



## Contributions towards the knowledge of *Favolaschia* (Mycenaceae, Agaricomycetes) from Brazil

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### Abstract

*Favolaschia* is a representative genus in the Brazilian Atlantic Forest where four species have been recently identified: *Favolaschia cinnabarina*, *F. dealbata*, *F. rubra* and *F. selloana*. *Favolaschia dealbata* is a new record for Brazil and *F. selloana* is new for Southeastern Brazil. Color images of the basidiomata, complete descriptions and illustrations of the four species are presented.

**Key words** – Agaricales – fungal taxonomy – neotropical mycota

### Introduction

*Favolaschia* (Pat.) Pat. is a genus of usually small, mushroom-like basidiomycetes that occur worldwide, especially in the tropics. Members of the genus are often characterized by their poroid hymenophore, amyloid spores, frequent presence of gloeocystidia and acanthocystidia and a trama that is usually gelatinous (Gillen et al. 2012). *Favolaschia* comprises approximately 50 species (Singer 1974, Parmasto 1999, Kirk et al. 2008) and about 20 of these have been reported for Brazil (Gillen et al. 2012). The first records of the genus in Brazil are from the nineteenth century (e.g. Spegazzini 1889, Bresadola 1896, Hennings 1897). More recent records include the description of a new species, *F. luteoaurantiaca* Capelari, Karstedt & J.S. Oliveira (Singer 1974, Singer & Fidalgo 1965, Capelari et al. 2013).

Although *Favolaschia* species are very common in the Brazilian Atlantic forests, few species have been reported from the state of Santa Catarina, in Southern Brazil: *F. agaricina* (Mont.) Kuntze, *F. cinnabarina* (Berk. & M.A. Curtis) Pat., *F. flava* (Bres.) Kuntze, *F. moelleri* (Bres.) Singer and *F. rubra* (Bres.) Kuntze (Bresadola 1896, Capelari et al. 2013). This article presents descriptions and illustrations of four *Favolaschia* species recently identified from Southeastern (Espírito Santo State) and Southern Brazil (Santa Catarina State). *Favolaschia dealbata* is a new record for Brazil and *F. selloana* is a new record for Southeastern Brazil and the first record of the genus for the state of Espírito Santo (Vinha 1988).

### Materials & Methods

Field expeditions were carried out in Santa Catarina (Southern Brazil) at Vargem do Braço, a

small area in the municipality of Santo Amaro da Imperatriz, and in Reserva Biológica Volta Velha, in Itapoá. In the State of Espírito Santo (Southeastern Brazil) collections were made in Reserva Biológica Augusto Ruschi, Santa Teresa. The predominant vegetation type in these areas is Atlantic Forest (Dense Ombrophilous Forest) and the climate is subtropical to tropical with high annual rainfall (1800 mm). Altitudes range from 350 to 750 m a.s.l., and the mean annual temperature varies between 20°C and 24°C in January (Summer) and 12°C and 16°C in July (Winter).

Basidiomata were slowly dried at a low temperature (about 40°C), on an electric dryer (Total Chef TCFD-05 Deluxe), and later analyzed (macro and microscopically) according to Singer (1974). Macroscopic features are described based on dried specimens. Colors were based on Kornerup & Wanscher (1978). Microscopic observations were made with KOH, congo red, cresyl blue or Melzer's reagent. Vouchers are deposited at FLOR (Thiers 2013).

## Results and Discussion

***Favolaschia cinnabarina*** (Berk. & M.A. Curtis) Pat., Essai Tax. Hyménomyc. (Lons-le-Saunier): 141, 1900. Figs 1A–2

Basidiomata gregarious; pileus 0.4–0.8 mm in diam., semiglobose, reddish orange (7A8) to orange (6A8, 6A7), glabrous to slightly pruinose, pruina lighter than pileus color. Hymenophore poroid, ca. 3–4 pores per mm, irregular; pore edges concolorous with surface, dissepiments thick. Stipe absent to poorly developed, laterally attached.

