Effects of different land-use types on soil protist community

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Importance of protist in soil

- Protists are the most abundant and diverse eukaryotic organisms in soils. Changes in their dynamics and community structures influence the rate and type of soil formation and soil fertility.
- Soil protists are less investigated compared to other microbes.

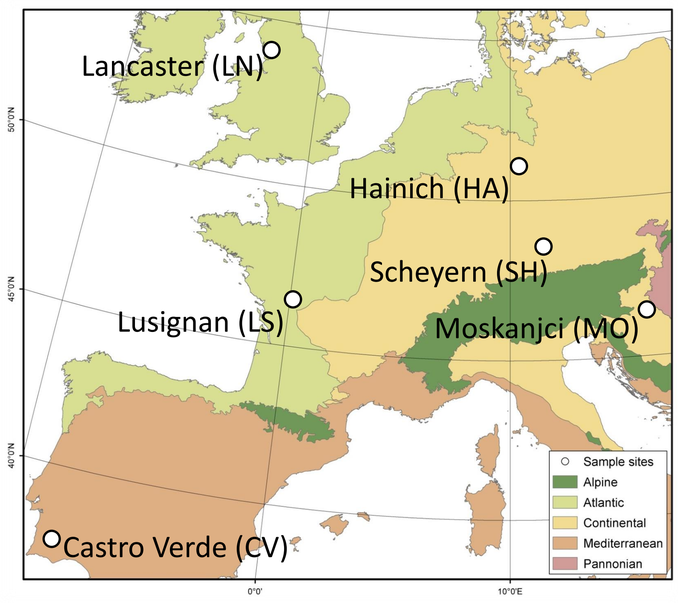
Research Aims

- Investigate the protistan community structure in soils covering different climatic zones in Europe.
  - ➡ **Different soils harbour distinct protist communities?**
- Assess the impact of different land-use types on the relative abundances of the major groups of soil protists.
  - ➡ **Which are the dominant protist taxa?**

Methodology

Field sites (white dots) were chosen from Long-Term Observatories at agricultural regions from four climatic zones in collaboration with EU FP7-264465 EcoFINDERS project.

Three replicated plots per each site of two contrasting treatments, **Control** and **Treatment**. The comparisons included: tillage vs. reduced-tillage (LS; MO); cereal vs. fallow (CV); conventional vs. organic arable management (SH); and intensive vs. extensive grassland management (LN; HA).

