

Comparisons of early humification process between coniferous and hardwood forest: Effects of litter species on the compositional quality of soil organic matter in temperate forests in Japan (Biological Interactions in Arable Land-Grassland-Forest Continuums and their Impact on the Ecosystem Functions, 7th International Symposium on Integrated Field Science)

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Comparisons of early humification process between coniferous and hardwood forest: Effects of litter species on the compositional quality of soil organic matter in temperate forests in Japan

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The chemical nature of plant litter, which soil organic matter (SOM) originates, can affect the quality of SOM accumulated in the soils. To quantitatively clarify the effect of the forest type on SOM accumulation, it is necessary to differentiate the SOM accumulation processes on the forest floors between coniferous and hardwood forests in Japan. Authors have already evaluated SOM accumulation processes on the forest floor during an early humification stage in hardwood forest by using a solid-state ¹³C cross polarization magic angle spinning nuclear magnetic resonance (CPMAS NMR) technique (Ono et al., 2009). In the present study, we conducted a litter-bag experiment at coniferous plantations and determined the mass loss rates of the organic carbon components in phased-humified coniferous litters (Japanese cedar and cypress) by applying solid-state ¹³C NMR technique. Organic carbons in both coniferous litter remained almost constant during the early humification process. Therefore, the composition ratios of aliphatic to *O*-alkyl carbons, that are indicators of the degree of litter humification, were quite stable at 0.5 throughout humification although litter masses decreased during the 3-year incubation. This result indicated that the coniferous litters incubated for 3 years were not well humified. And/or the coniferous litter mass loss might be susceptible to physical fragmentation by raindrop impact, freeze-thaw, and drenching-drying as well as biochemical degradation. The mass loss rate of carbon components during the humification for both coniferous litters was in the following order: aliphatic \geq *O*-alkyl > aromatic > carbonyl carbons. Decomposability of each carbon component differed between coniferous and hardwood litters. Especially, mass loss rate of aliphatic carbon in coniferous litters with high initial contents of resins and waxes were higher than in hardwood litters because of their quick leaching. A₁ horizon soils in coniferous forests have higher aliphatic and lower *O*-alkyl carbon contents than that of a hardwood forest. The compositional trend of A₁ horizon soils in the coniferous forests would be caused by high aliphatic supply rate due to high initial contents of resins and waxes in fresh coniferous needle litters and their rapid leaching. In conclusion, the difference of litter origins can strongly affect the processes of organic carbon supply into the soil and SOM accumulation.

References

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