

Plant cell wall chemistry changes impact the metabolome and microbiome of *Populus*



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Background

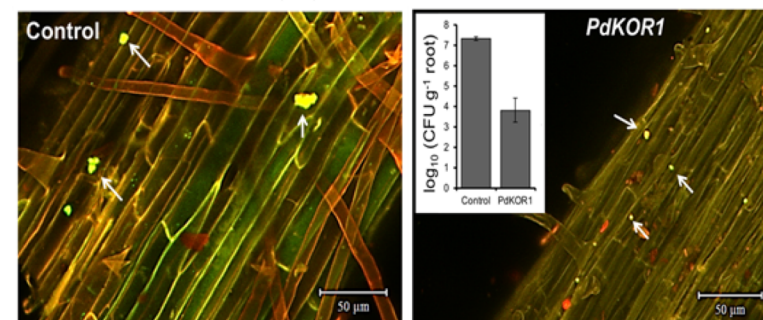
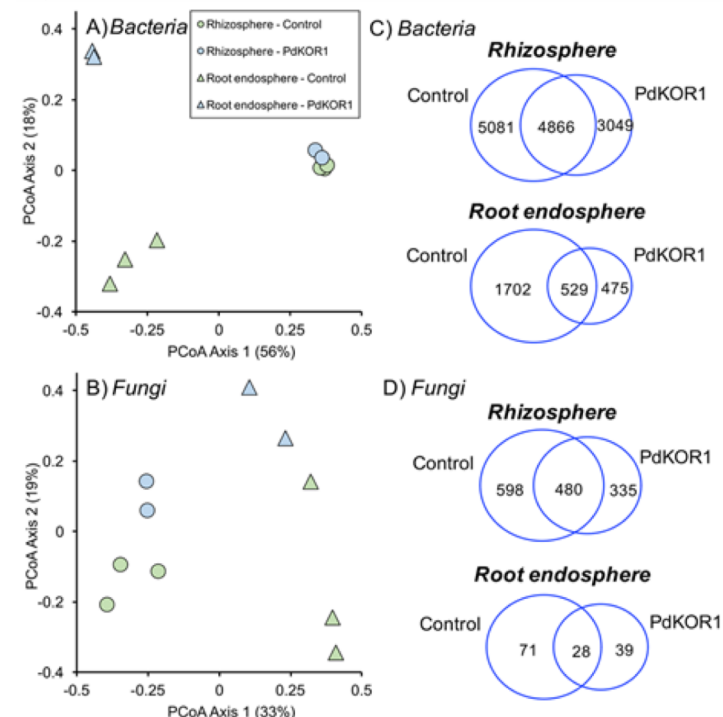
- The downregulation of the *PdKOR1* gene, an endo- β -1,4-endoglucanase, which strongly regulates plant development and overall health, impacts cellulose biosynthesis and cell wall composition in *Populus*.
- The impacts of *PdKOR1* gene downregulation, on the microbiome and root secondary metabolites in field-grown *Populus* were studied.

Science

- Root metabolite profiles were analyzed using GC-MS and showed that specific free amino acids were reduced while levels of salicylic-acid derivatives, flavonoids and caffeoyl-shikimates increased.
- Bacterial and fungal community composition were significantly affected. Reductions in root endophytic groups commonly seen in *Populus* (e.g., α - and γ -proteobacteria) were observed while Actinobacteria levels increased. Fungal *Ascomycota* levels decreased while *Basidiomycota* levels increased.

Significance

- This study shows that modification of plant cell walls via downregulation of *PDKOR1* gene in *Populus* impacts carbon metabolism in roots and alters the root-associated microbial community.
- The functional and ecological implications of biomass chemistry improvements are critical considerations for sustainable bioenergy crop production and management.



Differential bacterial and fungal community composition in rhizosphere and root endosphere habitats of *PdKOR1* and control plants (Top panel). Negative impact on *Pantoea* colonization on *PdKOR1* (bottom left) relative to the vector control (bottom right).