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GLOMUS ANTARCTICUM SP.NOV., A VESICULAR-ARBUSCULAR MYCORRHIZAL FUNGUS FROM ANTARCTICA

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SUMMARY

The examination of soil samples collected on the rhizosphereof *Deschampsia antarctica* Dev. from Danco Coast, Antarctic Peninsula for vesicular arbuscular mycorrhizal (VAM) fungi revealed an undescribed species of *Glomus* which forms sporocarps and abundant soil-borne as well as intradical spores in pot cultures characterized by an evanescent outer wall, a laminated middle wall and a membranous inner wall.

Vesicular arbuscular are by far the most important and most widely distributed (geographically as well as within the plant kingdom) type of mycorrhiza.

They have been reported from all continents except Antarctica (Tinker, 1975). But during the "Campaña Antártica Argentina de verano 1989" undertaken by one of us (M.N. Cabello) the examination of rhizospheric soil of *Deschampsia antarctica* revealed that there are mycorrhiza in this Continent at least in Danco Coast, Base Primavera. The same locality is indicated in a map by Gamundí and Spinedi (1987).

Colobanthus quitensis Kunth (Caryophyllaceae) and *Deschampsia antarctica* Dev. (Gramineae) are the only two native phanerogams known from within the Antarctic botanical zone, as defined by Greene (1964).

The soil under *Deschampsia* was characterized as Cryosaprist (muck) genetically dependent on the Gramineae where it takes root (Leonardi et al., 1987). Its characteristics are: organic matter: 79,35%; mineral

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fraction: 2,80%; Total C: 46,02%; N: 3,40%; P: 306ppm; pH: 5,3.

Spores were extracted from rhizospheric soil samples by wet-sieving and decanting (Gerdemann and Nicolson, 1963). Roots were cleared and stained (Phillips and Hayman, 1970).

This study revealed that rhizospheric soil and roots of *Deschampsia* are positively colonized by VAM, whereas *Collobanthus* has not mycorrhiza.

Spore wall terminology follows that of Walker (1983) and descriptions are based upon the appearence of spores mounted in a polyvinyl/alcohol/glycerol/lactic acid solution (PVLG) (Koske and Tessier, 1983). Collections have been deposited in the Herbarium of the Spegazzini Institute (LPS).

SPECIES DESCRIPTION

GLOMUS ANTARCTICUM *Cabello sp. nov. Fig.1-6.*

Sporocarpia *sine peridio, globosa vel subglobosa, 1000 x 564 um diam., chlamydosporae in sporocarpiis per mycelium glomerulatae.* ***Chlamydosporae*** *fulvae vel fuscae, globosae, subglobosae, ovoideae vel irregulares, 50 x 75 um diam.* ***Sporae tunica*** *3-12um crassa, stratis tribus: exteriore 2 um crassa, hyalino, ephemera; medio 4-8 um crasso, lutea vel brunnea ex laminosa, strato exteriore separabili, interiore 1,5-2 um crasso. Sporae ad hyphae subtendentes affixae, tunica exteriore breven parten hyphae proximam includente, et interiore per spatium 20 um in hypha extensa et eam incrassante. Sporarum contentus primo ab hypha a septo tenui separatus, maturarum a lamina interiore incrassata.*

