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Invasion success of Black cherry (*Prunus serotina*) in Europe: importance of root traits and associated mycorrhizae

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INTRODUCTION

Native of North America, Black cherry (*Prunus serotina*) is one of the most invasive tree species in European temperate forests. Although the abilities of *P. serotina* for light competition are well documented, we know little about competition for belowground resources (water, nutrients).

Our study aimed to better understand the incidence of belowground processes in the invasion abilities of *P. serotina*.

We investigated two types of competition between *P. serotina* and natives co-occurring species:

- Interference competition

Hypothesis 1: Fine roots morphology of the natives species is negatively affected by *P. serotina*

- Resources exploitation competition

Hypothesis 2: *P. serotina* shows a fine roots morphology more efficient for resource acquisition than native species

METHODS

We compared root functional traits and mycorrhizal colonisation rates between the Black cherry (*Prunus serotina*) and two European native species (European beech *Fagus sylvatica* and Scots pine *Pinus sylvestris*), in pure and mixed-species stands.

We focused on the fine roots of : (i) beech and pine, in pure stand and in mixture with *P. serotina*, (ii) *P. serotina*, in pure stand and in mixture with the beech or the pine. Measured traits:

- mean root diameter
- branching intensity
- specific root length (SRL)
- abundance of arbuscular mycorrhizae (AM)
- abundance of ectomycorrhizae (ECM)



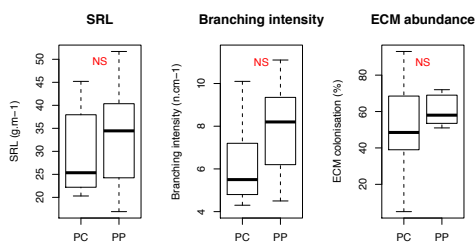
RESULTS

Interference competition

- Native species root traits in mixture with *P. serotina* vs. in pure stands

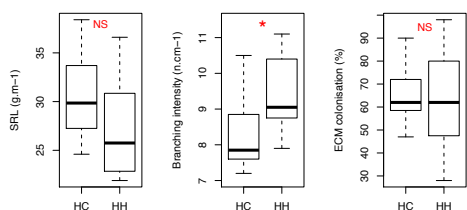
- Pine

PC : Pine with *P. serotina*
PP : Pine in pure stand



- Beech

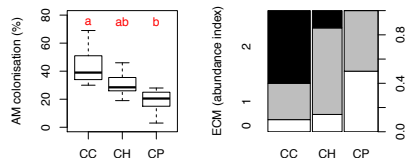
HC : Beech with *P. serotina*
HH : Beech in pure stand



- Root traits of *P. serotina* in pure (CC) vs. mixed stands with beech (CH) or pine (CP)

- no significant difference for SRL, root diameter and branching intensity

- less AM and ECM associations of *P. serotina* with pine than in pure stand



- ➔ No global negative effects of *P. serotina* on native species root traits (SRL, root diameter and branching intensity)
Hypothesis 1 partially rejected

Resources exploitation competition

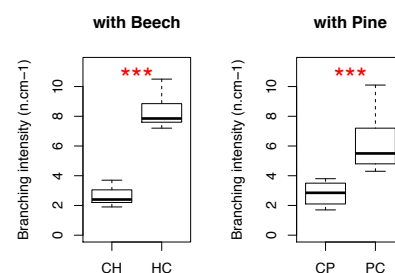
- Fine root morphology comparison between *P. serotina* and native species in mixed stand

- No significant difference for SRL and root diameter

- Significantly lower branching intensity of *P. serotina* compared to the associated native species

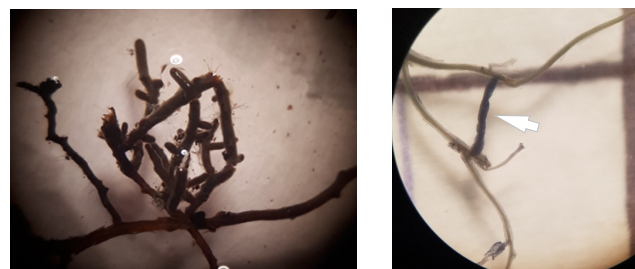
CH : *P. serotina* near beech
HC : Beech near *P. serotina*

CP : *P. serotina* near pine
PC : Pine near *P. serotina*



- ➔ Hypothesis 2 rejected

- However, we observed both arbuscular and ectomycorrhizal associations with *P. serotina*. An advantage due to complementary effect? (Hodge *et al.* 2017)



Arbuscular mycorrhiza and ectomycorrhiza of *P. serotina*

CONCLUSION

Our results show that, although *P. serotina* seemed disadvantaged by its root morphology (compared to pine and beech), the difference of branching intensity could be due to the type of associated mycorrhiza, more than an effect of resource acquisition ability itself (Liese *et al.* 2017). In addition, the ability of *P. serotina* to host both AM and ECM could confer an advantage. Finally, we did not find any global negative effect of *P. serotina* presence on the native species root traits, whereas pine reduced the mycorrhizal colonisation rate of *P. serotina*.

To be continued... Complementary data: characterisation of the microbial community biomass and structure (bacteria, fungi), soil biochemical activity, metagenomic data of the sampled soils.

References

- Hodge, A., 2017. Accessibility of inorganic and organic nutrients for mycorrhizas. In *Mycorrhizal Mediation of Soil* (pp. 129-148).
Liese, R., Alings, K. and Meier, I.C., 2017. Root branching is a leading root trait of the plant economics spectrum in temperate trees. *Frontiers in plant science*, 8, p.315.

