

## Two new species of *Marasmius* (*Basidiomycetes*, *Marasmiaceae*) from a xeric zone of Argentina

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**Abstract** – *M. rosatus* and *M. pseudoquercophilus* are proposed as new species. Detailed descriptions and illustrations of their macro- and microscopic characters are provided. The adaptation of *M. rosatus* and *M. pseudoquercophilus* to their xeric habitat is a fascinating aspect of both new species.

**Argentinean / Marasmiaceae / taxonomy / xeric adaptation / Agaricales**

**Résumé** – *M. rosatus* et *M. pseudoquercophilus* sont proposés comme nouvelles espèces. Des descriptions détaillées et des illustrations des caractères macroscopiques et microscopiques sont fournies. L'adaptation de *M. rosatus* et *M. pseudoquercophilus* à l'habitat xérophile est un aspect fascinant pour les deux nouvelles espèces.

**Argentine / Marasmiaceae / taxinomie / adaptation xérophile / Agaricales**

### INTRODUCTION

*Marasmius* traditionally belonged to the polyphyletic family *Tricholomataceae*, but the genus has recently been segregated into the family *Marasmiaceae* Roze ex Kühner, which includes several genera that are abundantly represented in the neotropics and the tropics (Singer, 1976). The genus *Marasmius* is characterized by a hymeniform epicutis composed of *Siccus*-type broom cells (with apical appendages or setulae more or less erect), *Rotalis*-type broom cells (with short appendages that cover the upper half of the cell) or exclusively of smooth clavate cells (Singer 1986).

Singer (1950, 1969), Singer & Digilio (1951) and Spegazzini (1880a, 1880b, 1883, 1887, 1891, 1898, 1902, 1926a, 1926b, 1909, 1925) described species of *Marasmius* from Argentina, Chile and Paraguay. Several type specimens of species described by Spegazzini were later studied by Singer (1952) and included in exhaustive monographs of *Marasmius* in South-America and the neotropics (Singer, 1958, 1965, 1976). Since these reports, mycological literature about this genus in the region has been scant. Recently, there has been a worldwide renewed interest in *Marasmius* (Antonín, 2003, 2004a, 2004b; Antonín & Noordeloos, 2010;

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Wannathes *et al.*, 2004; Antonín & Buyck, 2006; Desjardin & Ovrebo, 2006; Puccinelli & Capelari, 2006; Tan *et al.*, 2009). In Argentina, Lechner *et al.* (2006) cited new records of *Marasmius* collected in the northern region and several species have been described and photographed in a Pictorial Atlas of Iguazú National Park (Wright *et al.*, 2008).

Specimens collected in the last year during several trips in northern Argentina match none of the known species from Argentina nor those described in the monographs of Singer and recent reports. Thus, we considered that these two species described herein are new to science and merit formal description.

## MATERIALS AND METHODS

Specimens were photographed and their macroscopic features were recorded when fresh. Micromorphology was studied with a Nikon E-600 microscope. Microscopic examination of characters was made on different tissues mounted separately in 5% KOH plus 1% aqueous phloxine, or Melzer's reagent. For basidiospore description, the quotient (Q) between the length and width was calculated. Mean values of Q (Qm) for each species was used for comparisons among them. Line drawings were made with the aid of a light tube. Colors were described according to Maerz & Paul (1930). Authors of fungal names are cited according to the International Plant Names Index Authors website (<http://www.ipni.org/ipni/authorsearchpage.do>). Holotype and isotype specimens were dried, kept frozen for a week and deposited in BAFC herbarium (Department of Biodiversity and Experimental Biology, Faculty of Exact and Natural Sciences, Universidad de Buenos Aires).

## TAXONOMY

*Marasmius rosatus* B.E. Lechner & L. Papinutti **sp. nov.**

(Figs. 1-6)

*Mycobank*: 518618

*Etymology*: from roseus (Latin). Refers to color of pileus.

