



A TETRASPORIC *OCTOSPORA* (PYRONEMATACEAE, PEZIZALES) IN SOUTH AMERICA

Octospora tetrasporado (Pyronemataceae, Pezizales) en Sudamérica

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Summary: *Octospora gemmicola* var. *tetraspora* (Pyronemataceae), a species of bryophilous ascomycete, is recorded for the first time in South America from Argentina. This taxon is characterized by its parasitism on the propaguliferous moss *Bryum klinggraeffii* and the presence of tetrasporic asci. Macroscopic and microscopic features and ecological aspects of *Octospora gemmicola* var. *tetraspora* are discussed. Furthermore, pictures regarding conditions of the Argentinian occurrences, microscopic characters including spores, and infection structure are provided. Other related *Octospora* species with four-spored asci are discussed with the Argentinian collection, including a comparative illustration.

Key words: Apothecia, Argentina, bryoparasitic Pezizales, Bryophyta, *Bryum*.

Resumen: *Octospora gemmicola* var. *tetraspora* (Pyronemataceae), un ascomiceto briófilo, se registra para Sudamérica, en Argentina. Este espécimen se caracteriza por su parasitismo sobre el musgo propagulífero *Bryum klinggraeffii* y por la presencia de ascas tetrasporadas. Se discuten las características macroscópicas, microscópicas y aspectos ecológicos de *Octospora gemmicola* var. *tetraspora*. Además, se proporcionan imágenes que documentan las condiciones de las ocurrencias argentinas, así como los caracteres microscópicos, incluidas las esporas y las estructuras de infección. Otras especies de *Octospora* de ascas con cuatro esporas se relacionan con la colección de Argentina, incluyendo una ilustración comparativa.

Palabras clave: Apotecios, Argentina, Bryophyta, *Bryum*, Pezizales briófilos.

Introduction

The genus *Octospora* Hedw. (Pyronemataceae) forms sessile, discoid, saucer-shaped, or turbinate apothecia, exhibiting shades of orange, red, or pink (Sochorová *et al.*, 2021). It is characterized by operculate, inamyloid asci containing eight ascospores, or less commonly, four (Eckstein, 2024).

In late winter, an interesting tetrasporic *Octospora* (Fig. 1) was found growing on the acrocarp moss *Bryum klinggraeffii*

Schimp. Subsequent microscopic studies and host identification confirmed that this finding represented *Octospora gemmicola* var. *tetraspora* Benkert, a previously unreported species in South America, which is presented in this contribution.

Material and Methods

The fungus was collected in August 2024 in Argentina, along with the accompanying bryophytes, to study the infection and identify

