Student Poster Presentation – Undergraduate Competition

Animal Health and Production and Animal Products

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Assessing the Feasibility of a Low-Cost Recirculating System for Largemouth Bass (Micropterus nigricans) Culture. P. Randolph*; Department of Life and Physical Sciences, Lincoln University of Missouri, Jefferson City, MO 65101; M. Igou, A. Wilbers, C. King, A. Ishola, J. Loesch, A. Coursey and M. Matuha, College of Agriculture, Environmental and Human Sciences (CAEHS), Lincoln University of Missouri, Jefferson City, MO 65101.

Largemouth bass (Micropterus nigricans) is Missouri's second most produced aquaculture species, playing a key role in food production, recreational fishing, stocking programs, and conservation. Its commercial production is growing due to its rapid growth, high-quality meat, high yields, and ability to thrive at high stocking densities. However, data on the suitability and production efficiency of indoor recirculating aquaculture systems (RAS) for largemouth bass remain limited. This study evaluated the feasibility of using indoor RAS and examined the effects of stocking density on growth performance and feed utilization. Grow-out fish (38 ± 2.80 g) were stocked at three densities: T5 (five fish per tank), T7 (seven fish per tank), and T10 (ten fish per tank) and reared in 189-L rectangular tanks for four weeks. Fish were fed to apparent satiation, and growth performance, survival, and feed efficiency were assessed. Stocking density did not significantly affect growth performance or feed utilization; however, T7 showed the highest weight gain, specific growth rate (SGR), and feed conversion efficiency (FCE). Survival was highest and feed conversion ratio (FCR) was lowest in T10, while the condition factor was greatest in T5 and T10. These preliminary findings suggest that T7 best balances growth and feed efficiency, indicating that moderate stocking densities may optimize largemouth bass production in indoor RAS. Further research over an extended time is recommended to refine stocking strategies or validate these results and improve production efficiency in commercial RAS operations.

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Efficacy of Natural Preservatives on the Quality and Shelf Life of Chicken Eggs During Storage. A. Desha*, S. Henderson, A. Amey, A. Anthony, M. Haller and V. A. Uyanga., College of Agriculture, Environmental and Human Sciences (CAEHS), Lincoln University of Missouri, Jefferson City, MO 65101.

Natural preservatives are safe to consume and offer potential benefits such as biodegradability and alignment with consumer preferences for natural products. These additives are often rich in nutrients, antioxidants, and bioactive compounds that may contribute to overall well-being. This experiment was designed to evaluate the efficacy of natural preservatives, particularly vegetable oil and its combinations with ginger, turmeric, and lemon powder, in preserving the quality of stored eggs over various storage periods. A total of 160 uniform eggs were assigned to five treatment groups: uncoated (control), vegetable oil, and vegetable oil combined with ginger, turmeric, or lemon powders, with each treatment replicated using 32 eggs. At 0, 7, 14, and 21 days of storage, eggs were selected from each group for assessments of weight loss and internal and external quality traits. Data collected were subjected to analysis of variance (ANOVA) using Statistical Analysis Software (SAS), and treatment means were separated using Tukey's Honestly Significant Difference (HSD) test at $P \leq 0.05$. The results from this study revealed that uncoated eggs had higher weight loss and significant deterioration in egg quality characteristics. In contrast, eggs coated with natural preservatives maintained better quality attributes and extended shelf life. These findings demonstrate that natural preservatives can effectively maintain egg freshness and prolong the shelf life of table eggs. This indicates the potential of natural preservatives to enhance food safety, likely due to their antimicrobial properties that inhibit bacterial and fungal growth, thereby improving overall egg quality.

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A Survey of Undergraduate Students' Perception and Knowledge to Animal Welfare and Ethical Issues. A. Brown* and V. A. Uyanga, College of Agriculture, Environmental and Human Sciences (CAEHS), Lincoln University of Missouri, Jefferson City, MO 65101.

Ease of access to information through the internet and social media has garnered public interest in farm animal production systems. This study was designed to assess the perception and knowledge of undergraduate students on

animal welfare and ethical issues. A survey was designed using the Qualtrics software to collect anonymous responses from 130 participating undergraduate students. The survey used a 5-point Likert scale: (1) strongly disagree, (2) disagree, (3) neutral, (4) agree, and (5) strongly agree, and data were analyzed using descriptive statistics. A total of 123 completed responses were obtained. Students' prior experiences with animals varied with those that had owned pets/companion animals (50%), while grew up on livestock farms (26%). About 33% of the participants disagreed that human interests (e.g., profit, food production) should be prioritized over the welfare of farm animals. Regarding the student's familiarity with the five freedoms of animal welfare, 21% agreed, 39% were neutral and 33% disagreed to knowing this. Interestingly, 40% agreed that they were aware of animal welfare concerns or controversies related to factory farming, and the top five issues considered the most critical in farm animal welfare were animal confinement (68%); slaughterhouse practices (63%); physical alterations (49%); continuous breeding for productivity (43%), and transportation conditions of farm animals (42%). Altogether, the findings from this survey reveal that the inclusion of animal welfare and ethics education into the agricultural curriculum for undergraduate education is critical in expanding the formal education of students and the training of future professionals.

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Guardians of the Flock: The Effectiveness of Livestock Guardian Dogs in Reducing Predator-Related Losses in Pastoral Systems. S. Marshall*, Z. Singleton, and A. Houston, Department of Agricultural Sciences and Technology, College of Agricultural, Human and Environmental Sciences, Southern University and A&M College, Baton Rouge, LA 70813; C. Adams, Southern University Agricultural Research and Extension Center, Baton Rouge, LA 70813; J. Brown, and H. Mellieon, Jr., Department of Agricultural Sciences and Technology, College of Agricultural, Human and Environmental Sciences, Southern University and A&M College, Baton Rouge, LA 70813.

