



Ecological linkages between soil and above-ground communities

R. D. Bardgett (1)

1. Institute of Environmental and Natural Sciences, Lancaster, UK
(r.bardgett@lancaster.ac.uk)

Soil organisms are intimately linked to the plant community. Not only do plants provide carbon and other nutrients to the soil biological community, but plant roots also act as a host for many soil organisms, such as herbivores, pathogens, and symbionts. The soil biota in turn influence plant communities indirectly by recycling dead plant material and making nutrients available for plant use, and directly through the action of the root-associated organisms which selectively influence the growth of plant species, thereby affecting plant productivity and community structure. The increasing recognition of the influence of these components on each other has led to there being much interest amongst ecologists in the role played by these above-ground-below-ground feedbacks in controlling ecosystem processes and properties.

The aim this talk is to demonstrate, using data from recent experiments, how soil biota and their interactions can influence soil nutrient availability to, and the growth of, plants through two different pathways. First, I will demonstrate how variations in the composition and diversity of free-living living soil organisms in the root zone indirectly influence plant growth through influencing microbial sequestration of nitrogen (N), which ultimately determines the availability of N to plants. Specifically, I will present recently published data that supports the notion that changes in the abundance of particular species in the soil food web, rather than variations in diversity *per se*, are the main biotic control of plant-microbial competition for N. Second, I will demonstrate, using data from recent experiments, how biotrophic interactions between living plant roots and their herbivores can have significant influences in plant C nutrition and growth. This will be illustrated using the specific example of root herbivory of legumes. I will present data from recent studies that show that root herbivory of legumes can substantially influence plant C and N allocation, leading to enhanced

exudation of C and N from roots to soil, and increased transfer of this N to neighbouring plant species, thereby benefiting the neighbours growth. I will also demonstrate how trophic interactions between free-living organisms in the root zone and mycorrhizal fungi can also influence this herbivory induced transfer of N from legumes to roots. The overall aim of the talk is to illustrate the importance of soil biota and their interactions with plants as major structuring forces in plant communities.