ALGAL BIODIVERSITY OF ALPINE SOILS AND SOILS FROM ANTARCTICA

Zur Algenflora alpiner Böden und Böden der Antarktis

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Introduction

In the Alps orographic and often harsh climatic conditions result in sparse or absent vegetation cover in many areas. These open spaces in between higher plants are not bare of autotrophic life, but are often covered with soil crusts, soil surface communities consisting of algae, cyanobacteria, lichens, mosses and microfungi in different involvement. Climatic conditions on Antarctica are also very harsh, making them highly comparable to the environments in the alpine and nival zones of the Alps, therefore it is unsurprising that striking similarities in lichen, algae, and cyanobacteria species between high-altitude areas and deserts (also cold-deserts) have been reported (Türk & Gärtner, 2003). In the current study, the biodiversity of soil algae, which are an important part of these soil crust communities, is investigated.

Material and methods

Isolation, purification and cultivation

Soil samples from 4 study sites in the high alp near the village Vent (Otalp, Austria) and one from Antarctica (King George Island) were collected from the surface to 2.5 cm depth. Aliquots of a 10th dilution of the collected soil samples were spread on solidified Bold’s basal medium (Bischoff & Bold 1963) in 9 cm dishes for quantification of algae. After 4 weeks single cells or developed colonies were isolated, transferred to new media, incubated (~30 µmol photons m-2, 10-13°C, 12/12 h light/dark cycle) and stored in the Algal Culture Collection of the Botanical Institute in Innsbruck, Austria (Gärterner 1996), for long - term cultivation.

For light microscopy an Olympus BH – microscope with a Proxas C10 plus Jenoptik digital camera and PICcel Corea image analysis software (Jomesa Meßsysteme GmbH) was used. Identifications were made on the basis of cell and colony morphology using standard authoritative references (e.g. Ettl & Gärtner 1995).

Results and Discussion

A high level of algal diversity could be detected, even in soils, which seem to be bare of autotrophic life. In total 23 algal taxa were recovered. Chlorophyta (16 taxa) were by far the most diverse group encountered in Austrian soils, however the investigated soil from Antarctica (King George Island) is dominated by trichal Xanthophyta. Various taxa of the soil from Antarctica (pH=5) be detected up to now.

Various groups of algae and cyanobacteria were involved in the investigated high alpine soils. As an important part of these soil crust communities, most of the encountered species are cosmopolitan and widespread common taxa, such as e.g. Chlorophyta (Fig. 2a), Xanthophyta (Fig. 2c), Stichococcus (Fig. 2d), Xanthonema, Leptolyngbya. 1-10 different species are encountered on average for each location. In general, Xanthonema species and Leptolyngbya species are very common but obviously often overlooked or misinterpreted (cf. Kalina & Punčochářová 1987, Tschai kner et al. 2001).

Figure 1: Study sites, (a) periglacial area of Nordkraulshofen, near the village Vent, Tyrol, Austria, (b) overview, (c) detail of soil surface, (d) soil on King George Island, Antarctica.

Acknowledgement

This study was carried out with the financial support of the Tiroler Wissenschaftsfond (TWF project, No. 66405 to A. Tschai kner). The investigated soil sample from Antarctica was collected in 2007 from D. Remias, during an FWF financed research stay (project No. P20031 to Prof. C. Lütta, Institute of Botany, Department Physiology and Cell Physiology of Alpine Plants, University of Innsbruck, Austria).

Table 1: Species present in the 5 study – sites.

References


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