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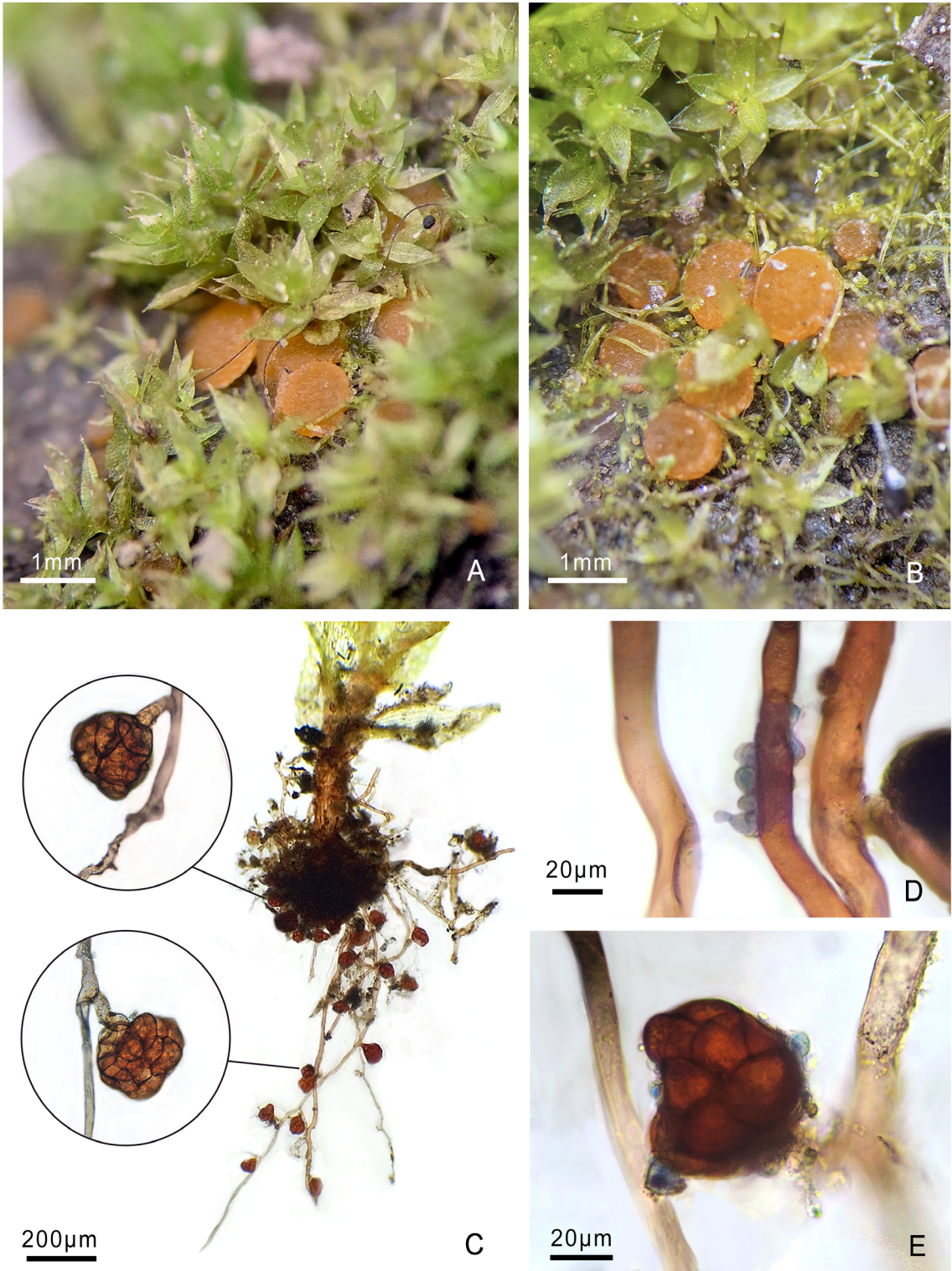


Fig. 1. *Octospora gemmicola* var. *tetrastora*. A-B: Apothecia with the host, *Bryum klinggraeffii*. C: *Bryum klinggraeffii* with its rhizoidal tubers. D-E: Appressoria on rhizoid and rhizoidal tuber.

the host. Observations of apothecial features were made on vital and rehydrated material in tap water or lactophenol cotton blue (LPCB). The absence of amyloidy in the asci was confirmed using Lugol's solution. Infection structures were observed in rehydrated material. Parts of the host plants close to an apothecium were separated and studied using light microscopy.

The moss *B. klinggraeffii* was identified as the host based on the presence of appressoria on the stem base, tubers, and rhizoids (Fig. 1). The fungus was identified based on the reference of Benkert (1998) and Eckstein (2016). Host species were determined using Crundwell & Nyholm (1964), Kalníková *et al.* (2018), and Lüth (2019). The voucher is deposited in the herbarium of the Fundación Miguel Lillo, San Miguel de Tucumán (LIL).

Results

Octospora gemmicola var. *tetraspora* Benkert, Österreichische Zeitschrift für Pilzkunde 7: 50. 1998.

Apothecia are scattered or gregarious, sometimes partly submerged in the soil among the shoots of their host, measuring (0.5-)1-2 mm in diameter, plane to cupulate when young, and with a weak membranaceous margin. Appressoria were observed infecting rhizoids and rhizoidal tubers, and less frequently the stem. The hymenium is orange, with paraphyses apically slightly curved. The non-amyloid asci consistently contain four uniseriately arranged ascospores. The ascospores are ellipsoid to narrowly ellipsoid, measuring $18-25 \times 7.5-10.5$ μm , smooth, and containing one to three large and several small oil droplets. (Fig. 2).