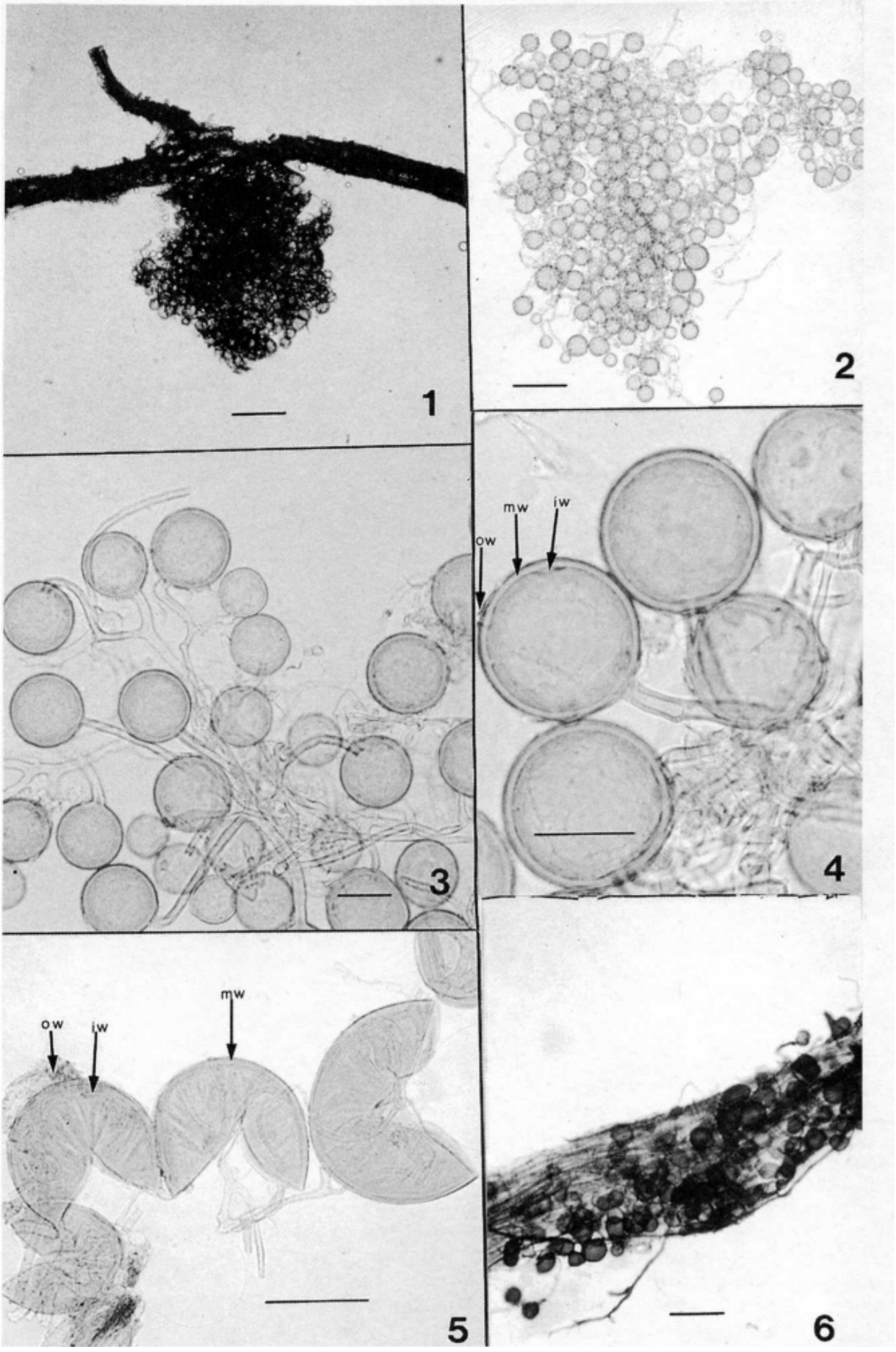
HOLOTYPUS: *Antarctica, Peninsula Antarctica, Terra de Danco, Base Primavera, Leg. M.N. Cabello, I-1989, LPS 45265*

Sporocarps without peridium, globose or subglobose 1000 x 564 um diam.; sporocarps formed by interwoven hyaline hyphae, hyphae 3-5,5 um in diam. with 0,1-0,5 um thick walls; the surface of the sporocarps is knobby due to the appearence of spores.

Chlamydospores yellow to brown, globose to subglobose, occasionally ovoid or irregular, 50-70 um diam.

Spore wall structure 3-12 um consisting of three walls; the outer wall 2 um thick, ephemeral, hyaline; the middle layer 4-8 um thick, light brown, laminated; inner wall hyaline, 1,5-2 um thick.