Basidiospores  $8\text{--}10 \times 5\text{--}8 \mu\text{m}$  ( $Q=1.4$ ), broadly ellipsoid to ovoid, smooth, hyaline, amyloid. Basidia  $26 \times 8 \mu\text{m}$ , clavate, thin walled, hyaline; 2-spored, sterigmata  $3 \mu\text{m}$  long. Hymenial gloecystidia  $30\text{--}34 \times 5\text{--}8 \mu\text{m}$ , clavate, scattered, with golden yellow oily contents, inamyloid. Pileipellis composed of acanthocystidia and gloecystidia; gloecystidia  $31\text{--}55 \times 8\text{--}11 \mu\text{m}$ , clavate, with golden yellow oily contents, inamyloid; acanthocyst spiny on the upper two third, spines  $1\text{--}2 \mu\text{m}$  long, clavate to pyriform,  $26\text{--}31 \times 7\text{--}9 \mu\text{m}$ , hyaline. Trama of the pileus interwoven,  $2\text{--}4 \mu\text{m}$  broad, hyaline, inamyloid, immersed in gelatinized matrix, clamp connections present.

Habitat – growing on dead herbaceous twigs.

Distribution – Bolivia, Brazil, British Guyana, Colombia, Cuba, Ecuador, Panama, Venezuela (Singer 1974, Gillen et al. 2012). In Brazil, the species is cited for the states of Paraná (Meijer 2001, 2006, 2008), Rondônia (Capelari and Maziero 1988), Santa Catarina (Capelari et al. 2013) and São Paulo (Singer 1974; Pegler 1997, Capelari et al. 2013).

Material examined – Brazil, Santa Catarina, Itapoá, Reserva Biológica Volta Velha, 18 November 2012, Urrea-Valencia, S. 204 (FLOR 49850).

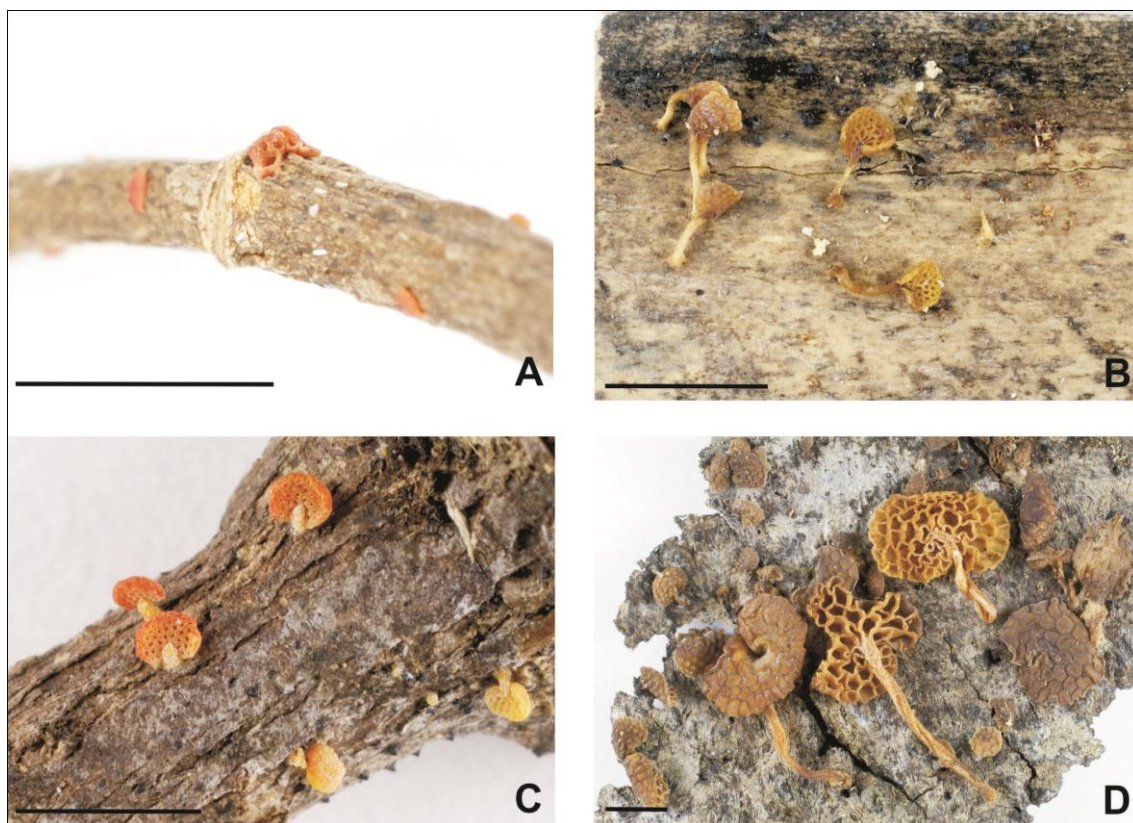
Remarks – *Favolaschia cinnabarina* is recognized by the following: a vibrant pigmented, reddish-orange basidiomata; stipe absent to poorly developed; pileipellis with numerous gloecystidia and empty acanthocystidia; hymenial gloecystidia with golden yellow, oily content; basidiospores broadly ellipsoid,  $8\text{--}10 \times 5\text{--}8 \mu\text{m}$ ; and gelatinized trama. Following Singer (1974), *F. cinnabarina* fits into section *Favolaschia* subsection *Auriscalpium*, a group distinguished by its taxa with brightly pigmented basidiomata, conspicuous gloecystidia and distinct acanthocystidia.

