Shan Damas, Michael Botey, Nwadiuto Esiobu

Teagan Duenkel,

research hotspots using UAS as a tool for wetland monitoring, restoration, and management initiatives.

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Genetically modified (GM) crops are a biotechnology phenomenon that is widely utilized in the agricultural industry. This farming technique has become increasingly popular over the years with farmers demonstrating a dependency on artificially manufactured plantations. More than 90% of the soybeans produced by U.S. legume companies are modified by genetic engineers (Maddell, 2019). This large percentage becomes worrisome when soil biodiversity comes into consideration. Most studies focus on the reliability of these crops including pest resistance and longer shelf life, with little to no regard for unveiling the potential dysbiotic effect that transgenic crops could have on the plant's microbial community. The concern then becomes the microbes' inability to flourish off the nutrients secreted from the plant. A change in plant genotype/genome could distort the plant's natural capability to support the microbes via root structure changes and altered foliar niche. More so, an alteration in the plant's genotype could lead to the accumulation of herbicides and agrochemicals which will directly affect endophytes, phyllospheric, and rhizospheric bacteria residency. And although these GMOs are engineered for beneficial agricultural traits in a changing climate; if the plant microbiome is adversely impacted, critical ecological activities - CO2 sequestration, organic matter recycling, and biogeochemical cycling of gasses will be impaired over time.

This research will authenticate the genetically modified seeds and the organic equivalent by PCR. Both will be planted in replications in pot soils with various treatments. Endophytic, rhizospheric, and phyllosphere bacteria will be measured using 16S rRNA amplicon metagenomic sequencing at time zero, and one-month intervals for 4 months. Other measurements include plant biomass, pH balance, and soil parameters. We hypothesize that there will be a difference in the plant microbiome community structure of the genetically modified plant and the organic control. This study will attain a better understanding of the repercussions that transgenic plants could have on soil microbes.

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Plant melatonin has been shown to play crucial functions stress responses and developmental processes. In this study, it was found that melatonin plays an important role in defense against environmental stressors in tobacco Nicotiana tabacum. Environmental stresses including radiation, sodium chloride and potassium chloride concentrations aggregated the CRISPR enabled melatonin-knockout plants as compared to the wild type control plants. Tobacco samples exposed to UV radiation exhibited visual signs of stunted growth and damage to plant tissue. We propose that due to the absence of melatonin biosynthesis, these knockout plants were unable to regulate the expression of various stress-response pathways. Lacking melatonin also leads to the impairment of photosynthetic process, such as biosynthesis of chlorophyll a/b. Under stress, these samples were subjected to manage stresses imposed upon them by spending more energy in either tissue generation or in root generation. The study provides insight into the role melatonin undertakes in alleviating damage caused by environmental stressors that plants face constantly during their life cycle of growth and development.

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This study presents initial macroscopic charcoal trends from our study site, Laguna Arancibia, in Costa Rica. The sediment cores examined were recovered in 2019 from a small (1 ha), moderately deep (6.2 m) lake in the western portion of the Central Valley region. Laguna Arancibia, at 1250 meters elevation, is situated on the Pacific side of the Cordillera de Tilarán within the Puntarenas Province in an area prone to frequent landslide activity. The closed basin Laguna Arancibia occupies likely formed at ca. 1500 cal yr BP by a landslide or slump. Macroscopic charcoal deposited in lake sediments is a direct environmental proxy for fire activity within a watershed. Often influenced by major climate drivers or anthropogenic activity, fire events are frequent and variable even in the tropics. We analyzed macroscopic

charcoal to characterize the intensity and frequency of fire events over time. We counted macroscopic charcoal in two size ranges: 125 to 250 µm and 250 to 500 µm. Out of 162

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ALS is a motor neuron disease that results in the degeneration of the neurons that allow patients to move and that afflicts 31,000 people in the United States, majority of which are between 55 and 75 years old. Typically, within a few years someone diagnosed with ALS will die due to respiratory failure since they become paralyzed and lose the ability to breathe independently. Generally, most patients are going to have the sporadic type of ALS, but about 5-10% of patients will have a familial type of ALS. Gene mutations related to ALS often cause issues in proteins that are meant to process nucleic acids. Stem cells are used to both research ALS and to actually treat it, through the growth of motor neurons and astrocytes. Four genetic mutations - C9ORF72, SOD1, TARDBP, and FUS - contribute to the vast majority of familial cases of ALS, and some treatments exist to target these specifically. Notably, tofersen can be used for those with the SOD1 gene mutation. Other medications, like riluzole, edaravone, and a combination of sodium phenylbutyrate and taurursodiol.

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Traditional agricultural practice has relied on the use of antibiotics, pesticides and chemical fertilizers to combat issues such as stress, disease and nutrient deficiency. Genetically modified bacteria symbionts of plants represent a cost-effective and sustainable solution to issues like these. These organisms could act as micro-machines that could be easily engineered and customized to changing climatic conditions as well as tailored to specific plant needs.

The goal of this research is to examine the transformation efficiencies of bacteria already known to have beneficial impacts on plants, in expressing GFP (Green Fluorescent Protein) introduced via a monomeric plasmid and electroporation. Pseudomonas strains and Bacillus megaterium will be tested. If successful, this will serve as a proof of concept that PGPB (Plant Growth Promoting Bacteria) can be transformed with genes coding for hormones, nutrients and immune signals to aid their plant hosts more effectively in times of stress or nutrient deficiency. It is noteworthy that our engineered next-gen plant boosters will not be released into the environment. Specifically, bacteria native to the microbiomes of crops important to the economy and regional identity of South Florida, like citrus, will be targeted. The innovative delivery system is a subject of a different study.

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preferred song. My project aims to test the prototype setup's functionality and reliability, refine the setup, and complete a full-scale experiment testing the mating preferences for 10 female finches. Currently, I am testing the reliability of one chamber to ensure that the full system is operating with 100% accuracy. I am doing this by comparing data output from the operant system to video recordings of the female's behavior. Once the system is fully functional, I will test whether female finches prefer the songs of familiar males to unfamiliar males. I predict that the females will prefer the songs of familiar males because it is already known that female finches prefer males from their own population over distant populations, healthy males over unhealthy males, songs that were learned accurately over inaccurately, and the familiarity preference has already been shown in other songbird species. This project will add to the existing knowledge of what qualities females look for in males when choosing a mate by determining if the female finches prefer the songs of familiar males over the songs of males never encountered before, and how individual females vary in their preferences.