

EGU22-7721

<https://doi.org/10.5194/egusphere-egu22-7721>

EGU General Assembly 2022

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Linking litter decomposition characterized by the Tea Bag Index to soil microbial characteristics under long term manure and crop rotation management

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Soil microbiome is an important indicator of soil quality and it is related to various soil functions, including soil carbon cycling. Plant litter decomposition is a key process in carbon cycling, and the use of standardized plant litter for the comparison of decomposition rates between different conditions is a promising method. In this study, we aimed to investigate the difference in microbial community composition in long-term manure amended soils with different crop rotations, and its relationship with litter decomposition by using the Tea Bag Index (TBI) protocol. Green tea and rooibos tea bags were buried pairwise in three long-term experimental sites (LTEs) in Germany, Denmark and Sweden for three months. The TBI, i.e. decomposition rate and stabilization factor, was calculated from the weight loss of tea. The three LTEs have contrasting soil textures and had been manured between 20 and 127 years. The rotation elements in the LTEs include spring barley, winter wheat, winter oat, maize, and grass/clover. The microbial community composition was characterized by biomarkers (phospholipid fatty acids and neutral lipid fatty acids) and 16S and ITS sequencing. Enzyme activity was quantified by fluorescein diacetate hydrolysis analysis. The linkage between TBI and several microbial properties including microbial biomass, enzyme activity, the fungal:bacterial ratio, and the abundance and the diversity of the microbial community, will be discussed. The interactive effect of soil texture and management on the TBI and microbial properties will be addressed, which shall provide implications for soil quality and soil management.