Material examined: **ARGENTINA.** **Tucumán:** Jardín Botánico de la Fundación Miguel Lillo, 26°49'52"S, 65°13'20"W, 442 m a.s.l., 26-VIII-2024, Suárez 2046 (LIL).

Distribution: The taxon is known from Austria, Czech Republic, Denmark, Germany, Norway, Slovakia, and Switzerland (Eckstein, 2024; GBIF, 2025). Here it is recorded for the first time in South America from Argentina. So far,

there is only one specimen from North America collected 1986 in the New York Botanical Garden (New York Botanical Garden, 2024).

Discussion

Several *Octospora* species exhibit four-spored asci with smooth ascospores, sharing morphological traits with *O. gemmicola* var. *tetraspora*. However, they can be distinguished by differences in spore dimensions, oil droplet arrangement, and host specificity (Fig. 3). *Octospora itzerottii* Benkert, for example, has ellipsoid ascospores measuring $(22.3-22.8-24.7(-25.4) \times (12.2-12.5-14.9(-15)$ μm , with a single large central lipid droplet (Calzada, 2021). Its paraphyses are cylindrical, septate, and bifurcate, and it parasitizes species of *Pterygoneurum* Jur. [particularly *P. ovatum* (Hedw.) Dixon and *P. subsessile* (Brid.) Jur.]. Similarly, *O. axillaris* (Nees) M. M. Moser var. *tetraspora* Benkert features narrowly ellipsoid to subfusiform ascospores $(22-26-32(-40) \times (9-10-12(-15)$ μm , mostly containing three oil droplets, one large central droplet flanked by two smaller ones, while growing on *Phascum cuspidatum* Schreb. ex Hedw. (= *Tortula acaulon* (With.) R. H. Zander).

Other related taxa include *Octospora coccinea* (P. Crouan & H. Crouan) Brumm. var. *tetraspora* Benkert and *Octospora leucoloma* Hedw. ex Gray var. *tetraspora* (Fuckel) Benkert. The former has narrowly ellipsoid to fusiform ascospores $(24-30-34(-40) \times (8-9-12(-15)$ μm , smooth, with four oil droplets, two larger central ones and two smaller near the poles, occurring on *Bryum rubens* Mitt. *Octospora leucoloma* var. *tetraspora* possesses ellipsoid ascospores $(22-23-27(-30) \times (10-11-13(-14)$ μm , which are sometimes asymmetrical, featuring one or two large and several small oil droplets, and is found on *Bryum argenteum* Hedw. (Benkert, 1998; Eckstein, 2016).

Octospora gemmicola var. *tetraspora* was observed growing on its specific host *B. klinggraeffii*, a common moss from the *B. erythrocarpum* complex (Crundwell & Nyholm, 1964). This moss has a wide distribution and is common in open habitats on disturbed soil with other pioneer bryophytes. In Argentina,

