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GEOGRAPHIC LOCATION AND LAND-USE TYPES DRIVE SOIL PROTIST DIVERSITY

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ABSTRACT

Among the processes currently eroding biodiversity, land-use intensification is one of the most important, with likely feedbacks on ecosystem functioning. Previous studies provided the knowledge that soils in managed agricultural systems often have very different bacterial diversity compared to unmanaged systems (Lauber et al., 2013). Protists, as the main components of micro-eukaryotes, are major players in providing ecosystem services, being responsible for approximately 70% of soil animal respiration (Foissner 1987). Ciliates colonize and inhabit virtually all environments and thus, are one of the most successful groups of protists on Earth (Lara and Acosta-Mercado, 2012). Considering their predominance within soils, ciliates represent a key functional group within the soil microbial loop (Lara et al., 2007). Changes in soil ciliate diversity have also been suggested as bioindicator markers of environmental stress (Lara and Acosta-Mercado, 2012). Ciliates are among the most studied group of soil protists, due to their shorter and high copy numbers of SSU sequences that ease amplification, making the existent database a robust starting point for soil protist diversity studies.In this study we investigate protist diversity in a wide range of soil samples that covers the European climatic zones and different vegetation types and land-use. A high-throughput DNA sequencing approach was applied, however previous studies indicated that the use of universal eukaryotic primers do not cover a sufficiently high number of individuals to provide a comprehensive overview of eukaryotic diversity (Lentendu et al., 2014). Therefore, a metabarcoding approach was applied to study soil ciliates, demonstrating that their diversity differs significantly between geographical locations. Likewise, vegetation types and land-use also influenced the overall ciliate community with lower taxonomic levels demonstrating higher levels of differences. The Normal Operating Range of ciliates diversity was established across the tested soils.Upon further development of the metabarcoding approach for different protist groups with relevance to soil, this technique is promising as an indicator of soil protist diversity and hence for monitoring soil biodiversity. Further studies on soil protist diversity and variability across different land-use will help build a more comprehensive understanding of soil function and verify the Normal Operating Ranges.