

NEW RECORDS AND DATA OF *RHODOCOLLYBIA POPAYANICA*
(AGARICALES: OMPHALOTACEAE) FROM MEXICO

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ABSTRACT

Rhodocollybia popayanica is described as a new record for the Mexican mycobiota in the states of Chiapas, Hidalgo, México, Michoacán and Nayarit. The studied specimens are congruent with descriptions from Colombia and Costa Rica. With this record, Mexico becomes the northernmost limit for this neotropically distributed species.

Key words: Mexican mycobiota, neotropical, new records.

RESUMEN

Se describe a *Rhodocollybia popayanica* como nuevo registro de la micobiota mexicana en los estados de Chiapas, Hidalgo, México, Michoacán y Nayarit. Los especímenes estudiados concuerdan con las descripciones de Colombia y Costa Rica. Con este registro México llega a ser el límite septentrional de la distribución neotropical de esta especie.

Palabras clave: micobiota mexicana, nuevos registros, neotropical.

INTRODUCTION

The genus *Rhodocollybia* was segregated from *Collybia* s.l. based on the presence of cyanophilic and dextrinoid spores and pinkish spore print (Lennox,

1979). Additionally, three other genera were segregated. *Connopus*, *Dendrocollybia* and *Gymnopus* are recognized based on macroscopic and microscopic characters as well as DNA data (Antonín et al., 1997; Halling, 1997; Hughes et al., 2001; 2010; Mata et al., 2004a; 2004b; Wilson and Desjardin, 2005). So far, on a worldwide basis more than 20 species are known to belong to *Rhodocollybia* (Kirk et al., 2008; Anonymous, 2014; Roskov et al., 2014). In Mexico only six species (including three varieties) have been reported for the genus, being *Rhodocollybia butyracea* (Bull.) Lennox and *Rhodocollybia maculata* (Alb. & Schwein.) Singer the most frequently cited (Guzmán et al., 1992; Villarruel-Ordaz et al., 1993).

As part of an ongoing review of collybioid agarics in Mexico, the authors found specimens fitting the diagnostic characters of *Rhodocollybia popayanica* (Halling) Halling, until now known only from Colombia and Costa Rica (Halling, 1989; Franco-Molano et al., 2000; 2010; Mata, 2002).

MATERIALS AND METHODS

All specimens were annotated in the field and examined in the laboratory following standard techniques of macromorphology and macrochemicals reactions described by Cifuentes et al. (1986). Basidiomata colors were matched with Korne-rup and Wanscher (1978).

Basidiomata micromorphology was examined using light microscopy. Sections of different tissues were mounted either with 3-5% aqueous KOH solution, lactic acid or Melzer's reagent; cotton blue or phloxine were used to stain cells when needed (Largent et al., 1977). The symbol "Q̄" represents the average of mean the length/width ratio of basidiospores. Most measurements and drawings were made using oil immersion objective at X 1250. A drawing tube was used to construct illustrations of microscopic features.

The following acronym appears below: FCME = Herbario, Facultad de Ciencias, Universidad Nacional Autónoma de México.

RESULTS

Rhodocollybia popayanica (Halling) Halling. 1997. Mycotaxon 63: 365. Figs. 1-6.
≡ *Collybia popayanica* Halling. 1989. Mycologia 81: 872.

