Regulation of ectomycorrhizal symbiosis by nutrient signalling in poplar

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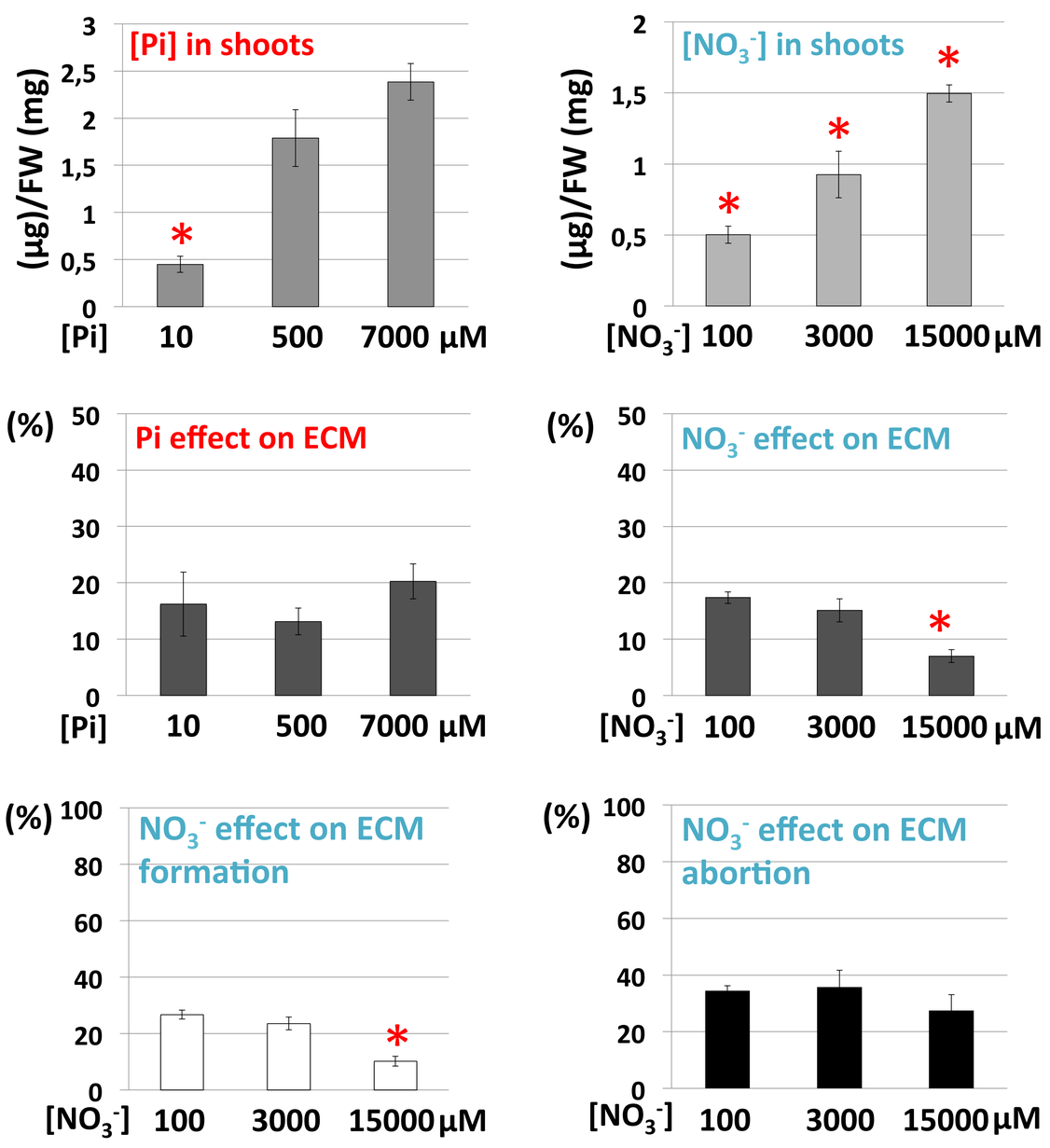
Rationale

Ectomycorrhizal fungi (ECM) provide mineral nutrient to trees in exchange for organic carbon.
Not to spend resources inefficiently, **trees should integrate nutritional cues to regulate these symbiotic associations**.
CLE and CEP Small-Secreted Peptides mediate the **nutrient stress signals** regulating symbiosis with nitrogen-fixing bacteria in Legumes.

