RESEARCH SYMPOSIUM

Room 308 Poster Session 2 Abstracts

Walker Spivey

(Environment) Crop Physiology, Crop Improvement, Lipidomics, and Climate Change

Heat stress limits the yield and profitability of the peanut crop. Breeding for heat-tolerant peanut varieties has been slow due to incomplete knowledge of the physiological and genetic basis of heat tolerance and a lack of reliable high-throughput screening tools for evaluating large germplasm collections. This research evaluates a peanut breeding population for heat tolerance with the objective to identify physiological and lipidomic mechanisms that confer heat tolerance and can be used as markers for selection in peanut breeding programs. An F6 population of 52 peanut lines, derived from a cross between the heat-tolerant genotype ICGS 76 (PI546372) and the heat susceptible genotype 'Tamrun OL 02' was evaluated for physiological and lipid-metabolic responses to heat stress under controlled environmental conditions. The peanut plants were grown at optimal temperature conditions (29/20°C day max/night min) until the onset of flowering. Thereafter, half of the plants were exposed to high temperatures (38/28°C) for 14 days, while the rest were kept at optimal temperature conditions. Chlorophyll index, chlorophyll fluorescence, and cell membrane damage were measured on the 13th day of the temperature treatment period. Leaf tissue was collected for lipid extraction on the 14th day. We found significant genetic variability in the tested population for heat tolerance based on physiological traits with some genotypes exhibiting transgressive segregation. Further, the lipidomic analysis revealed that specific alterations in the peanut lipidome contribute significantly to differences in heat stress responses among genotypes, and specific lipid species and metabolic traits differentiate heat-tolerant genotypes from the susceptible ones.

Payton Davis

(Environment) Environment, Soil, and Cover Crops

Incorporating cover crops into crop rotations has grown in popularity and usage across the United States. Particularly in the southern Piedmont region of South Carolina, the use of cover crops has been low due to the lack of information on cover crops and their performance within the region. What works well in one region may not work well in another region as the growth and benefits associated with cover crops are dependent on climate,

soil type, and timing of termination. A randomized complete block design was used to investigate how eight cover crops and a fallow treatment influence soil characteristics, biomass, and nutrient credit to the subsequent cash crop. This experiment was conducted in the fall/winter of 2021/2022 and repeated in the fall/winter of 2022/2023. Preliminary results suggest that cover crops have minimal influence on soil characteristics. Soil characteristics, such as volumetric water content seem to be influenced more so by weather. Certain cover crops resulted in different biomasses. Nutrient analysis is forthcoming. This experiment will be repeated fall/winter 2023/2024.

Siddhartha Regmi

(Environment) Sea Level Rise, Coastal Forest Ecology, and Marsh Transgression

Salt marshes provide many valuable ecosystem services, including sequestering carbon and providing habitat to many commercially important fisheries. Yet salt marshes are under direct threat of drowning due to sea level rise. One-way salt marshes can survive sea level rise is to migrate upland into forests in a process known as marsh transgression. This occurs when intruding saltwater causes tree mortality and marsh plants migrate uphill into the newly dead forests, known as ghost forests. This process appears to be accelerating on the east coast of the U.S., however more needs to be known about the mechanisms or rates at which this is occurring. In this project, we will monitor the recovery of coastal forests following extreme mortality caused by hurricane Hugo in 1989. In this study, we will establish new transects from the marsh's edge into the forests to monitor the transition from coastal forests to the salt marsh in Hobcaw Barony, South Carolina, where relative sea level rise has averaged 3-4 mm/y since 1920. Combining and analyzing the historical forest data collected more than 27 years after Hurricane Hugo, we can quantify the mortality rate of trees due to storm surges and saltwater intrusion. We will be collecting the data for several more years on the historic forest plots adjacent to the salt marsh, and perform analyses of existing data that are critical to assess the effect of the sea level rise on coastal ecosystems.