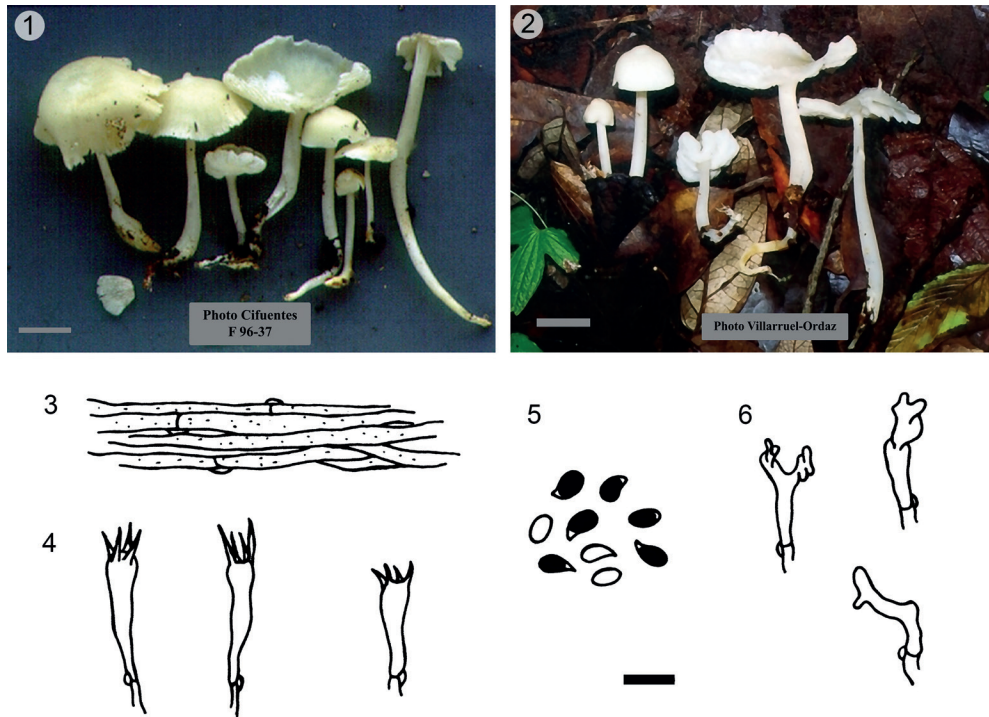
Pileus 7-60 mm in diameter, first convex, then campanulate-umbonate, or sometimes plane-convex, with center sharply papillate to cuspidate, margin straight to uplifted, sometimes eroded when mature; surface glabrous to finely appressed-fibrillose, slightly striate by transparency, moist and hygrophanous; when young usually yellowish white (1-4A2) to pale yellow (3A3), when mature irregularly staining more pale yellow (3A4-4A3) or darker, at center becoming light brown (6D7) to brown (7E7); context thin, white to pale yellow (3-4A3); taste slightly bitter; smell pleasant.

Lamellae subattached to almost free, crowded, very narrow, whitish cream (2A1) to yellowish white (2-4A2); margin smooth, in age fimbriate to crenate. Stipe 22-105 mm long, 2-7 mm broad, cylindrical to compressed, twisted, attenuate toward apex and broader below; context fibrous-cartilaginous; surface moist to dry, glabrous or slightly fibrillose to scantily villous toward the base, yellowish white (2-4A2) or pale yellow (2-3A3), developing light yellow (4A4-5) stains toward the base with age. Basidiospores orange white (5A2) to grayish orange (5B3) in deposit, 6.3-7.5 X 3.5-4.2 mm ($\bar{Q} = 1.8$), amygdaliform in side view, ellipsoid in dorsal view, smooth, thin-walled, hyaline, many dextrinoid and cyanophilous. Basidia tetrascopic, 20-27 X 6-7 mm, clavate, sterigmata in some basidia measuring up to 8 mm in length. Pleurocystidia absent. Cheilocystidia 18-22 X 6-7mm, clavate to cylindrical, diverticulate with short projections. Pileipellis a cutis, with entangled cylindrical hyphae, radially oriented. Clamp connections abundant and present in all tissues.

Habitat and distribution: Humicolous or on very rotten wood; in mixed *Pinus-Quercus*, and Mexican montane mesophytic forests, at 800-2090 meters above sea level. It occurs during the months of July to September and its edibility is unknown.

Macrochemical tests: Pileus and stipe context, as wells as gills turn pale yellow (2-3A3-4) with KOH (10%), pileus and stipe context turn grayish red (9B2-5) with Phenol (3%), pileus and stipe context, as well as gills turn very pale orange (5A1-3) with formalin (40%).

