Forest trees species shape the biochemistry of soil organic matter under the control of their associated microbial communities

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Soil organic matter (SOM) is the largest carbon reservoir on the continents. It contains three to four times more carbon than vegetation. SOM content is particularly high in forest ecosystems, which cover 30% of Europe. The tree species is one of the main factors influencing the storage and biochemistry of soil organic matter, through its litter quality and the species-specific microbial communities.

The objectives of our study were (i) to compare the effect of tree species on the biochemical quality of SOM (ii) to investigate the impact of the biochemical quality of SOM on microbial communities and vice versa.

We hypothesized, that the tree effect on SOM biochemical quality was regulated by the pedoclimatic conditions. Also, we thought that the microbial community enriches the SOM with N compounds and some specifics polysaccharides.

In this aim, we sampled forest floor and topsoil (0-10 cm) in seven monospecific plantations of different tree species in five European sites (total of 24 conditions). We characterized the organic matter using a technique combining pyrolysis and gas chromatography (Pyro-GC/MS). We also described the microbial communities present in these same samples using metabarcoding (16S and ITS Miseq) and we measured microbial functions involved in SOM decomposition and nutrient mobilisation through enzymatic activities.

Our Pyro-GC/MS results revealed that some organic compounds were tree species-specific and others were site-specific. In particular, we showed that N-fixing tree species and arbuscular mycorrhizal (AM) tree species increased the proportion of N-compounds in SOM. These biochemical results will be discussed in relation to microbial community and functional diversity data.

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