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Seminar Presentation by

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Massachusetts Institute of Technology

Wednesday, October 21, 2020

1:00-2:00 PM

ZOOM MEETING INFO

https://usc.zoom.us/j/2137400603?pwd=WjNYYk8xdzVpU2M5OEVNS2NHQThlUT09

Meeting ID: 213 740 0603

Passcode: 715351

A Bioinspired Approach to Engineer the Seed Microenvironment to Alleviate Salinity Stress

Abstract:

Scientific discoveries in agriculture and sustainability are at the crossroads of material science, biochemistry, agriculture and biology. They underpin the innovative technological solutions that will impact water, energy and food security (WEFS). These new technologies can then be implemented to address major societal problems that are linked to climate change, soil degradation and soil salinization. In particular, our objective is to augment agricultural outputs (*i.e.* crop yield and production) while decreasing inputs (*e.g.* water, energy, fertilizers, land, pesticides) by deploying plant-growth-promoting-bacteria (PGPBs) in the soil to alleviate plant stressors to be specific soil salinity. Synthetic fertilizer use has been instrumental in food production; however, usage tends to degrade soils (~1/3 of the world's soil is degraded) and salinize our soils while also contributing ~3% of world carbon emissions during fertilizer production. Using PGPBs as a substitute to fertilizer our design approach engineers the seed microenvironment by coating the seeds with PGPB laden materials. PGPBs are well known to enhance crop production and protect plants from biotic and abiotic stresses, while decreasing the need for water and fertilizers[1]. However, the bacteria's delicate nature has hindered their use in current agricultural practices. We use a silk and trehalose mixture that is able to protect, preserve and deliver Rhizobium tropici to Phaseolus Vulgaris. The coated Phaseolus Vulgaris seed are shown to be able to significantly alleviate soil salinity stress in Moroccan soil when compared with uncoated (control) Phaseolus Vulagris seeds.

Biography:

Augustine Zvinavashe is a fifth year PhD candidate in the school of Civil and Environmental Engineering at the Massachusetts Institute of Technology (MIT). He earned an undergraduate degree in Civil and Environmental Engineering and Finance (2016) from MIT and is a previous recipient of the GEM fellowship, Legatum fellowship (Mastercard Foundation), ODGE fellowship & Schoettler scholarship fund for Doctoral Research. His research is focused on "Engineering the seed microenvironment" for delivering

microbes and nutrients to plants to alleviate biotic and abiotic stressors. He currently works in the Marelli Laboratory for Advanced Biopolymers in the Civil and Environmental Engineering Department.