Linking the degradation of simple and complex carbon substrates with specific microbial groups in soil

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The purpose of the exchange visit was to get a deeper knowledge on ^{13}C-PLFA analyses, focusing especially on the data processing and statistical analyses. Within my thesis I am studying microbial dynamics in cultivated peat soils, and compound-specific PLFA analysis is one of the central methods applied. The scientific aim of this specific joint project was to determine the role of microbial communities in the degradation of carbon substrates. We used two soil types, a mineral soil and an organic (peat) soil, both cultivated with reed canary grass (*Phalaris arundinacea*). The studied substrates were glucose, cellulose, reed canary grass litter and phenol, representing both plant- and soil-derived substrates.

Prior to the visit soil samples were incubated in Kuopio. ^{13}C-labelled substrates; glucose, cellulose, reed canary grass litter and phenol, were added to the samples after one week of preincubation. Control samples with no substrate addition were also included. Respiration rates and δ^{13}C of respired CO_2 were measured once a week during the three week incubation period. After the sampling on the second week, three replicate soils of each treatment were frozen for PLFA analyses. PLFAs were extracted in Kuopio and the extracts were transported to Ghent.

During my visit the samples were first prepared for the analyses. They were then analyzed with GC-C-IRMS for quantitative and qualitative analyses of PLFAs. The data were processed and statistical analyses were done.

The turnover and utilization of substrates by microbes was different in the two soil types. This was evident in both respiration data and PLFA data. Especially, the functional differences in microbial communities of the two soil types revealed by the ^{13}C-PLFA analyses are notable. E.g., phenol seemed to be utilized by a completely different set of microbes in the two soil types, most likely due to the variable nature of peat and mineral soils. The results will be complemented by minor additional analyses and the dataset will be published as an article which will be submitted by autumn 2010.

I gained very much useful knowhow about the technical aspects of ^{13}C-PLFA analyses with GC-C-IRMS as well as data processing and statistical analyses. The research team in Ghent has years of experience with these analyses and their procedures are comprehensive, well established and efficient. The knowhow I attained during the project will help us to develop our analytical procedures in University of Kuopio, for example, the quantitative analyses of PLFAs by GC-C-IRMS. The scientific outcome of the project was more than successful.

In addition to ^{13}C-PLFA analyses, the research groups in University of Ghent and University of Kuopio have also many other research interests in common, e.g. trace gas analysis and nitrogen-related studies, so there are good possibilities for research collaboration also in the future.

All and all, the research exchange visit was very beneficial for me. I am very grateful to Prof. Pascal Boeckx and his research group for sharing their expertise in all the stages of the project. I am also thankful to MOLTER for the grant which made the visit possible.