POPCC

Impact of drought and air warming in POPlar in Context of Climate Change

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Summary —

Context —
Climate change imposes major societal challenges. By the end of the century, the global temperature is expected to increase by 1.8 to 4 °C (IPCC, 2014) and extremes are already occurring. The expected increase in average temperatures combined with increasing occurrence and severity of summer drought and heat waves will be main stressors for plants. The persistence of forest species depends on the tolerance and the adaptive capacity of tree populations to new climatic conditions and the current species might not be sufficiently adapted. One of the solutions to minimize the risks is diversifying the forest reproductive material with better-adapted species and provenances. The POPCC project focus on poplars, an important economic plantation species in France and envisions to the practical aspect of the adaptative capacity of young seedlings for future implantations.

Objectives —
The main objective of the POPCC project is to improve our understanding of the variability of the response to water deficit in combination with high temperature in poplars. We focus on two important key processes: stomatal and antioxidant regulations and aim to evaluate: i) if some differences in the dynamics of stomatal movements linked to environmental variables exist between genotypes under drought/heat conditions? What is their influence on transpiration efficiency variations? ii) Which leaf detoxication actors are the best players involved in tolerance to stress combination?

Approaches —
Four poplar genotypes from different origins will be selected to analyze differences. Eight unique temperature-regulated growth chambers on the Lorraine University campus will be used. Gas exchange measurements will be performed on leaves and transpiration efficiency will be calculated. The potential involvement of essential detoxification systems (ROS production, constitutive levels of different key metabolites) will be investigated.

Expected results and impacts —
Results will improve knowledge about the mechanisms determining adaptation of trees to multiple abiotic stresses and will ground future solutions to select appropriate plant materials.