Researchers reveal mechanisms of soil organic carbon accumulation in acidified forest soils

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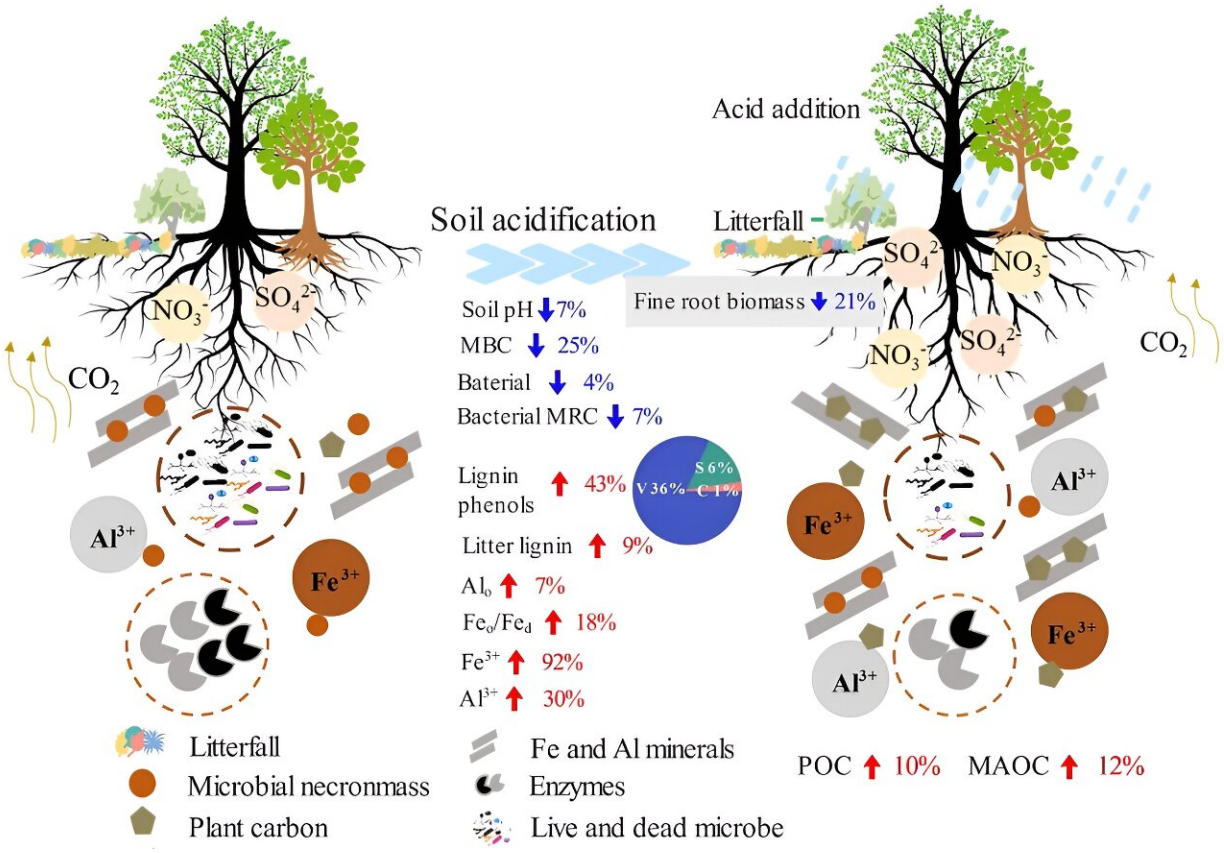

A conceptual diagram of the impact of 11-year acid addition on SOC sequestration in subtropical forest. Credit: Yu Mengxiao

Southern forests contribute more than 50% of the soil organic carbon (SOC) in China's forest ecosystem, and the soil can still accumulate SOC. Deeply developed tropical and subtropical forest soil has undergone severe acidification, but the mechanism of continuous SOC accumulation in deeply acidified forest soils remains unclear.

Based on a long-term simulated acid addition experiment in Dinghushan, Guangdong Province, researchers from the South China Botanical Garden of the Chinese Academy of Sciences conducted a study on the mechanism of SOC accumulation and stabilization in monsoon evergreen broadleaf forests under acid addition treatment.

They found that in terms of carbon composition, acid addition significantly increased the accumulation of particulate organic carbon (POC) and mineral-associated organic carbon (MAOC). Their results were published in *Plant and Soil*.

According to the researchers, in terms of carbon sources, acid addition significantly reduced the accumulation of microbial residual carbon, while significantly increasing lignin phenol from plant sources.

Further analysis revealed that the increase in soil lignin phenol caused by acid addition and the inhibition of soil microbial decomposition promoted the accumulation of POC, while the accumulation of MAOC was mainly attributed to mineral protection by iron-aluminum oxides and metal cations.

These results suggest that mineral protection and continuous input of plant-derived carbon have improved SOC accumulation and stabilization with soil acidification. This study emphasizes that forest soil acidification promotes both mineral protection and the accumulation of plant-derived carbon. The findings provide mechanistic support for the function of continuous carbon sequestration in deeply acidified forest

soils.

More information: Mengxiao Yu et al, Soil acidification enhanced soil carbon sequestration through increased mineral protection, *Plant and Soil* (2024). DOI: 10.1007/s11104-024-06608-8

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