Figure 1-6 *Glomus antarcticum sp. nov.*
1. Sporocarp attached to a piece of root.
2 & 3. Cluster of chlamydospores.
4. Mature chlamydospores; ow: outer wall, mw: middle wall, iw: inner wal.
5. Mature broken chlamydospores.
6. Sporulation in the root cortex of *Medicago sativa* in pot culture.
Bars represent 300 um in 1; 100 um in 2 & 6; 50 um in 3, 4 & 5.

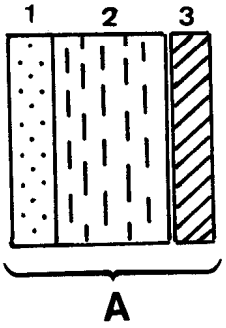

1
2
3
4
ow
mw
iw
5
ow
iw
mw
6

Spore with a hyphal attachment. Outer wall extending down the attached hypha thickened by the extension of the inner spore wall for up to 20 um.

Spore contents separated from the attached hypha by a thin septum; at maturity, the opening occluded by inner wall thickening.

Collection examined: Holotype, Antarctic Peninsula, Danco Coast, Cierva Cove, Base Primavera, leg. M.N. Cabello, I-1989, LPS 45265.
Paratype, originating from the rhizosphere of *Medicago sativa* L. LPS culture N° 81.

Murograph of *Glomus antarcticum*



Arabic numerals indicate each wall in order from outer to inner wall. Wall 1 is evanescent, wall 2 is laminated, wall 3 is membranous; the letter A indicates a wall grouping.

Distribution and habitat: *Glomus antarcticum* has been found in rhizospheric soil of *Deschampsia antarctica* at Danco Coast, Base Primavera, Antarctic Peninsula.

Mycorrhizal associations: forming vesicular-arbuscular mycorrhiza with alfalfa (*Medicago sativa* L) and sorghum (*Sorghum vulgare* Pers.) in pot cultures whose spore or root material is used as inoculum. Associated in the field with roots of *Deschampsia antarctica*.

DISCUSSION

Our description of *Glomus antarcticum* sp. nov. shows that it is closely related in size and shape to *G. fuegianum* (Spegazzini) Trappe & Gerdemann and *G. fasciculatum* (Taxter sensu Gerdemann) Gerdemann & Trappe. However, this new species has some characteristics that distinguish it from them. The sporocarps of *G. antarcticum* differ from *G. fuegianum* in the lack of peridium and in the chlamydospores that never arise from a vesicle supported by a broad sporophore. On the other hand, *G. antarcticum* spores revealed negative reaction to Melzer's reagent and they have the outer unit wall evanescent while *G. fasciculatum* spores have an inner wall that turns red in

Melzer's reagent and the outer wall is not evanescent (Walker and Koske, 1987).

An other significant character that is used in identification of species of *Glomus* is the presence of a septum that occludes the lumen of the spore. In *G. antarcticum* this septum is constituted by the thickening of the inner wall of the subtending hypha at maturity; in *G. fuegianum* the amorphous material of the septum appears to be derived from modified cytoplasm (Yao et al., 1992) and in *G. fasciculatum* the spores are never occluded by a septum.

This study revealed the presence of a new species of *Glomus* which was isolated from rhizospheric soil of the only grass which grows in Antarctica: *Deschampsia antarctica*. This recovering in the Antarctic area answers the question made by Christie and Nicolson (1983) about if mycorrhizas were absent from the Antarctic. These authors have reported that mycorrhizas were not present in several places of Antarctic Peninsula included Spring Point. On the other hand, Stubblefield et al. (1987) found a fossil endogonaceous fungus that remebered them to *Sclerocystis*, in a silified matrix from the Triassic of Antarctica.

In field conditions a low number of spores and some colonized *Deschampsia* roots were found. By means of the pot culturing method active VAM fungal propagules were found in rhizospheric soil of *Deschampsia*. In this way *Glomus antarcticum* was isolated at the Spegazzini Institute.

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