

A group of ectomycorrhizal fungi restricts organic matter accumulation in boreal forest

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Abstract

Boreal forests soils are important global carbon sinks, with significant storage in the organic topsoil. Decomposition of these stocks requires oxidative enzymes, uniquely produced by fungi, of which many live in ectomycorrhizal symbiosis with the trees. Here we show that presence of a group of closely related species of ectomycorrhizal fungi – *Cortinarius acutus* s.l. – decreased local carbon storage in the organic topsoil by 33% across Swedish forests. Our findings challenge the prevailing view that ectomycorrhizal fungi generally act to increase carbon storage in soils and show that certain ectomycorrhizal fungi can complement free-living decomposers, maintaining nutrient cycling and tree productivity under nutrient poor conditions. The finding that a narrow group of fungi exerts a major influence on carbon cycling refutes the prevailing dogma of functional redundancy among microbial decomposers. *Cortinarius acutus* s.l. responds negatively to forestry, and population declines are likely to increase soil carbon sequestration while impeding nutrient cycling.

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