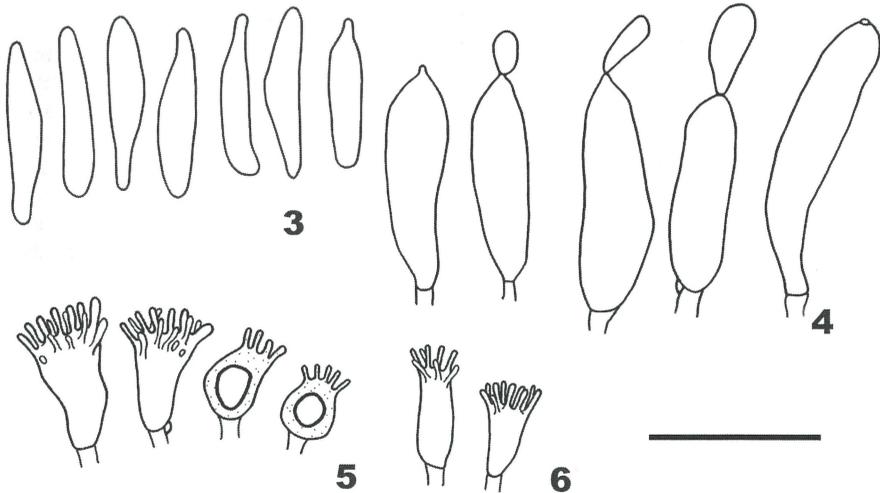
*Pileo roseo, 2-2.5 mm lato, 2-3.5 mm alto, campanulato vel parabolico, pallide roseo vel marginem versus albido, glabro, sulcato. Lamellis albis, 11-16, adnatis. Stipite castaneo, glabro, 31-37 × 0.2-0.5 mm. Basidiosporis 19.2-22.0 × 2.4-4.2 μm, laevibus, hyalinis, inamyloideis. Basidiis clavatis, 24.7-25.0 × 6.0-6.5 μm, 1-2 sporis sterigmatibus parvis. Cheilocystidiis clavatis, 15.1-18.3 × 4.1-5.1 μm, similibus elementis typi Marasmii sicci. Elementis epicuticularibus typi Marasmii sicci, tenuitunicatis, 9.4-9.8 × 6.6-7.0 μm. Ad folia delapsa.*

*Holotypus*: ARGENTINA, La Rioja, Chilecito, S29° 09' 41.64", W67° 29' 28.44", ad folia delapsa *Prosopis* sp., 12-III-2008, coll. L. Papinutti et G. Rolón. (in herbario BAFC conservatus sub nr 51728).

*Pileus* (Fig. 1) 2-2.5 mm diam. × 2-3.5 mm high, campanulate to parabolic, sulcate, glabrous, rose (Plate 43, I1-J2, Maerz & Paul 1930) to canna antique (Plate 14, J11, Maerz & Paul 1930), colonial rose (Plate 14, I9, Maerz & Paul 1930) when drying, pale rose to whitish near the margin. *Context* white, very thin, less than 0.5 mm thick. *Lamellae* (Fig. 2) adnate, subdistant (11-16), lamellulae absent, entire, whitish, with a hardly distinguishable colored edge. *Stipe* 28-32 × 0.2-0.5 mm, cylindric, glabrous, not insititious, chestnut-brown.



Figs. 1-2. Basidiomata of *Marasmius rosatus*.



Figs. 3-6. *Marasmius rosatus*, micromorphology. 3: Spores. 4: Basidia. 5: Cheilocystidia. 6: Elements of the pileipellis. Scale bar = 20  $\mu\text{m}$ .

