

# Oidiodendron maius and Scytalidium vaccinii from the mycorrhizas of Ericaceae in northern Finland

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*Scytalidium vaccinii* was isolated from roots of *Vaccinium vitis-idaea* and *Oidiodendron maius* was isolated from roots of *Vaccinium vitis-idaea*, *V. myrtillus*, and *Empetrum nigrum*, all of which were collected on a fjell at Kevo Subarctic Research Station in northern Finland. Both fungal species are mycobionts in ericoid mycorrhizas. These reports extend the known range of the common endomycorrhizal fungi and indicate that these taxa have a circumboreal distribution with ericaceous plants.

Key words: Ericoid mycorrhizas, Myxotrichaceae, *Hymenoscyphus ericae*

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## Introduction

Darkly-pigmented fungi, including *Scytalidium vaccinii* Dalpé, Sigler & Litten (= anamorph state of *Hymenoscyphus ericae* (Read) Korf & Kernan) and *Oidiodendron maius* Barron, form endomycorrhizas with many plants belonging to the Ericales. These fungi are, at least partially, responsible for the ability of the ericoid shrubs to survive and thrive in stressful habitats such as sand dunes, bogs, and alpine heaths (Read 1991). Although many of the ericaceous plant hosts have a circumboreal distribution, there are only a few localized reports concerning the identity of their mycorrhiza-forming fungi. *H. ericae* has been reported with Ericaceae and Epacridaceae worldwide (Egger and Sigler 1993, Straker 1996, Hambleton and Currah 1997, Chambers et al. 1999) whereas *Oidiodendron maius* has been reported primarily from western Canada, Britain, and Italy (Hambleton 1998, Stoyke and Currah

1991, Douglas et al. 1989, Perotto et al. 1994, 1996). There are no such reports of either mycorrhizal endophyte for the ericaceous plants of Finland.

## Materials and Methods

In July 1998, plants of *Vaccinium vitis-idaea* L., *Vaccinium myrtillus* L., and *Empetrum nigrum* L. were collected at Kevo Subarctic Research Station in Kevo, Utsjoki, Finland (69° 45' N, 27° E; 80 m asl). Plants were dug from the slope of Jesnalvaara Fjell which is dominated by *Betula pubescens* var. *tortuosa* with an understorey of primarily *Vaccinium*, *Ledum* and *Empetrum* shrubs.

Portions of the feeder roots were cut away, surface sterilized in approximately 10% household bleach for three minutes and rinsed several times in sterile distilled water and plated out on Corn Meal Agar (CMA) with tetracycline. Strains

were transferred to and maintained on CMA for identification.

Fresh mounts in lactofuchsin were made for initial identifications. Cereal slide cultures (Sigler 1993) were prepared and mounted in acid fuchsin-polyvinyl alcohol for taking photographs.

## Results and Discussion

Both *Oidiodendron maius* and *Scytalidium vaccinii* were obtained in culture from the ericaceous species collected in Kevo. These ericoid mycorrhizal taxa are easily identified on the basis of the distinctive morphology of their arthroconidial states.

*Oidiodendron maius* forms a white or pale grey capitulum of mostly cylindrical arthroconidia which develop along a series of sinuous hyphae that emanate from the apex of a long (200–500 µm) thick-walled, dematiaceous conidiophore (Fig. 1). These dendritic structures, which

are characteristic for the genus, form readily in culture. Hambleton and Currah (1997) point out that *O. maius* may be confused with *O. griseum* Robak which is probably a rhizosphere or soil-inhabiting fungus rather than an ericoid mycorrhizal endophyte. Conidiophores of *O. griseum* are generally shorter (<150 µm); the conidia are greyish to pale brown and develop in short compact chains. *O. griseum* also produces an amber-coloured diffusing pigment in agar media while no diffusing pigment is produced by *O. maius*. Molecular data show that, in spite of their superficial morphological similarity, these two taxa are not closely related within the genus (Hambleton, Egger and Currah 1998). Other species of *Oidiodendron* which may be found in organic soils e.g., *O. periconioides* Morrall (Currah, Tsuneda and Murakami 1993) are easily distinguished from *O. maius* on the basis of arthroconidial shape and size (Tokumasu 1973).

