

New findings in plant root and fungal interaction help to resolve the complexity of soil carbon cycling

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Two new scientific papers accentuate the role of microorganisms in organic matter accumulation and add a new piece in the puzzle of understanding the soil carbon cycle. New findings contribute to

improved process understanding that is needed to create better soil carbon models and more reliable climate scenarios.

A group of Finnish and international researchers have found that interaction between [plant roots](#) and fungi governs stabilization of [carbon](#) in the soil. The researchers investigated the mechanisms behind soil [organic matter](#) formation and decomposition in [boreal forests](#) focusing on plant–soil–microbe synergies and biochemical interactions between microbial and plant inputs.

"The studies confirmed our hypothesis that tannins, abundant plant polyphenolics, and chitin, a polymer present in fungal cell wall, are involved in stabilization of fungal necromass that is highly abundant in soils," says the lead author of the papers, Dr. Bartosz Adamczyk from Luke. "Furthermore, the field experiments showed that plant roots promote a different soil nitrogen economy with higher concentrations of organic soil nitrogen compared to inorganic soil nitrogen. Taken together, these findings provide a novel framework on how plant roots affect soil organic matter decomposition and stabilization."

The need to understand the mechanisms behind carbon stabilization into slowly cycling pools has become urgent due to the threat of climate change. A major part of global carbon pool is stored belowground in boreal forests, mainly in soil organic matter. However, the mechanisms of soil organic matter transformations, i.e. decomposition and stabilization have not been well identified nor yet described in Earth System Models used to estimate global climate change.

"Until now, researchers have focused mostly on plant litter input, the role of soil microbial communities on its decomposition, and on the effects of allocation of plant photosynthates to soil that may induce organic matter decomposition," says Doc. Jussi Heinonsalo from the University of Helsinki. "Our research elucidates the role of plant-derived

active biomolecules that interact with microbial necromass to create stable soil organic matter. This pathway adds a new piece in the puzzle of understanding the highly complex soil carbon cycling and highlights [plants](#)' active role also in [soil](#) organic matter formation and stabilization."

More information: Bartosz Adamczyk et al. Plant roots increase both decomposition and stable organic matter formation in boreal forest soil, *Nature Communications* (2019). [DOI: 10.1038/s41467-019-11993-1](https://doi.org/10.1038/s41467-019-11993-1)

Bartosz Adamczyk et al. Interaction between tannins and fungal necromass stabilizes fungal residues in boreal forest soils, *New Phytologist* (2019). [DOI: 10.1111/nph.15729](https://doi.org/10.1111/nph.15729)

Stephan Hättenschwiler et al. The chitin connection of polyphenols and its ecosystem consequences, *New Phytologist* (2019). [DOI: 10.1111/nph.15840](https://doi.org/10.1111/nph.15840)

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