Tagungsnummer
V130

Thema
Kommission III: Bodenbiologie und Bodenökologie

Umwelteinflüsse auf Funktion und Diversität von Bodenorganismen

Autoren
K. Munoz[1], S. Thiele-Bruhn[2], D. Diehl[1], M. Meyer[1], C. Buchmann[1], Z. Steinmetz[1], M. Schmidt-Heydt[3], G. E. Schaumann[1]
[1]University of Koblenz-Landau, Institute for Environmental Sciences, Group of Environmental and Soil Chemistry, Landau; [2] Trier University, Soil Science, Faculty of Regional & Environmental Sciences, Trier; [3]Max Rubner-Institute, Department for Safety and Quality for Fruits and Vegetables, Karlsruhe

Titel
Shift of microbial communities and reduced enzymatic activity in soil under plastic mulching system in strawberry cultivation

Abstract
The use of plastic mulching (PM) in agriculture has strongly increased in the last years. Improved water saving and higher soil temperature are some advantages of this management. Yet, an intensive use of PM has been recently linked to negative effects on soil quality. The aim of this study is thus to assess the effects of long-term plastic mulching (PM) on soil microbial indicators. PM was compared with the use of wheat straw mulching (SM), an also widely used mulch material. Samples were collected at two depths (0-5 and 5-10 cm) from strawberry fields, after 4-year management. Cultivation in PM and SM was done in a ridge-furrow system with subsurface irrigation. Soil characterization comprised soil texture and aggregate stability, soil organic carbon, pH and water content. Soil microbial analysis included: Soil microbial biomass (C_{mic}), a fraction of soil cultivable fungi (CFU values), soil bacteria (16S rRNA), denitrifying community (nirK, nirS, narG, napA genes), soil enzyme activity (C-Chitinase, P-Phosphatase and N Leucine-aminopeptidase), deoxynivalenol (DON) content and C_{mic}:C_{org} ratio. Positive effects on soil physicochemical properties were observed under PM as compared to SM, reflected by a higher soil carbon content and better aggregate stability ($p>0.05$). Yet, soil microbial analysis revealed some differences between managements. C_{mic} values were comparable in both systems, showing no differences in soil microbial biomass. In the same way, the analysis of functional genes of the N cycle and the activity of the enzymes P-Phosphatase and N Leucine-aminopeptidase was not affected by the mulching treatment. But, the abundance of bacteria (18%) and a fraction of soil cultivable fungi were reduced by respectively 18 and 62% under PM. Since the C_{mic} values remained similar between treatments, this accounts for a shift of microbial communities under PM. Additionally, C-Chitinase activity declined under PM. Interestingly, this enzyme correlated positively with CFU values ($r=0.781$, $p=0.001$), suggesting that a reduction of the activity is a consequence of the reduction of the fungal biomass. Additionally, a higher deoxynivalenol concentration (2.2 ± 2.4 µg kg^{-1}) and a reduced C_{mic}:C_{org} ratio (1.3±0.3%) were observed under PM, indicative of less appropriate soil conditions after long-term PM management.