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TWO NEW ACAULOSPORA SPECIES FROM TROPICAL AMERICA

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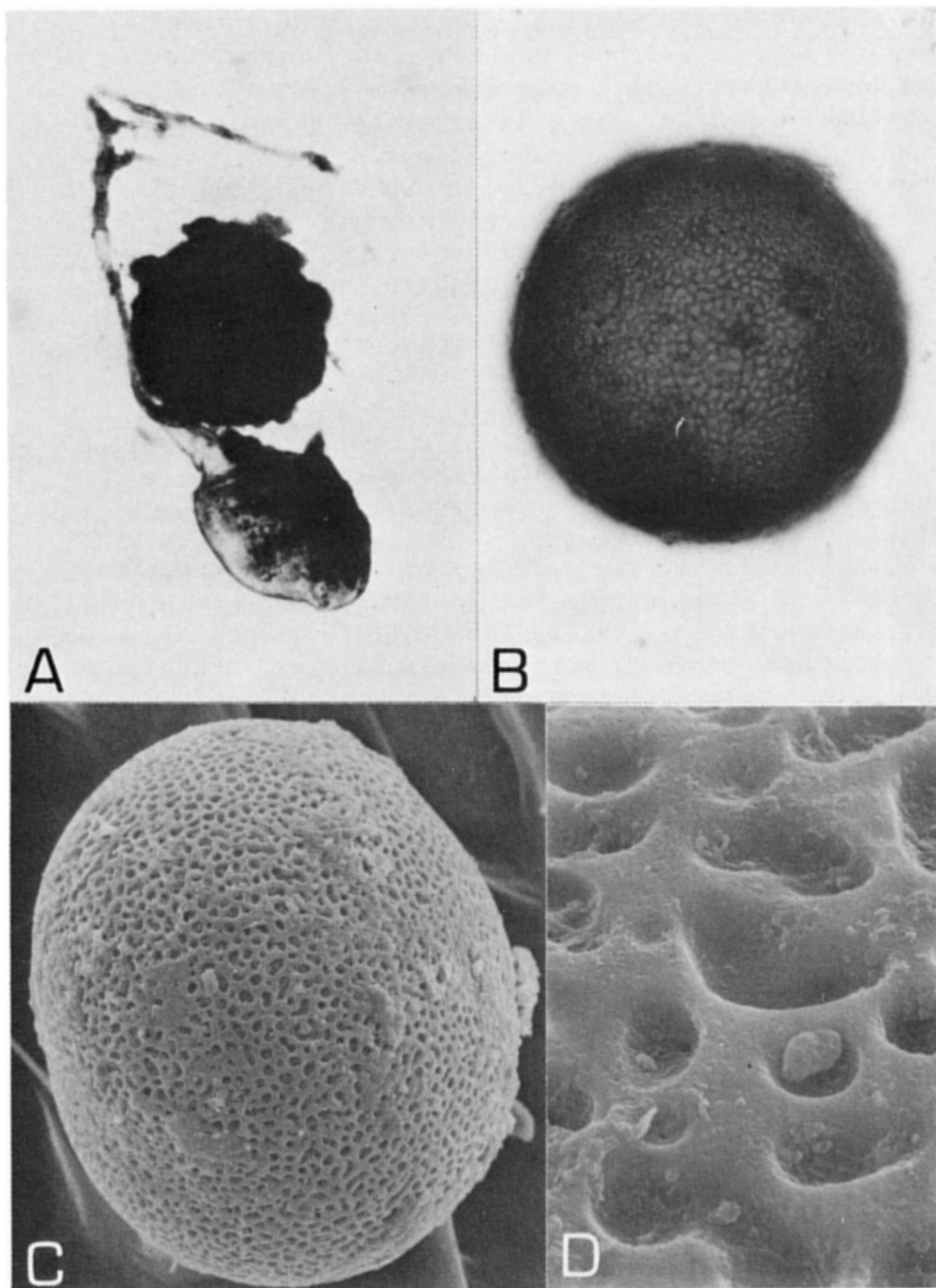
During investigations of the ecology of vesicular-arbuscular mycorrhizal associations in a lowland tropical rain forest in Costa Rica (Janos 1975a, 1980a), one of us (DPJ) found numerous spores lacking hyphal attachments in the soil of pot experiments. After sterilization, this soil had been inoculated with fragments of field-collected Theobroma cacao L. roots (Janos 1975b). The spores were identical with a new Acaulospora species (Endogonaceae; Endogonales) found earlier in tropical Mexico (by JMT). In subsequent investigations of the abundance of this species in forested and disturbed habitats in Costa Rica (Janos 1980b) and Panama, a second, less-common species was discovered. Although often wet-sieved and decanted (Gerdemann and Nicolson 1963) together from soil, these two species differ in spore wall ornamentation. Their ornamentation, thick walls, and color distinguish them from other species of Acaulospora.