Julia Boone

(Environment) UAV-based Wildfire Monitoring and Detection, Multi-agent Systems

Wildfires pose a severe risk to human life and property. Rapid response is key to minimize the damages incurred. Current forest monitoring systems include satellite remote sensing, piloted aircraft, and observation towers. Presently, these methods fail to meet the real-time

temporal and spatial requirements needed to detect and alert for wildfires in their earliest stages. Conversely, unmanned aerial vehicles (UAVs) have unique 3D mobility, low flight altitude, and easy deployment mechanisms that allow for them to meet these requirements. UAVs are also capable of accessing remote areas that ground vehicles cannot reach and can more safely fly in conditions that pose danger to firefighters and piloted aircraft attempting to assess the situation. The use of UAVs for wildfire mitigation provides an overall safer and more efficient way to respond to these disasters.

In our work, we focus on the development of the various AI solutions needed to enable UAVs for fire detection and monitoring tasks. For instance, models capable of real-time inference with both limited pre-existing training data and hardware are critical for fire detection and monitoring tasks. We also focus on the complexities of AI-based decision making for UAVs. UAVs must be capable of efficient autonomous decision making that can still operate in harsh wildfire environments to ensure that they can adequately meet the real-time wildfire mitigation requirements. Through the development of these various AI-based solutions, we create tools that can be leveraged to efficiently and effectively detect and monitor wildfires via UAVs.

Suzanne Crull

(Environment) Environmental Microbiology

Legionella is a genus of free living environmental bacteria commonly found in man-made water sources. Legionella contains pathogenic species such as Legionella pneumophila which can cause Pontiac fever and Legionnaire's Disease. Pontiac fever results in mild flu-like symptoms, while Legionnaire's disease results in pneumonia and potentially death. Legionnaire's disease outbreaks are a result of an increase in L. pneumophilia in contaminated water supplies that become aerosolized such as in cooling towers. A potential cause of this increase in Legionella is its ability to reproduce within amoebas. Not only do amoebas provide protection to Legionella from disinfectants, there is evidence that Legionella released from the amoebas have increased resistance to chemical disinfection, pH, temperature, and have increased infectivity in mammalian hosts. Therefore, it is critical to characterize the relationship between different amoebas and Legionella for outbreak prevention. In this study, water and soil samples and environmental data were collected from a water cooling tower in South Carolina over a 6 month period. Both the bacterial and eukaryotic communities were characterized using next generation genetic sequencing techniques. Network and correlation analyses was performed to help elucidate the connection between Legionella and different amoeba. The amoeba genera Vannella,

Acanthamoeba, and Korotnvella were consistently correlated with an increase in Legionella across our samples. Vannella and Acanthamaeba are known potential hosts for Legionella, while Korotnvella is not a well documented host. Understanding the environmental conditions that are associated with an increase in Legionella and its host amoebas is important for preventing Legionnaire's Disease outbreaks.

Jyoti Prasad Kakati

(Environment & Industry) High-Protein Trait in Soybean

A major factor determining the value of U.S. soybean is protein content, dictating the high demand from the soybean industry for high-protein soybean seeds. To address the industry needs, the Southeastern soybean breeding program developed soybean lines with relatively higher seed protein (>40%). In the present study, we tested how well the soybean genotypes with the High-Protein trait perform under drought and heat stresses. Four high-protein (40-44%) lines (N14-7017, Benning Hi-PRO, N16-9924, and NLM09-77), five low-protein (35-36%) lines (N11-9228, NC-Dilday, NC-Dunphy, N09-2505, and NC-Raleigh), a heat-tolerant line (DS 25-1), and a heat susceptible line (DT 97-4290) were grown under optimal temperature (30/20°C) and water conditions until the R5 growth stage (seed-filling stage). Thereafter, one set of plants was exposed to drought stress for 14 days; another set was exposed to heat stress for 20 days; and the rest were maintained under optimal conditions. Seeds were harvested at maturity and total oil and protein contents in the seeds were measured by NIR spectrometry. The results indicate that the High-Protein genotypes could maintain the high protein contents under drought and heat stresses which demonstrates the stability of the High-Protein trait irrespective of environmental stresses (drought and heat). Among all the tested soybean lines, NLM09-77 maintained the highest protein content irrespective of the heat and drought stresses. The High-Protein genotypes will be a useful resource to develop new varieties with high yield and desirable protein and oil quantity and quality not only under optimal conditions but under drought and heat stresses.

