



Microbial activity promotes carbon storage in temperate soils

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Soils are one of the most important carbon sink and sources. Soils contain up to 3/4 of all terrestrial carbon. Beside physical aspects of soil properties (e.g. soil moisture and texture) plants play an important role in carbon sequestration. The positive effect of plant diversity on carbon storage is already known, though the underlying mechanisms remain still unclear. In the frame of the Jena Experiment, a long term biodiversity experiment, we are able to identify these processes. Nine years after a land use change from an arable field to managed grassland the mean soil carbon concentrations increased towards the concentrations of permanent meadows. The increase was positively linked to a plant diversity gradient.

High diverse plant communities produce more biomass, which in turn results in higher amounts of litter inputs. The plant litter is transferred to the soil organic matter by the soil microbial community. However, higher plant diversity also causes changes in micro-climatic condition. For instance, more diverse plant communities have a more dense vegetation structure, which reduced the evaporation of soils surface and thus, increases soil moisture in the top layer. Higher inputs and higher soil moisture lead to an enlarged respiration of the soil microbial community. Most interestingly, the carbon storage in the Jena Experiment was much more related to microbial respiration than to plant root inputs. Moreover, using radiocarbon, we found a significant younger carbon age in soils of more diverse plant communities than in soils of lower diversity, indicating that more fresh carbon is integrated into the carbon pool. Putting these findings together, we could show, that the positive link between plant diversity and carbon storage is due to a higher microbial decomposition of plant litter, pointing out that carbon storage in soils is a function of the microbial community.