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The input of plant litter largely governs carbon dynamics in soils. Microbial degradation of lignin is assumed to control C mineralization and the production of dissolved organic matter (DOM) during later stages of litter decomposition. Global climate change will affect the quantities of plant litter input into forest soils. Therefore, it is necessary to understand how changes in litter input rates influence lignin degradation and related soil processes. Our objective was to study how experimentally doubled annual aboveground litter input and exclusion of fresh litter affect lignin degradation and its transfer into aqueous phase. We analysed soil samples (forest floor, 0-5 cm, 5-10 cm) from 3 long-term experimental sites, located in the mixed beech-oak forest "Steigerwald" (Bavaria, Germany), the douglas fir forest "H.J. Andrews" (Oregon, USA) and the sugar maple forest "Bousson" (Pennsylvania, USA), using the CuO method. The litter input was manipulated over a period of 8, 10 and 16 years, respectively. Additionally, lignin-derived compounds were analysed in DOM samples from one of these sites.

Initial results showed that doubling the annual litter input caused enhanced lignin degradation, possibly as a result of co-metabolic lignin degradation upon the availability of fresh and easily degradable organic matter. Lignin-derived compounds in DOM samples increased upon the litter addition. We assume that accelerated lignin degradation is responsible for the increased production of DOM in the forest floor which is commonly observed with increased litter inputs.

S01.B.03

Decomposition and microbial colonisation of litter affected by the depth of incubation in a column experiment

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An incubation experiment was carried out with maize (*Zea mays* L.) litter to analyze the decomposition and microbial colonization effected by the depth of litter incubation. Therefore 20 cm high columns were filled by two types of disturbed and sifted (2mm) soils. The soils used were a sand from the experimental site of the IBDF in Darmstadt and a loam from the experimental site "Hohes Feld" in Angerstein near Göttingen. Litter of maize was incubated at depths of 0-5 cm and 15-20 cm. The experiment was carried out in PVC columns on sand-bed for 57 days at 19°C and 40% water holding capacity with the following 6 treatments: (1) sand control, (2) loam control, (3) sand with litter at 0-5 cm, (4) sand with litter at 15-20 cm, (5) loam with litter at 0-5 cm, (6) loam with litter at depth of 15-20 cm. After the incubation time of 57 days, the columns were destructively sampled and microbial biomass C, biomass N, ergosterol and the loss of litter were measured. With the analysis of the $\delta^{13}\text{C}$ in litter, soil, microbial biomass and carbon dioxide, the translocation of decomposed carbon was monitored. First results showed no impact of the incubation depth on microbial biomass in the loam, whereas a significant influence ($\alpha=0.05$) was detected in the sand. There, the ergosterol content was significantly higher at 0-5 cm ($1.5 \mu\text{g g}^{-1}$) than at 15-20 cm ($4.0 \mu\text{g g}^{-1}$). Furthermore, the ergosterol content of loam showed no significant differences at 0-5 cm ($3.6 \mu\text{g g}^{-1}$) and at 15-20 cm ($3.9 \mu\text{g g}^{-1}$). The microbial biomass C contents did not differ at any depth in the sand (0-5 cm; $280 \mu\text{g-C g}^{-1}$; 15-20 cm; $340 \mu\text{g-C g}^{-1}$) and in the loam (0-5 cm; $410 \mu\text{g-C g}^{-1}$; 15-20 cm; $330 \mu\text{g-C g}^{-1}$).

S01.B.04

Soil biodegradation of maize roots: relative importance of chemical characteristics and endogenous microflora

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Roots remaining after crop harvests constitute one of the main sources of carbon entering the soil and contribute to build up the soil organic matter pool. Unlike for plant above-ground parts, few studies relate in details the processes driving soil decomposition of roots. The chemical quality of crop residues is a well-known factor that influences their decomposition in soil and associated carbon and nitrogen fluxes. For instance, the proportion of the cell wall fraction and its composition are known to have a strong impact on crop residues decomposition. Roots are characterized by a high content in cell walls when compared to above-ground parts and most of these are strongly lignified.

To assess the precise role of the chemical quality of cell wall components on the kinetics of carbon mineralization, roots of different maize genotypes including "brown-midrib" mutants and normal maize were used. These lines were shown to have similar soluble and cell wall contents while they differ significantly in the cell wall composition despite root anatomy and tissue distribution did not vary. Carbon mineralization kinetics of maize roots differed markedly between the genotypes confirming the importance of specific cell walls properties on carbon mineralization. However, scanning electron microscopy investigations revealed contrasted microbial colonization on root samples before soil decomposition. We hypothesize that these endogenous microorganisms may partly be responsible of the initial variations of the cell walls quality observed between genotypes. A study was thus performed to evaluate the impact of the endogenous microorganisms on root chemical characteristics and on the kinetics of carbon and nitrogen mineralization.

S01.B.05

Effect of litter quality on organic matter composition of earthworm casts

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Earthworms contribute to decomposition and stabilization of organic matter (OM) in soil. The digestion during intestinal passage inside worms may lead to a change in the composition of OM. The Fourier Transform infrared spectroscopy (FTIR) can be used to characterize the OM composition in form of hydrophobic (A) and hydrophilic (B) functional groups (i.e., A/B-ratio). It is largely unknown whether the type of litter the earthworm is feeding affects the OM composition in casts. The objective was to compare the composition of OM within casts of the primary decomposer *Lumbricus terrestris* with that of corresponding litter samples. Litter from 10 different plant species including leaves of birch, beech, oak, spruce, pear, mustard and wheat straw (3 replicates) was offered separately to *L. terrestris* in microcosms containing a Luvisol soil. The OM composition of casts, collected from the soil surface after 4-weeks, and of litter was analyzed with FTIR (DRIFT technique). The A/B ratio of casts was generally increased as compared to that of the soil. For most litter types, the A/B ratio of cast was relatively similar except for casts from birch (*Betula pendula*) and pear (*Pyrus communis*) where the hydrophobic group contents strongly increased (i.e., 3-times higher A/B ratio as compared to wheat (*Triticum aestivum*) or beech (*Fagus sylvatica*) casts). The higher A/B ratios seem to be related to the relative higher C/N ratios in the casts from *Betula pendula* and *Pyrus communis* feeding experiments. The assumption that worm casts may enrich hydrophobic OM components could be verified only partly. The results indicate that digestion of litter by the worm