Future climate models greatly affected by fungi and bacteria

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Researchers from Lund University, Sweden, and USA have shown that our understanding of how organic material is decomposed by fungi and bacteria is fundamentally wrong. This means that climate models that include microorganisms to estimate future climate change must be reconsidered.

When a plant dies, its leaves and branches fall to the ground. Decomposition of soil organic matter is then mainly carried out by fungi and bacteria, which convert dead plant materials into carbon dioxide and mineral nutrients.

Until now, scientists have thought that high quality organic materials, such as leaves that are rich in soluble sugars, are mainly decomposed by bacteria. Lower quality materials, such as cellulose and lignin that are found in wood, are mainly broken down by fungi.

Previous research has also shown that organic material that is broken down by fungi results in a reduced leakage of carbon dioxide and nutrients compared to material decomposed by bacteria.

This has consequences for climate models, since more loss of carbon dioxide and mineral nitrogen would have a direct bearing on the soil's contribution to greenhouse gases and eutrophication.

In a 23-year experiment, researchers from Lund University and USA have examined the relative significance of fungal and bacterial decomposition.

"In contrast with expectations, there was no evidence that high quality organic material was mainly broken down by bacteria. In fact, the data strongly suggested the contrary", says Johannes Rousk, researcher in Microbial Ecology at Lund University in Sweden.

"There was also no evidence to suggest that organic material broken down by fungi reduced the leakage of carbon dioxide into the atmosphere, or the leakage of nutrients. Once again, the results tended to suggest the contrary", says Johannes Rousk.

The results could have consequences not only for future climate models, but may also impact current policies on land use intended to promote fungi. This may be based on flawed assumptions regarding the fungal role in reducing negative environmental effects.

More information: "Revisiting the hypothesis that fungal-to-bacterial dominance characterizes turnover of soil organic matter and nutrients." *Ecological Monographs* 85:457–472. dx.doi.org/10.1890/14-1796.1

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