

Diversity and Ecology of Ectomycorrhizae on *Polygonum viviparum* L. in the Bavarian Alps

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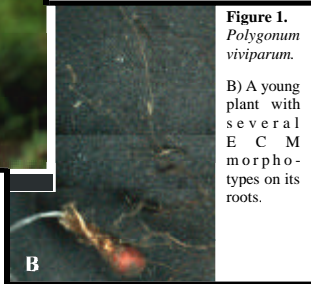
Ectomycorrhizae (ECM) are usually formed by woody plants. In the northern hemisphere these trees and shrubs belong mainly to the families Pinaceae, Fagaceae, Betulaceae, and Salicaceae. There are, however, also a few herbaceous plant species known to form this type of symbiosis. The arctic-alpine perennial *Polygonum viviparum* L. (Polygonaceae) [Fig. 1] is one of them, occurring frequently in North America, Europe and Asia..



Although reports about ectomycorrhizal structures in *Polygonum viviparum* roots date back as far as 1900 (Hesselmann), little is known about the diversity of associated fungi.

Figure 1.
Polygonum viviparum.

B) A young plant with several ECM morphotypes on its roots.



Fontana mentioned 16 ECM-morphotypes (Fontana 1977), but so far only *Cenococcum*

geophilum Fr. (Syn. *Cenococcum graniforme* (Sow.) Ferd & Winge) and *Russula emetica* Fr. var. *alpestris* Boud. as well as the genera *Amanita* and *Inocybe* have been identified as fungal partners (Fontana 1977, Gardes and Dahlberg 1996, Treu et al. 1996, Massicotte et al. 1998).

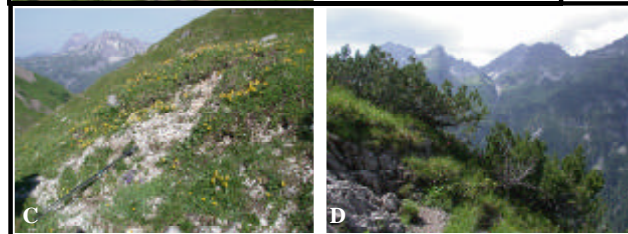
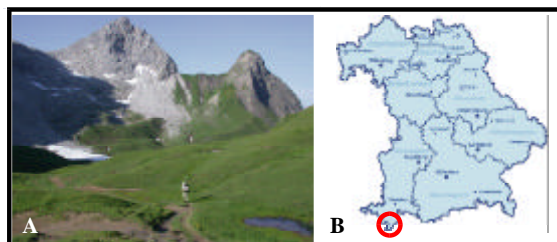
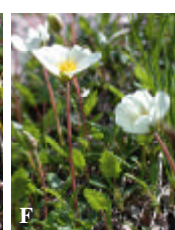


Figure 2. The nature reserve "Allgäuer Hochalpen" is located at the very South of Bavaria (B).

Some study sites: two alpine meadows at 2100 m, one without woody plants (A), the other with *Dryas octopetala* (C); D) a subalpine *Pinus mugo* belt at 1700 m.

E and F) Two potential ECM donors to *P. viviparum*: *Salix reticulata* (E) and *Dryas octopetala* (F).



The Project

Aims:

This PhD project aims at describing the ectomycorrhizal diversity of *Polygonum viviparum* at alpine sites in the Bavarian nature reserve "Allgäuer Hochalpen" at approx. 1300-2100m height above sea level [Fig. 2].

We will also examine whether proximity to woody ectomycorrhizal plants influences the ECM community of *Polygonum viviparum*.

Methods:

- Plants plus their whole root systems will be sampled both on alpine meadows without any woody plants and in proximity to *Picea abies* (L.) Karsten (Pinaceae), *Pinus mugo* Turra (Pinaceae), *Salix* spp. (Salicaceae) or *Dryas octopetala* L. (Rosaceae).

- Fungal species [Fig. 3] will be identified and characterized via morphological and anatomical features according to Agerer (1987-2002) and via sequencing of rDNA ITS regions (using the UNITE database for reference (Koljalg et al. 2005)).

- Root systems will be compared for relative ECM % frequency, i.e. relative occurrence of each ECM species.

- Roots of *Polygonum viviparum* and those of nearby *Picea abies*, *Pinus mugo*, *Salix* spp. or *Dryas octopetala* will be compared for ECM diversity.

- Correlation analyses will be carried out to determine the involvement of soil characteristics (i.e. nutrients, pH, etc.) on ECM diversity.

- Bulbils (vegetative propagules) [Fig. 4] will be collected from inflorescences and stored at -18°C until used for axenic culture.

- Future plans include describing and comparing extracellular enzyme activity on excised ECM tips using a microplate multiple enzyme test system (Pritsch et al. 2004,



Figure 3. Some ECM morphotypes found on

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Figure 4. A *Polygonum viviparum* inflorescence. The upper part usually carries white flowers (already whilted in this picture) which only occasionally set seeds, while the lower part produces bulbils as vegetative propagules.