*Favolaschia gaillardia* is very similar to *F. cinnabarina* due to its reddish basidiomata; however, the former species usually has larger basidiomata (2.8–5.0 mm in diam.) and its basidiospores are broadly ellipsoid to ovoid (Singer 1974, Pegler 1997).

***Favolaschia dealbata*** Singer, Mycologia 47(5): 763, 1955.

Figs 1B–3

Basidiomata gregarious, usually not confluent; pileus 0.6–1.6 mm in diam., semiglobose to fan-shaped, deep orange (6A8) to orange (6A6, 6A7), glabrous to slightly pruinose, pruina concolorous with the surface; tessellate by transparency (corresponding to the pore dissepiments). Hymenophore poroid, ca. 5–6 pores per mm, pores 0.05–0.25 mm in diam., irregular to favoloid in shape, some round near the margin; pore edges grayish orange (5B5). Stipe 0.8–1.8 mm in length; deep orange (5A8) to light orange (5A5), glabrous to slightly pruinose, laterally attached.



**Fig. 1** – Dried basidiomata: A *F. cinnabarina*, B *F. dealbata*, C *F. rubra*, D *F. selloana* (Scale: 3 mm).

Basidiospores  $8\text{--}9.5 \times 5\text{--}6 \mu\text{m}$  ( $Q=1.6$ ), broadly ellipsoid to subglobose, smooth, thin-walled, usually with a central oil drop, amyloid. Basidia cylindric to clavate, 4-spored. Hymenial gloecystidia not abundant, cylindrical to broadly cylindrical,  $19\text{--}28 \times 5\text{--}7 \mu\text{m}$ , smooth, with golden yellow to orange oily content. Pileipellis composed of acanthocystidia and gloecystidia; acanthocystidia clavate to broadly clavate,  $20\text{--}28 \times 11\text{--}24 \mu\text{m}$ , densely spinulose over the upper half, hyaline to light yellow; gloecystidia, clavate to broadly clavate,  $23\text{--}39 \times 12\text{--}18 \mu\text{m}$ , smooth, with gold-yellow to orange oily content. Trama slightly gelatinous, hyphae irregularly arranged in pileus trama, thin-walled, clamp connections absent.

Habitat – growing on dead culms of native bamboo (*Chusquea* sp.).

Distribution – Panamá (Singer 1955), Ecuador (Gillen et al. 2012) and Brazil (present study).

Material examined – Brazil, Santa Catarina, Santo Amaro da Imperatriz, Vargem do Braço, 12 November 2006, L. Trierweiler-Pereira s/n (FLOR 32187).

