

Frost hardiness of mycorrhizal and non-mycorrhizal scots pine (*Pinus sylvestris* L.) roots

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There are many studies about mycorrhizal associations but only few about their survival and functioning at low temperatures. The aim of this research was to compare the frost hardiness of mycorrhizal and non-mycorrhizal roots of pine (*Pinus sylvestris* L) seedlings. The effect of daylength and temperature on the frost hardiness of roots was also studied.

Seedlings were cultivated in four blocks for 17 weeks. Every block contained both mycorrhizal (*Hebeloma* sp.) and non-mycorrhizal seedlings. After 13 weeks growth in long day and warm temperature growing chamber, half of the mycorrhizal and non-mycorrhizal seedlings were taken to a chamber with short day and low temperature to cold-acclimate. The study was done with low nutrient contents.

The frost hardiness of the roots was assessed with electrolyte leakage tests. From each block three parallel root samples from four treatments were prepared for 6-7 frost exposure temperatures. Analysis of variance was used to compare the results of the electrolyte leakage tests, dry weights and nutrient concentrations of the roots, stems and needles. The inflection point of the temperature response curve for non-mycorrhizal roots with hardening treatment was -6.8°C, mycorrhizal roots with hardening treatment -7.5°C; non-mycorrhizal roots without hardening treatment -9.8°C and mycorrhizal roots without hardening treatment -8.9°C.

No difference was found between frost hardiness of mycorrhizal and non-mycorrhizal pine roots. Also the interaction of mycorrhiza and hardening treatment was not statistically significant. Unexpectedly, the roots without the hardening treatment were more frost hardy than the roots with the hardening treatment. In this study the nutrient contents were very low and that has probably affected also the frost hardiness of the roots. More information about functioning of mycorrhizas at low temperatures is needed especially with different nutrient contents and different mycorrhizal fungi.

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