



Effects of experimentally modified soil temperatures and nutrient availability on growth and mycorrhization of *Pinus cembra* at the alpine treeline

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Soil temperature affects litter decomposition, nutrient uptake, root growth and respiration and it is suggested that soil temperature has direct impact on tree growth at the alpine treeline. We have evaluated the impact of experimentally modified soil temperatures and nutrient availability on growth and mycorrhization of *Pinus cembra* at the treeline in the Central Eastern Alps (c. 2150 m a.s.l., Tyrol, Austria). Soil temperature in the rooting zone of naturally grown c. 25 year old trees (n=6 trees per treatment) was altered by shading and heat-trapping using non-transparent and glasshouse foils mounted c. 20 cm above soil surface. Additional trees were selected for a nitrogen fertilisation treatment and as controls. During the study period, mean soil temperatures at 10 cm depth were reduced by c. 3°C at the cooled vs. warmed plots. Soil moisture was not influenced due to soil water transport along the slope. Results revealed that changed soil temperatures did not significantly affect tree growth, gas exchange, needle nutrient content and specific leaf area. We also found no significant difference in degree of mycorrhization or number of mycorrhized root tips between treatments. On the other hand, nitrogen fertilization and a reduction of interspecific root competition led to significantly raised radial stem growth. Results indicate that tree growth at the selected study area was not limited by soil temperature, while interspecific competition for nutrients among trees and low stature vegetation (dwarf shrubs, grasses) had significant impact. Therefore, we suggest that root competition with alpine grassland and dwarf-shrub communities will hamper temperature driven advance of alpine treeline in the course of climate warming.

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