Livestock guardian dogs (LGDs) play a critical role in mitigating predation risks in pastoral systems by protecting livestock from carnivorous predators such as wolves, coyotes, and wild dogs. This study investigates the behavioral characteristics of LGDs, focusing on their guarding instincts and the factors influencing their effectiveness in reducing livestock losses. A comparative analysis of different LGD breeds including Anatolian Shepherds, Great Pyrenees, and Maremma Sheepdogs, their training methods, and the environmental conditions in which they perform best will be conducted. Additionally, an economic evaluation will assess the costs and benefits of using LGDs compared to alternative predator control strategies. The findings aim to provide insight to producers, extension specialists, and other stakeholders into the practical and financial implications of incorporating LGDs into livestock management systems, offering recommendations for optimizing their use in various agricultural settings. Evidence-based recommendations will be used to support the broader adoption of LGDs as a viable solution for enhancing livestock protection and promoting animal welfare.

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From Predators to Peace: Impact of Livestock Guardian Dogs on Livestock Welfare and Stress Reduction. Z. Singleton*, S. Marshall, and A. Houston, Department of Agricultural Sciences and Technology, Southern University and A&M College, Baton Rouge, LA 70813; C. Adams, Southern University Agricultural Research and Extension Center, Baton Rouge, LA 70813; J. Brown, and H. Mellieon, Jr., Department of Agricultural Sciences and Technology, College of Agricultural, Human and Environmental Sciences, Southern University and A&M College, Baton Rouge, LA 70813.

This project investigates the role of Livestock Guardian Dogs (LGDs) in contributing to the improvement of livestock welfare by reducing stress and influencing animal behavior. Studies have indicated that Livestock producers have found LGDs effective in protecting herds from predation. Domesticated sheep and goats often face threats from predators due to the lack of pastoral protection, which leads to an incline in the hormone cortisol. Cortisol is secreted from the organism's Adrenal Cortex and is a classical sign of stress when elevated. Cortisol is used in experimental settings to evaluate the overall stress placed on an animal by any type of physical or emotional stimulus. In most operations, the presence of livestock guardian dogs deters predators but also fosters a more secure environment allowing animals to exhibit more natural and relaxed behaviors. Producers often report how LGDs provide reliable, consistent herd protection and reduce the frequency of predator attacks frequently. This research highlights how LGDs help animals stay calmer, avoid injuries, and live in safer, healthier environments. It also supports the adoption of LGDs as the best practice in modern livestock production.

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Precision Livestock Health: Smartphone Blood-Splatter Analytics for Anemia in Goats. Z. Carlton*, A. Siddique, A. K. Mahapatra, and T. H. Terrill, Department of Agricultural Sciences, Fort Valley State University, Fort Valley, GA 31030; S. S. Panda, Institute for Environmental Spatial Analysis, University of North Georgia, Oakwood, GA 30566; E. R. Morgan, Institute for Global Food Security, Queen's University Belfast, UK; and J. A. van Wyk, Department of Veterinary Tropical Diseases, Faculty of Veterinary Science, University of Pretoria, Onderstepoort, South Africa.

Small ruminants, particularly goats, are critical to global agriculture, providing food, fiber, and income. Their health is often compromised by anemia caused by blood-feeding gastrointestinal parasites such as *Haemonchus contortus*. This study evaluated an AI-driven biosensor for on-farm anemia detection by examining the relationship between blood splatter diameter, packed cell volume (PCV), and FAMACHA© scores, while also testing the effect of drop height on splatter outcomes. A total of 150 blood splatter observations were collected from 75 adult male Spanish goats. Blood samples (30 µL) were applied from three heights (5, 10, and 15 cm) onto glycerol-infused Whatman filter paper, with splatter images recorded via smartphone after 180 seconds. PCV values were determined using centrifugation, and splatter images were analyzed with machine learning models, including Support Vector Machine , K-nearest Neighbors , Backpropagation Neural Network , and a Keras-based image classifier. The dataset (1,054 samples) was divided into training, testing, and validation sets (70:20:10). Results showed no significant effect of drop height on splatter diameter (mean = 1.02 mm). However, splatter diameter was moderately and negatively correlated with PCV ($r = –0.584$, $p < 0.001$), indicating larger splatters in anemic goats with lower PCV values. Model performance improved from 76.1% to 95.8% accuracy after optimization. BPNN achieved 91–100% accuracy, while SVM produced F1 scores ranging from 74–100%. This semi-invasive biosensor requires minimal blood volume and enables rapid, on-site anemia detection. The findings highlight its potential for practical deployment in livestock systems, with future research needed to validate performance under a variety of field conditions.

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Analysis of Cryopreserved Sperm from Alpine and Spanish Bucks. R.D. Murray*, M. Bodu, M. Hitit, S. Woldesenbet, Z. Erdoğan, O.C. Greenwood, A. Pech Cervantes, and E. Memili, CAFNR, Prairie View A&M University, Prairie View, TX 77446; and M.R. Uğur, IVF Michigan Fertility Centers, Bloomfield Hills, MI 48304.

