PopSCREEN

Poplar Small Secreted Peptides Candidates REgulating Ectomycorrhizal symbiosis during Nitrate stresses

Responsable scientifique : Clémence BONNOT, UMR Interaction Arbre Micro-organismes (IAM) 1136

Partenaires Labex : Marie-Béatrice BOGEAT-TRIBOULOT (CR, UMR SILVA); Annegret KOHLER (IR, UMR IAM)

Summary

Context — Ectomycorrhizal (ECM) symbioses are pivotal for carbon-sequestration and nutrient cycling in boreal and temperate forests. They enhance tree growth in providing limiting mineral nutrients and increasing photosynthesis in high-atmospheric CO_2 levels, but represent an energetic cost for the tree, which divert up to 20% of its carbon resources toward them. To invest their resources efficiently and maintain optimal growth, trees perceive and integrate environmental nutritional cues to regulate adequately their ECM interactions. Increase of the concentration of nutrients in forest soil via fertilization or pollution represses ECM associations and decreases ECM fungal populations, affecting trees growth, health, resilience and carbon-sequestration. The signalling pathways regulating ECM associations in response to nutrient stresses in trees are unknown. However, in herbaceous plants it is known that Small Secreted Peptides (SSPs) transduce local and long-distance signals triggering adaptive responses to abiotic and biotic nutritive cues, including the regulation of their symbiotic associations with nitrogen-fixing bacteria and arbuscular mycorrhizal fungi. Also present in trees, the role of SSPs in mediating nutrient signals regulating ECM associations was not investigated.

Objectives — PopSCREEN aims to verify whether trees' SSPs regulates ECM symbiosis in response to nutrient cues in the model tree *Populus x canescens.*

Approaches — To fulfil this objective we designed as a three steep procedure: the identification of SSPs transcriptionally and specifically regulated by nitrate starvation or excess in ECM poplars using existing transcriptomic datasets*;* the assessment of their effects on ECM symbiosis between *P. x canescens* and the ECM fungus *Laccaria bicolor In vitro*; and the characterisation of their specificity, transposability and dose-effect.

Expected results and impacts — The discovery of SSPs regulating ECM symbiosis in response to nitrate and their subsequent functional characterisation will improve our understanding of the signalling pathways governing the integration of environment nutritive cues that regulates tree-microbes interactions and tree growth and nutrition in a changing environment.