

Publication

Adaptation of *Poa alpina* to altitude and land use in the Swiss Alps

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Current land use and climate change are prompting questions about the ability of plants to adapt to such environmental change. Therefore, we experimentally addressed plant performance and quantitative-genetic diversity of the common Alpine Meadow Grass *Poa alpina*. We asked how land use and altitude affect the occurrence of *P. alpina* in the field and whether its common- garden performance suggests adaptation to conditions at plant origin and differences in quantitative genetic diversity among plant origins. Among 216 candidate grassland sites of different land use and altitude from 12 villages in the Swiss Alps, *P. alpina* occurred preferentially in fertilized and grazed sites and at higher elevations. In a common garden at 1,500 m asl, we grew two plants of [600 genotypes representing 78 grassland sites. After 2 years, nearly 90% of all plants had reproduced. In agreement with adaptive advantages of vegetative reproduction at higher altitudes, only 23% of reproductive plants from lower altitudes reproduced via vegetative bulbils, but 55% of plants from higher altitudes. In agreement with adaptive advantages of reproduction in grazed sites, allocation to reproductive biomass was higher in plants from grazed grasslands than from mown ones. For 53 grasslands, we also investigated broad-sense heritability H^2 , which was significant for all studied traits and twice as high for grazed as for mown grasslands. Moreover, possibly associated with their higher landscape diversity, H^2 was higher for sites of villages of Romanic cultural tradition than for those of Germanic and Walser traditions. We suggest promoting diverse land use regimes to conserve not only landscape and plant species diversity, but also adaptive genetic differentiation and heritable genetic variation.

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