

Predicting plant-soil feedbacks from plant traits

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Credit: Wout Berger

In nature, plants cannot grow without soil biota like fungi and bacteria. Successful plants are able to harness positive, growth-promoting soil organisms, while avoiding the negative effects of others. Which plant traits can predict these interactions, or the success of a plant? Researchers and plant breeders like to know. In a paper in the *Journal of Ecology* of August 24 a team from the Netherlands Institute of Ecology (NIOO-KNAW), Wageningen University and the Universität Leipzig tested exactly this and found thick roots to be a leading trait.

To test the subterranean interactions of plant roots with their soil organisms, also named 'plant-soil feedback', the research team tested the responses of 48 different grassland species to their own soil biota and to control soil. The plant selection comprised grasses, legumes, tall and short herbs. In addition, the authors determined a number of aboveground and belowground plant traits, such as the thickness of roots, and related these traits to plant-soil feedback.

Thick roots help

The international research group found that overall the plant species grew less in soil with their own soil biota. However, when analysed further, it appeared that grasses and small herbs suffered, whereas tall herbs benefitted from growing with their own soil biota. Interestingly, the thinner the [plant roots](#) of a species the more the plants suffered from negative soil biota. The researchers revealed that it was not root thickness per se explaining the net outcome of plant-soil feedback interactions, but rather the combination of thickness and root colonisation by [mycorrhizal fungi](#). These are fungi that help [plants](#) in taking up nutrients and water, while protecting them against pathogens. Plant species with more mycorrhizal fungi in their roots also had more benefits from soil biota in general.

Predicting benefits

With this knowledge on root thickness and mycorrhizal colonisation researchers and crop breeders can predict which [plant species](#) may benefit, and which may suffer from soil biota. This will be useful input for future research. For example, to understand how plant diversity loss influences composition and productivity of natural vegetation.

More information: Roeland Cortois et al. Plant-soil feedbacks: role of plant functional group and plant traits, *Journal of Ecology* (2016). [DOI: 10.1111/1365-2745.12643](https://doi.org/10.1111/1365-2745.12643)

Provided by Wageningen University

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