To investigate the implications of breed-specific differences in fatty acid composition for sperm function and reproductive efficacy, this study conducted a comparative analysis of the post-thaw sperm lipidomic profiles of Alpine and Spanish-Creole goat breeds. Lipids were extracted from cryopreserved sperm samples of Alpine ($n = 7$) and Spanish-Creole ($n = 4$) mature bucks and analyzed using gas chromatography-mass spectrometry (GC-MS), resulting in the identification of 21 fatty acids across the two breeds. Eight fatty acids, specifically 13:0, 16:0, 18:0, 24:0, 14:1, 18:1 (cis-9), 24:1, and 18:2, demonstrated significant differences ($p < 0.05$). The Alpine breed exhibited increased levels of 16:0, 18:0, 24:0, 18:1 (cis-9), 18:1, and 18:2, while the Spanish-Creole breed showed increased levels of 13:0, 14:1, and 24:1 ($p < 0.05$). Among these, 16:0, 18:1 (cis-9), and 18:2 exhibited both statistical and biological significance ($p < 0.05$, $FC > 2$). The Alpine breed showed significantly higher concentrations of total fatty acids, total saturated fatty acids (Total-SFA), and total polyunsaturated fatty acids (Total-PUFA), while the Spanish-Creole breed showed significantly higher concentrations of total cis-monounsaturated fatty acids (Total cis-MUFA) ($p < 0.05$). Network and pathway analyses indicated that 16:0, 18:1 (cis-9), and 18:2 were integral to the most central nodes of the lipidomic network, potentially enhancing membrane stability and cryotolerance. Lipidomic differences among breeds can be ascribed to genetic and environmental influences, offering potential enhancements for breeding strategies, artificial insemination programs, and sperm cryopreservation methods.

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Effects of Diet, Breed, and Sex on Taxonomic and Functional Signatures of the Rumen Microbiome in Meat Goats. J. Lyons*, R. Puchala, I. Tovar-Luna, A. K. Patra, American Institute for Goat Research, Langston University, Langston, OK 73050.

Goat meat production is influenced by factors such as diet, breed, sex, and age, which also shape ruminal microbiome. This study investigated the effects of dietary concentrate level, breed, and sex on taxonomic and functional profiles of rumen microbial population in growing Boer and Kiko goats. Forty-eight kids (equal numbers per breed and sex) were

fed diets containing either 30% (30C) or 70% (70C) concentrate, with lespedeza hay as the sole forage source. After 76 days of feeding, rumen contents were collected for genomic DNA extraction and sequenced using the Illumina platform with 300 bp paired-end reads. Different indices, e.g., Chao1, Simpson, and Shannon were higher in 30C group than in 70C group, while breed and sex showed no significant effects. Principal coordinate analysis revealed a clear separation between the 30C and 70C diets but not between breeds or sexes. Thirty-eight bacterial genera and fifty-two species differed between the diets. Breed-related effects were detected for six genera and eight species, whereas sex-related differences were minimal. Four archaeal species were more abundant in 30C group, with no breed or sex effects observed in the archaeal community. Diet also influenced 141 predicted functional pathways, with 67 pathways being more abundant in the 30C group. Twenty-four pathways differed between breeds, with 11 higher in Boer goats. Fifteen pathways were more abundant in males and three in females ($P < 0.05$). Overall, dietary concentrate level exerted the strongest influence on rumen microbial composition and function, while breed contributed moderately and sex had minor effects.

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Effect of *Haemonchus contortus* Infection on Parasitological and Hematological Measures in Pregnant Ewes During the Peripartum Period. K. J. Hardy*, S. J. Ikuejamoye-Omotore, and J. O. Adebayo, Department of Animal Science, North Carolina A&T State University, Greensboro, NC 27411; M. Harrison, A. Mills-Widemon, Z.M. Estrada-Reyes, and A.A. Pech-Cervantes, CAFNR Research, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446; and T. Terrill, College of Agricultural, Family Sciences, and Technology, Fort Valley State University, Fort Valley, GA 31030.

This study evaluated the effects of *Haemonchus contortus* infection on hematological and parasitological parameters in Florida Cracker ewes during the peripartum period. Twenty pregnant Florida Cracker ewes were dewormed at 90 days of pregnancy. Ewes were randomly assigned to either an infected (INF; $n = 10$) or control (CTL; $n = 10$) group. At 120 days of gestation, the INF group received an oral dose of 10,000 L3 *H. contortus* larvae, while the CTL group was administered 3 mL of distilled water. Fecal egg count and FAMACHA score were performed before infection (-1 hour), and at 7-, 14-, 21-, 28- and 35- days post-infection (pi). Blood was collected by jugular venipuncture using vacutainer EDTA tubes and 21g needles before infection (-1 hour) and at, 3-, and 6-hours, and at 7-, 14-, 21- and 28-days pi to perform a full hematology analysis. Parasitological analysis revealed significant differences for FEC and FAMCHA score, at 21-, 28- and 35-days pi and at 14-21-, 28- and 35-days pi, respectively. For hematological data, significant differences ($p < 0.05$) were observed for white blood cell count (WBC), lymphocyte count (LYM), neutrophil count (NEU), monocyte count (MON) and mean corpuscular volume (MCV). These findings highlight the impact of *H. contortus* infections on parasitological and hematological responses.

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Comparative Accuracy of Two Ultrasound Machine Models in Diagnosing Pregnancy and Fetal Count by Skilled and Unskilled Operators in Three Goat Breeds in Oklahoma. N. Achariya[1]*, A. Sonibare[1], R. Puchala[1], D. Tadesse[1], H. Yirga[1], A. Patra[1], D. Woldemariam, G. Dinegdie, and F. Belkasmi. [1]American Institute for Goat Research, Sherman Lewis School of Agriculture and Applied Sciences, Langston University, Oklahoma, Ok 73050.

