Root research is producing valuable information about tree growth

Photo: Metla/Tapani Repo

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Root research is producing valuable information about tree growth under changing climate conditions

Under changing climate conditions, new information is urgently needed concerning the functioning of roots so that we can gain a better understanding of tree growth and fluxes in the boreal forest ecosystem. This information includes details of the impact of climate change on the different tree species, forest sites, and treatments, and also on the between-year variations.
Our studies are intended to enable us to assess the root and shoot responses when roots are exposed to a variety of different stress factors at different stages in the annual cycle of trees. The root studies at Metla are conducted under both in laboratory and field conditions.

Efficient research around the year – both within and beyond the laboratory

Metla has a roots laboratory in Joensuu that, in European terms, is unique. In addition, its use is shared by Metla and the University of Eastern Finland.

The roots lab consists of specially designed growth chambers known as *dasotrons*. With these, the annual cycle of trees can be accelerated by changing the dasotron conditions, so that in a single calendar year trees can be raised for the equivalent of two growing seasons and two dormancy periods. Despite their size, it is also possible to study the responses not only of small seedlings but also of saplings.

Since the air and soil conditions can be strictly controlled, our dasotron experiments are providing us with detailed information about the functioning of roots. A variety of different methods for studying roots can now be tested experimentally prior to their application under field conditions, and the results of the laboratory studies can be validated by field studies lasting several years.

Multidisciplinary approach

Our research is concerned with the effects of low soil temperature, soil frost, drought and waterlogging on roots and mycorrhizas, and also with the ways in which changes in a root system impact on shoots. Included in our study methods are microscopy, root minirhizotron imaging (growth dynamics, longevity), high pressure flow metering of root hydraulic conductance, root electrical impedance and morphology, physiological measurements of foliage (chlorophyll fluorescence, photosynthesis, water potential, cold hardiness, trunk sap flow, electrical impedance) and biomass assessment.

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