Within the Ericaceae, *O. maius* shows no detectable host specificity and has been identified



Figure 1. Capitulum of cylindrical arthroconidia of *Oidiodendron maius* (from *Vaccinium myrtillus*, Jesnalvaara Fjell) at the apex of a thick-walled, dematiaceous conidiophore. Bar = 10 µm.

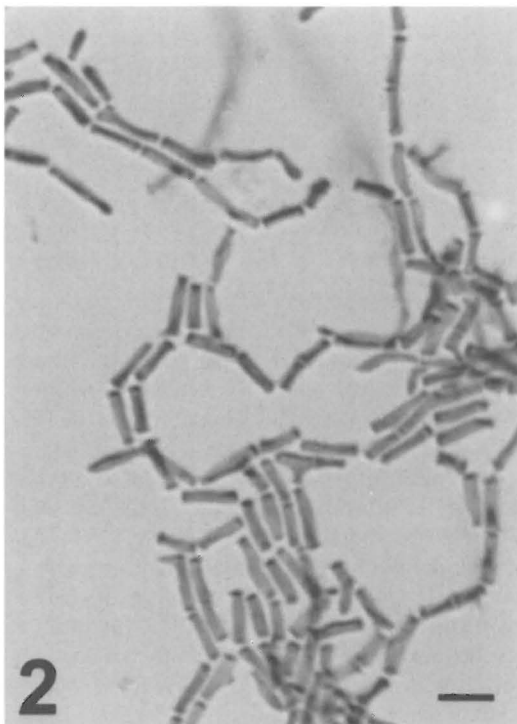


Figure 2. Distinctive zig-zag chains of long arthroconidia of *Scytalidium vaccinii* (from *Vaccinium vitis-idaea*, Jesnalvaara Fjell). Bar = 10 µm.

from roots of many ericaceous plants from alpine and boreal regions of western Canada (Hambleton 1998), from *Rhododendron* grown in field culture in Ireland (Douglas et al. 1989), and from ericoid shrubs in Italy (Perotto et al. 1994, 1996). Our cultures were isolated from each of the three species: *Vaccinium vitis-idaea*, *V. myrtillus*, and *Empetrum nigrum*.

In *Scytalidium vaccinii*, morphology varies but, in general, colonies are slow growing and after two months are radially sulcate and creamy to more or less dematiaceous but retain some whitish aerial hyphae. However, on a relatively nutrient poor medium, e.g. CMA, the distinctive zig-zag chains of long, narrow (1.5–2.5 µm) arthroconidia form in abundance along prostrate hyphae (Fig. 2) and are diagnostic (Hambleton and Currah 1998). Our single strain was from *Vaccinium vitis-idaea*.

Both *Oidiodendron maius* and *Scytalidium vaccinii* are mitosporic states (Hyphomycetes) although the link between *S. vaccinii* and the teleomorph *Hymenoscyphus ericae* is now well-established on the basis of both molecular (Egger and Sigler 1993, Dalpé et al. 1989) and cultural and morphological evidence (Hambleton 1998, Hambleton et al. 1998). The taxonomic position of *O. maius* has been established among the inoperulates on the basis of the molecular similarity of *O. maius*, other species of *Oidiodendron*, and related teleomorphs in the Myxotrichaceae.

The distribution of *H. ericae* is probably global, being found wherever the Ericaceae or Epacridaceae (Ericales) occur (Egger and Sigler 1993, Hambleton and Currah 1997, Chambers et al. 1999, Straker 1996). The species has also been implicated in the formation of mycorrhizas in Pinaceae (Vrålstad and Schumacher 1998) or mycorrhiza-like structures in liverworts (Chambers et al. 1999) in habitats where these species occur concurrently with ericaceous shrubs. It is plausible that ericaceous plants and non-ericaceous neighbouring species are linked by these common mycorrhizal symbionts in much the same way as ectotrophic species (Simard et al. 1997). Consequently, the ecology of these associations would be of importance in cold- and nutrient-stressed environments such as the fjell in Finland where our material was collected. Although an attempt was made, the fungi were not isolated from the roots of the neighbouring birch species.

These reports expand the known range of two known endomycorrhizal endophytes of the Ericaceae and indicate that these taxa have at least a circumboreal distribution with their host plants.

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