*Basidiospores* (Fig. 3) 19.2-22.0  $\times$  2.4-4.2  $\mu\text{m}$ ,  $Q = 5.4-7.3$ ,  $Q_m = 5.93$ ,  $n = 30$ , elongate-clavate, hyaline, non-dextrinoid, smooth, thin-walled. *Basidia* (Fig. 4) clavate, 23.7-27.0  $\times$  6.0-6.5  $\mu\text{m}$ , 1-2 spored, with an almost imperceptible sterigma; development of basidiospore resembles a budding. *Basidioles* numerous, 22.7-24.2  $\times$  5.5-6.5  $\mu\text{m}$ . *Pleurocystidia* claviform to cylindrical, 33.6-44.1  $\times$  6.6-9.4  $\mu\text{m}$ . *Cheilocystidia* (Fig. 5) of *Siccus*-type broom cells, body 15.1-18.3  $\times$  4.1-5.1  $\mu\text{m}$ , clavate, setulae up to 3.1  $\mu\text{m}$  long, thin-walled. *Hymenophoral trama* regular to subregular; hyphae hyaline, clamped, 2.1-5.2  $\mu\text{m}$  diam. *Pileipellis* of *Siccus*-type broom cells, body 9.4-9.8  $\times$  6.6-7.0  $\mu\text{m}$ , mostly subvesiculose and clavate, setulae up to 3.1  $\mu\text{m}$  long, thin-walled, intermixed with thick-walled elements, 6.5-10.3  $\times$  6.2-7.8  $\mu\text{m}$  (Fig. 6); all elements yellowish brown in KOH. *Hyphae of the context* 2.1-5.2  $\mu\text{m}$  diam., thin-walled, clamped, dextrinoid. *Hyphae of the stem* 2.6-5.2  $\mu\text{m}$  diam., brownish in KOH, thin- and thick-walled, irregular, clamped. *Caulocystidia* absent.

*Habit and habitat:* gregarious to scattered on fallen leaves of *Prosopis* sp.

*Specimens examined:* ARGENTINA, La Rioja, Chilecito, 12-III-2008, legunt L. Papinutti and G. Rolón, on decaying leaves of *Prosopis* sp. trees, (BAFC 51728; holotype).

*Commentary:* *Marasmius rosatus* is characterized by a very small (2-2.5 mm diam.), campanulate to parabolic pileus coloured rose on the disc and pale rose to whitish near the margin; subdistant (11-16), whitish lamellae; a glabrous stipe 28-32 × 0.2-0.5 mm coloured chestnut-brown; basidiospores in the range 19.2-22.0 × 2.4-4.2 µm with mean 20.5 × 3.5 µm; basidia one- and two-spored with an almost imperceptible sterigma; pleurocystidia in the range 33.6-44.1 × 6.6-9.4 µm; *Siccus*-type cheilocystidia and pileipellis broom cells with setulae up to 3.1 µm. This species could be placed in section *Sicci* subsect *Siccini* Singer, due to the presence of broom cells of the *Siccus*-type and hyphae of the trama with dextrinoid reaction. In the Series *Haematocephali*, Singer (1976) described some varieties of *M. haematocephalus* (Mont.) Fr. based on the color of pileus, but all of these varieties have wider spores (3.5-6 µm) compared to those observed in *M. rosatus*, and the pilei are broader. *Marasmius pallescens* Murrill another species in the Series *Haematocephali*, has similar macromorphological characteristics, but differs in having shorter spores (11-17 × 3.2-4.5 µm) and a different color of the pileus. Tan *et al.* (2009) described *Marasmius distantifolius* Y.S. Tan & Desjardin in Series *Haematocephali*, but this species has a papillate and brownish red to brownish violet pileus, the lamellae are distant with darker pinkish red edges and the spores are broader, with mean size 21.4 × 4 µm.

***Marasmius pseudoquercophilus* B.E. Lechner & L. Papinutti sp. nov.** (Figs. 7-12)

*Mycobank:* 518619

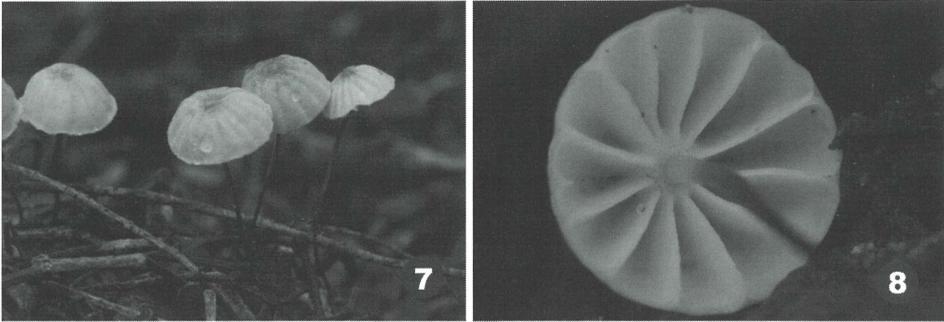
*Etymology:* macromorphologically similar to *Marasmius* (*Gymnopus*) *quercophilus*.

