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A LECTOTYPE FOR *GLOMUS MICROCARPUM* (ENDOGONACEAE, ZYGOMYCETES)

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ABSTRACT

A lectotype for *Glomus microcarpum*, chosen from among the original materials collected by the Tulasnes, is described and illustrated. The lectotypes of *G. microcarpum*, *G. fasciculatum*, and *G. macrocarpum*, are compared morphologically and found to differ distinctly. The features of sporocarp anatomy and chlamydospore morphology considered in this comparison are: presence or absence of a peridium, a gleba, and a clustered arrangement of the spores within the sporocarp, and spore size range, shape, and number of wall layers.

Key Words: vesicular-arbuscular mycorrhizal fungus, taxonomy, *Glomus*.

When *Glomus microcarpum* Tul. & Tul. (Endogonaceae, Endogonales, Zygomycetes) was first described in **1845** as the first species of the genus *Glomus* Tul. & Tul., the description provided was brief and, as a consequence, the species definition was vague. By **1851**, the Tulasnes had published a detailed and well-illustrated redescription of this fungus under a new combination as *Endogone microcarpa* (Tul. & Tul.) Tul. & Tul.

What the Tulasnes did not do, however, was to designate a holotype collection. In choosing a neotype for *Endogone pisiformis* Lk., type species of the Endogonaceae, Trappe and Gerdemann (**1979**) pointed out the need for taxonomic stability in this family. This is particularly true of the genus *Glomus*, most species of which form vesicular-arbuscular mycorrhizae (VAM) and are the subjects of intensive fundamental and applied research.

The localities of the collections reported by the Tulasnes in the original description of *G. microcarpum* were the Bois de Boulogne and Vincennes near Paris in the province of Touraine, France. We have examined these two specimens plus another collected by Broome in Italy, which was verified by the Tulasnes and reported in **1851**. We conclude that these are all collections of a single species which corresponds well to the detailed description provided by the Tulasnes. We have designated the collection from the Bois de Boulogne as the lectotype because: 1) the single sporocarp of this collection is intact but for a missing slice; 2) the anatomy of the sporocarp is well preserved; 3) the morphology of the chlamydospores accords well with the Tulasnes' illustrations.

GLOMUS MICROCARPUM Tul. & Tul., Giorn. Bot. Ital. **2**: 63. 1845. FIG. 1

≡*Endogone microcarpa* (Tul. & Tul.) Tul. & Tul., Fungi Hypogaei, p. 182. 1851.
=*Endogone neglecta* Rodway, Proc. Roy. Soc. Tasmania, **1917**: 107. 1918.

Lectotype description: The sporocarp is irregularly ellipsoidal, with a portion missing, 3 × 3 × 5 mm, and enclosed by a peridium to which some soil debris adheres. The peridium is 50–100 μm wide and composed of interwoven hyphae up to 10 μm wide with walls 1–2 μm thick.

The spores are firmly embedded in glebal hyphae that are either variably swollen, 4–10 μm wide and thin-walled (<1 μm thick), or straight (up to 10 μm wide) and relatively thick-walled (1–2 μm thick). Spores are globose or subglobose, (30–)40(–45) × (30–)35(–40) μm. The spore wall is smooth and composed of a single layer, 4–6 μm thick, hyaline, light yellow or yellow-brown, that may have

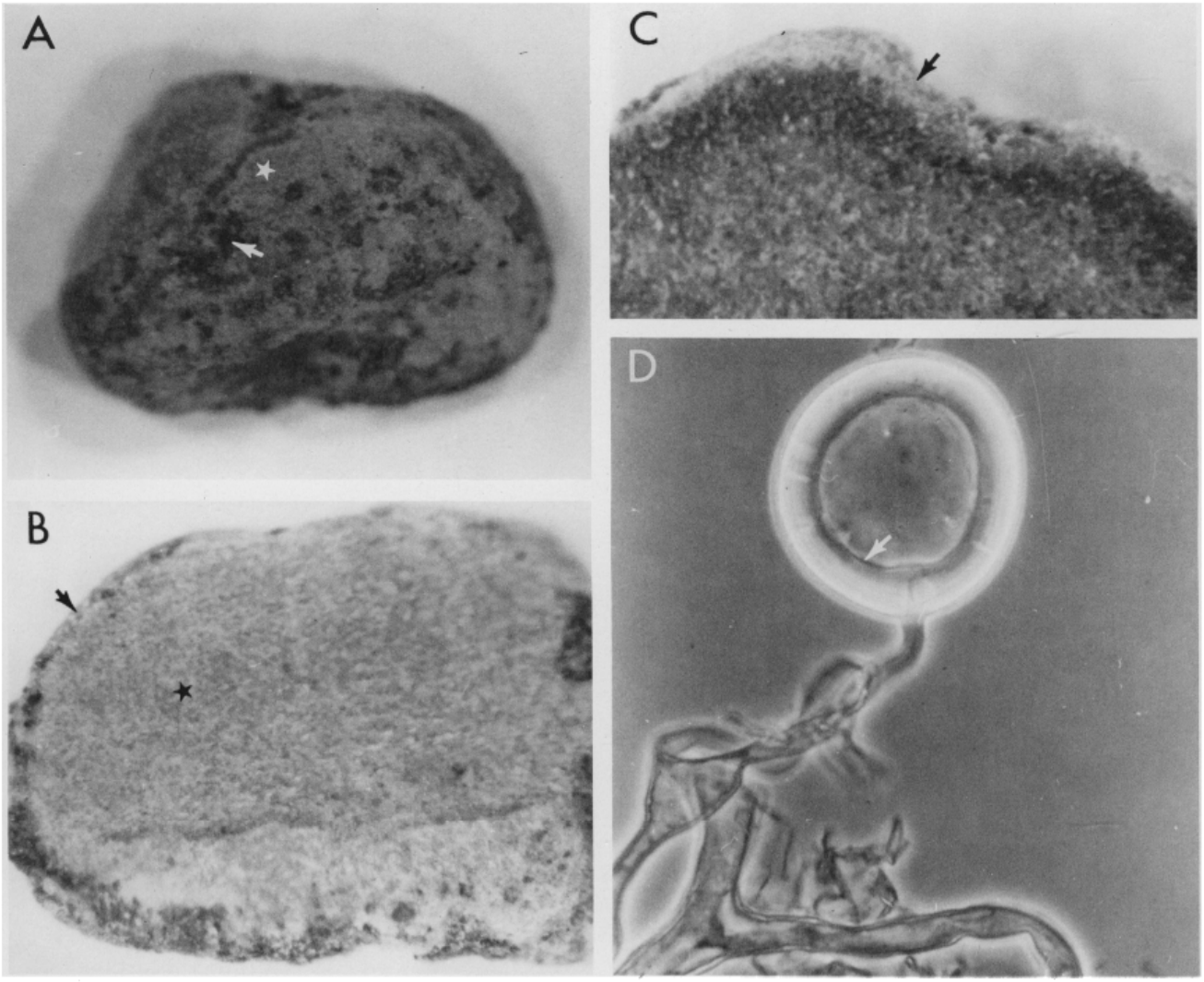

FIG. 1. *Glomus microcarpum.* Lectotype. A. Exterior of sporocarp illustrating debris (arrow) adhering to peridium (star), ×15. B. Interior of sporocarp with chlamydospores embedded in gleba (star) surrounded by peridium (arrow), ×20. C. Interior of sporocarp from Italy, collected by Broome (PC), with thin peridium (arrow), ×40. D. Chlamydospore with thick, laminate wall (white arrow) and subtending hypha (black arrow), ×600.

numerous laminations. The width of the single subtending hypha at its point of attachment to the spore is 4–8.5 μm. The subtending hypha has a wall 1–2 μm thick and is typically persistent, although in some cases the subtending hypha is ephemeral. The pore in the subtending hypha either remains open, or is partially or completely occluded by thickening of the spore wall.

LECTOTYPE: (PC) France, Paris, Bois de Boulogne, 1844, Tulasne, examined by F. Bucholtz, V–1911.

OTHER SPECIMENS EXAMINED: (PC) 1. France, Vincennes, 1844, Tulasne, Bucholtz No. 4 (as No. 5 in Beih. Bot. Centralbl. **29**: 193. 1912). 2. Italy, autumn, 1846, Broome, Bucholtz No. 7. (FH) 3. Isotype of *Endogone neglecta* Rodway. Tasmania, Hobart, X–1910, Rodway 1309, Thaxter No. 5212.

