Community Level Physiological Profiling of the Longleaf Pine Savannah Microbiome

Gavin Treadaway, Dr. Ramya Rajagopalan

Soil microorganisms secrete chemicals into their surroundings, which the root system will uptake and in return release root exudates, which usually consist of low-molecular-weight organic compounds. These root exudates behave as signaling molecules and substrates for microorganisms to recruit beneficial soil bacteria to the plant root system, which will provide the plants with immunity to foliar diseases and pathogen infection. Studies have shown that bacteria on the root surface can protect aerial sections of the plant by promoting induced systemic resistance, a mechanism of increasing physical or chemical barriers of the plant.

The longleaf pine is an endangered species of tree that once covered ~90 million acres of land that is now estimated to only cover 3% of that. Longleaf pines are slow growing but offer better resilience to climate change driven disasters like wildfires or droughts than the faster growing pine trees. My research involved characterizing the carbon-utilization profiles of soil microbiomes from fifteen soil samples collected from a long leaf pine forest region using BIOLOG™ EcoPlates with subsequent data analysis performed in R. Our data indicates that there are significant variations in terms of microbial activity between the soil samples. By analyzing phenotypic data about compounds utilized by the microbiome we can better understand the intricate relationship between the microbiome and the above-ground plant community as well as understand the optimum growing conditions for the trees for a better chance of establishing a thriving ecosystem.