Studied material. MEXICO. CHIAPAS: Municipality of Ocozocuatla, educational park “Laguna Bélgica”, km 18 road Ocozocuatla-Malpaso, *Ocampo Genoveva 27* (FCME 10718); *Gallegos Cupil 11* (FCME 10728). ESTADO DE MÉXICO: Municipality of Valle de Bravo, km 21 road San Francisco Oxotitlpa-Valle de Bravo, *Pompa González 82* (FCME 2303, Photo Cifuentes 42-68); km 4



Figs. 1-6: *Rhodocollybia popayanica*. 1-2. basidiomata with cuspidate-umbonate pileus; 3. pileipellis hyphae (cross section); 4. basidia with sterigmata up to 8 μm in length; 5. basidiospores, many dextrinoid; 6. cheilocystidia. Scale 1-2 = 2cm, 3-6 = 10 μm .

circuit Manantiales-Avándaro, *Hernández-Muñoz* 32 (FCME 2205, Photo Cifuentes 42-68). HIDALGO: Municipality of Jacala, km 192 road Pachuca-Nuevo Laredo, *Villarruel-Ordaz* 902 (FCME 19634, Photo Villarruel-Ordaz 2002-2). MICHOACAN: Municipality of Charo, National park “Insurgente José Ma. Morelos”, *Audelo Valona* 19-august-1983 (FCME 11471). NAYARIT: Municipality of Tepic, km 4.5 deviation to “El Cuarenteño” hill San Juan, *Villarruel-Ordaz* 131 (FCME 1985); km 6 deviation to “El Cuarenteño” hill San Juan, *Villarruel-Ordaz* 432 (FCME 18371, Photo Cifuentes 96-37); km 11 deviation to “El Cuarenteño” hill San Juan, *Cifuentes* 2781 (FCME 2600, Photo Cifuentes 39-92); “La Capillita” hill San Juan, *Villarruel-Ordaz* 106 (FCME 3913, Photo Hernández-Muñoz 1-12); “La Capillita” hill San Juan, *Villarruel-Ordaz* 123 (FCME 4343, Photo Cifuentes 46-83); “La Noria” hill San Juan, *Villarruel-Ordaz* 110 (FCME 4063).

DISCUSSION

Rhodocollybia popayanica is easily distinguished by its campanulate to plano-convex pileus, which is clearly cuspidate to papillate at center. At first, basidiomata are almost white or very pale yellow but tend to develop yellow or brown stains when older. Previous descriptions (Halling, 1989; Franco-Molano et al., 2000) have reported a more yellow to brown coloration (as brown as 6C4 and at center could be in age as reddish as 7-8A3), as well as longer stipe dimensions (80 to 200 mm), but Mata (2002) found paler basidiomata with shorter stipe just like the Mexican specimens. Mata (2002) related such variations to different developmental stages and we concur with his opinion.

Rhodocollybia popayanica is similar to the *R. maculata* complex because of the yellowish basidiomata (Halling, 1989), but we regard its consistency as cartilaginous rather than fibrous, just like in *R. butyracea*. In addition, *R. maculata* has globose spores while *R. popayanica* are ellipsoid.

Rhodocollybia popayanica is now recorded from central, southwestern and southern Mexico (Chiapas, Estado de México, Hidalgo, Michoacán and Nayarit). It seems to be widely distributed in the Neotropics with Colombia and Mexico respectively as its southern and northern limits so far.

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LITERATURE CITED

- Antonín, V., R. E. Halling and M. E. Noordeloos. 1997. Generic concepts within the groups of *Marasmius* and *Collybia sensu lato*. *Mycotaxon* 63: 359-368.
- Anonymous. 2014. Index fungorum. CABI Bioscience, CBS and Landcare Research. www.indexfungorum.org. Viewed on september of 2014.
- Cifuentes, J., M. Villegas and L. Pérez-Ramírez. 1986. Hongos. In: Lot, A. and F. Chiang (eds.). Manual de herbario. Consejo Nacional de la Flora de México, A.C., México, D.F., México. pp. 55-64.
- Franco-Molano, A. E., R. Aldana-Gómez and R. Halling. 2000. Setas de Colombia (Agaricales, Boletales y otros hongos). Guía de campo. COLCIENCIAS. Universidad de Antioquia. Medellín, Colombia. 156 pp.