Remarks – *Favolaschia dealbata* is characterized by the following: orange, non-gelatinous basidiomata; laterally attached stipe; pileipellis composed of acanthocystidia and gloecystidia; 4-spored basidia; basidiospores broadly ellipsoid,  $8\text{--}9.5 \times 5\text{--}6 \mu\text{m}$ ; and hyphae without clamp connections (Gillen et al. 2012). In tropical America, the species has been found at high altitudes (ca 2000–2800 m a.s.l.), but the Brazilian specimen was found at a lower altitude (ca. 350–600 m a.s.l.) in a subtropical forest.

The substratum is also an important feature used to identify this species because it has always been collected on bamboo (Singer 1955, Gillen et al. 2012). According to Singer (1974), most species of *Favoslashia* are specific to a particular substratum, although some species might be found on different substrata (e.g., *F. calocera*). Another South American species known to occur on dead bamboo is *F. aurantiaca* Singer (reported from Argentina, Bolivia, Ecuador and Panama); however, this species has white to brown, gelatinous basidiomata (Gillen et al. 2012).

*Favolaschia dealbata* is phylogenetically related to *F. calocera* R. Heim, a common paleotropical species that also has orange basidiomata and gloecystidia in the pileipellis (Vizzini

et al. 2009, Gillen et al. 2012). Both species can be easily separated because *F. calocera* has 2-spored basidia, larger basidiospores (9–13.5 µm in length), and does not grow specifically on bamboo.

*Favolaschia luteoaurantiaca* Capelari, Karstedt & J.S. Oliveira, recently described from Brazil, also shares similar macroscopic features with *F. dealbata*, but the first was found growing on dicotyledon shrubs and the basidiomata color ranges from orange to yellow. Moreover, basidiospores of *F. luteoaurantiaca* are slightly smaller (7.5–8.5 µm long) (Capelari et al. 2013).

***Favolaschia rubra* (Bres.) Kuntze, Revis. gen. pl. (Leipzig) 3(2): 476, 1955. Figs 1C–4**

Basidiomata gregarious; pileus 0.3–1.0 mm in diam., semiglobose, brownish orange (6C8) to orange (6A7, 6A8), slightly pruinose, pruina whitish to yellowish. Hymenophore poroid, ca. 7–8 pores per mm; pore irregular to round, edges light orange (6A5), dissepiments thick. Stipe 0.3–0.6 mm in length; light orange (6A5, 6A6), slightly pruinose, laterally attached.

Basidiospores 6–8 × 5–6 µm (Q=1.2), ellipsoid, hyaline, smooth, thin-walled, amyloid. Basidia cylindric to clavate, thin walled, hyaline, 2–4-spored, sterigmata 2–4 µm long. Hymenial gloeocystidia absent. Pileipellis composed of numerous dermatocystidia, 22–46 × 5–8 µm, cylindrical to versiform, wavy, branched or nodulose, hyaline, inamyloid. Trama of the pileus interwoven, slightly gelatinous, hyphae 2–6 µm broad, hyaline, inamyloid; trama of the stipe parallel, 4–12 µm broad, hyaline, dextrinoid, clamp connections absent.

Habitat – growing on dead herbaceous stems and small twigs.

Distribution – Bolivia, Brazil, Brithish Guiana, Ecuador, and Panama (Singer 1974). In Brazil, the species is reported from Blumenau (Santa Catarina), the type locality.

Material examined – Brazil, Santa Catarina, Itapoá, Reserva Biológica Volta Velha, 18 November 2012, Flores, G. 001 (FLOR 49851).

Remarks – *Favolaschia rubra* fits into section *Anechinus*, due to its acanthocystidia that are poorly developed or absent, and subsection *Rubrinae* due to its absent or rare gloeocystidia (Singer 1974). The pileipellis of *F. rubra* is composed by dermatocystidia. The bright red basidiomata distinguishes this species from the others within subsection *Rubrinae*.

