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BACKGROUND

- Long-term measurements of heavy metals pollution → mainly soil & mosses
- However, heavy metals and atmospheric pollutants were also found in tree stems.
- Monitoring/predicting PM concentration → is crucial
- Use of **terrestrial biomonitors** → Trees

Exposure of plants to NPs as atmospheric pollutants
→ little scientific attention

Fate of fine particles (i.e., nanoparticles) in trees and forest ecosystems
→ yet to be explored

OBJECTIVES

1. Localize the nanoparticles in the tree
2. Understand if dendrochemistry can be used as a potential tool to monitor environmental nanoparticle pollution.

We compared leaf-to-root with root-to-leaf NP translocation under experimental conditions in order to better understand the fate of NPs particles in trees.

METHODS

Three treatments

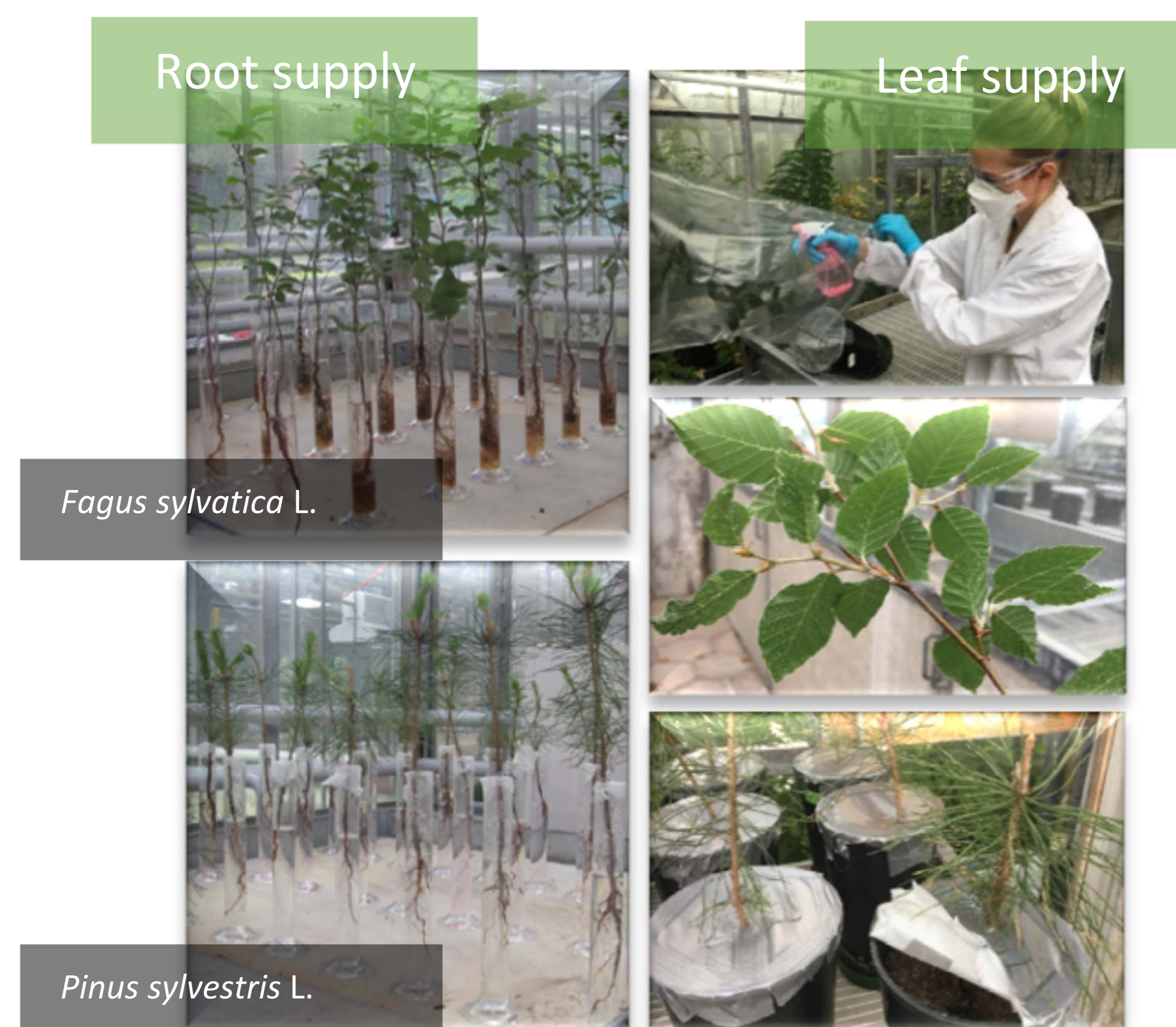
- positive, negative and neutral surface-charged gold nanoparticles (Au NPs - spherical 40 ± 5 nm)

