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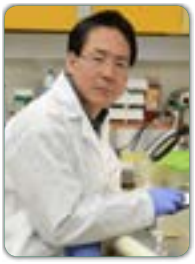

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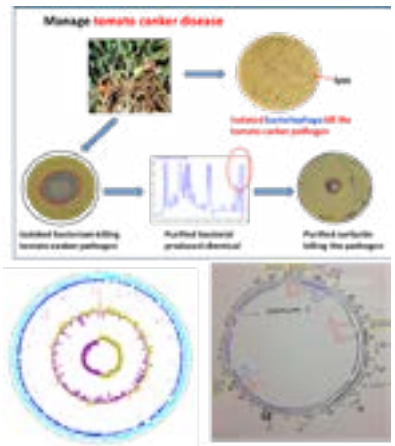
Isolation, characterization and application of beneficial bacteria for sustainable agriculture and horticulture

Chemical fertilizers and pesticides have been heavily used in agriculture and horticulture food production, resulting in serious concerns including food safety and eco-system sustainability. Plant growth promoting bacteria are able to improve plant health and productivity and reduce pathogens and diseases, representing an ecologically-friendly alternative to chemical fertilizers and pesticides. We recently isolated various beneficial bacterial species including *Paenibacillus polymyxa* CR1 (*BMC Genomics* 2014; *Frontiers in Microbiology* 2015; *BMC Microbiology* 2016); *Bacillus velezensis* strain 9D-6 (*BMC Microbiology* 2019); *Bacillus velezensis* strain 1B-23 (*GenBank Accession*: NZ_CP033967.1) and *Burkholderia cenocepacia* CR318 (*Genome Announcements* 2017). These beneficial bacteria are capable of promoting crop health and inhibiting the growth of wide range of bacterial and fungal pathogens. In particular, *Bacillus velezensis* strain 9D-6 and 1B-23 produce surfactin, the most powerful biosurfactant. Surfactin aids in biocontrol through its antimicrobial action and through contribution to reducing biofilm formation. Our study further indicated that *Bacillus velezensis* strain 9D-6 and 1B-23 protect tomato plants from bacterial canker disease caused by *Clavibacter michiganensis pv michiganensis*. Interestingly, we found strain 1B-23 produces surfactin more efficiently at temperature between 16 to 20 °C. Our results suggest the potential of using beneficial bacteria to develop inoculants to protect agricultural important crops while reducing the use of chemical fertilizers and pesticides, towards more sustainable agriculture and horticulture.



Recent Publications

1. 2019. Elliot Grady; Jacqueline MacDonald; Margaret Ho; Brian Weselowski; Tim McDowell; Ori Solomon; Justin Renaud; Ze-Chun Yuan. Characterization and complete genome analysis of the surfactin-producing, plant-protecting bacterium *Bacillus velezensis* 9D-6. BMC Microbiology. 2019. Jan 8;19(1):5. doi: 10.1186/s12866-018-1380-8.
2. 2019. Naeem Nathoo, Jacqueline MacDonald, Brian Weselowski and Ze-Chun Yuan. Comparative transcriptomic analysis reveals different responses of *Arabidospsis thaliana* roots and shoots to infection by *Agrobacterium tumefaciens* in a hydroponic co-cultivation system. 2019. Physiological and Molecular Plant Pathology. Volume 106, April 2019, Pages 109-119.
3. 2018. Munmun Nandi, Jacqueline MacDonald, Peng Liu, Brian Weselowski and Ze-Chun Yuan. *Clavibacter michiganensis* subsp. michiganensis: Bacterial Canker of Tomato, Molecular Interactions and Disease Management. Review. Molecular Plant Pathology. 2018 Mar 12. doi: 10.1111/mpp.12678.
4. 2017. Filip Zekic, Brian Weselowski, Ze-Chun Yuan. Complete Genome Sequence of *Burkholderia cenocepacia* CR318, a Phosphate-Solubilizing Bacterium Isolated from Corn Root. Genome Announcement. 2017. Jun 8;5(23). pii: e00490-17. doi: 10.1128/genomeA.00490-17.
5. 2017. Naeem Nathoo, Mark A. Bernards, Jacqueline MacDonald and Ze-Chun Yuan. A hydroponic co-cultivation system for simultaneous and systematic analysis of plant-microbe molecular interactions and signaling. 2017. Journal of Visualized Experiments. doi: 10.3791/55955. PMID: 28784965.
6. 2016. Elliot Nicholas Grady, Jacqueline MacDonald, Linda Liu, Alex Richman, Ze-Chun Yuan. Current Knowledge and Perspectives of *Paenibacillus:* A Review. BMC Microbial Cell Factories. 2016. 1;15(1):203.
7. 2016. Brian Weselowski, Naeem Amirali Nathoo, Alexander Eastman, Jacqueline MacDonald and Ze-Chun Yuan. Isolation, Identification and characterization of *Paenibacillus polymyxa* CR1 with potentials For biopesticide, biofertilization, biomass degradation and biofuel production. BMC Microbiology, 2016 Oct 18;16(1):244.

Biography

Ze-Chun Yuan is a research scientist and principal investigator at Agriculture and Agri-Food Canada. He is also a research professor and graduate student supervisor at the Department of Microbiology and Immunology, University of Western Ontario, Canada. He has expertise in soil microbiology, bacterial genetics and genomics with great passion in improving crop health and productivity through alternative strategies. He has been isolating and characterizing beneficial microorganisms to manage crop disease or improve crop health and productivity, in particular, developing biofertilzers and biopesticides to reduce the use of classical chemical fertilizers and pesticides in agriculture and horticulture. Ze-Chun Yuan is also interested in developing renewable bioproducts from biomass, in particular, crop residues. His research also involves synthetic biology and microbial engineering aiming at rewiring microbial metabolic pathways towards higher productivity of bio-based products and biochemicals. Ze-Chun Yuan looks for opportunities for collaborative research and training of highly qualified personnel including graduate students and postdoctoral fellows.

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