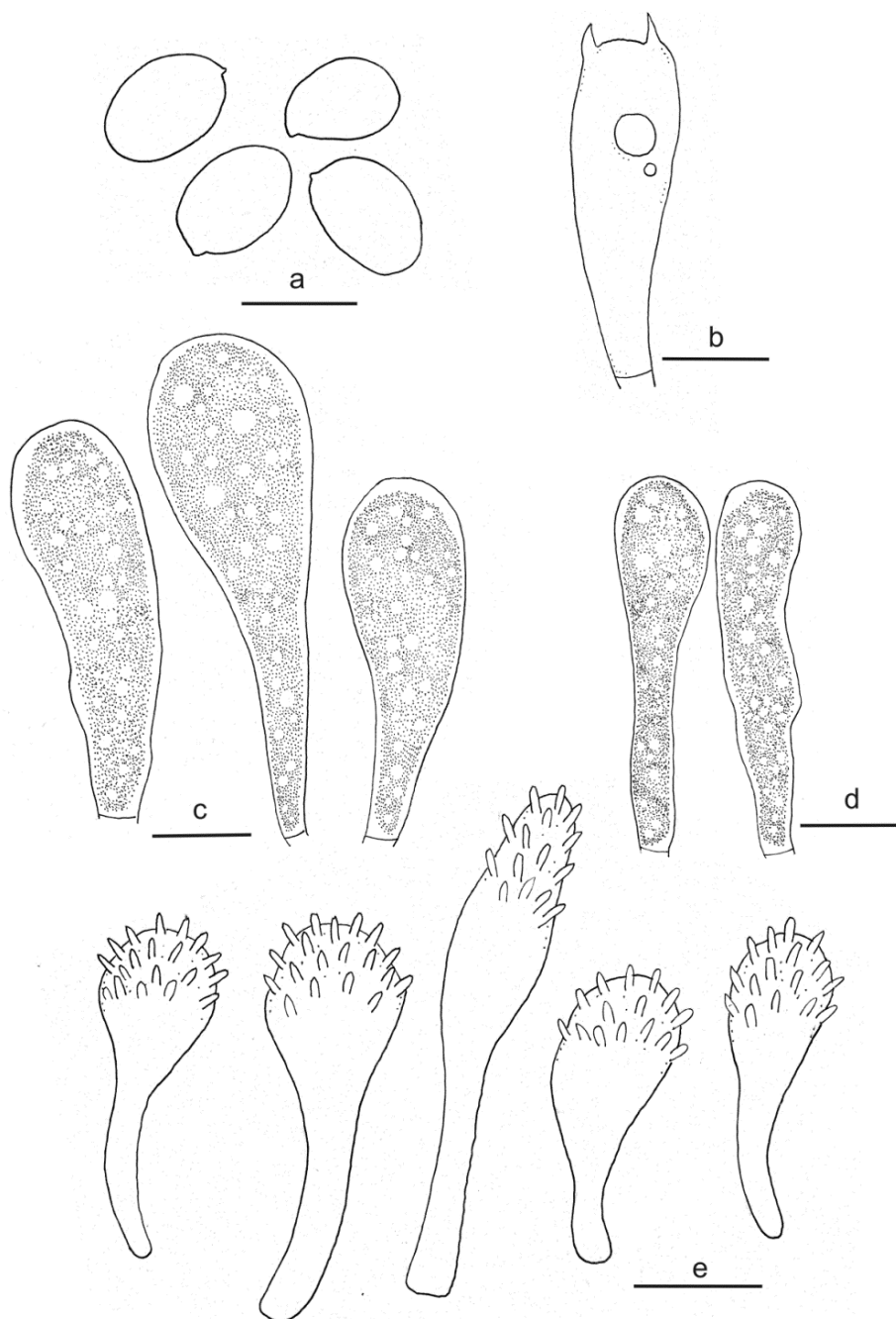
The description here agrees with the original (Bresadola 1896). The type material of this species is from the same region, which was collected in very similar vegetation and a similar climate where our specimens were collected; the distance between the two localities, in the Santa Catarina State, is about 160 km.