We want to investigate **whether and how trees nutrient signals control ECM associations** by:

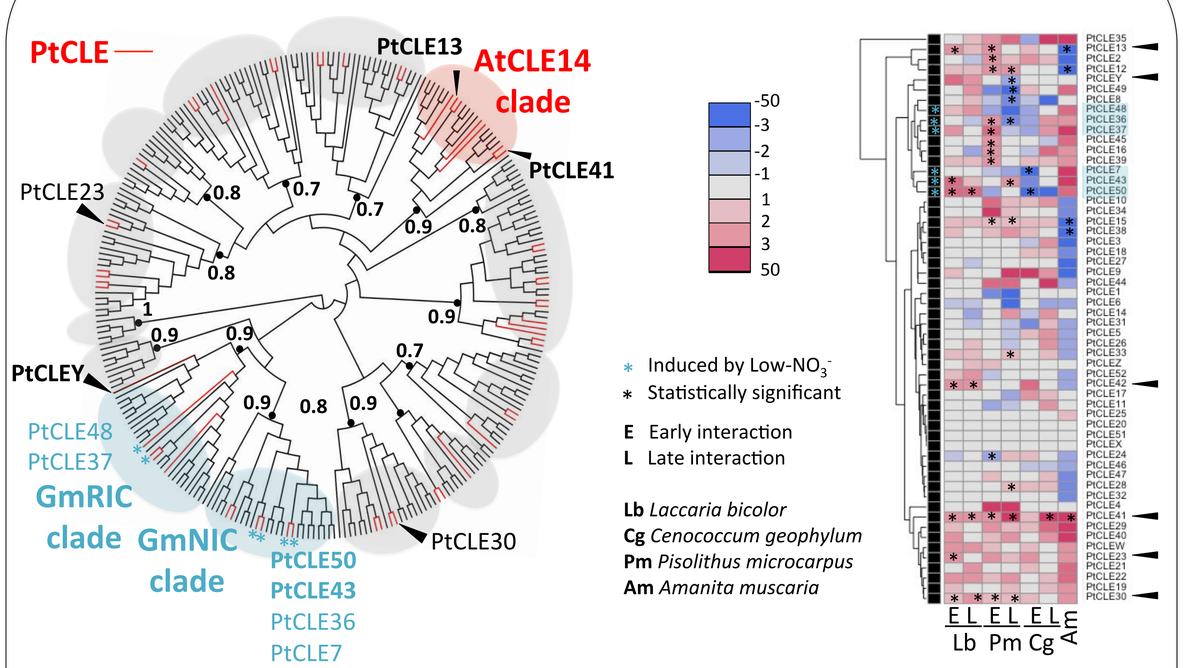
- Characterizing the effects of nutrient stresses on ECM symbiosis in *Populus canescens* associated to the fungus *Laccaria bicolor*
- Identifying CLE and CEP members in *Populus*
- Assessing their role in the transduction of nutrient signals regulating *Populus-Laccaria* ECM by transcriptomics and secretomics.

