

Fertilization Alters Plant–Fungal Interactions

Background

- Plants are colonized by diverse microorganisms serving important symbiotic functions that are key to plant growth. Harnessing these interactions is useful in both managed and natural ecosystems faced with global change, but it is unclear how environmental and soil characteristics alter these interactions.

Approach

- In this study, we examined how nitrogen addition altered plant–fungal interactions within *Populus deltoides* and *P. trichocarpa*. We manipulated initial inoculum (native soil vs. imported soil for each tree species) and nitrogen addition. After ~10 weeks of growth, we characterized plant growth factors, the soil, and root fungal communities using targeted amplicon sequencing.

Results

- Nitrogen addition altered plant growth factors and variation in factors correlated with shifts in the fungal community (Figure 1) in soil but had less impact in root mycobiomes.
- Tree species, soil origin, and nitrogen addition impacted soil fungal community composition.
- Starting soils collected from Oregon and West Virginia were dominated by the ectomycorrhizal fungi *Inocybe* (56% relative abundance), but when *P. deltoides* was grown in its native West Virginia soil, the roots contained a high abundance of the arbuscular mycorrhizal fungi, *Rhizophagus* – one of the Glomeromycetes (Figure 2).

Significance

- These results highlight that fertilization may decrease the relative abundance of symbiotic soil fungi, and further demonstrate the importance of both plant species and soil origin on plant–fungal interactions. Future research should examine the long-term impact of nutrient addition mediated shifts in fungal communities on plant establishment, plant growth and health, nutrient uptake, and subsequent changes in ecosystem function.

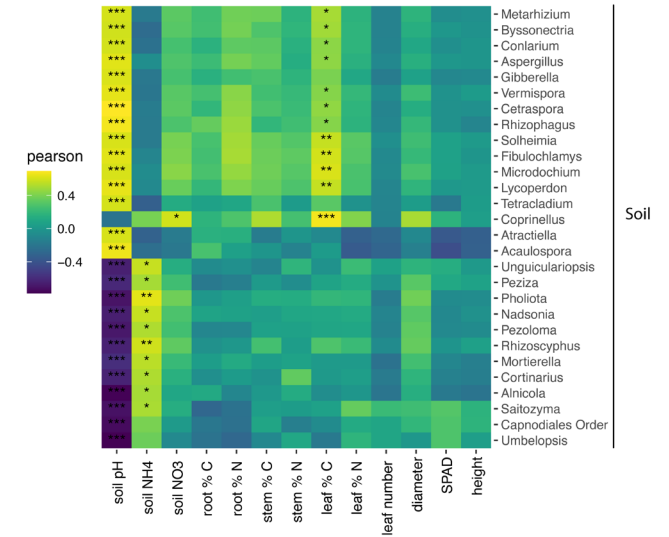


Figure 1. Pearson correlation test of the relationship between fungal genera and plant/soil properties. * $P \leq 0.05$; ** $P \leq 0.01$; *** $p \leq 0.001$.

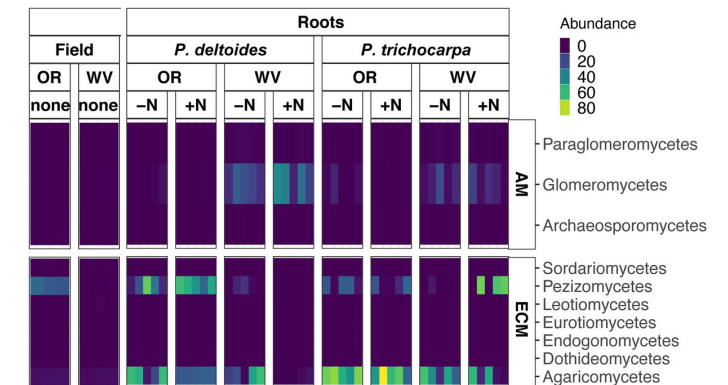


Figure 2. Heatmap of FUNguild assigned arbuscular mycorrhizae (AM) and ectomycorrhizae (ECM) fungal class relative abundance of *P. trichocarpa* and *P. deltoides* root and starting field soil samples with nitrogen addition and different initial soils (WV, West Virginia; OR, Oregon).