Two supplies

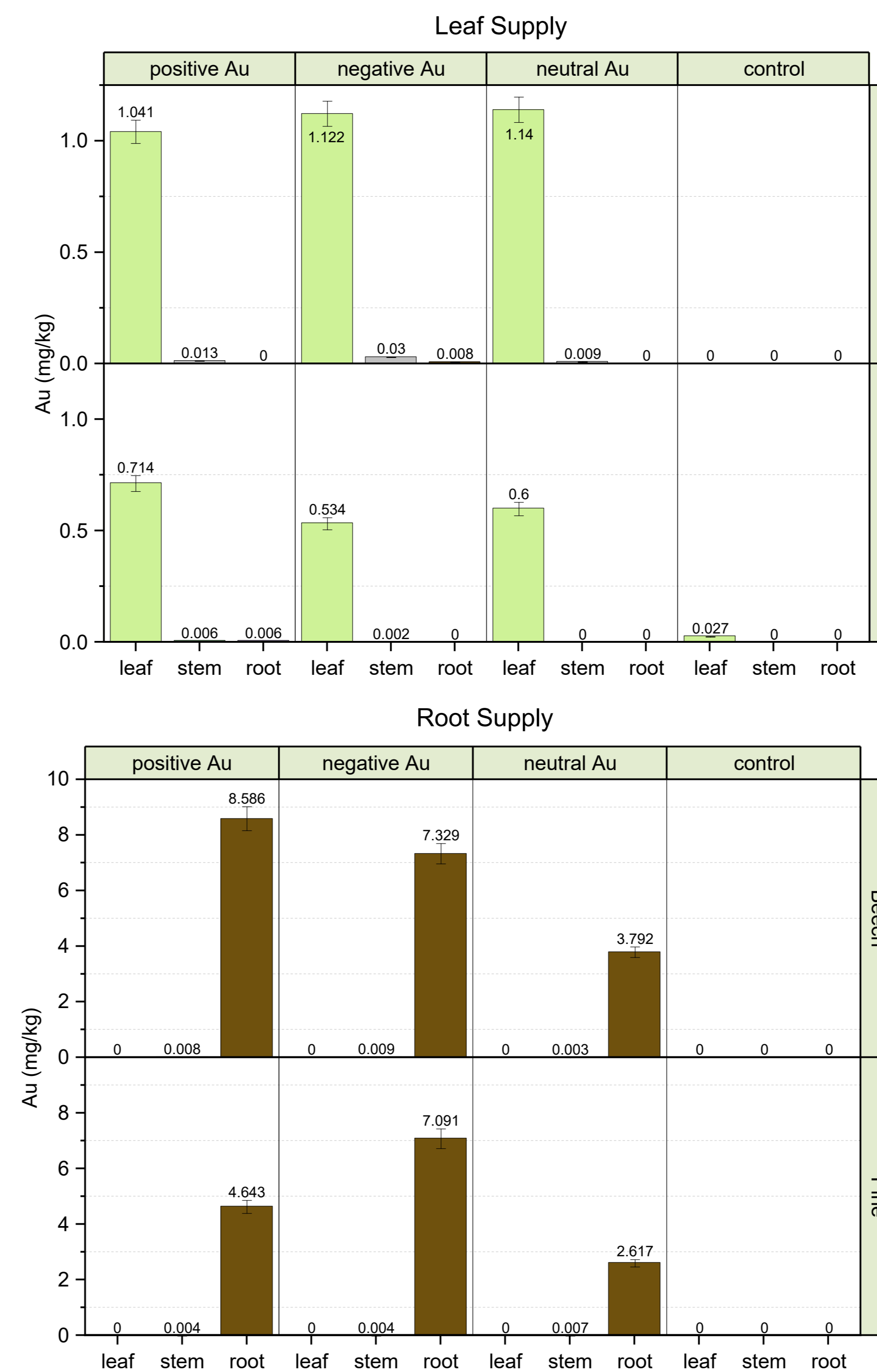
- roots (hydroponics)
- leaves (via spraying)

