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Thema
Kommission II: Bodenchemie

Organische Bodensubstanz: Struktur, Funktionen, Dynamik

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Titel
SOM and microbes – what is left from microbial life in soils

Abstract
Soil organic matter (SOM) is the basis for many soil functions and plays an important role for soil fertility and mitigation of global change. Recently, novel analytical tools have been adopted and significant progress has been made in the field of SOM characterisation and elucidation of SOM processes. The results obtained led to the perception of SOM as a continuum of plant and microbial residues at different stages of decay rather than newly synthesised macromolecules. There is increasing evidence that microbial residues make a large contribution to SOM. Here, we review processes involved in SOM formation and turnover. Plant-derived material is processed by microorganisms and transformed into microbial biomass and finally necromass. The latter is persistent in soil, mainly by its spatial organisation and by interactions with soil minerals. SOM formation therefore is embedded in the triangular relationship between soil, plants and microorganisms. Critical flux controlling factors in this process chain are the energy content and the availability of plant-derived carbon to the microorganisms, their carbon use efficiency, which determines the yield of biomass produced per substrate consumed, and the effectivity of stabilisation of the necromass. These factors depend on microbial abundance and metabolism as well as on environmental factors. Microbes and microbial communities are thus both drivers and substantial contributors to SOM dynamics in soil. This improved understanding offers various options to assign properties and processes in soils to processes of living organisms, which was previously not possible. Mechanistic insight into the carbon flow from plant material input through the microbial foodweb to microbial necromass stabilisation and finally to SOM will be the basis for future improvements of SOM models. These improved models will be the basis of knowledge-based land management options for sustainable soil use.