ACAULOSPORA FOVEATA Trappe & Janos, sp. nov. Figs. 1A-D

Sporocarpia ignota. Azygospores singulae in solo efformatae, sessiles, lateraliter gestae in hypha infundibuliformi hyalina cum terminatione inflata globosa. Sporae globosae vel ellipsoideae, 185-310(-410) x 215-350(-480 μm), castaneae vel atrobrunneae, depressionibus 4-8 x 4-16 μm foveatae. Sporae tunica e stratis duplicibus: exteriore foveato, cinnamomeo, 11-15 μm crasso; interiore adhaerenti, hyalino, 1.5-3 μm crasso. Typus: Nova Hispania, Veracruz, Trappe 3601 (OSC).

Sporocarps unknown. Azygospores formed singly in soil, sessile, borne laterally on a hyaline, thin-walled, funnel-form hypha \pm 75 μm diam at the point of spore attachment, widening towards an inflated, globose, hyaline, thin-walled terminus \pm 200 μm diam that partially empties and collapses by spore maturity. Spores globose to ellipsoid, 185-310(-410) x 215-350 (-480) μm , yellowish-brown to light reddish-brown in youth, becoming reddish brown to brownish black at maturity. Spore surface uniformly pitted with round to oblong or occasionally irregular depressions 4-8 (-12) x 4-16 μm , 1.5-3 μm deep, with rounded bottoms, separated by ridges 1-12 μm broad. Outer spore wall yellowish or reddish brown to brown, 11-15 μm thick, with an adherent but separable, hyaline inner layer 3 μm thick. Spore contents of small hyaline guttules. Spores orange brown in Melzer's reagent. Hyphal attachment an inconspicuous circular depression \pm 20 μm diam. Subtending hypha tapered and giving rise to scattered, fine hyphae below the point of spore attachment.

Fig. 1. (A-D) Acaulospora foveata: (A) spore with broad funnel-form subtending hypha and partially collapsed terminus, X 80; (B) pitted surface of spore, X 180; (C) scanning electron micrograph (SEM) of ellipsoid, pitted spore, X 225; (D) SEM detail of pitted surface, X 2400.



DISTRIBUTION AND HABITAT: Usually found without an attached hypha in moist to wet tropical forests, banana or cacao plantations, sugar cane fields and secondary vegetation in Mexico, Costa Rica, and Panama.

MYCORRHIZAL ASSOCIATIONS: Associated in the field with roots of Saccharum officinarum L., Musa x paradisiaca L., and forbs and grasses in Mexico, Theobroma cacao L. in Costa Rica, and with many rain forest tree species in Costa Rica and Panama. Sieved in quantity from pots of Inga oerstediana Benth., Pentaclethra macroloba (Willd.) Kuntze., Stryphnodendron excelsum Harms, and Carapa guianensis Aubl.

ETYMOLOGY: Latin, foveata (pitted), referring to the spore surface.

COLLECTIONS EXAMINED: TYPE: MEXICO--Veracruz, 5km NE of Orizaba in a sugar cane field, 7 July 1972, Trappe 3601 (OSC; isotype ENCB). PARATYPES: MEXICO--Oaxaca, Salinacruz, in tropical grass field, 12 July 1972, Trappe 3776 (OSC). Veracruz, near Santiago, in soil under banana, 7 July 1972, Trappe 3603 (OSC); Municipio San Andres, U.N.A.M. Tuxtla Biol. Field Sta., in roadside soil under weeds and grasses, 9 July 1972, Trappe 3605 (OSC, ENCB). COSTA RICA--Heredia, forest and successional strips near the junction of the East River Road and Holdridge Trails on the La Selva Field Station near Puerto Viejo, August 1975, Janos 01 (OSC) and August 1976, Janos 02 (OSC). PANAMA--Colon, forest behind Tall House on Barro Colorado Island, December 1979, Janos 04 (OSC).