***Favolaschia selloana* Henn., Hedwigia 36(4): 203, 1897. Figs 1D–5**

Basidiomata gregarious, usually not confluent; pileus 2–7 mm in diam., semiglobose to fan-shaped, sometimes reniform, brownish orange (7C7, 7C6), lighter between the tessellate lines (7A5), becoming yellow brown when dry, glabrous to slightly pruinose, pruina concolorous with the surface; tessellate following the pore dissepiments. Hymenophore poroid, ca. 1–2 pores per mm, tubes grayish orange (6B4); pore irregular, some round near the margin and some alongate near the stipe, pore edges concolorous with the pileus surface. Stipe 2–9 mm long; grayish orange (6B4), glabrous to slightly pruinose, compressed, laterally attached.

Basidiospores 7–9 (–10) × 4–5 µm (Q=1.93), ellipsoid, hyaline, smooth, thin-walled, amyloid. Basidia 28–33 × 6–7 µm clavate, thin walled, hyaline, 2–4-spored, sterigmate 2–3 µm long. Hymenial gloeocystidia 38–48 × 6–9 µm, clavate to fusiform, frequent, with golden yellow oily contents in H<sub>2</sub>O and 3% KOH, inamyloid. Pileipellis with numerous gloeocystidia 46–86 × 16–19 µm, clavate to versiform, with golden yellow oily contents; acanthocystidia spiny on the upper two third, 26–46 × 11–13 µm; dermatocystidia globose with pedicel, 26–45 × 18–22 µm, hyaline; and ventricose-rostrate 40–47 × 11–15 µm, hyaline. Stipitipellis with elements similar in size and shape from the pileipellis. Trama of the pileus interwoven to sub parallel hyphae, 3–11 µm broad, hyaline, inamyloid, with blue small contents in cresyl blue, slightly gelatinized; trama of the stipe parallel, 4–13 µm broad, hyaline, inamyloid, clamp connections present and conspicuous.

Habitat – growing on twigs of angiosperm.

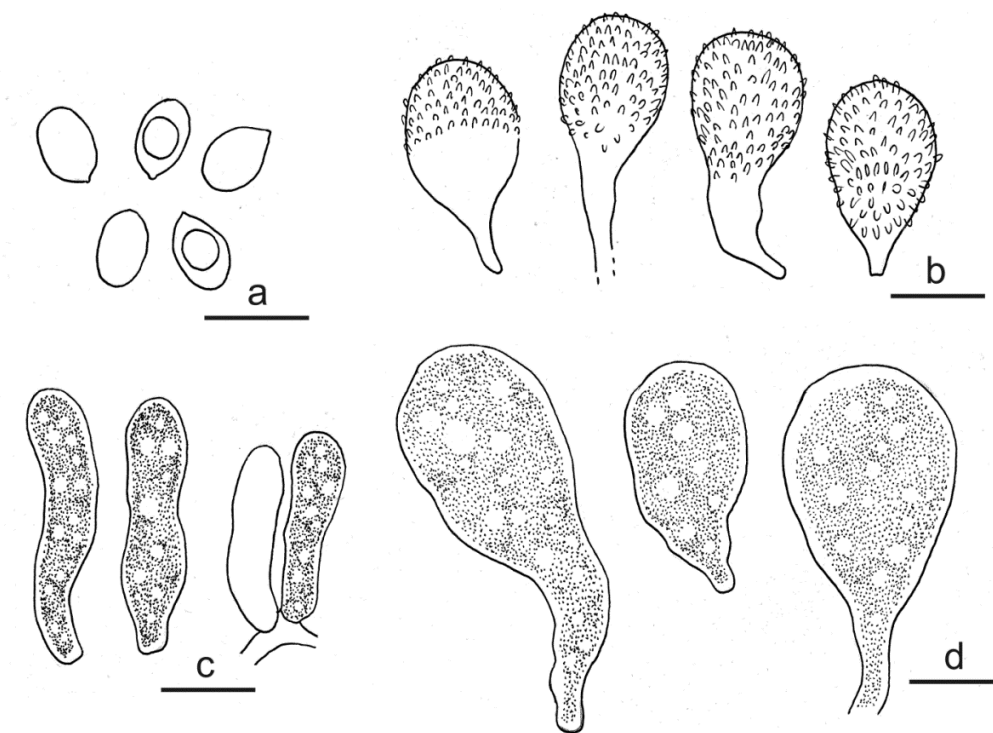


**Fig. 2** – Microscopic structures of *F. cinnabarina*: basidiospores, a basidia, b gloecystidia from the pileipellis, c hymenial gloecystidia, d acanthocystidia from the pileipellis. e – Bar = 10  $\mu$ m.