Sepideh

(Industry) Food, Nutrition and Packaging Sciences

This study aimed to conduct a sensory evaluation of the teas made of mango leaves. Herbal tea is a popular beverage broadly consumed in most countries and has historically been used in treating numerous human disorders as a method to apply traditional

medicine. The likability, sensory attributes, and overall acceptability of mango leaf tea and green tea were evaluated using a 9-point hedonic scale with 61 participants who evaluated five different mango teas (‘Tommy Atkins’, ‘Keitt’, ‘Kensington Pride’, ‘Carabao’) and commercial tea bags and also a green tea as a control. Ten gm dried leaves were placed in the infuser, put in each kettle after reaching the temperature of 212°F/100°C, and stepped for 15 min. The statistical tools for analyzing the sensory analysis data were ANOVA, based on an Augmented incomplete block design followed by Tukey's test to compare all pairs of means. No significant differences ($P \leq 0.05$) were observed among all four mango cultivars (‘Carabao’, ‘Tommy Atkins’, ‘Keitt’, ‘Kensington Pride’) on aroma, appearance, flavor, aftertaste, overall acceptability, bitterness, astringency, and honey-sweet attributes of mango leaf teas.

Anastasia Thayer

(Society) Agricultural Economics

Fed cattle transactions reported through the Livestock Mandatory Reporting Act are separated into two types: negotiated and non-negotiated transactions. Non-negotiated transactions are often set with base prices that are then adjusted for different traits, including quality. A common method for establishing the base price of non-negotiated transactions is using the previous week’s negotiated price. As a result, characteristics of cattle marketed through negotiated transactions influence the value of cattle marketed through non-negotiated means in subsequent weeks.

The dynamic interaction of the two transaction types warrants review of the characteristics of cattle marketed through each transaction type. This research will investigate the effect of cattle characteristics including quality grade, weight, and other factors on price and determine whether any systemic differences in type of cattle marketed in each transaction type are present.

Using an econometric model of weekly fed cattle price transactions, if present differences among transactions in quality, weight, and other cattle characteristics are expected to emerge. Given concern over the price discovery and the volume of transactions for cash negotiated sales, results are expected to illuminate any potential differences in marketing strategies or underlying incentive structures.

RESEARCH SYMPOSIUM

Penelope Romo

(Society) DNA Repair

DNA repair proteins regress stalled replication forks into a “chicken-foot” formation (3-way Junction). The RAD5X protein family play an essential role in this process by stimulating the spontaneous remodeling of the replication fork into a four-way Holliday junction. Although previous studies between interactions of 3-way Junction with Rad5X protein family have been made, many aspects of their folding are still poorly understood. Here, we seek to characterize the 3-way Junction with and without RAD51L. We designed a 3-way Junction with FRET labels in the leading parent/daughter and lagging parent/daughter strands that we characterized using PAGE gels and Size Exclusion Chromatography (SEC). Using Fluorescence Correlation Spectroscopy (FCS), we determined the dissociation constant. Preliminary confocal single-molecule FRET experiments show when Rad51L binds to the 3-way junction, the FRET efficiency increases from zero to ~ 0.1, while the expected product shows higher FRET efficiencies. DMD simulations show a heterogenous stacking between the leading and lagging arms. Our results suggest that fork regression requires the proper stacking between the leading and lagging strand aided by Rad51L.