Forest plant community as a driver of soil biodiversity: experimental evidence from collembolan assemblages through large-scale and long-term manipulation of tree canopy opening

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Plant-soil interactions are increasingly recognized to play a major role in terrestrial ecosystems functioning. However, few studies to date have focused on slow dynamic ecosystems such as forests. As they are vertically stratified by multiple vegetation strata, tree removal could alter forest plant community through tree canopy opening. Very little is known about cascading effect on soil biodiversity.

We conducted a large-scale, multi-site assessment of collembolan assemblage response to long-term experimental manipulation of tree canopy opening in oak temperate forests. A total of 33 experimental plots were studied covering a large gradient of tree canopy basal area, stand age and local abiotic contexts.

Collembolan abundance strongly declined with tree canopy opening in early forest successional stage and this was mediated by a shift in understory plant community composition. Collembolan functional groups had contrasting response patterns, which were mediated by different ecological factors. Epedaphic abundance and species richness increased with tree canopy opening in relation with the increase in understory plant species richness. In contrast, euedaphic abundance and species richness declined in early forest successional stage in relation with changes in understory plant community composition and species richness, as well as microclimatic conditions.

Overall, our study provides experimental evidence that forest plant community can be a strong driver of collembolan assemblages. It also emphasizes the role of trees as foundation species of forest ecosystems that can shape soil biodiversity through their regulation of understory plant community and ecosystem abiotic conditions.

We have a preference for a standard presentation.

Session targeted
1- Soil ecology, biogeochemistry and plant-soil interactions