Effect of AgNPs in the functional and structural microbial community using ARISA and next generation sequencing

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Introduction

- The effect of pollutants on soil microflora is of interest since they play a significant role in the functioning of the nutrient cycles and the retention function for pollutants.
- Is it possible to identify changes in functional and structural microbial community of applied soils through the assessment of the active fraction of genetic material (RNA) and DNA, respectively?
- Objective: Evaluate the performance of two community fingerprinting methods to assess the effect on microbial community, in a study case using silver nanoparticles (AgNPs).

Test setup

Figure 1. Test set up and sampling schedule. Samples were taking at the beginning (day 0) and after 7 and 28 days. On each sampling DNA and RNA (reverse transcribed to cDNA before analysis) of the samples were extracted and the microbial community analyzed with ARISA-PCR and NGS.

Results and conclusion

Microbial community analysis:
- Automated Ribosomal Intergenic Spacer Aanalysis (ARISA). PCR amplification of the 16S-23S intergenic spacer region in the rRNA. ARISA-PCR fragments ranging in size from 400 to 1,200 bp were next discriminated and measured by using an automated electrophoresis system.
- Next generation sequencing (NGS): metabarcoding of the 16S rDNA (Illumina MiSeq Sequencing technology)

- The larger changes in community profiles were observed in the functional community (cDNA).
- Changes in the microbial community were observed during the time course of the experiment, but it was also possible to observe an effect of the AgNPs in the community.
- With both techniques it was possible to observed the mentioned effects (similar clustering).

Recommendation: ARISA-PCR is a cheap and useful technique which is of interest to observe general effect or changes in a community, and NGS provides deeper insight and it is possible to discriminate to a deeper level between samples.