

Playing hide and seek below the soil

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Below the soil of a diverse grassland area you'll find a jungle of plant roots. It is also home to a wide variety of bacteria and fungi, of which some are pathogenic and looking for a host in the tangle of roots. It appears that this is much more difficult when there is a larger diversity of plants as the host plant is more able to hide among the varied crowd. Greater plant diversity therefore results in fewer diseased plants and more productivity. Personal professor in Plant Ecology Liesje Mommer will be using a VIDI subsidy to look into the mechanisms behind this

phenomenon.

"Quite a lot is known about the interaction between certain fungi and plant varieties – especially agricultural crops, and particularly within the molecular framework," says Mommer. "But this does not apply to the relations between multiple fungi and plant varieties, or in natural ecosystems. This is a very complex issue."

It has been known for some time that a broader diversity of plants in natural grassland increases productivity; almost as if the plants are cheering each other on. The theory was that every variety occupies its own niche, with more varieties meaning enhanced productivity. In her VENI research, Mommer showed that it is much more complicated than that. She used molecular techniques to quantify the various types of roots (which visually all look alike). This showed that the varieties mainly occupy the top layer of the soil, which allowed her to conclude that niches were not applicable.

Supported by the VIDI subsidy from the Netherlands Organisation for Scientific Research (NWO) she is now following up on the previous research with two research assistants. "We are examining plant-soil feedback: the plant influences its own micro-organisms on the root – albeit positively or negatively. In a monoculture the pathogens accumulate which affects the productivity. In a diverse mixture there are fewer pathogens and we will now be studying why that is."

Fungi lose their way

The daisy, for instance, is susceptible to the fungus *Paraphoma chrysanthemicola*. More daisies in the grassland therefore means more of that type of fungus. However, it appears that individual flowers are better at hiding between the roots of other varieties. "A new aspect is whether the daisy is better at hiding between grass varieties or between

the roots of plants that are more closely related. From the perspective of the fungus we could ask ourselves: is it the density of the roots that makes it harder for the fungus to find the [host plant](#)? Or does the fungus lose its way because various plants secrete different sugars and aromatics?"



Intercropping

Mommer and her team are using pot tests to learn the rules of the game; then she will study whether the same rules apply in the field. The

research results may be useful for nature management as well as agriculture. "If you mix the cultivation of varieties, also known as intercropping, the average pathogen reduction is 40 per cent. Nobody knows exactly why. Maybe planting different [plants](#) strategically in between the crops could also have a fungus-reducing effect."

Provided by Netherlands Organisation for Scientific Research (NWO)

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