A. foveata is readily distinguished from the other Acaulospora with a pitted surface, A. scrobiculata Trappe (1977), by its larger pits (4-8 x 4-16 μ m vs 1-1.5 x 1-3 μ m), darker color at maturity (dark reddish brown to dark brown vs. light olive to light brown), and lack of distinctive reaction of the inner wall layer to Melzer's reagent (vs a deep red reaction). The wall ornamentation of A. foveata conspicuously differs from that of the other Acaulospora spp. as well (Gerdemann and Trappe, 1974; Ames and Linderman 1976; Nicolson and Schenck 1979; Rothwell and Trappe 1979; Walker and Trappe 1981).

ACAULOSPORA TUBERCULATA Janos & Trappe, sp. nov. Figs. 2A-D

Sporocarpia ignota. Azygosporae singulae in solo efformatae, sessiles, lateraliter gestae in hypha lata cum terminatione inflata globosa, 255-327 x 255-340 μm , melleae vel hepaticae, tuberculis superficibus 0.7-1.5 μm altis atque 0.7-1.5 μm latis ornatae. Sporae tunica e stratis tribus: exteriore luteolo, 7-12 μm crasso; medio adhaerenti, melleo, 1.5 μm crasso; interiore separabilo, hyalino, 1.5-3 μm crasso. Typus: Panama, Colon, Janos 05 (OSC).

Sporocarps unknown. Azygospores formed singly in soil, sessile, borne laterally on a light yellow, thick-walled, broad hypha 10-24 μm diam with a hyaline to yellow, thin-walled, inflated, globose terminus \pm 150 μm diam that empties and collapses by spore maturity. Spores globose to subglobose, 255-327 x 255-340 μm , light yellowish brown to honey brown in youth, deepening to dark honey brown or almost reddish black at maturity. Spore surface uniformly covered with tubercles 0.7-1.5 μm tall, 1.5 μm diam at the base, tapering to 0.7-1.1 μm at the rounded tip. Spore wall consisting of three layers: an outer, clear yellow layer 7-12 μm thick; a tightly adherent, yellowish brown middle layer, \pm 1.5 μm thick; and an easily separable hyaline inner layer 1.5-3 μm thick. Spore contents of globose to ellipsoid, hyaline guttules 8-19 μm long. Spores orange-brown in Melzer's reagent. Hyphal attachment an inconspicuous circular depression 12-15 μm diam.

DISTRIBUTION AND HABITAT: Rare, usually found without attached hypha in lowland tropical moist and wet forests and secondary vegetation in Costa Rica and Panama.

MYCORRHIZAL ASSOCIATIONS: Associated in the field with roots of many tropical tree species.

ETYMOLOGY: Latin, tuberculata (with small rounded projections), referring to the spore surface.

