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Effects of temperature and drought stress on germination and establishment of glacier foreland species

Auswirkungen von Temperatur und Trockenstress auf die Keimung von Gletschervorfeldarten

Erich SCHWIENBACHER & Brigitta ERSCHBAMER

Alpine environments are considered as being highly sensitive to climate change. One of the most visible effects of climate warming in the Alps is the fast glacier retreat. On the newly exposed moraines immigration of plants occurs after a few years if enough moisture enables germination and establishment. Drought periods are often fatal for the most sensitive life stages of plants such as seeds and seedlings. Climate change effects may influence hydrological processes in different ways, predictions ranging from a general increase in precipitation to more pronounced drought periods especially in spring and summer.

We assessed the effect of drought and temperature on germination of ten glacier foreland plant species in the Austrian Central Alps using experiments in the field and in the growth chamber. The selected species represented different strategies from pioneer to late successional species.

In the field we used an experimental design with an automatically controlled irrigation system to avoid naturally occurring drought periods on bare ground plots of young moraines. Seedlings were counted once a week during the growing season in irrigated and non-irrigated plots. In the growth chamber a drought gradient was simulated by addition of increasing concentrations of PEG 6000 (Polyethyleneglycol) to H_2O dest. The water availability was ranging from standard condition (H_2O dest.) to different levels of water deficit (max. -0.6 MPa of osmotic potential). Two different temperature regimes were applied simulating late spring and early summer conditions. Seedlings were counted and removed twice a week for one month.

We will report first results of an ongoing study. Percent germination, coefficient of velocity, and recruitment success were expected to increase with controlled irrigation in the field. In contrast, germination will decrease with increas-

ing water potential deficit in the growth chamber. We hypothesized that seeds of pioneer species are less sensitive to drought under a low temperature regime during germination in comparison to late successional species.

address:
Erich SCHWIENBACHER & Brigitta ERSCHBAMER
Institute of Botany
University of Innsbruck
Sternwartestrasse 15
A-6020 Innsbruck

email:
erich.schwienbacher@uibk.ac.at

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