Soil carbon cycling depends on both microbial thermal adaptation and substrate availability

February 28 2024, by Zhang Nannan

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A new study has shed light on how soil microorganisms, which are crucial to the carbon cycle, adapt to different levels of temperature and

organic matter availability.

In this study, researchers from the Institute of Applied Ecology of the Chinese Academy of Sciences collected soil samples from forests across a natural temperature gradient and measured the rate of soil microbial respiration (SMR), the process by which organic matter is broken down into energy and carbon dioxide, under various conditions.

They found that microbial thermal adaptation, which is the ability of microorganisms to regulate their metabolism to cope with changes in environmental temperature, and soil substrate availability, which is the amount of organic matter available for microbial consumption, are both important factors influencing SMR.

They also developed a numerical model to simulate the effects of these factors and other variables on SMR and compared their results with those from two other large-scale datasets.

The study, published in *The ISME Journal*, suggests that soil microorganisms may be more resilient to warming than previously thought.

The results indicate that thermal adaptation in warmer regions may have a more pronounced negative impact on microbial respiration when substrate availability is abundant, according to the researchers.

This study highlights the importance of considering both microbial thermal adaptation and substrate availability in soil carbon cycle models.

More information: Lingrui Qu et al, Stronger compensatory thermal adaptation of soil microbial respiration with higher substrate availability, *The ISME Journal* (2024). DOI: 10.1093/ismejo/wrae025

Provided by Chinese Academy of Sciences