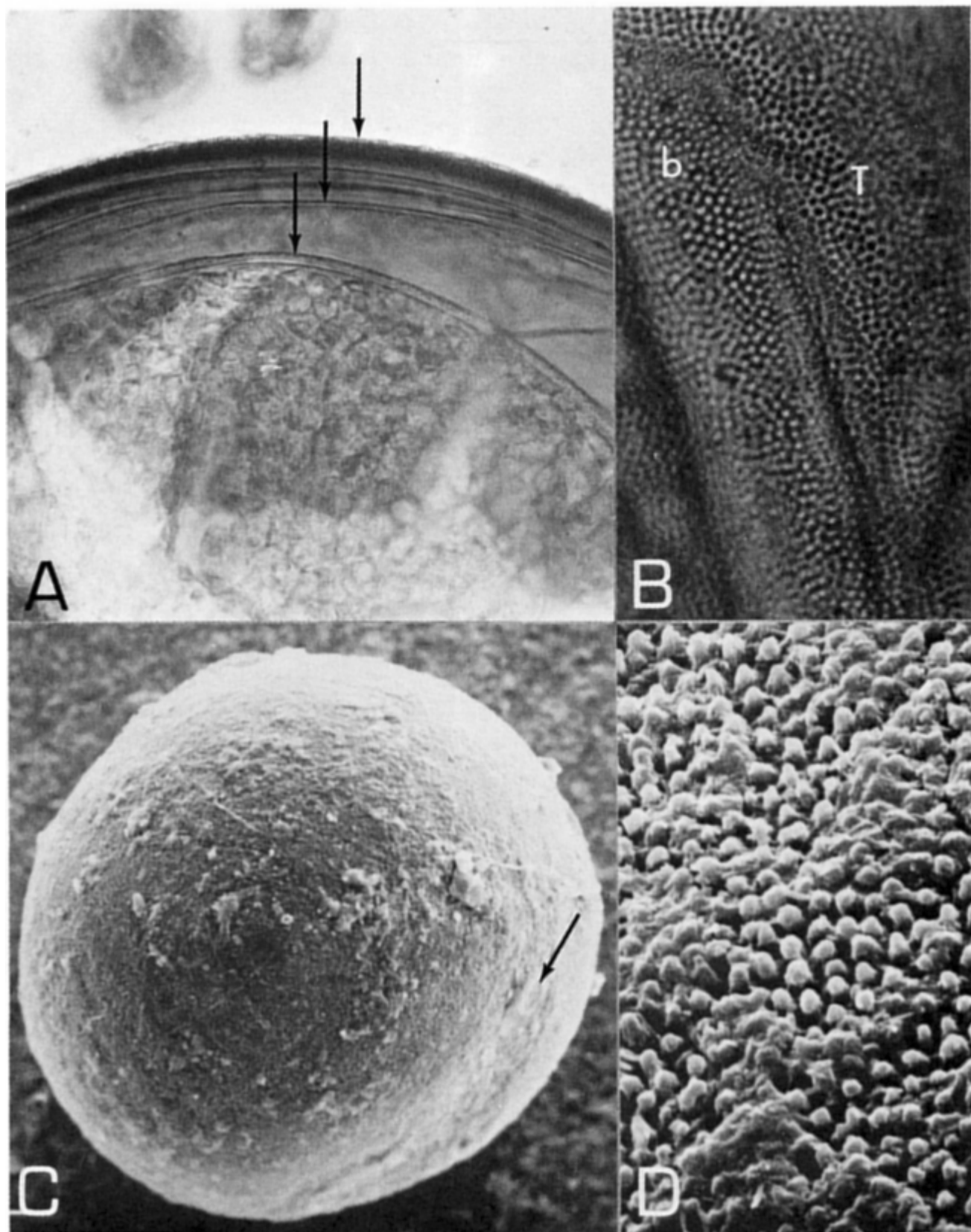
COLLECTIONS EXAMINED: TYPE: PANAMA--Colon, forest behind Tall House on Barro Colorado Island, December 1979, Janos 05 (OSC). PARATYPE: COSTA RICA--Heredia, forest and successional strips near the East River Road and Holdridge Trail junction on the La Selva Field Station near Puerto Viejo, August 1976, Janos 03 (OSC).

Azygospores of A. tuberculata are similar in color to those of A. elegans Trappe & Gerdemann (1974), A. spinosa Walker & Trappe (1981) and A. foveata. A. tuberculata alone among described Acaulospora species, however, is covered by tubercles. The tubercles are coarser and more widely spaced than the spines of A. spinosa and do not adhere to form a partial reticulum (visible by scanning electron microscopy) as in the latter species.

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Fig. 2. (A-D) Acaulospora tuberculata: (A) crushed spore showing three wall layers (arrows), X 320; (B) surface of outer spore wall under oil immersion showing tips (T; appearing dark) and bases (b; appearing light) of tubercles, X 690; (C) scanning electron micrograph (SEM) of sub-globose spore uniformly covered by tubercles, showing the occluded pore (arrow) at which the subtending hypha was attached, X 220; (D) SEM detail of tubercles, X 2200.



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