NSICC

Assessment of New Species to cope with the possible Impacts of Climate Change

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With the collaboration of: WSL, UMR PIAF

Work package: WP2

Context —
With the projected increase in frequency, duration and intensity of droughts, forest management is faced with the challenge of maintaining stable forest ecosystems that continue to provide ecosystem services. This is particularly important for currently dominant tree species that are sensitive to drought, such as European beech and oaks. *Fagus orientalis*, *Quercus cerris and Quercus pubescens* have been proposed as species suitable for assisted migration, however, it is unknown if their drought tolerance is superior to native French forest tree species such as European beech and pedunculate and sessile oaks.

Objectives —
In this project, we will assess the drought response of beech species taking advantage of existing Oriental beech plantations in Switzerland, Germany and France, in the proximity of European beech forests. Using existing genetic data and parentage analysis, the species affiliation of the adult trees
and seedlings of the two species and their hybrid were determined. *Q. cerris* and *Q. pubescens* will be compared with *Q. petraea*. NSICC project aims at disentangling coordinated mechanisms of transpiration related to drought tolerance of species for assisted migration. The applied goal is to promote the selection of tolerant and resilient species that maintain survival under soil water deficit. NSICC is based on a multi-scale study from leaf, wood and root to the whole tree, in controlled conditions, and with a multi-disciplinary approach including ecophysiology, microscopy, isotopy and plant hydraulics. It includes a robust analysis of the functional relevance of the selected physiological properties.

Approaches —
To realize these objectives, the NSICC project is designed in four tasks to provide indicators related to drought adaptation, tightly involving the Silvatech platform. Task 1 will be dedicated to monitoring the drought experiments with robots. Task 2 will study how growth and transpiration are regulated in response to drought. Task 3 and 4 will characterize the mechanisms related to root, wood and leaf hydraulics that play a central role in the adaptation to drought.

Changes in root, wood and leaf anatomy will also be investigated in order to look at whether those variations are coordinated together. We will determine the impact on water use efficiency at leaf and whole plant levels for different integrating periods (daily / seasonal).

Key results —

- carrying out drought experiment on the different species of beech.
- Measurements of foliar gas exchange, growth, pigment contents, biomass, sampling for anatomy, water use efficiency

Perspectives —

Further ecophysiological and anatomical analyzes

The comprehensive approach used in this project will serve as a model for testing other species proposed for assisted migration