This study evaluated the diagnostic accuracy of two ultrasound machine models, one human-adapted (Aloka SSD-500V) and one portable veterinary model (Dawei S1 35), operated respectively by a professional and a non-professional examiner, for pregnancy diagnosis and fetal counting in goats. A total of 202 does (Alpine, Spanish, and Kiko) were bred and examined 45–50 days post-mating. Sensitivity, specificity, accuracy, positive predictive value (PPV), and negative predictive value (NPV) were calculated for each breed and operator type. Across all breeds, the professional operator achieved higher sensitivity (96.5%) compared with the non-professional (93.6%, $p = 0.045$), while specificity remained low for both (36% vs. 40%). Accuracy values were similar (80.6% vs. 79.6%), and PPV exceeded 80% in both cases. Breed-specific analysis revealed slightly better diagnostic precision in Spanish goats, suggesting potential anatomical effects on image interpretation. Both operators demonstrated limited success in identifying fetal numbers beyond twins, with accuracy declining as litter size increased. The professional operator correctly identified 45 pregnancies, and the non-professional 46, with no significant difference in fetal count accuracy ($p > 0.05$). These results suggest that portable veterinary ultrasound devices can achieve diagnostic performance comparable to that of conventional human-adapted systems when used by minimally trained personnel. The findings

support broader adoption of low-cost portable ultrasound for field-based pregnancy diagnosis and reproductive management in goat herds, especially within resource-limited or smallholder production systems.

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Effects of Storage Duration on the Physical and Chemical Stability of Experimental Goat Feeds Under Controlled Conditions. A. Thomas*; F. Belkasmi. Sherman Lewis School of Agriculture and Applied Sciences, Langston University, OK 73050.

Feed stability during storage is a critical yet often overlooked factor affecting nutrient availability, animal performance, and data reliability in controlled feeding trials. Within the framework of a feed-controlled experiment, this study investigated the influence of storage duration on the physical and chemical quality of feed and ort samples collected from five nutritional treatments. Samples were analyzed for dry matter (DM) at 50 °C and 100 °C, as well as for ash and gross energy content. To evaluate temporal effects, samples were classified into three groups based on the interval between feed mixing and analysis: Group 1 (<2 weeks), Group 2 (1–2 months), and Group 3 (>3 months). Both oil-supplemented and non-supplemented feeds were included to assess potential interactions between lipid content and storage time. Results revealed a progressive decline in DM and gross energy with increasing storage duration, particularly in oil-enriched samples, suggesting oxidative degradation and moisture uptake during storage. Ash content remained relatively stable, while the DM100/DM50 ratio exhibited greater variability after two months of storage. These findings emphasize the importance of timely feed analysis, ideally within two weeks of preparation, to ensure accurate compositional data, especially in diets containing essential oils or bypass fats. Prolonged storage may lead to nutrient losses and compromised analytical precision, potentially biasing the interpretation of feed efficiency and animal performance in long-term experimental trials.

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Effect of parasitic load (FAMACHA) on Milk Yield and Composition in Dairy Goats. E. Luster*; C. Alvarado; F. Belkasmi. Sherman Lewis School of Agriculture and Applied Sciences, Langston University, OK 73050.

Parasitic infections are a major constraint on the productivity and welfare of dairy goats, primarily by inducing anemia and reducing feed efficiency. This study examined the relationship between parasite load, as assessed by the FAMACHA scoring system, and milk production traits in Alpine dairy goats. Forty healthy, age- and breed-matched Alpine does were maintained under controlled feeding conditions, utilizing Calan gates to ensure accurate monitoring of individual feed intake. Body condition score (BCS), FAMACHA score, milk yield, and milk composition (fat and protein) were recorded throughout the experimental period. Preliminary observations indicated that goats with higher FAMACHA scores (reflecting higher parasite burden) exhibited lower BCS and reduced feed intake. These animals also tend to produce less milk with decreased fat and protein content compared to goats with lower FAMACHA scores. These results support the hypothesis that parasite load adversely affects both the quantity and quality of milk in dairy goats. Effective parasite management, therefore, not only improves animal health but also enhances production efficiency and cheese yield potential. This study underscores the value of integrating FAMACHA scoring as a practical tool for on-farm monitoring and early intervention in small ruminant production systems.

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Enhancing Growth and Health of *Largemouth Bass Fingerlings* with Single Cell Proteins and Probiotics in Basal Diets. R. Cheriyan*, F. Karim, H. Wanjala, S. Reed, Y. Ramena, and G. Ramena; Department of Aquaculture and Fisheries, Department of Arts and Sciences University of Arkansas at Pine Bluff, Pine Bluff, AR 71601.

There is an ever increasing need to meet the nutritional needs of a growing population, projected to reach nearly 10 billion by 2050. Aquaculture presents a promising solution, and *Largemouth Bass (LMB*) has gained attention as a high-value species and an emerging food fish for U.S. aquaculture. Advances in technologies such as recirculating aquaculture systems (RAS) have improved production efficiency and sustainability. However, the scalability of LMB aquaculture remains limited by high feed costs, reliance on fishmeal-based diets, and the associated environmental concerns. The growth, survival, and health of Largemouth Bass are significantly influenced by diet quality. Therefore, spirulina this study evaluates the potential of three, yeast, and probiotics as sustainable supplements offering enhanced nutrition, gut health, and immune support. The incorporation of probiotics and yeast into LMB diets significantly

improved survival and gut health, while growth and feed utilization remained consistent across all diets. Better Cumulative weight gain, better survival in Yeast and Probiotic fed LMB, Yeast had immunostimulant effect, better intestinal homeostasis and reduced stress Abundance of good microbiome (probiotic) and increased diversity in Yeast and Spirulina fed LMB. However, an increased concentrations of dietary supplements to achieve optimal specific growth rate for a sustainable LMB production need to be assessed.

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Temporal Variation in Glycerol and Biochemical Composition of *Artemia* Reared Under Controlled Salinity Conditions. I. Reed-Guy*, University of Arkansas, Department of Aquaculture and Fisheries, University of Arkansas at Pine Bluff, Pine Bluff, Arkansas 71601.