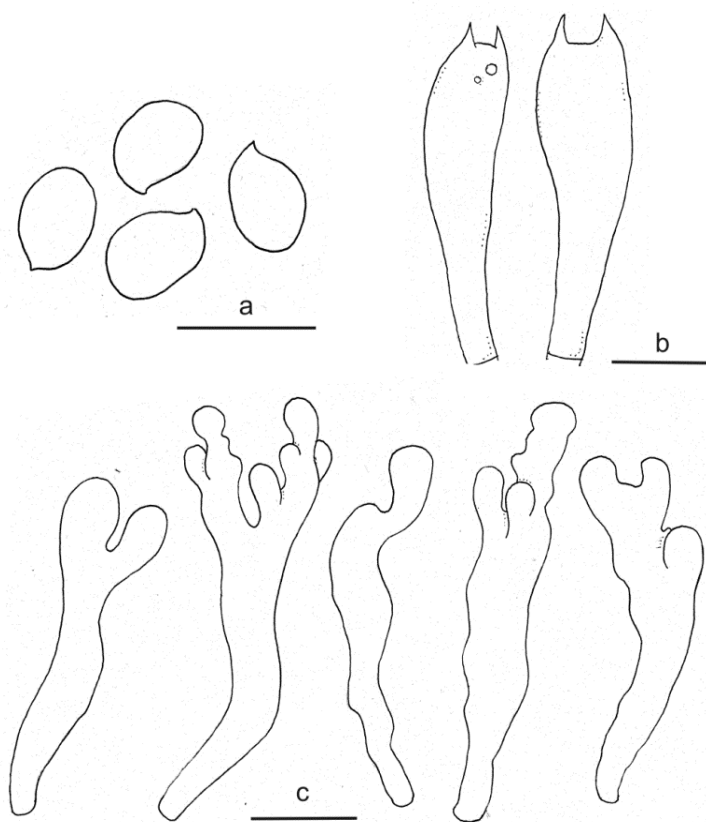
Distribution – Brazil, Bolivia, and Colombia (Singer 1974).

Material examined – Brazil, Esp rito Santo, Santa Teresa: Reserva Biol gica Augusto Ruschi. 19 54'19.60"S, 40 34'8.20"W, 05 Dez 2012, Salvador-Montoya, C.A.. 501 (FLOR 49852).

Remarks – *Favolaschia selloana* is characterized by its tessellate, orange pileus that is up to 17 mm in diam. and its orange stipe that is laterally attached and up to 30 mm long (Hennings 1897). Microscopically it is recognized by the following: elliptical basidiospores, 7–9(–10)  $\times$  4–5  $\mu$ m; pileipellis with gloecystidia and acanthocystidia; and the presence of hyaline, globose pediculate to ventricose-rostrate dermatocystidia. *Favolaschia selloana* is placed in section *Favolaschia* subsection *Auriscalpium* following Singer (1974). Singer (1945) considered it a subspecies of *F. thwaitesii* (Berk. & Br.), but later (Singer 1974) kept it as a separate species due to geographical distribution, wider pores, larger stipe, and occasionally larger pileus.