*Pileo bruneo-aureo mallo pallide vel griseo-aureo mallo pallide, 2.5-6 mm lato, hemispherico vel convexo, albido ad marginem, glabro, sulcato. Lamellis albis, 12-14, distantibus, adnatis. Stipite castaneo, glabro, 7-9 × 0.5 mm. Basidiosporis 15.3-18.2 × 3.5-4.6 µm, laevibus, hyalinis, inamyloideis. Basidiis clavatis, 27.8-42.9 × 5.5-9 µm, 2, 4 sterigmatibus. Cheilocystidiis clavatis, 14.8-24.4 × 4.3-5.2 µm, simulantibus elementis typi Marasmii sicci. Elementis epicuticularibus typi Marasmii sicci, tenuitunicatis, 8.6-16.4 × 3.7-12 µm. Ad folia delapsa.*

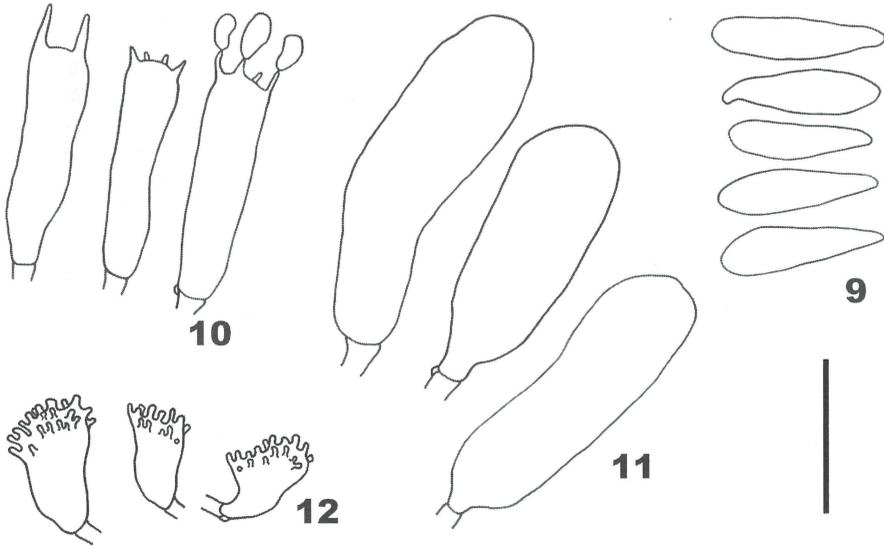
*Holotypus.* ARGENTINA, La Rioja, Chilecito, S29° 18' 45.25", W67° 35' 38.37", ad folia delapsa *Prosopis* sp., 12-III-2008, coll. L. Papinutti and G. Rolón (in herbario BAFC conservatus sub nr 51727).

*Pileus* (Fig. 7) 2.5-6 mm broad, hemispheric when young, becoming convex to broadly convex in age; surface dry, dull, opaque, glabrous, slightly sulcate, pale brownish orange to grayish orange, more translucent at the margin. *Context* white, very thin, less than 0.5 mm thick. *Lamellae* (Fig. 8) adnate, distant (12-14), attached to a thin collar of tissue with a pale brownish orange margin that usually remains adhered to the stipe apex. *Stipe* 7-9 × 0.4-0.6 mm, equal, tough, not insititious, glabrous, chestnut brown to dark brown, whitish at the apex.