This study investigated the temporal variation in glycerol content and biochemical composition of *Artemia* reared under controlled laboratory conditions. Approximately 2 g of *Artemia* cysts were incubated in 1 L Imhoff cones containing seawater at 25 ppt of salinity. Cultures were maintained under optimal hatching conditions with continuous aeration, and the experiment was conducted in triplicate to ensure reproducibility. Post-hatching, *Artemia* nauplii were harvested at 24, 48, and 72 hours to assess developmental and metabolic changes over time. Glycerol content was quantified to evaluate its role in osmotic regulation and stress response during development. Additionally, proximate composition, amino acid, and fatty acid analyses were performed to determine the influence of culture duration on the organism's nutritional and biochemical profiles. Results revealed significant temporal differences in glycerol concentration, corresponding to incubation time. These fluctuations indicate that glycerol synthesis and accumulation are dynamic processes associated with the osmoregulatory and metabolic adjustments of *Artemia*. Concurrent changes in amino acid and fatty acid profiles further support adaptive biochemical modulation during development. Overall, the findings provide insight into the physiological and biochemical adaptations of *Artemia* across different hatching stages, highlighting glycerol as a key metabolite in maintaining cellular homeostasis under varying environmental and developmental conditions.

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Precision Telemetry as a Foundation for Post-Disaster Livestock Management: A Research-Informed Blueprint. J. Shoalmire*, M. K. Tate, Sr., J. Snowden, C.P. Bagley, and A. Lastie, Southern University Agricultural Research and Extension Center, Baton Rouge, LA 70813.

Southern Louisiana has numerous climatic calamities, ranging from disastrous hurricanes to frequent thunderstorms accompanied by high winds and lightning. To better determine the impact of sch eweather conditions on beef cattle stressors, this research-informed blueprint applies data from Southern University's precision-livestock trial to enhance livestock resilience in disaster scenarios. Although the study lacked satellite tags or geofencing technology, telemetry captured stress-response data that mirror conditions experienced during post-hurricane containment or transport. Handling events triggered measurable physiological and behavioral changes, including temporary decreases in rumination and sharp activity spikes, demonstrating the potential of internal telemetry for welfare monitoring during emergencies. Building upon these observations, researchers conceptualized a digital livestock management network combining eBolus sensors, halter collars, and virtual fencing. This integration would enable animal location tracking, welfare alerts, and identification verification even if infrastructure is damaged. Drawing on the senior authors' disaster-response experience, the framework highlights how telemetry data can guide emergency containment, verify ownership, and protect animal welfare until producers regain access. The model reinforces proactive planning—summarized by the principle "Proper Preparation Prevents Poor Performance." This blueprint underscores the role of precision-livestock technology in improving preparedness and disaster recovery for rural producers. It supports Southern University's Smart Ranching initiative and USDA-NIFA goals for climate-resilient, welfare-centered agriculture capable of withstanding environmental disruptions. Gaining experience as more weather events are encountered allows us to build a better model for reducing stress in cattle and determining how best to minimize the length and severity of stress in cattle.

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Conceptual Integration of Blockchain and Geofencing for Post-Disaster Livestock Traceability. J. Shoalmire*, M K. Tate, Sr., Mallory K. Tate, Jr., J Snowden, C.P. Bagley, and A. Lastie, Southern University Agricultural Research and Extension Center, Baton Rouge, LA 70813.

This conceptual model expands Southern University's precision-livestock research into post-disaster management through blockchain and geofencing integration. South Louisiana has experienced some of the most severe and long-lasting weather events in the country due to its proximity to the Gulf of America. The system being developing as reported in this study would link animal identification, welfare, and ownership data onto a secure blockchain ledger synchronized with satellite or RFID-based geofencing systems. During natural disasters such as hurricanes, virtual boundaries could automatically document animal departures and returns, generating immutable, time-stamped custody and welfare records. Even without physical fencing or paper logs, such a digital system could verify ownership, track location, and alert managers when animals experience distress or displacement. Telemetry data from the dewormer study demonstrated how physiological parameters—temperature, rumination, and activity—respond predictably to stress. Integrating these real-time indicators into a blockchain ledger would provide automated verification and early warnings of abnormal events. The model also extends beyond cattle, offering scalable application for goats, sheep, and swine. While conceptual, the framework presents a feasible path toward data-secure, climate-resilient livestock management. It ensures transparency, continuity, and recovery efficiency after disasters. This integration of animal welfare science with emerging digital technologies represents the next phase of Southern University's Smart Ranching initiative, uniting research, innovation, and producer security for the future of agriculture. Engaging producers in the development of this technology can expand its outreach and make it more adaptable to on-farm applications.

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Efficacy of Livamol® with BioWorma® on Third-Stage Parasites in Meat Goats. L. Bell*, T. Wright, and K. Matthews, Department of Agriculture and Natural Resources, Delaware State University, Dover, DE 19901; E. Otchere, Department of Poultry Science, College Station, TX 77843; D. O'Brien, Virginia Cooperative Extension, Virginia State University, Petersburg, VA 23806.

Gastrointestinal nematodes (GINs), especially *Haemonchus contortus*, are the most problematic parasites affecting small ruminant production. Due to the widespread use of anthelmintics, resistance to all available drug classes is rapidly emerging. Livamol® with BioWorma®, a product containing the fungus *Duddingtonia flagrans*, has become a potential alternative strategy to reduce nematode populations. Therefore, this study aims to evaluate the effectiveness of Livamol® with BioWorma® in decreasing larval development in adult meat goats. Forty-five meat goats (n = 45) were assigned to one of three treatment groups: control (CON), daily Livamol® with BioWorma® supplementation (BIO1), and biweekly Livamol® with BioWorma® supplementation (BIO2), based on initial body weight (BW). Each treatment group included three replicates (n = 3), with five goats per replicate (n = 5), housed on nine pastures and monitored over 98 days. Fecal samples were collected every 14 days and used to set up coprocultures. Briefly, fecal samples from each treatment group were weighed, collected, and incubated at 27°C for 7 days to allow larval development. Third-stage larvae (L3) were harvested using the Baermann funnel technique, stained with Lugol's iodine, heated to 55°C, and counted under a microscope at 40× magnification, using a parasite identification key. The results showed a treatment-by-day interaction effect of Livamol® with BioWorma® on larval counts ($P < 0.001$). Under the conditions of this study, daily supplementation of Livamol® with BioWorma® demonstrated promising potential for reducing pasture larval burdens and may help decrease reliance on anthelmintics.