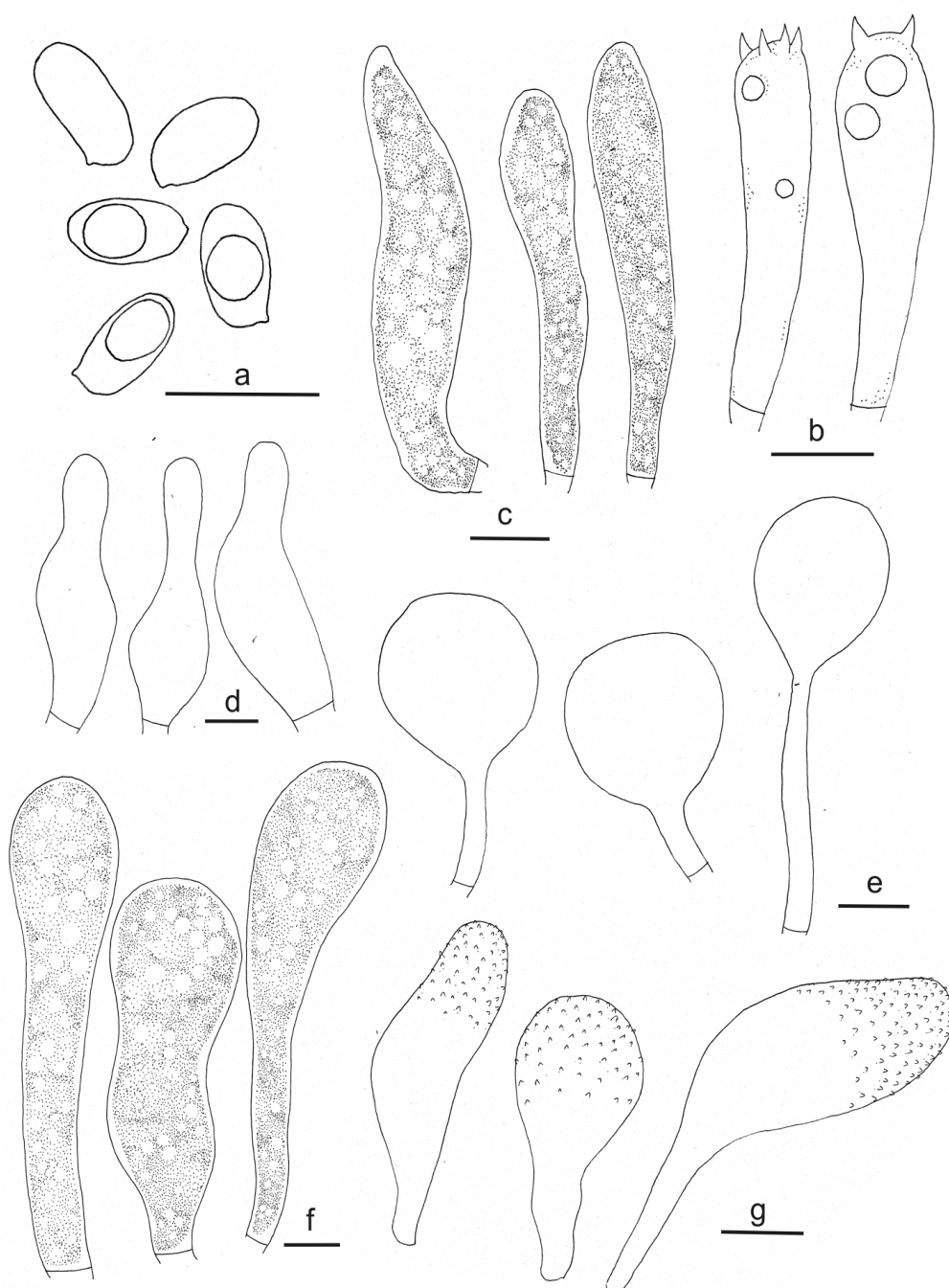


**Fig. 3** – Microscopic structures of *F. dealbata*: basidiospores, a acanthocystida from the pileipellis, b hymenial gleocystidia, c gleocystidia from the pileipellis, d – Bar = 10  $\mu$ m.



**Fig. 4** – Microscopic structures of *F. rubra*: basidiospores, a basidia, b dermatocystidia, c – Bar = 10  $\mu$ m.





**Fig. 5** – Microscopic structures of *F. selloana*: basidiospores, a basidia, b hymenial gleocystidia, c ventricose dermatocystidia, d globose dermatocystidia with pedicel, e gloecystidia from the pileipellis, f acanthocystida from the pileipellis, g – Bar = 10  $\mu$ m.

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