

Linking above- and belowground diversity: plants and microbes as indicators of grassland management intensity

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Introduction: Within the framework of the BIOINVENT project (<https://www.biodiversa.org/972>), a Pan-European (Sweden, Germany, Switzerland and Portugal/Azores) survey of plant and microbial diversity in grasslands was undertaken. We tested the hypothesis that there was a high correlation between plant and fungal indicator species, depending on the management regime.

Materials and methods: Soil samples from grasslands under three management intensity levels were taken in summer 2017 from all regions. An amplicon-based Illumina Miseq sequence analysis was conducted on the fungal internal transcribed spacer (ITS) region and an OTU table built. Differences in floristic composition were sharp along the Azores gradient of management (semi-natural pasture – low management intensity; permanent pasture – medium management intensity, kept for 10 years; resown pasture – high management intensity, kept for 3 to 5 years). We used redundancy, co-correspondence, correlation and indicator species analyses to estimate the degree of association between plant and microbial communities.

Results: Plant and fungal indicator species were clearly found to be associated with the different management intensity levels (Figure 1), and high correlation values were found between the two types of indicators. That is, correlation was highest for plants and fungi that indicated the same type of grassland management. Similar results were obtained for bacteria.

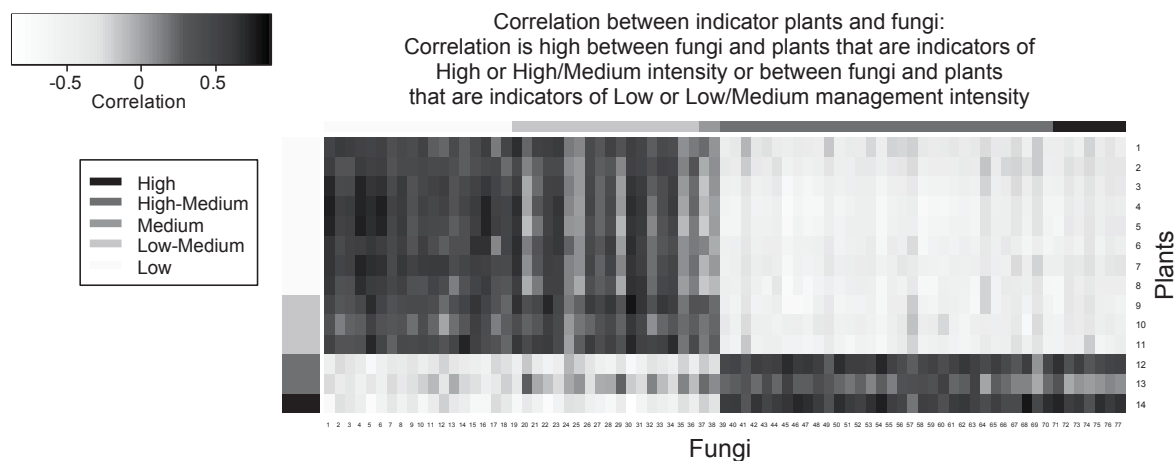


Figure 1. Results of an indicator species analysis based on 60 Azorean pastures. Only species with a significant indicator value ($P < 0.05$), above 0.8, were included (14 plants, 77 fungi). Heatmap: Grey scale of the cells: darker – positive correlation between plants and fungi; Grey scales on sides: darker – higher management intensity.

Conclusion: A link between grassland management and indicator species was clearly revealed. Further, this was expressed as a high correlation between plant and microbial indicators, that is, between above and below-ground communities.