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Computational Identification of Secreted and Antigenic Protein Candidates from the Mycobacterium avium subsp. paratuberculosis (MAP) Proteome for Diagnostic Development. K. Hardaway*, J.C. Peel, R. Merkel, D.T. Woldemariam, H. Akbar. Sherman Lewis School of Agriculture and Applied Sciences, Langston University OK 73050.

Johne's disease, caused by Mycobacterium avium subsp. paratuberculosis (MAP), remains a major health challenge in small ruminants, particularly goats, leading to chronic enteritis, reduced productivity, and significant economic losses. Current diagnostics often lack sensitivity during the early stages of infection, underscoring the need for novel antigenic targets that can enhance detection accuracy. This study employed a computational bioinformatics pipeline to identify secreted and antigenic MAP proteins with potential value for developing improved diagnostic assays. The

reference MAP K-10 proteome was obtained from publicly available protein sequence databases and systematically analyzed using a suite of bioinformatics tools. Signal peptides, subcellular localization, and transmembrane helices were analyzed to identify proteins likely to be secreted or membrane-associated. Antigenicity scores were evaluated using a bacterial prediction model, and high-confidence surface-exposed proteins were further examined for predicted B-cell epitopes using immunoinformatic resources. Analysis of the MAP proteome revealed a subset of proteins with strong secretion signals, membrane-association features, elevated antigenicity scores (>0.5), and multiple predicted B-cell epitopes. These top-ranked candidates collectively represent promising targets for future serological or peptide-based diagnostic assay development. This study provides foundational genomic insights for prioritizing MAP antigens and supports ongoing efforts at Langston University to advance early detection strategies for Johne's disease in goats. The identified candidates offer a valuable starting point for subsequent proteomic and immunological validation.

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The Effects of Water-to-Feed Ratio and Fermentation Day Length on Nutrient Profiles in Swine and Poultry Diets. M.J. Edwards*, C. Guilbeaux, Department of Agricultural Sciences and Technology, College of Agricultural, Human and Environmental Sciences, Southern University and A&M College, Baton Rouge, LA 70813; F. DeRouen, and J. Obuya, Southern University Agricultural Research and Extension Center, Baton Rouge, LA 70813; and J.M. Morton, Department of Agricultural Sciences and Technology, College of Agricultural, Human and Environmental Sciences, Southern University and A&M College, Baton Rouge, LA 70813.

Fermenting feed is an ancient practice that has gained popularity among small livestock producers in recent years due to its potential to increase feed mass while lowering costs. However, there are concerns that fermentation might reduce the nutritional density required for livestock. This research focused on how the length of fermentation and the feed-to-water ratio affect the nutritional composition of diets for *sus scrofa* and *gallus gallus domesticus* purchased from Kentwood Coop in Kentwood, LA. Over the course of three days, the study examined the nutritional composition of commercial swine and poultry diets under different water-to-feed ratios. The experiment included a control group and three treatment groups with varying ratios: 1:1, 1:2, and 2:1. Each treatment was mixed in a bucket, placed in a bag, and stored at room temperature. During the fermentation process, temperature and pH levels were measured daily, and the bags were stored in freezers based on the fermentation time. Feed samples from each treatment were sent to Ward Labs in Kearney, NE, for proximate analysis. Results indicated that in swine diets, a high moisture content (2:1 ratio) enhances the availability of minerals and increases protein content, while a low moisture content (1:2 ratio) tends to favor fat content. For poultry diets, the length of fermentation did not significantly alter nutrient composition; rather, the water-to-feed ratio was the primary factor affecting nutrient composition. It is recommended that additional nutrients, such as vitamins, amino acids, and anti-nutritional factors, be assessed to determine the best feeding practices when using fermented feed.

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Genomic Insights into Heat Tolerance of Florida Cracker Sheep via RNA Sequencing. E. Dennett*, Z. Estrada-Reyes, and S. Ikuejamoye-Omotore, CAFNR Research, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446; A. Pech Cervantes, College of Agricultural, Family Sciences, and Technology, Fort Valley State University, Fort Valley, GA 31030; J. Adebayo, M. Harrison, and T. Terrill, Department of Animal Science, North Carolina A&T State University, Greensboro, NC 2741.

This study investigated the impact of heat stress on the transcriptomic profile of Florida Cracker ewes. Fourteen ewes were randomly assigned to either a heat stress (HT; $n = 7$) or cooling (CTL; $n = 7$) group for six weeks. HT ewes were exposed to natural summer temperatures, while CTL ewes had access to an evaporative cooling fan. Ambient temperature and humidity were recorded weekly to calculate the Temperature-Humidity Index (THI). Blood samples were collected via jugular venipuncture at weeks 1, 3, and 6, and stabilized using RNAprotect tubes. Total RNA was extracted with the RNeasy Protect Animal Blood Kit (Qiagen), and libraries were prepared using the KAPA RNA HyperPrep Kit with RiboErase Globin Reduction (Roche). Sequencing was performed on the Illumina NovaSeq 6000 platform. Quality filtering of FASTQ files was done using FastQC, and differential gene expression analysis was conducted with DESeq2. Genes with a false discovery rate (FDR) ≤ 0.05 were considered differentially expressed (DEGs). Functional enrichment of DEGs was performed using SR-plot. Comparative analysis revealed 47 DEGs at week 1, 24 at week 3, and 4 at week 6 (GBP2, GSTT1, ITGB5, ENSBTAG00000037634). Week 1 DEGs were linked to immune responses and proteolysis; week 3 to peptide metabolism and p53 signaling; and week 6 to cell adhesion,

detoxification, and oxidative stress. Our results evidence the ability of Florida Cracker sheep to adapt to heat stress in the summer season. More studies are needed to understand the adaptation mechanisms of this thermotolerant sheep breed.

