



Effects of change in soil substrate quality, and microbial community composition on the plant community during primary succession

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During succession, plants directly and indirectly affect microbial communities and soil properties. Such below-ground changes then feedback on plants. Although of both substrate-plant and microflora-plant interactions have been studied, the joint interactions of all three remain underexplored. We studied the effects of the microbial community and substrate on plants in a full-factorial experiment. Substrates from 10- and 50-year-old post-mining sites were sterilized. Suspensions from the early and late substrate, each applied in two dilutions (high and low diversity), were used to inoculate each substrate. Substrates were sown with three early and three late successional plant species both with one grass and two herbs.

Aboveground plant biomass was higher in the late than early successional substrate. Grasses were not stimulated by higher diversity of microbial community while herbs grew better with the more diverse microbial community. Late successional herbs grew better with the late successional microbial community but early successional herbs grew well with both early and late microbial community. Grasses were thus very responsive to substrate quality and were not stimulated by microbial diversity while herbs responded positively to microbial diversity. This may affect species replacement during succession, from early succession herbs not demanding to microbial community composition to late succession herbs demanding on specific microflora and grasses demanding on more nutrients. Also nutrient supply and reduction of microbial community is likely to support grasses over herbs.