*Basidiospores* (Fig. 9) 15.3-18.2 × 3.5-4.6 µm, Q = 3.1-4.9, Qm = 3.82, n = 30, elongate-clavate, hyaline, non-dextrinoid, smooth, thin-walled. *Basidia* (Fig. 10) clavate, 27.8-42.9 × 5.5-9 µm, 2 and 4 spored. *Basidioles* clavate, numerous, 28.2-37.7 × 5.0-5.9 µm. *Pleurocystidia* (Fig. 11) claviform, with dense content, 26.7-43.8 × 8.7-13.4 µm. *Cheilocystidia* of *Siccus*-type broom cells, body 14.8-24.4 × 4.3-5.2 µm, clavate setulae up to 1.5 µm, thin-walled. *Hymenophoral trama* subregular to irregular, hyphae hyaline, clamped, 2.6-5.8 µm diam., weakly



Figs. 7-8. Basidiomata of *Marasmius pseudoquercophilus*.



Figs. 9-12. *Marasmius pseudoquercophilus*, micromorphology. 9: Spores. 10: Basidia. 11: Pleurocystidia. 12: Elements of the pileipellis. Scale bar = 20  $\mu$ m.

dextrinoid. *Pileipellis* (Fig. 12) of *Siccus*-type broom cells, body 8.6-16.4  $\times$  3.7-12  $\mu$ m, mostly subvesiculose and clavate, setulae up to 1.6  $\mu$ m long, thin-walled. *Hyphae of the context* hyaline, thin-walled, 3.1-3.9  $\mu$ m diam, weakly dextrinoid. *Hyphae of the stem* 2.6-7.8  $\mu$ m diam.

*Habit and habitat*: gregarious on fallen leaves of *Prosopis* sp.

*Specimens examined*: ARGENTINA, La Rioja, Chilecito, on fallen leaves of *Prosopis* sp., 12-III-2008, legum L. Papinutti and G. Rolón (BAFC 51727, holotype).

*Commentary*: *Marasmius pseudoquercophilus* is characterized by a small (2.5-6 mm diam.), hemispheric to broadly convex pileus coloured pale brownish orange to grayish orange, more translucent at the margin; distant (12-14), whitish, lamellae, attached to a thin collar of tissue with a pale brownish orange margin; a

glabrous stipe 7-9 × 0.4–0.6 mm coloured chestnut brown to dark brown; basidiospores in the range 15.3-18.2 × 3.5-4.6 µm with mean 16.8 × 4.5 µm; basidia 2 and 4 spored, in the range 27.8-42.9 × 5.5-9 µm; *Siccus*-type cheilocystidia and pileipellis broom cells with setulae up to 1.6 µm.

The macro- and micromorphological structures place this species in section *Sicci* Singer ser. *Haematocephali*. Desjardin (1987) provided a description of *M. quercophilus* Pouzar and pointed out that it is one of the more common oak leaf-leaving species of *Marasmius* in California. The macromorphological characteristics of *M. pseudoquercophilus* are indistinguishable from *M. quercophilus*, but in terms of its micromorphology *M. quercophilus* has shorter spores and a pileus epicutis formed from a continuous *Rameales*-structure. The latter species has been transferred into the genus *Gymnopus* (Antonín and Noordeloos 2008).

The geographic region where *M. rosatus* and *M. pseudoquercophilus* were found belongs to the northern area of the Argentinean Monte Desert. Most of the known South American species of *Marasmius* are found in humid tropical regions. The two new species herein described were encountered immediately after one of the characteristic sporadic rains. This fact suggests that the physiology of growth and fructification should be very different for the new species when compared to those distributed in humid regions.

Desjardin *et al.* (1992) described *Marasmius inaquosi* Desjardin from the Sonoran Desert of Arizona state, USA, where it was isolated from *Cercidium microphyllum*. In that work, the strain was cultivated on *Prosopis* wood. Thus, this species differs from *M. pseudoquercophilus* by the habitat where it was found, and its macro- (smaller pileus, different rate pileus broad/stem length, margin not crenate, different attachment of the lamellae) and micromorphology (longer spores, longer and narrower cheilocystidia).

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