3rd International Conference on

Applied Microbiology and Beneficial Microbes

June 06-07, 2018 Osaka, Japan

The plant microbiome: Key to sustainable food production, forestry, bioenergy and reduction of environmental pollutants

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ust as the human microbiome is essential for our health, the microorganisms within plants play critical roles in plant growth and health. The plant microbiota provides numerous benefits to the host plant including nutrient acquisition, phytohormone production, reduced stress responses, antimicrobial production and tolerance to heat, salt; drought and pollutant degradation. We study the microbial endophytes of plants in challenging environments. Poplar (Populus) and willow (Salix) are pioneer plant species able to colonize the rocky substrates deposited following riparian flooding. We demonstrated that N-fixation occurs in these non-nodulating plant species, and that N-fixing bacterial species could be cultured from wild poplar and willow and added to hybrid poplar, increasing growth and N-fixation. Not only did the microbes improve growth of this important bioenergy tree species, they also increased growth, health and yields of an exceptionally broad range of plant species, including rice, tomato, pepper, strawberries, ryegrasses and forest tree species under nutrient-limited conditions. Considering the negative consequences of the production and use of chemical fertilizers, these naturally-occurring bacteria offer a more environmentally-sustainable approach for increasing plant health and growth. In addition to improving nutrient acquisition, inoculation of plants with endophytes improved water use efficiency and drought tolerance of the host plant. With the increased stress of climate change, the implications of plant-microbe symbioses for agriculture, forestry and bioenergy production are profound. Human health is also impacted by the widespread presence of pollutants, both organic and inorganic. Phytoremediation, the use of plants to remove environmental pollutants, can be limited by the phytotoxic effects of the chemicals. However, through specific plant-microbe partnerships, these effects can overcome, leading to substantial improvements in our ability to remove carcinogenic pollutants from the environment.

Biography

Sharon Lafferty Doty is the current Chair of the working group on Environmental and Ecosystem Services of the International Poplar Commission, a branch of the United Nations. She was recently elected as Vice President of the International Symbiosis Society In Charge of Education. She is part of the NSF-funded Plant Nitrogen Network (PlaNNet) to link together researchers. She is a Member of the UW Astrobiology program and the UW-SPACE program. She is part of the School of Environmental and Forest Sciences (SEFS) in the College of the Environment at the University of Washington.

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Applied Microbiology: Open Access