Nutrient availability regulates ECM

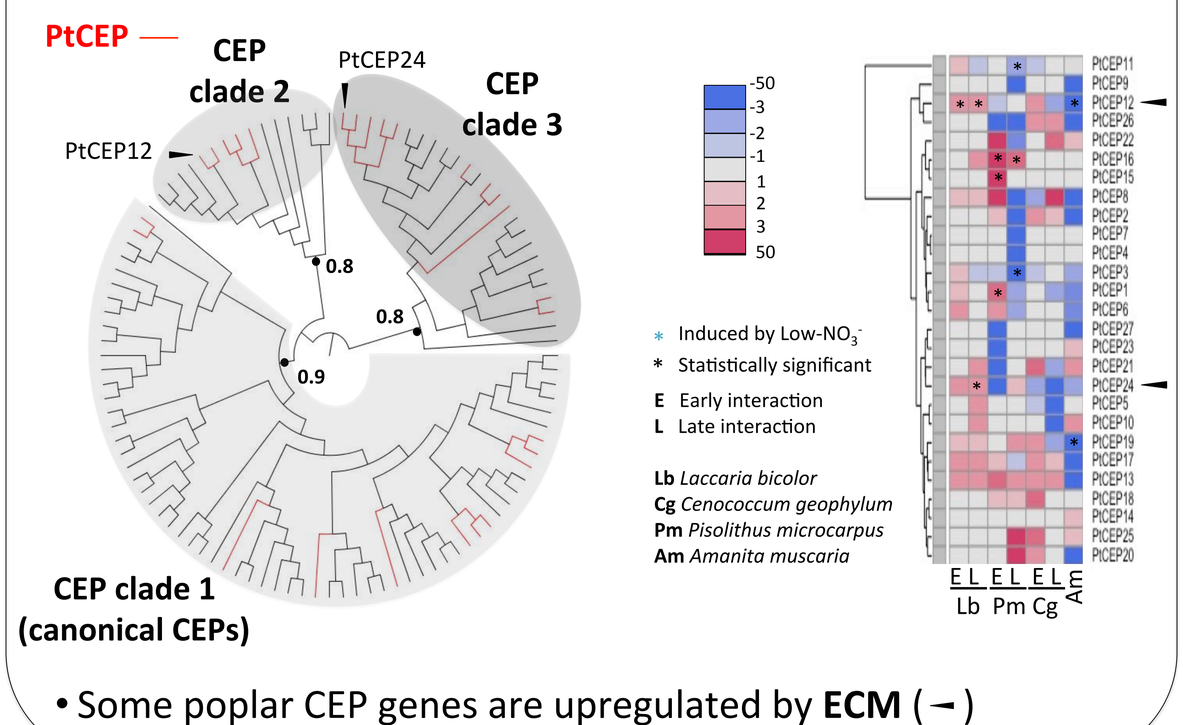


- NO_3^- and **Pi** availability in soil affect their concentrations in poplar
- ECM symbiosis is regulated by $[NO_3^-]$ **BUT NOT** by **[Pi]** availability
- $[NO_3^-]$ availability represses ECM formation

Poplar CLE and CEP families



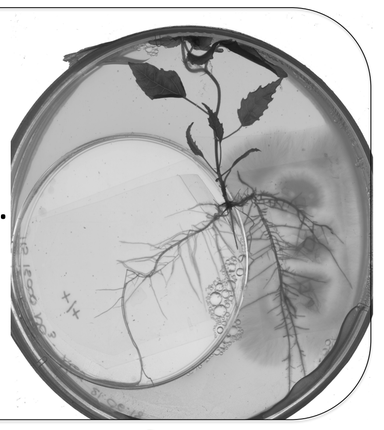
- The expression of some poplar CLEs (*) is enhanced by low $[NO_3^-]$
- Some poplar CLE genes are upregulated by **ECM** (▬)



- Some poplar CEP genes are upregulated by **ECM** (▬)

Conclusion

- *Populus canescens* regulates its association to *Laccaria bicolor* in response to NO_3^-.
- Poplar CLEs transcriptionally upregulated by **N stresses** and orthologous to legumes CLEs mediating **N stresses** signals could mediate the transduction of the signal repressing ECM symbiosis in response to NO_3^- excess in poplar.
- In legumes, pre-existing nodules repress the formation of new nodules, through action of CLE peptides. The ECM-mediated transcriptional induction of poplar CLEs and CEPs suggests similar auto-regulation of ECM symbiosis.



This work was supported by a grant overseen by the French National Research Agency (ANR)
as part of the "Investissements d'Avenir" program (ANR-11-LABX-0002-01, Lab of Excellence ARBRE)