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Seasonal Hatch Effects on Growth and Onset of Lay in Barred Rock Pullets. T. Mitchell*, D. Knipker, R. Baker, and T. Fisher, College of Agriculture, Environmental and Human Sciences (CAEHS), Lincoln University of Missouri, Jefferson City, MO 65101.

Small-scale chicken (*Gallus gallus domesticus*) egg producers typically purchase day-old pullets from hatcheries rather than breeding their own stock. While most pullets are purchased in the spring or early summer, hatcheries often have availability from February through September. Season of hatch may have important implications for pullet growth, egg production, and overall flock productivity, especially in systems managed without artificial lighting. This study compared the growth of Barred Rock pullets hatched in fall (September 2023) and spring (March 2024), raised outdoors without supplemental lighting. Each cohort of 56 one-day-old chicks was divided into four replicate pens of 14 and managed identically. Pullets were given ad libitum access to chick feed (19% crude protein) and water. Body weight and feed consumption were recorded weekly through 28 weeks of age, and age at first egg was noted. At hatch, fall-hatched pullets were significantly heavier than spring-hatched pullets (38.2 vs 32.4 g), likely due to larger egg size from older breeder hens. Body weight differences between the cohorts varied over time without a consistent trend, and feed consumption was similar between the cohorts. Spring-hatched pullets reached sexual maturity earlier (133 vs 150 days), but fall-hatched pullets laid larger eggs at the onset of production. These results suggest fall-hatched pullets provide several advantages to early egg production in small-scale poultry flocks. However, further research should examine whether these early differences impact long-term productivity and cost-efficiency.

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The Effects of Fermented Feed On 4-Week-Old Post-Wean Pigs Growth and Feed Efficiency. S.S. Horton-Conecin*, Department of Agricultural Sciences and Technology, College of Agricultural, Human and Environmental Sciences, Southern University and A&M College, Baton Rouge, LA 70813; S. Shields, College of Applied and Natural Sciences, Louisiana Tech University, Ruston, LA 71272; L. Butler, School of Education, Southern University and A&M College, Baton Rouge, LA 70813; F. DeRouen, Southern University Agricultural Research and Extension Center, Baton Rouge, LA 70813; H.I. Mellieon Jr., and J.M. Morton, Department of Agricultural Sciences and Technology, College of Agricultural, Human and Environmental Sciences, Southern University and A&M College, Baton Rouge, LA 70813.

Weaning is an essential *sus scrofa* production phase, but it often stresses pigs because of the abruptness of the diet change and disrupts their gastrointestinal health. Fermented feed may be a cost-effective way for farmers to improve pigs' health, growth, and performance by improving their gastrointestinal health post weaning. Fermented feed consists of complete dry feed or feed ingredients mixed with water that sits covered for multiple days to allow for natural fermentation to occur. This research aims to offer scientific evidence to help develop sustainable and effective pig farming methods for small farms feeding weaned pigs. This study used ten 4-week-old grower pigs (Gloucestershire Old Spot and Yorkshire x Berkshire) and were divided into five pens. Two pigs were placed in each pen. Three pens were fed a 3-day fermented feed with a 1:1 ratio of feed to water. While two pens were fed a complete dry feed (control, Kentwood Co-op Swine Feed 19% Protein). During the 4-week study, all pigs were weighed weekly, the saliva pH level was measured, and the temperature and pH of the fermented feed were also recorded daily before feeding. By the end of the study, pigs on the control diet were almost two to three times heavier than the pigs that were fed fermented feed, despite consuming less overall feed. The results of this study indicate that pigs fed fermented feed have lower feed efficiency due to potential nutrient losses when water is added to the feed during fermentation.

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AniHealth: A Cloud-Enabled Smart Farming Platform for Rapid Anemia Detection and Sustainable Small Ruminant Health Management. D. Jenkins*, A. Haneefat, A. Siddique, A. K. Mahapatra, and T. H. Terrill. Department of Agricultural Sciences, Fort Valley State University, Fort Valley, GA 31030; S. S. Panda, Institute for Environmental Spatial Analysis, University of North Georgia, Oakwood, GA 30566; E. R. Morgan, Institute for Global

Food Security, Queen's University Belfast, UK; J. A. van Wyk, Department of Veterinary Tropical Diseases, Faculty of Veterinary Science, University of Pretoria, Onderstepoort, South Africa.

Agricultural productivity in small ruminants, especially goats and sheep, is increasingly constrained by parasitic infections such as *Haemonchus contortus*. These parasites are a leading cause of anemia, poor weight gain, and substantial economic losses. Traditional diagnostic methods, such as fecal egg counts, are slow, invasive, and costly, highlighting the urgent need for rapid, affordable, and farm-ready alternatives. To address this challenge, we are developing Ani Health, an integrated smart farming platform that leverages artificial intelligence, biosensing, and cloud computing to advance animal health management on a scale. Ani Health combines two complementary diagnostic innovations. The first is a blood biosensor requiring only a minimal sample to accurately assess anemia. The second is an AI-driven FAMACHA® scoring system, which analyzes eyelid images to provide non-invasive anemia classification. Together, these tools enable farmers to rapidly detect parasitized animals, reduce reliance on chemical dewormers, and adopt sustainable herd management practices. The platform is supported by AWS Cloud Services to ensure scalability and reliability. Amazon SageMaker hosts AI models for real-time prediction, while AWS Lambda streamlines serverless processing. Amazon S3 provides secure data storage, DynamoDB manages animal health records, and Cognito ensures user authentication. CloudWatch monitors performance, and API Gateway enables seamless mobile-to-backend integration. By merging biosensing with advanced cloud infrastructure, Ani Health delivers actionable insights that improve herd health, lower treatment costs, and strengthen long-term sustainability. This work highlights the transformative potential of AI-enabled, cloud-supported technologies to reshape animal agriculture, offering a practical and optimistic pathway for future livestock management.

