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George Lazarovits

A&L Biologicals, Canada

A road map to finding microbiomes that most contribute to plant and soil health

The human eye does not have sufficient resolution to unravel the mysteries of soil and plant health. Corn is one of the major grains grown in Canada. The proposed maximum theoretical yield of corn is 450-500 bu/acre, but average growers are producing 150 bu/acre. The main aim of this study is to understand the factors associated with soil health and plant productivity beyond the cropping system and practices. We measure the aspects of soil physical, chemical properties and differences in microorganism communities will be related to yield responses collected from plants harvested from 40 diverse sites across Ontario using aerial infrared photography to identify sections of fields where plants appear healthy or stressed (as we discovered that when corn plants were randomly selected for testing, their microbiomes were quite similar). In this way, we hope to identify some of the primary reasons that confer the unevenness in crop yield seen across the same field when the same farm inputs had been applied. Such findings will be used to improve low production sites, thereby increasing overall yields significantly. Based on results from our previous studies we hypothesized that the difference in the plant productivity at different sites are due the abundance and diversity of microbial communities, and the impacts of their specific activities such as nitrogen fixation, phosphorous solubilisation, root growth promotion, and suppression of plant pathogens. The ratio of different soil chemical parameters affects microbial community richness and diversity in many ways. The study results will be integral in our understanding of the microbial community structures that influence crop productivity either negatively or positively. We expect to find out who are the key microorganisms and their roles in corn growth and productivity. Our initial analysis of data generated through TRFLP and next generation based sequencing of microbial communities showed, the endophytic microbial communities were distinct between low and high producing sites across most of the field sites tested. The high producing area had significantly higher bacterial richness and less diversity than the low producing area. Initial correlation analysis revealed potential positive interactions between the general fertility index, potassium to magnesium ratio, the gram negative and nitrogen fixer bacterial communities with yield and yield related parameters. Taken together, the corn sap bacterial community composition and richness was greatly influenced by soil chemical properties, which may indicate shifts in their functionality despite equal levels of total bacterial loads. The talk will identify factors associated with high and poor yielding sites and how this relates to soil and crop health.

Biography

George Lazarovits graduated with his doctorate from the University of Toronto and worked as a research scientist (Plant Pathology) at Agriculture and Agrifood Canada until 2010. He accepted a position as Research Director at a newly formed company A&L Biologicals where he leads a staff of 5 researchers and 8 technicians. Their research program studies plant health from an ecological perspective where both beneficial and detrimental organisms in soil are considered to affect plant vigor. He has extensive national and international collaborators and has over 120 refereed scientific publications, numerous book chapters and one book. He is an adjunct professor at Western University, was president of the Canadian Phytopathological Society, and has organized and participated as keynote speaker in numerous national and international scientific conferences.

Notes:

lazarovitsg@alcanada.com