

Microbiology & Applied Microbiology

February 11, 2022 | Webinar

Novel phytomicrobiome members and their plant-regulatory signals as a sustainable crop production strategy

Donald L Smith and Dongmei Lyu

McGill University, Canada

It is increasingly recognized that evolution acts on the combined entity resulting from the plant and its associated microbes, the phytomicrobiome, constituting the holobiont. The plant provides the phytomicrobiome with reduced carbon as an energy source; members of the phytomicrobiome are in the privileged position of being deliberately given a supply recently fixed energy. Because of their relationship, what is good for the plant is good for the members of the phytomicrobiome. We now understand that each plant is generally accompanied with a substantial, complex and carefully orchestrated population of microbes, most of which are beneficial through performing specific activities for the plant. As climate change conditions continue to develop, field crops are facing the stressful conditions more frequently and the levels of stress will be more extreme. The application of beneficial microbes or their products, microbe-to-plant signal compounds, have the potential to be a very low-input, sustainable mechanism to help plants deal with climate change and, specifically, to help the global crop production sector to continue prospering and producing secure food supplies, as challenging climatic conditions become more prevalent. Given the ability of phytomicrobiome, the biological signals, or the microbes themselves could play a major role in increasing the productivity of crops under extreme growth conditions. Thus, beneficial plant-microbe relationships can not only increase plant productivity through things like nutrient provision, but also can play a role in mitigating climate change effects, enhancing agricultural sustainability and reducing greenhouse gas emissions. At this time we are aware that there is a substantial phytomicrobiome associated with every plant, which regulates the plant and is being regulated by the plant. Thus, there is a capacity to use plant growth promoting bacteria (PGPB) to enhance

the climate change resilience of global food production systems. We have developed rapid systems for isolation, screening, characterizing and deployment of beneficial phytomicrobiome members and the plant-growth-enhancing compounds they sometimes produce. From the results of the studies conducted in our laboratory, we have observed the isolated beneficial PGPB and the signal compounds they produce offer enormous potential for a full range of crop species, from corn, soybean, canola to cannabis, under the optimum conditions and stress condition. To date we have isolated and commercialized three materials produced by PGPB. The background to this work and the potential of this area will be synthesized and presented. Beneficial microbe application as sustainable approach should be deployed for the development of more sustainable and climate change resilient crop production and this presentation will outline the route for this effort..

Speaker Biography

Donald L. Smith is distinguished James McGill professor. During his 36 years at McGill, he has conducted research in the production and physiology of crop plants, with an emphasis on plant-microbe interactions. Specific research areas have been: nitrogen metabolism, nitrogen fixation, methods for injection of metabolites into plants, cereal production, plant growth regulators, intercropping, inter-plant competition, plant-microbe signaling, plants and climate change, biofuel crops, crop stress responses, biochar as a soil amendment and cannabis management. He has trained 82 graduate students, ~2/3 at the Ph.D. level, published >360 papers, generated thirteen patents, started a spin-off company (Bios Agriculture Inc.), and commercialized technologies that are now applied to ~100 million ha of cropland per year. He has been cited more than 16,000 times and his current H index is 63 (Research Gate). He has been principal investigator on research grants totaling >\$80 million. He currently leads the biofuelnet and Biomass Canada, (\$13 M).

e: Donald.Smith@mcgill.ca

 Notes: