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ACAULOSPORA SPLENDIDA, A NEW SPECIES IN THE ENDOGONACEAE FROM COSTA RICA

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SUMMARY

Acaulospora splendida forms globose to irregular hyaline spores, 147 x 317 μm diam, with 2 wall groups having the 5 walls a total thickness of 2.5 - 5 μm . The collapsed translucent sporiferous saccule or a hyphal remnant is generally attached to spores collected from field samples. Spores do not sediment in water. The known distribution of this species is restricted to Costa Rica.

RESUMEN

Acaulospora splendida forma esporas hialinas, globosas a irregulares, 147 - 317 μm diam. Tienen 2 grupos de paredes y el grosor total de las 5 paredes es 2.5 - 5 μm . El sáculo esporífero o un fragmento de la hifa generalmente queda conectado a la espora en colecciones del campo. Las esporas no sedimentan en agua. Hasta la presente la nueva especie solamente se conoce de Costa Rica.

INTRODUCTION

Several species of vesicular arbuscular mycorrhizal fungi were found in soil of a two year old nursery planting of Quercus costaricensis Liebm. Hyaline spores of an undescribed species of Acaulospora Gerd. & Trappe were found in addition to A. scrobiculata Trappe; Entrophospora infrequens (Hall) Ames & Schneider; E. schenckii Siev. & Toro;

Scutellospora calospora (Nicol. & Gerd.) Walker & Sanders; S. coralloidea (Trappe, Gerd. & Ho) Walker & Sanders; S. gilmorei (Trappe & Gerd.) Walker & Sanders; S. pellucida (Nicol. & Schenck) Walker & Sanders, and S. savannicola (Herr. & Ferr.) Walker & Sanders. Spores of the new species were mounted in polyvinyl-alcohol-lactophenol (PVL), lactophenol and Melzer's reagent. Spores were stored in 5% formalin. Wall descriptions follow the terminology of Walker (1983). Diameter was determined from 125 spores, wall measurements are from 50 spores.

ACAULOSPORA SPLENDIDA sp. nov. Sieverding, Chaverri & Rojas (Fig. 1 and 2).

Sporae singulae in solo formatae; sporae hyalinae, globosae vel subglobosae vel irregulares, (147) 209-317 x (133) 157-264 μm diam. Sporae lateraliter gestae ad collum sacculi sporangiferi. Sacculus sporiferis hyalinus, globosus vel irregularis, 160-300 x 150-200 μm diam. Distantia inter sporam et sacculum sporiferum 30-75 μm longa; sacculus ad maturitatem sporae generatim non evanescens. Parietis sporae e startis quinque: exterius, 0.3-0.7 μm crassum, continuum cum pariete sacculi sporiferi; startum secundum rigidum, 1-2 μm crassum, adherens a strato primo. Stratum tertium membranosum, 0.2-0.5 μm crassum, et quartum rigidum, 0.5-1 μm crassum, separabile vel adherentes. Stratum quintum rigidum, 0.5-1 μm in aqua, in lactophenolio dilatatum.

Spores formed singly in soil, hyaline (glistens in water), shiny smooth, globose or subglobose, 190 - 250 μm diam., ovoid, oblong, broadly ellipsoid, broadly rectangular, or triangular with round edges or irregular, (147) 209 - 317 x (133) 157 - 264 μm diam. Spores borne laterally on a tapering hypha, 25-52 μm wide at point of spore attachment; pore at point of attachment 6-11 μm diam., closed by second spore wall.

Sporiferous saccules globose, broadly ellipsoid or irregular in shape, 160-300 x 150-200 μm diameter, slightly constricted at the neck. Wall is 0.3-0.7 μm thick. After spore formation the sporiferous saccule becomes translucent and may collapse, but usually remains attached to the spore. Distance between sporiferous saccule and spore 30-75 μm .

Spore wall structure (Fig. 1 b, c, d and Fig. 2) of five hyaline walls (walls 1-5) in 2 wall groups (A&B), having a total thickness of 2.5-5.0 μm .

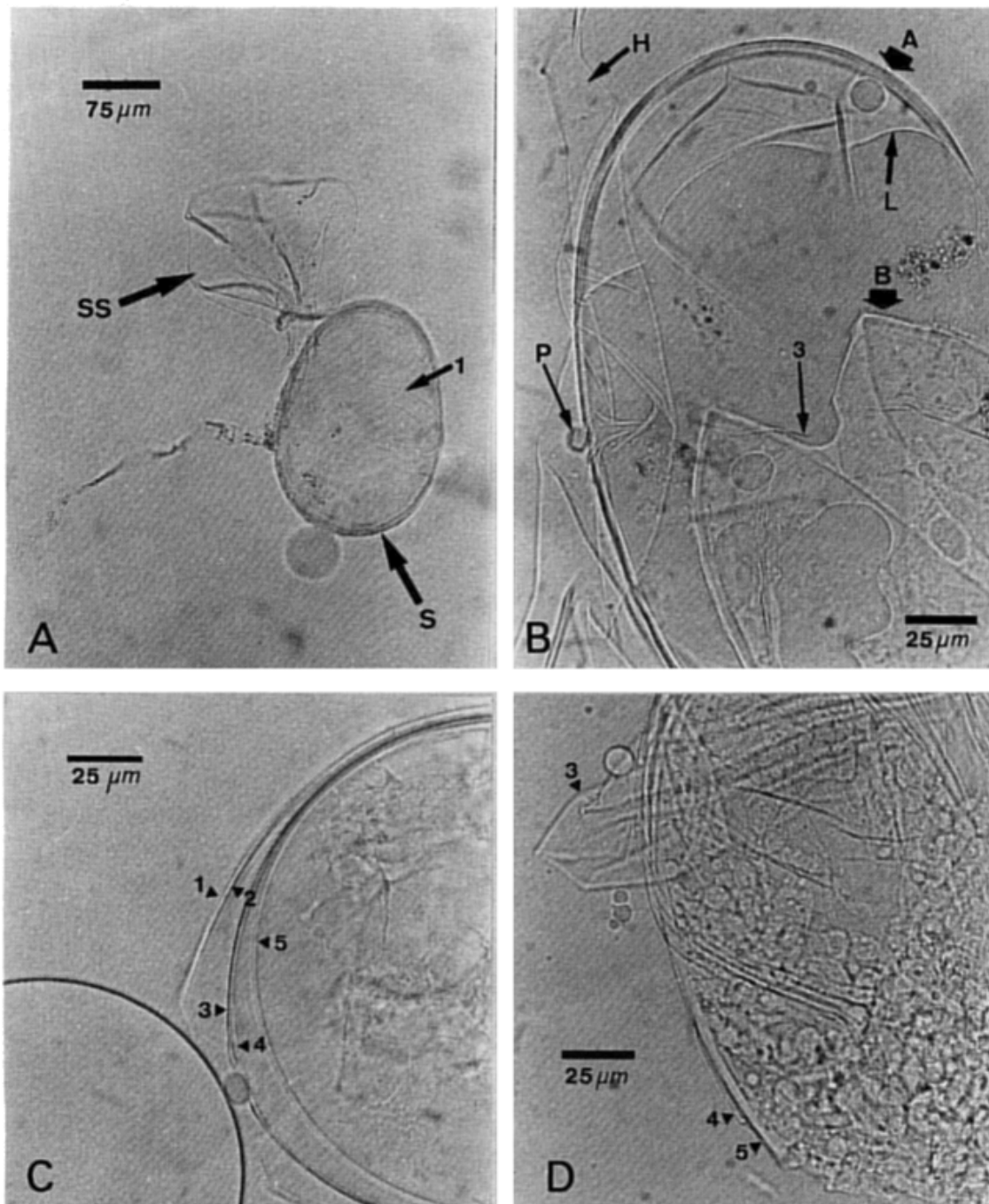


Figure 1. Microphotographs of *Acaulospora splendida*. A) Spore (S) with usually attached hypha and sporiferous saccule (SS); wall 1 is broken and wrinkles. B) Broken spore showing two wall groups (A&B); wall 1 is continuous with the wall of the attached hypha (H), see the pore (P); note the fine wrinkled wall 3 on wall group B; the line (L) is the periphery of the out-flowing oily spore content. C) Broken spore showing 5 walls (1-5); walls 1&2 and 3&4 are adherent, wall 5 is swollen in lactophenol. D) Wall group B of spore with walls 3, 4 & 5; wall 3 wrinkles, walls 4 & 5 are unit walls and usually adherent.

Wall group A with two walls (1 & 2); outer wall (wall 1), 0.3-0.7 μm thick, continuous with wall of tapering hypha on which spore is borne, adherent to a unit wall 2, 1-2 μm thick; walls 1 & 2 often appear as one single wall. Wall group B of three walls (walls 3, 4 & 5); wall 3, a membranous wall, 0.2-0.5 μm thick, usually adherent to wall 4, a unit wall, 0.5-1 μm thick; walls 3 & 4 can appear as a single wall; wall 5 is a unit wall, 0.5-1 μm thick in water, 2-3 (-6) μm thick when spores are stored in formalin or lactophenol; wall 5 occasionally separates from wall 4; wall 5 stains reddish-brown in Melzer's reagent when fresh mounted or after storing in formalin.

Type of mycorrhiza unknown.

HOLOTYPE: Costa Rica, Heredia, Concepción de San Rafael, in nursery bed with Quercus costaricensis; GOET. Isotypes; OSC.

ETYMOLOGY: splendida (latin, adj.) referring to the sparkling of the hyaline spores under incident light.

DISTRIBUTION: Only known from Costa Rica. The nursery seed bed where A. splendida was found had been planted with Q. costaricensis two years previously. The soil (37% sand, 47% loam, 16% clay, 12.5% organic matter) had the following chemical characteristics: pH 5.9; 0.15 meq Al, 7.5 meq Ca, 1.0 meq Mg and 0.49 meq K / 100 ml soil; 8 μg P, 5.4 μg Zn, 4 μg Mn, 7 μg Cu and 40 μg Fe / ml soil, extractable.

MYCORRHIZAL ASSOCIATIONS: In the nursery with Q. costaricensis and weeds belonging mostly to the Compositae and Gramineae. Attempts to establish pot cultures with sorghum failed.

DISCUSSION: Spores of A. splendida are always hyaline with a smooth surface. Some spores obtained from the field had light yellow or brown shaded areas on the surface; those were contaminated by other fungi growing on the spore surface. Spores of A. splendida float on the surface of water and other liquids; care should be taken not to decant spores in the process of extraction from soil.

The size of spores and spore wall structure separate A. splendida from other species of the genus with smooth hyaline spores. Spores of A. delicata Walker, Pfeifer & Bloss, A. longula Spain & Schenck, A. myriocarpa Spain, Siev. &

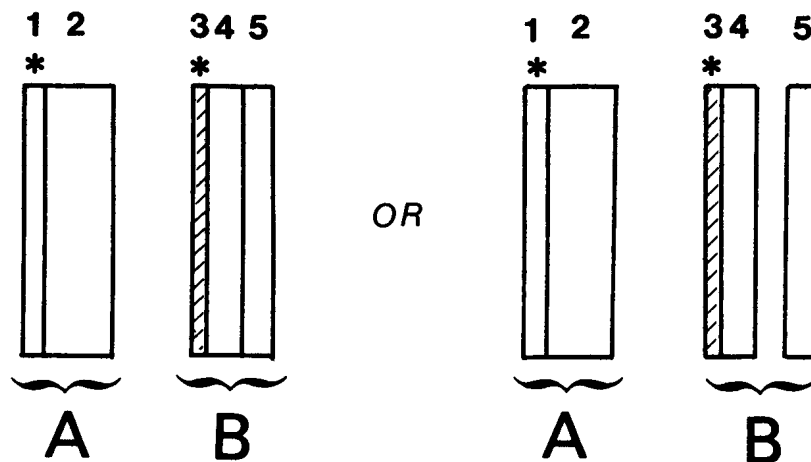


Figure 2. Murograph of walls of Acaulospora splendida. Five walls (1-5) in two wall groups (A, B). Walls 1 and 3 are difficult to observe (*).

Schenck, and A. trappei Ames & Linderman are smaller in size. In contrast to A. splendida, spores of A. nicolsonii Walker, Reed & Sanders have an evanescent thin outer wall and a laminated second wall.

Some of the walls of A. splendida are difficult to discern. Broken spores readily show two wall groups (Fig. 1B). Wall 1 is very difficult to observe; on most specimens walls 1 & 2 are strongly adherent and appear as one single wall. Wall 1 was detected on some specimens because the wall wrinkled remaining attached to wall 2 (Fig. 1A). Walls 3 & 4 may also appear as a single wall; the two walls can be distinguished by the wrinkling of wall 3 (Fig. 1D); wall 4 is usually adherent to wall 5 (Fig. 1D), but may be separated from latter wall on some specimens (Fig. 1C). Wall 5 stains a reddish-brown color in Melzer's reagent; this wall is not a amorphous wall as described by Morton, 1986a; the increase of wall thickness may have been due to mounting media as was reported by Morton (1986b). On few of freshly extracted specimens from one collection date we found between wall groups A & B a $\leq 0.2 \mu\text{m}$ thin membrane which was adherent to or separated from wall group A; when squashed the membrane appeared granular breaking down to form a viscous and stringy mass. The membrane was not included in the description since its observation was not reproduced in spores from other collection dates.

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LITERATURE CITED

- Morton, J.B. 1986a. Three new species of Acaulospora (Endogonaceae) from high aluminum, low pH soils in West Virginia. *Mycologia* 78: 641-648.
- Morton, J.B. 1986b. Effects of mountants and fixatives on wall structure and Melzer's reaction in spores of two Acaulospora species (Endogonaceae). *Mycologia* 78: 787-794.
- Walker, C. 1983. Taxonomic concepts in the Endogonaceae: Spore wall characteristics in species description. *Mycotaxon* 18: 443-455.