Optimization of the Use of Bioassays and Metabolite Profiling to Confirm Plant Growth Promoting Capabilities of Microbes

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To extract nutrients such as phosphorus, iron, or nitrogen, plants secrete significant amounts of their carbon stores in the form of root exudates and secondary metabolites which interact with rhizosphere micro-organisms which can symbioses or have plant growth promoting effects. The focus in studying bacterial populations for plant growth promoting capabilities has been on in vitro experiments with artificial nutrient media and often without observing plant-microbe interactions in the rhizosphere. Indeed, in vitro screening is an efficient first look into the capabilities of bacteria and as such I am in the midst of organizing a system for the collection of mass amounts of secreted metabolites to incorporate into these screening tests to tailor such methods to specific plant species. In my PhD I am focusing on secondary metabolite interactions between roots and rhizosphere microbes which help plants to acquire nutrients and increase pathogen resilience. My current experiment is set up to show how bacteria can aid tomato (*Solanum lypersicum*) in recovering from nitrogen deficiencies whilst inoculated with either free-living *Azotobacter*, or a soil isolated *Streptomycete* which is a putative nitrogen fixer and has additional strong activity against a variety of fungal pathogens. Additionally, by collecting metabolites from the substrate, I hope to identify any metabolic signals which are upregulated before and after bacterial inoculation.