- Franco-Molano, A. E., A. Corrales and A. M. Vasco-Palacios. 2010. Macrohongos de Colombia II. Listado de especies de los órdenes Agaricales, Boletales, Cantharellales y Russulales (Agaricomycetes, Basidiomycota). *Actual Biol.* 32(92): 89-113.
- Guzmán, G., V. M. Bandala and L. Montoya. 1992. Noteworthy species of *Collybia* from Mexico and a discussion of the known Mexican species. *Mycotaxon* 44: 391-407.
- Halling, R. E. 1989. Notes on *Collybia* III. Three neotropical species of subg. *Rhodocollybia*. *Mycologia* 81: 870-875.
- Halling, R. E. 1997. A revision of *Collybia* s.l. in the northeastern United States and adjacent Canada. <http://www.nybg.org/bsci/res/col/colintro.html>. Viewed on august of 2014.
- Hughes, K. W., D. A. Mather and R. H. Petersen. 2010. A new genus to accommodate *Gymnopus acervatus* (Agaricales). *Mycologia* 102: 1463-1478.
- Hughes, K. W., R. H. Petersen, J. E. Johnson, J. M. Monclavo, R. Vilgalys, S. A. Redhead, T. Thomas and L. McGhee. 2001. Infrageneric phylogeny of *Collybia* s.s. based on sequences of ribosomal ITS and LSU regions. *Mycol. Res.* 105: 164-172.
- Kirk, P. M., P. F. Cannon, D. W. Minter and J. A. Stalpers. 2008. *Dictionary of the Fungi*. 10a. ed. CAB International. Wallingford, Great Britain. 771 pp.
- Kornerup, A. and J. H. Wanscher. 1978. *Methuen Handbook of Colour*. 3rd ed. Eyre Methuen. London, Great Britain. 224 pp.
- Largent, D. L., D. Johnson and R. Watling. 1977. How to identify mushrooms to genus III: Microscopic features. Mad River Press. Eureka, USA. 148 pp.
- Lennox, J. W. 1979. Collybioid genera in the Pacific Northwest. *Mycotaxon* 9: 117-231.
- Mata, J. L. 2002. Taxonomy and systematics of *Lentinula*, *Gymnopus* and *Rhodocollybia* (Agaricales, Fungi), with emphasis on oak forests of southern Costa Rica. Ph.D. dissertation. University of Tennessee. Knoxville, USA. 263 pp.
- Mata, J. L., R. E. Halling and R. H. Petersen. 2004a. New species and mating system reports in *Gymnopus* (Agaricales) from Costa Rica. *Fungal Divers.* 16: 113-129.
- Mata, J. L., R. E. Halling, K. H. Hughes and R. H. Petersen. 2004b. *Rhodocollybia* (Agaricales) in neotropical montane forests. *Mycol. Prog.* 3: 337-351.
- Roskov, Y., T. Kunze, T. Orrell, L. Abucay, L. Paglinawan, A. Culham, N. Bailly, P. M. Kirk, T. Bourgoin, G. Baillargeon, W. Decock, A. De Wever and V. Didžiulis (eds.). 2014. Species 2000 & ITIS Catalogue of Life-Annual Checklist 2014. www.catalogueoflife.org/annual-checklist/2014. Viewed on september 2014.
- Villarruel-Ordaz, J. L., L. Pérez-Ramírez and J. Cifuentes. 1993. Nuevos registros del género *Collybia* (Tricholomataceae) y descripción de especies poco estudiadas en México. *Rev. Mex. Mic.* 9: 139-164.
- Wilson, A. W. and D. E. Desjardin. 2005. Phylogenetic relationships in the gymnopoid and marasmiod fungi (Basidiomycota, euagarics clade). *Mycologia* 97: 667-679.

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