Time of exposure

- 24 h with NPs, 2 months in soil
- Harvest after 20-40-60 days

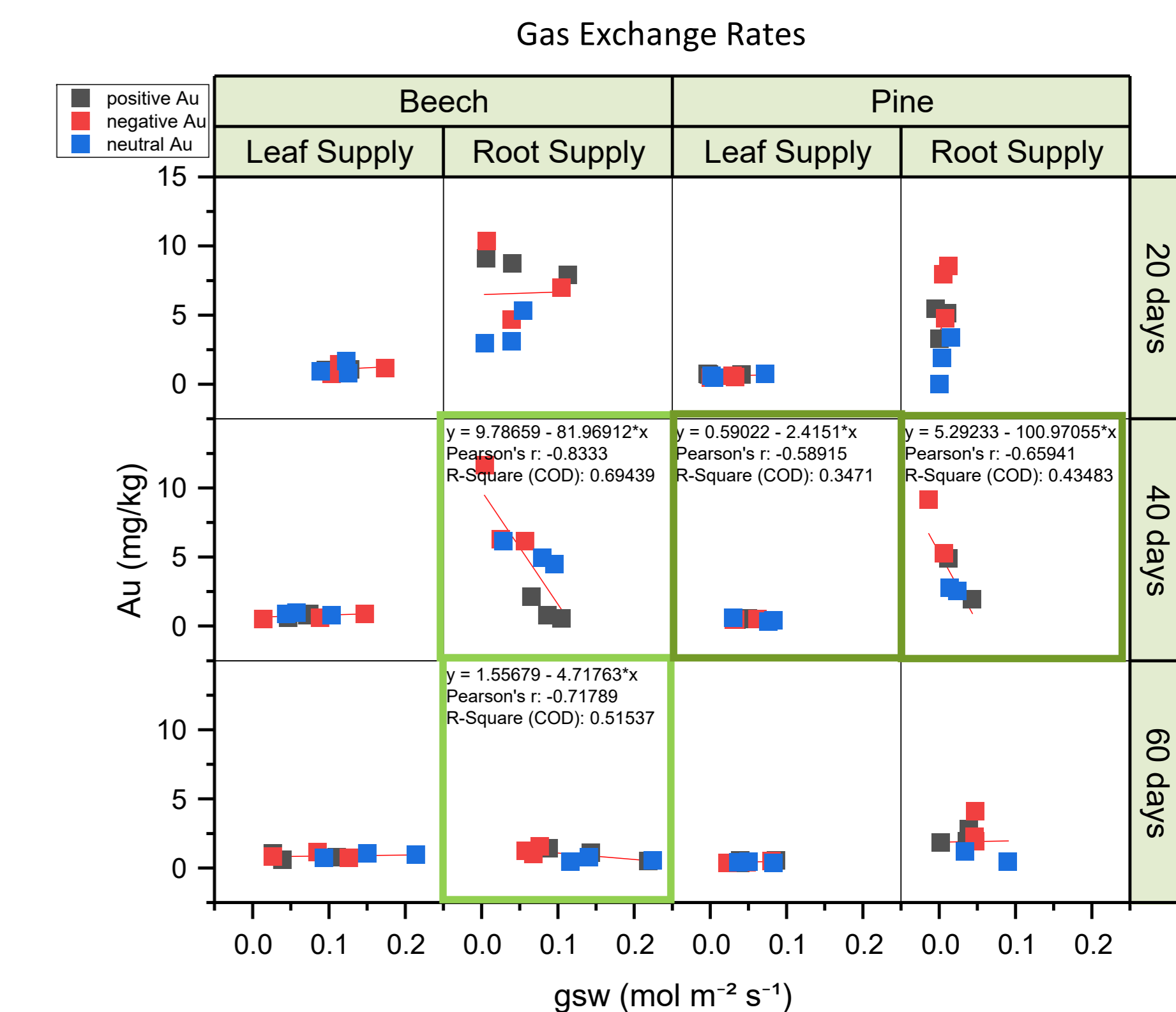


RESULTS



For the **Leaf Supply**, gold concentrations were higher in leaves and stems than in roots.

For the **Root Supply**, higher gold concentration was found in the roots than in the stems, whereas gold was not detected in the leaves.



Negative correlation between total gold content and stomatal activity in beech in root supply 40 and 60 days after the treatment and in pine at 40 days.

CONCLUSIONS

- Trees can take up nanoparticles through both roots and leaves.
- Nanoparticles are transported for longer distances from the leaves than from the roots.
- Higher accumulation in the stem in leaf supply.
- The surface-charge may affect the nanoparticle uptake and transport.

This study provides a better mechanistic understanding of heavy metal and atmospheric pollutant fluxes in trees.