Tagungsnummer
V37

Thema
Kommission III: Bodenbiologie und Bodenökologie

Funktionelle Bedeutung von Mikroorganismengemeinschaften für die Stoffdynamik in Böden

Autoren
M. Görs[1], C. Baum[1], M. Grafe[2], S. Schulz[2], M. Schloter[2], P. Leinweber[1]
[1]Universität Rostock, Agrar-und Umweltwissenschaftliche Fakultät, Bodenkunde, Rostock; [2]Helmholtz Zentrum München, Deutsches Forschungszentrum für Gesundheit und Umwelt (GmbH), Research Unit Comparative Microbiome Analysis, Neuherberg

Titel
Long-term impact of different fertilization management on microbial P mobilization and community structure in the bulk soil and rhizosphere of maize

Abstract
The efficiency of the arable P use can be fundamentally increased by improving the management. We aim to disclose soil microbial fundamentals to optimize P storage, P mobilization and P turnover in agricultural systems for plant growth promotion. We investigated treatments from a long-term fertilization experiment in Rostock (Mecklenburg-Western Pomerania). Soil sampling was conducted in spring and autumn of 2015 and 2016. Microbial P storage, enzymatic P mobilization and the community structure of bacteria and arbuscular mycorrhizal fungi (AMF) as key players of the P mobilization and transfer were analysed at four fertilization treatments with no additional P (control), mineral P-fertilizer (TSP), organic P-fertilizer (compost) and a combination of mineral and organic P-fertilizers. Microbial P (P_{mic}) was significantly affected by the type of P-fertilization and increased by factor two to three in fertilized treatments compared to the control. The microbial P storage did not differ significantly between mineral and organic fertilization treatments. Organic P fertilization leads to a short term increase of the P pool in the soil. Enzyme activities were significantly higher in treatments with organic fertilization compared to those with no or mineral fertilisation, independent on season. This pattern was found for enzymes of the P-cycle (acid and alkaline phosphomonoesterases, phosphodiesterase) and of the C-cycle (ß-glucosidases) indicating a strong correlation between C and P cycling. Further, enzymatic P mobilization is rather controlled by availability of substrates than by the current P demand of the vegetation. Community structure of AMF and bacteria show similar results. A pool of species was site-specific common in each treatment, whereas a small fraction was treatment-specific. The findings contribute to one of the overarching objective of the BonaRes-project (BMBF) InnoSoilPhos to improving the P use efficiency of arable crops by selection of suitable management strategies in the agricultural practice.