Soil-plant properties differentially impact microbiome networks in a cover crop biodiversity experiment

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Abstract

Cover crops may influence soil health and functioning. However, little is known about the role of belowground root architectural traits in linking cover crop diversity with rhizosphere soil ecosystem properties. We hypothesize that cover crop diversity may improve root traits, which in return, could influence its effects on essential indicators of soil physicochemical heterogeneity, such as the composition of soil aggregate-size classes and nutrients, the soil organic matter (SOM) and soil organic carbon (SOC) contents, and microbial communities. We studied the impact of cover plant diversity on root traits, soil properties and microbial communities. The four soil aggregate-size classes, such as large macro- (>2000μm), small macro- (<2000-500μm), meso- (<500-250 μm), and micro-aggregates (<250 μm) were separated by the dry sieving. Root traits such as surface area (cm^2) and length (cm) were quantified by image analysis using Winrhizo. The soil nutrient, SOM, and SOC contents were determined by standard methods. Plant diversity improved productivity, root architectural traits, composition of soil aggregate-size classes and nutrients, SOM and SOC contents, composition and networking of microbial communities. Our results suggest that competition among plant roots in species-rich than poor communities may improve rhizosphere soil carbon storage, composition of soil aggregate-size classes and microbial communities.