

Going back to the Roots: Impact of the microbiome on plant health and growth

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Plant roots are colonized by an astounding number of microorganisms that can reach cell densities much greater than the number of plant cells. Various studies have shown that members of the plant microbiome contribute to plant tolerance to abiotic (e.g. drought) and biotic (e.g. diseases) stress factors, but also to plant nutrition, growth and development. For the vast majority of plant-associated microorganisms, however, there is limited knowledge on their support functions and the mechanisms involved. Novel 'omics technologies have provided more in-depth knowledge of the diversity and functioning of the plant microbiome and significant advances are being made to uncover mechanisms, genes and metabolites involved in the multi-trophic interactions in the plant microbiome. To better understand this intriguing complexity, both reductionists' and systems approaches are needed to identify the biotic and abiotic factors involved in microbiome assembly and activity. Here, new results are presented on the role of rhizosphere and endosphere bacteria in protection of plants against soil-borne pathogens. For the rhizosphere bacteria, we showed that representatives of the Proteobacteria protect plants from pathogen infection by the production of chlorinated peptides and alter root architecture and plant growth via modulation of sulfur assimilation. In-depth metagenomic sequencing of the endosphere allowed de novo assembly of high quality bacterial genomes and revealed various yet unknown biosynthetic genes and pathways with new potential for plant protection and antibiotic discovery. An overview will be given on the wealth of genes and functions of the plant microbiome.