



## **Molecular markers indicate different dynamics of leaves and roots during litter decomposition**

Jens Altmann (1), Boris Jansen (1), Marjo Palviainen (2), and Karsten Kalbitz (1)

(1) IBED, Universiteit van Amsterdam, Amsterdam, Netherlands (j.g.altmann@uva.nl), (2) Department of Forest Ecology, University of Helsinki, Helsinki, Finland

Up to now there is only a poor understanding of the sources contributing to organic carbon in forest soils, especially the contribution of leaves and roots. Studies of the last 2 decades have shown that methods like pyrolysis and CuO oxidation are suitable tools to trace back the main contributors of organic matter in water, sediments and soils. Lignin derived monomers, extractable lipids, cutin and suberin derived compounds have been used frequently for identification of plant material. However, for the selection of suitable biomarker the decomposition patterns and stability of these compounds are of high importance but they are only poorly understood.

In this study we focused on following questions:

- (I) Which compounds are characteristic to identify certain plant parts and plant species?
- (II) How stable are these compounds during the first 3 years of litter decomposition?

We studied the chemical composition of samples from a 3-year litterbag decomposition experiment with roots and leaves of spruce, pine and birch which was done in Finland. Additionally to mass loss, carbon and nitrogen contents, free lipids were extracted; by alkaline hydrolysis non extractable lipids were gained. The extracts were analyzed afterwards by GC-MS, the insoluble residues were analyzed by curie-point Pyrolysis GC-MS. In addition to the identification and quantification of a variety of different compounds and compound ratios we used statistical classification methods to get deeper insights into the patterns of leaf and root-derived biomarkers during litter decomposition.

The mass loss was largely different between the litter species and we always observed larger mass loss for leaf-derived litter in comparison to root derived litter. This trend was also observed by molecular analysis. The increase of the ratio of vanillic acid to vanillin was correlated to the mass loss of the samples over time. This shows that the degree of decomposition of plant material was linked with the degree of lignin degradation.

Preliminary results show, that we were able to distinguish the different species and plant parts using various approaches, e.g., abundance and patterns of different substances and different ratios of compounds. The polyesters suberin and cutin were particularly useful to differentiate between roots and leaves. We conclude that knowledge of the decomposition patterns of molecular markers will largely improve the identification power of organic matter sources in soils.