The spore size range of the other sporocarps examined includes larger spores (up to 52 × 48 μm) than does that of the lectotype (45 × 40 μm). The spore wall in other collections may be less thick (up to 4 μm) and the point of attachment of the subtending hypha narrower (up to 7.5 μm) than in the lectotype (up to 6 μm and 8.5 μm, respectively).

TABLE I

COMPARISON OF IMPORTANT TAXONOMIC FEATURES OF *Glomus microcarpum*, *Glomus fasciculatum*, AND *Glomus macrocarpum* BASED ON LECTOTYPE DESCRIPTIONS

	Glomus microcarpum	*Glomus fasciculatum*	*Glomus macrocarpum*
SPOROCARP ANATOMY			
Peridium	+	−	+
Gleba	+	−	+
Chlamydospores clustered	−	+	−
CHLAMYDOSPORE MORPHOLOGY			
Size range (μm)	30–45 × 30–40	(60–85 × 60–70)[1]	90–140(–180)[2] × 70–130
Shape	globose, subglobose	globose, subglobose	ellipsoid, subglobose
Wall layers	1	2?	2

[1] Taken from original description (Thaxter, **1922**).
[2] Upper limit from contemporary collection (Berch and Fortin, **1983**).

Examination of the isotype material of *Endogone neglecta* Rodway (FH), confirmed that this fungus is conspecific with *G. microcarpum*, as determined previously by Gerdemann and Trappe (**1974**).

Gerdemann and Trappe (**1974**) stated that if sufficient specimens were examined, *G. microcarpum*, *G. fasciculatum* (Thaxter) Gerd. & Trappe, and *G. macrocarpum* Tul. & Tul. might form a continuous series of spore size. Support for their decision not to combine these three species taxonomically has come from examination of a number of features of their lectotypes (TABLE I) in addition to the spore size range.

Gerdemann (**1965**) designated a lectotype for *G. fasciculatum* from the original collections made by E. C. Jeffrey in Little Metis, Québec, and described living material of this fungus produced in pot culture. Berch and Fortin (**1983**) chose and described a lectotype for *G. macrocarpum* from the original Tulasne collections, and herein have designated a lectotype for *G. microcarpum*.

The sporocarps of *G. microcarpum* and *G. macrocarpum* are differentiated anatomically into more or less well-defined peridium and gleba. The chlamydospores of both species are formed randomly among the hyphae of the gleba. In contrast, the sporocarps of *G. fasciculatum* are composed of loose aggregations of chlamydospores formed in clusters or fascicles. Most chlamydospores of both *G. microcarpum* and *G. fasciculatum* are globose or subglobose, those of *G. macrocarpum* are ellipsoid or subglobose. There is no overlap of spore size range among these three species when lectotypes only are considered. Examination of further collections of these fungi will undoubtedly provide a more realistic reflection of their spore size range. The chlamydospore wall of *G. microcarpum* consists of a single, laminate layer, while two distinct layers compose the wall of *G. macrocarpum*, and perhaps that of *G. fasciculatum* though this is unclear from the descriptions provided by Thaxter (**1922**) and Gerdemann (**1965**).

In summary, when sporocarp anatomy and chlamydospore morphology of the lectotypes are considered, *G. microcarpum*, *G. fasciculatum*, and *G. macrocarpum* are found to be distinct species. All of these fungi are VA mycorrhizal and form ectocarpic (not formed within a sporocarp but in relative isolation in the soil or other substrate) chlamydospores in pot culture under appropriate conditions. Gerdemann and Trappe (**1974**) collected ectocarpic chlamydospores of *G. macrocarpum* that resembled sporocarpic chlamydospores. The ectocarpic chlamydospores of *G. fasciculatum* described by Gerdemann (**1965**) were evidently iden-

tifiable as conspecific with sporocarpic chlamydospores. Berch (**1979**) sieved loose groups of ectocarpic chlamydospores of *G. microcarpum* from the rhizosphere soils of naturally-VAM ferns. That these species remain distinct under such conditions seems indisputable, but their potential intraspecific variability remains to be investigated.

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