Rising CO₂ levels are likely to have a range of impacts on plant ecosystems. One issue of concern is the relationship between above ground (e.g. by trees) and below ground (e.g. by soil microbes) carbon cycling. Soil fertility appears to play an important role in this process as higher CO₂ levels lead to greater competition between microbes and trees for soil nutrients, according to new research.

Soils are an important sink for carbon and understanding how microbes that fix carbon react to changes in soil fertility and atmospheric CO₂ may become increasingly important in the context of global climate change. Researchers from the University of Tuscia, Italy studied soil microbes at the POPFACE¹ experimental plantation over a five-year period. POPFACE is a plantation of three species of poplar trees in central Italy with controlled atmosphere facilities. This allowed researchers to test the effects of different atmospheric concentrations of CO₂ and levels of soil nitrogen on the ability of microbes to sequester carbon.

The research explored the impact of raised atmospheric CO₂ levels on carbon sequestration by soil microbes. When soils were richer in nitrogen, microbes processed more carbon, leading to a greater release of CO₂ into the atmosphere. This release of CO₂ was also affected by the species of poplar and season. In unfertilised soil where nitrogen was limited, microbes living beneath trees in a raised CO₂ atmosphere sequestered more carbon.

The researchers also investigated whether increased CO₂ levels would alter the microbial community in the plantation. Nitrogen levels were more important than the CO₂ level or the poplar variety in determining the range of microbes in the soil. The research suggests that the application of nitrogen based fertilisers, sometimes used to stimulate growth of young trees, will lead to greater CO₂ loss from soils.

¹ POPFACE was funded by the European Commission’s 4th Framework Programme as part of the Environment and Climate RTD Programme. See: http://www.unitus.it/dipartimenti/disafri/progetti/Popface/home.htm


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