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Funktionelle Bedeutung von Mikroorganismengemeinschaften für die Stoffdynamik in Böden

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Titel

Incorporation of diverse catch crop mixtures in crop rotation cycles increase biodiversity and nutrient availability in soils

Abstract

Catch cropping have positive impacts on plant nutrition, on biological, chemical, and physical soil properties and reduce the amount of fertilizers. Mixtures of diverse catch crops with varying rooting depth and microbial associations can have additional impact on the nutrient and water acquisition from the subsoil. The decay rate of the catch crop litter during the crop rotation controls the release of nutrients for the succeeding crop. This study investigates the release of nutrients and the microbial community in the cause of litter decomposition from catch crops of varying biodiversity. Therefore, litter-bags filled with litter of the previous catch crop rotation was buried in 15 cm soil depth beneath the main crop maize. The experiment used a fallow treatment as control, mustard as single catch crop, a mixture of crimson clover, oat, phacelia and mustard, and the commercial mixture TerraLife(R) (12 plant species). All treatments were applied in triplicates and straw from the previous main crop (winter wheat) was used as control. The litter decay was investigated at five time points, each every four weeks. At each time point 14 macro and micro-elements were measured. The temporal fluctuation within the decomposer community was investigated by phospholipid-fatty-acid and neutral-fatty-acid analysis (PLFA/NLFA) and quantitative-PCR techniques. Mustard litter showed the longest residence time in soil and decrease over the four mix and wheat straw towards the TerraLife mix. Significantly higher amounts of P, K, Fe and Al were found in the litter of the two catch crop mixtures compared to mustard and the control. Phosphorous and K from the mixed catch crops were released in the early stage of decomposition and meet the nutrient demand of those elements in young maize plants. The diversity index and total microbial biomass increasing in the order: fallow, mustard, four mix and TerraLife. Particularly the markers for saprophytic and arbuscular mycorrhiza fungi indicated doubling of their biomass in the mix treatments compared to mustard and the fallow. Application of high diverse catch crop mixtures support the nutrient demand of main crops and support higher microbial biomass and diversity. Crop rotation with high diverse catch crops leads to continuous soil health and is recommended as a sustainable form of farm land management.