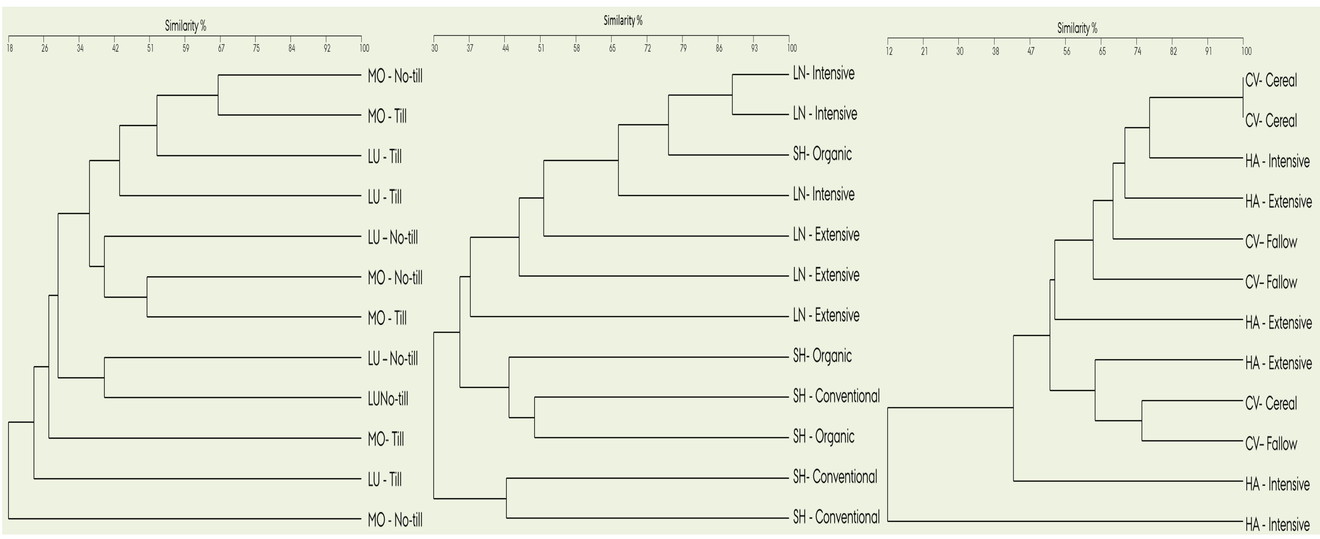


The protist community was investigated by qPCR with general 18S rDNA eukaryotic primers. To assess in more detail the effect of the different land-use types in specific protists, Amoeba and Ciliate communities were investigated by molecular methods, qPCR and DGGE, respectively using specific primers for the different groups.

Results

Ciliate 18S rRNA

DGGE based dendrograms of the ciliate communities in the different soil samples. Similarity matching data was calculated according to cluster analysis based on UPGMA and Dice's coefficient, under 1% tolerance.

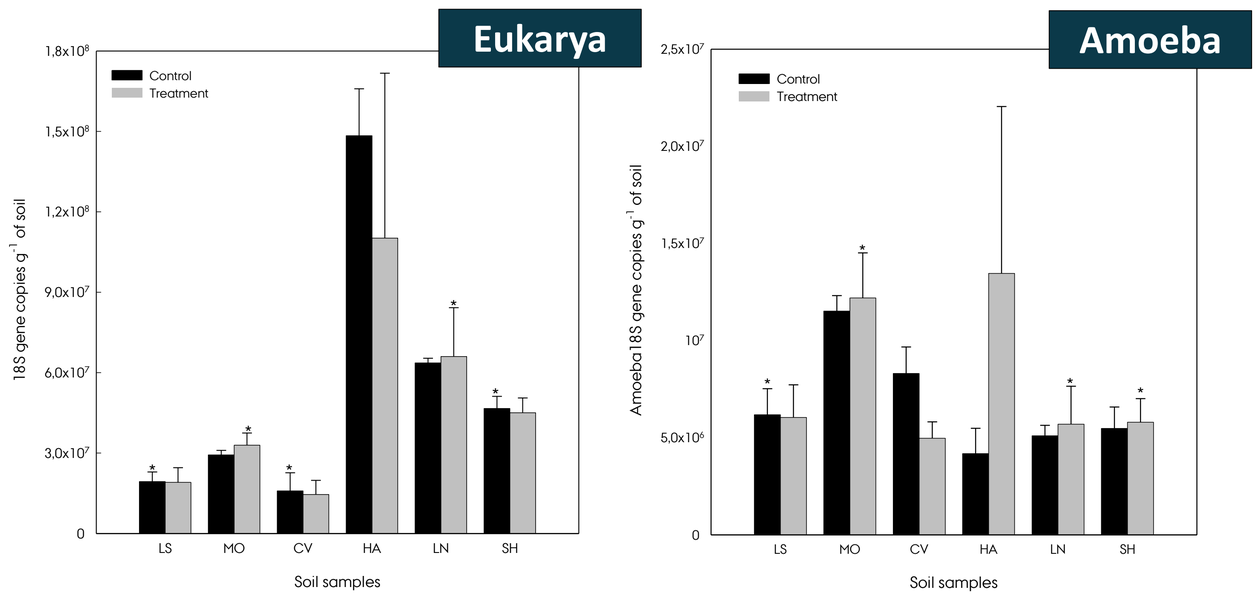


DGGE patterns from Ciliate genetic community structure in all soil samples were heterogeneous and showed different phylotypes. Fingerprints analysis revealed that soil samples tend to group together based on the land-use type.

