



Plant traits co-vary with altitude in grasslands and forests in the European Alps

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Abstract

Biological traits that are advantageous under specific ecological conditions should be present in a large proportion of the species within an ecosystem, where those specific conditions prevail. As climatic conditions change, the frequency of certain traits in plant communities is expected to change with increasing altitude. We examined patterns of change for 13 traits in 120 exhaustive inventories of plants along five altitudinal transects (520–3,100 m a.s.l.) in grasslands and in forests in western Switzerland. The traits selected for study represented the occupation of space, photosynthesis, reproduction and dispersal. For each plot, the mean trait values or the proportions of the trait states were weighted by species cover and examined in relation to the climatic conditions. With increasing altitude in grasslands, we observed a decrease in anemophily and an increase in entomophily, complemented by possible selfing; a decrease in diaspores with appendages adapted to ectozoochory, linked to a decrease in achenes and an increase in capsules. In lowlands, pollination and dispersal are ensured by wind and animals. However, with increasing altitude, insects are mostly responsible for pollination, and wind becomes the main natural dispersal vector. Some traits showed a particularly marked change in the

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alpine belt (e.g. the increase of capsules and the decrease of achenes), confirming that this belt concentrates particularly stressful conditions to plant growth and reproduction (e.g. cold, short growing season) that constrain plants to a limited number of strategies. One adaptation to this stress is to limit investment in dispersal by producing capsules with numerous, tiny seeds that have appendages limited to narrow wings. Forests displayed many of the trends observed in grasslands but with a reduced variability that is likely due to a shorter altitudinal gradient.

Keywords

Alpine ecology Biological traits Environmental gradient Plant functional type
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Electronic supplementary material

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Supplementary material

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