Tagungsnummer
P21

Thema
Kommission II: Bodenchemie

Organische Bodensubstanz: Struktur, Funktionen, Dynamik

Autoren
B. Michalzik[1], S. Bischoff[1], K. Näthe[1], M. T. Schwarz[2], W. Wilcke[3], L. Thieme[4], J. Siemens[5]
[1]Universität Jena, Bodenkunde, Jena; [2]Office of Landscape, Agriculture and Environment, Zürich; [3]Karlsruhe Institute of Technology (KIT), Institute of Geography and Geoecology, Karlsruhe; [4]Technical University of Berlin, Chair of Soil Science, Berlin; [5]Justus-Liebig-University of Giessen, Institute of Soil Science and Soil Conservation, Gießen

Titel
Tree species driving functional properties of mobile organic matter in throughfall and forest floor solutions of beech, spruce and pine forests

Abstract
The chemical nature of mobile organic matter is a prerequisite for advancing our understanding of the C and nutrient cycling and other forest ecosystem processes. Tree species differ in leaf composition (e.g. nutrient, polyphenol content) and leaf litter quality, which in turn affects a variety of ecosystem processes. However, the composition of OM derived from living plant material via throughfall (TF) and its compositional fate traversing the forest floor (FF) is insufficiently understood.
Are there tree-species specific differences in functional properties (e.g. aromaticity) of OM in TF and FF solutions collected from pine, spruce and different beech stands? And if yes- how do functional properties change with tree species and ecosystem compartment (throughfall vs. forest floor)?
We addressed these questions by applying solid-state C-13 NMR spectroscopy to TF and FF solutions from European beech forests of the three DFG "Biodiversity Exploratories", from Norway spruce sites of the Hainich-Dün-Exploratory and Scots pine stands in East-Thuringia. C-13 NMR spectroscopy revealed a homogeneous composition of TF-DOM under beech between the three Exploratories and exhibited remarkable tree-species related differences in DOM composition: Compared to spruce and pine, TF-DOM under beech showed higher intensities of aromatic and phenolic C (beech > pine > spruce) and lower ones of alkyl-C (pine = (aprox) spruce > beech). Consequently, beech TF exhibited higher aromaticity values and lower alkyl/O-alkyl ratios (i.e. extent of decomposition) in comparison to coniferous TF-DOM.
FF-DOM under beech was very similar between the three "Biodiversity Exploratories" and surprisingly analog to FF-DOM under spruce, while under pine higher intensities of aromatic and phenolic C and alkyl-C (pine > beech = (aprox) spruce) and lower O-alkyl-C signals were observed. Thus, pine FF-DOM exhibited the highest values for both aromaticity (28%) and decomposition (0.87).
In essence, tree-species effects became most notable for the composition and functionality of DOM in TF exhibiting consistently the highest aromatic and phenolic C signals for the beech sites. In view of the allelopathic effectiveness of phenolic compounds, the results might point to an increased allelopathic potential of beech TF, which successfully impairs competing plants and organisms and hence alter ecosystem processes and functioning. In the end, the ecological functions of DOM in ecosystems are still imperfectly understood.