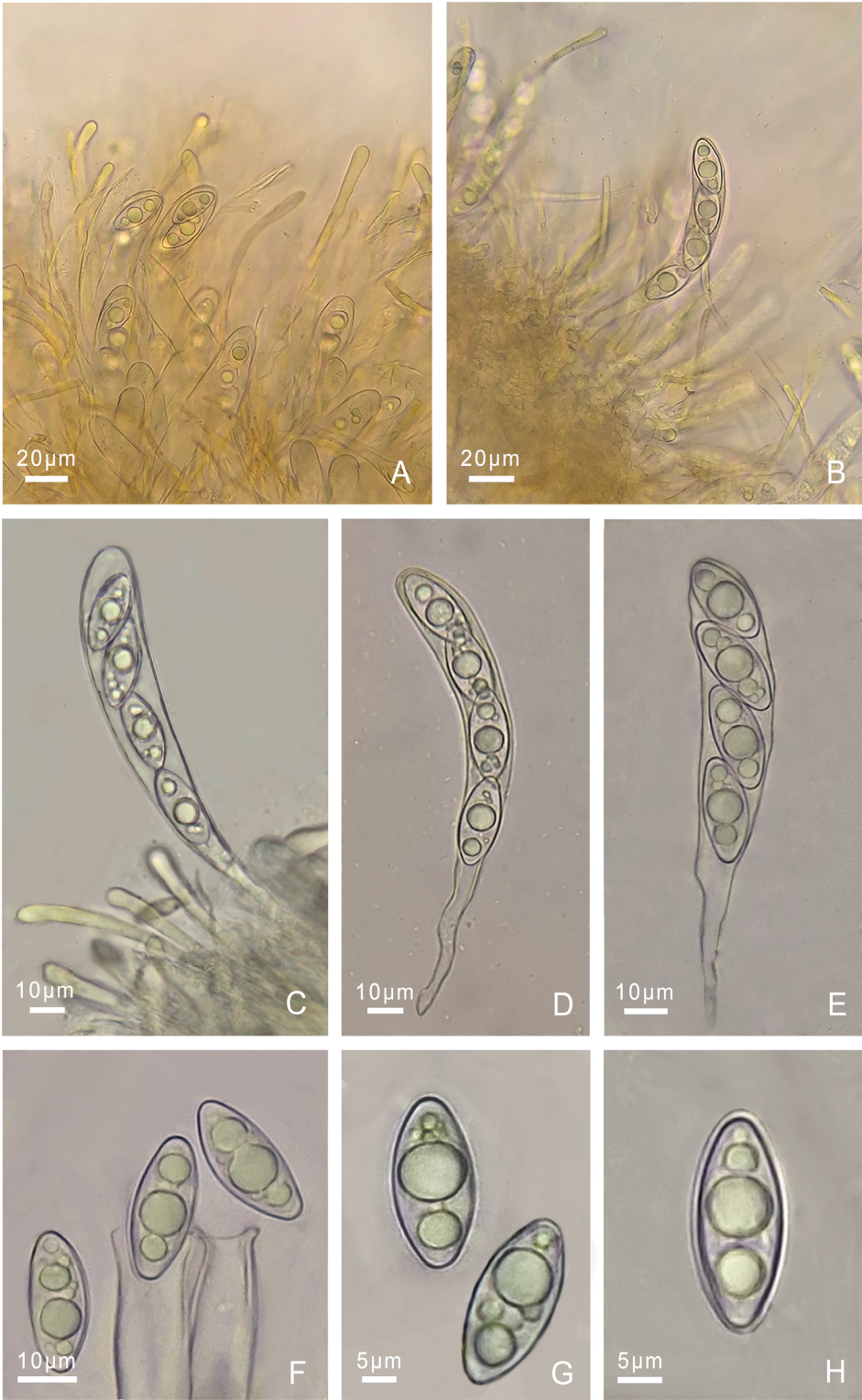


Fig. 2. *Octospora gemmicola* var. *tetraspora*. A-B: Detail of the hymenium. C-E: Asci and ascospores. F-H: Mature spores.

