of *B. rhacodes* with gleba concentrated on the upper half of the columns, and we have seen basidiomata of *B. angolensis* where the lateral projections were evident but no mucilaginous gleba was visible in the ‘teeth’ (Fig. 1A). The original illustration of *B. angolensis* (Welwitsch & Currey 1870) shows the gleba concentrated in the upper part of the columns, but we can ascertain that in this species this feature is not constant.

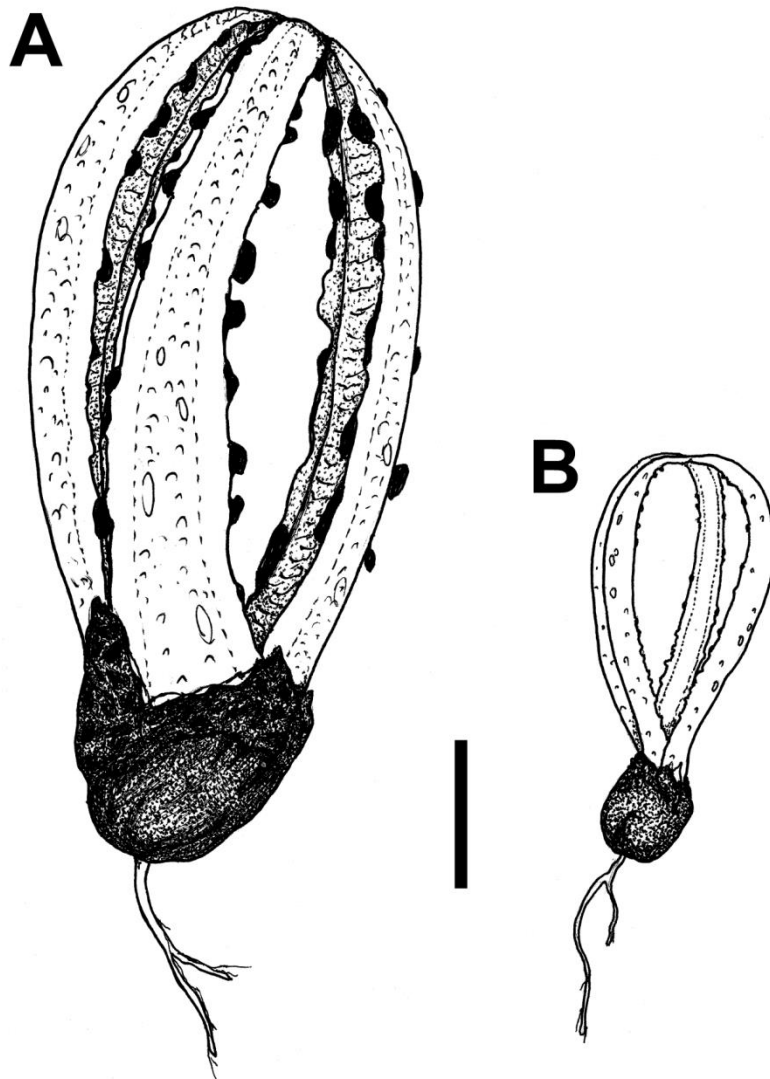


Figure 3 – *Blumenavia* species. A *Blumenavia rhacodes* B *Blumenavia angolensis*. – Bar = 2 cm.

Key to *Blumenavia* species

- 1. Basidiomata robust, 9–13 cm high, columns up to 2 cm in wide when fresh, receptacle light yellow *B. rhacodes*
- 1'. Basidiomata delicate, 4–6 cm high, columns up to 0.5 cm in wide when fresh, receptacle pure white *B. angolensis*

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