Results

Quantification of eukaryotic 18S rRNA genes abundances

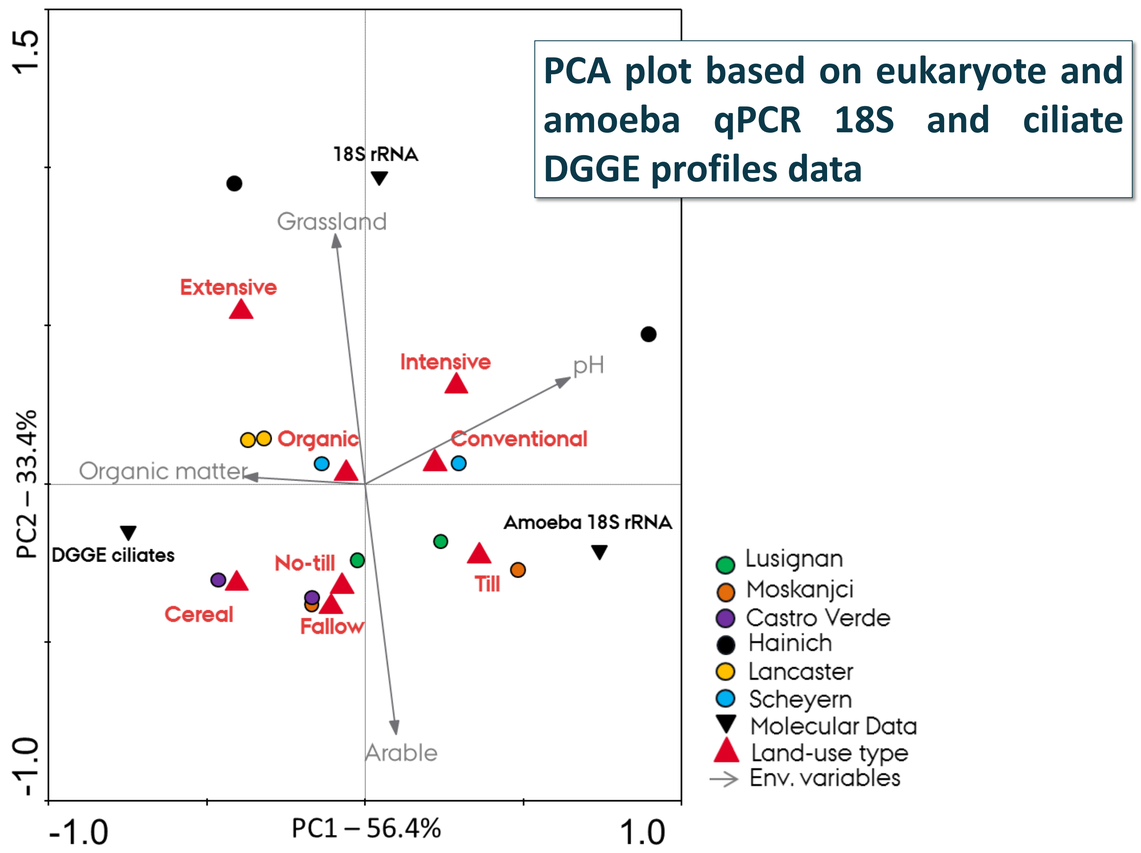
Differences between land-use types (*) Significant differences between treatments (*P* value between 0.005 and 0.04; t-test)



Differences between soil samples with general18S rDNA eukaryotic primers revealed similar relative quantifications for the different soil samples.

Within the same soil samples, differences between land-use types showed significant differences for most of the soil samples, with exception of Hainich samples.

Land-use effect on protist communities



Conclusions

- Although eukaryotic copies per gram of soil seemed to be similar in the soils belonging to different climatic regions, the quantities associated with land-use were distinct enough to identify significant differences in Amoeba composition between treatments. The same was observed with Soil Ciliate composition by DGGE
- Till/No-till and cereal/fallow appeared to be the strongest drivers of Amoeba and Ciliate communities, respectively. Intensive vs. extensive grassland management did not induce significant changes in all soil samples.

Outlook

Protist community in contrasting land-use systems will be studied by metabarcoding with Illumina sequencing.

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