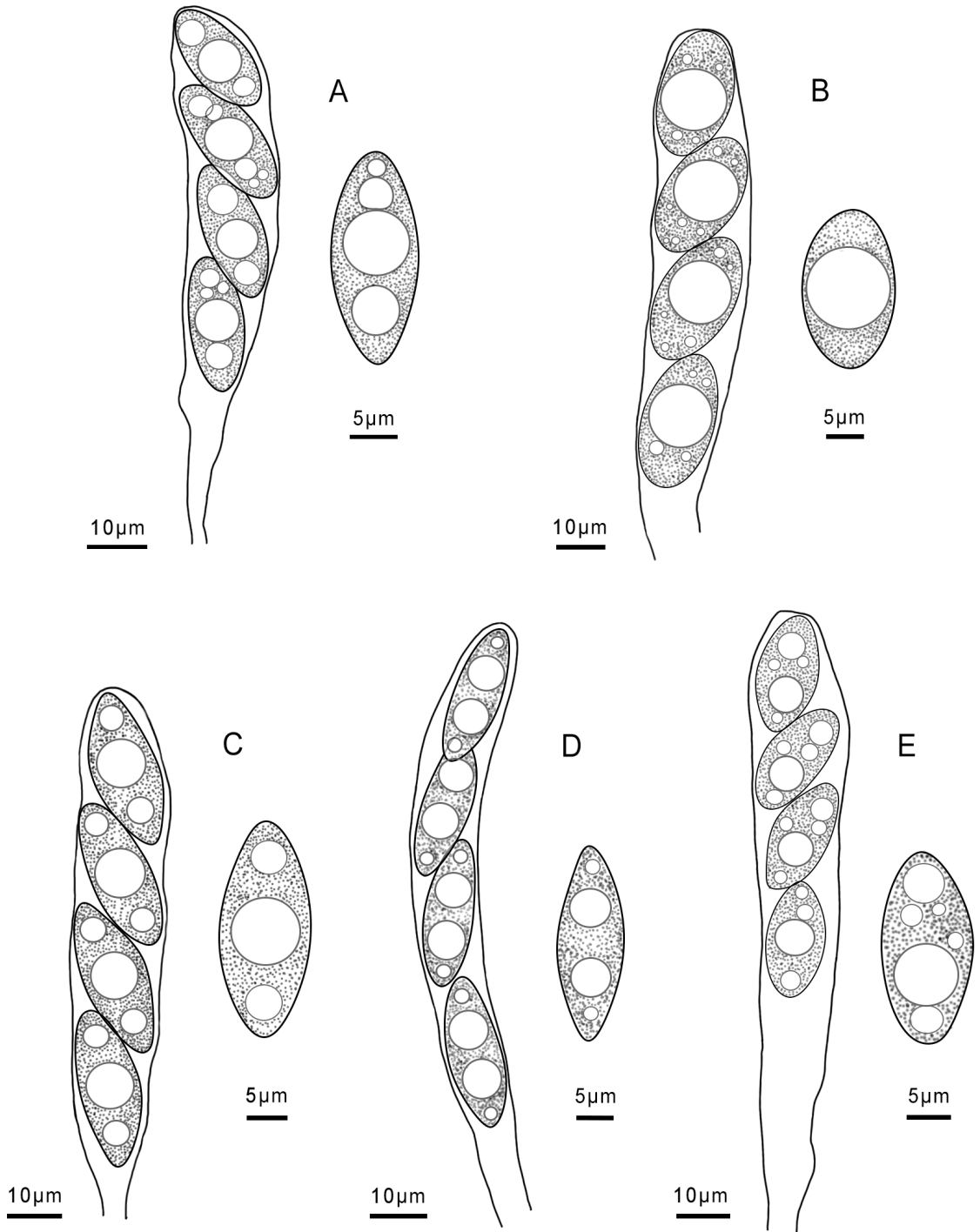


Fig. 3. *Octospora gemmicola* var. *tetraspora*. A: Asci and ascospores. *Octospora itzerottii*. B: Asci and ascospores. *Octospora axillaris* var. *tetraspora*. C: Asci and ascospores. *Octospora coccinea* var. *tetraspora*. D: Asci and ascospores. *Octospora leucoloma* var. *tetraspora*. E: Asci and ascospores.

B. klinggraeffii had only been reported in the province of San Juan (Matteri, 2003). This study represents its first occurrence in Northwestern Argentina, along with its fungal parasite. In the flora of North America (Spence, 2014), it is suggested that *B. klinggraeffii* [as *Gemmabryum klinggraeffii* (Schimp.) J. R. Spence & H. P. Ramsay] may be an introduced species. Furthermore, it is possible that this species has also been introduced to South America, potentially alongside its parasitic fungus, *O. gemmicola* var. *tetraspora*. If this is the case, the introduction of both the moss and its associated parasite could have occurred simultaneously, likely through human-mediated dispersal. The infectious structures of *O. gemmicola* var. *tetraspora* were found in the rhizoids, rhizoidal tubers, and stems of the moss, indicating potential pathways for the parasitic fungus to colonize and affect the host plant. Given the location of these structures, it would be relatively easy for them to be dispersed by human activity, such as through foot traffic or other forms of movement. The fact that both American records of *O. gemmicola* var. *tetraspora* are from botanical gardens supports the scenario of an introduction to the Americas.

This study reports *Octospora gemmicola* var. *tetraspora* as a newly recorded species in South America, specifically from Argentina. This significant finding highlights the intricate interactions between fungi and their bryophyte hosts. The discovery of this tetrasporic parasite on *B. klinggraeffii* underscores the ecological importance of mosses as critical substrates for various bryophilous fungi, enriching the ecosystem.

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