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Data-Driven Approaches for Predicting Anemia Risk in Small Ruminants Under Parasitic Infections. E. B. Martin*, G.K. Isai, A. Siddique, A. K. Mahapatra, and T. H. Terrill. Department of Agricultural Sciences, Fort Valley State University, Fort Valley, GA 31030; S. S. Panda, Institute for Environmental Spatial Analysis, University of North Georgia, Oakwood, GA 30566; E. R. Morgan, Institute for Global Food Security, Queen's University Belfast, UK; J. A. van Wyk, Department of Veterinary Tropical Diseases, Faculty of Veterinary Science, University of Pretoria, Onderstepoort, South Africa.

Parasitic infections, particularly gastrointestinal nematodes, remain a major constraint to the health and productivity of small ruminants worldwide. This study examined the relationships among fecal egg count, packed cell volume, and FAMACHA© scores over time, while also integrating environmental variables such as temperature, humidity, and precipitation. The goal was to evaluate anemia dynamics and develop predictive frameworks for improved herd management. Descriptive analyses revealed high variability in parasite loads, with mean values of 950 eggs per gram for FEC and 26.8% (±5.4) for PCV. A strong negative correlation between PCV and FEC ($r = –0.72$) and a positive correlation between FAMACHA© and FEC ($r = 0.67$) confirmed the utility of FEC as a reliable proxy for anemia status. Seasonal analysis showed elevated parasite burdens during warm, humid months, aligning with climatic conditions favorable to nematode development. Predictive models further demonstrated that logistic regression classified anemia severity with 80.2% accuracy, and Random Forest models predicted FAMACHA© scores with 85.4% accuracy. SHAP analysis ranked humidity, temperature, and FEC as leading predictors of anemia. Time-series forecasting using ARIMA and Prophet projected increased anemia risk during weeks 24–38, with an average 3.5% PCV decline. Clustering identified high-risk groups, while survival analysis showed goats with PCV < 22% had a 75% probability of severe anemia within six weeks. These findings demonstrate how integrating climate data with machine learning can enhance early detection, enabling decision-support systems that support sustainable small ruminant health management in resource-limited environments.

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AI-Driven Blood Biosensor for on-farm Anemia Detection in Goats: Linking PCV, FAMACHA Scores, and Splatter Characteristics M. Lomax*, A. Siddique, K. Mahapatra, and T. H. Terrill, Department of Agricultural Sciences, Fort Valley State University, Fort Valley, GA 31030; S. S. Panda, Institute for Environmental Spatial Analysis, University of North Georgia, Oakwood, GA 30566; E. R. Morgan, Institute for Global Food Security, Queen's University Belfast, UK; J. A. van Wyk, Department of Veterinary Tropical Diseases, Faculty of Veterinary Science, University of Pretoria, Onderstepoort, South Africa.

Small ruminants, particularly goats, play a critical role in global agriculture as sources of food, fiber, and livelihoods. This study examined the effect of blood drop height on an AI-driven biosensor developed for on-farm anemia detection. The aim was to correlate blood packed cell volume (PCV), FAMACHA scores, and splatter characteristics to optimize biosensor performance. A total of 150 observations were conducted on 75 adult male Spanish goats. Blood samples were collected and analyzed for PCV using centrifugation. Additionally, 30 µL of blood was applied to glycerol-infused Whatman No. 1 filter paper and released from heights of 5 cm, 10 cm, and 15 cm. Splatter patterns were recorded with a smartphone camera after 180 seconds, resulting in 1,054 images for analysis. Four machine learning models, Support Vector Machine (SVM), K-Nearest Neighbors (KNN), Backpropagation Neural Network (BPNN), and a Keras-based classifier were trained using a 70:20:10 split for training, testing, and validation sets. Model optimization improved classification accuracy from 76.1% at baseline to 95.8%. SVM achieved F1 scores between 74% and 100% across PCV ranges, while BPNN demonstrated 91% to 100% accuracy in detecting anemia. However, a moderate negative correlation was observed between PCV and splatter diameter, indicating that anemic goats with lower PCV values produced larger splatter diameters due to reduced blood viscosity. These findings confirm the diagnostic potential of AI-driven biosensors for the rapid, on-site detection of anemia. Future studies should validate performance under varying environmental conditions to enhance the field applicability and precision of parasite management.

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Sustainable Control of Gastrointestinal Nematodes Using *Duddingtonia flagrans*: A Systematic Review Study. S. Thomas*, A. Siddique, N. Whitley, O. Samples, T.H. Terrill, and D. Bumpers, Fort Valley State University, Fort Valley, GA 31030; J. Burke, USDA-ARS, Booneville, AR 72927.

Nematophagous fungi, particularly *Duddingtonia flagrans*, represent a sustainable and eco-friendly alternative to chemical anthelmintics for managing gastrointestinal nematodes (GIN) in livestock. Rising resistance to anthelmintic drugs underscores the urgent need for alternative approaches that safeguard animal health and farm productivity. *D. flagrans* has proven effective in reducing pasture contamination by trapping and destroying nematode larvae within feces, thereby disrupting the reinfection cycle. This systematic review synthesizes current evidence on the biological control potential of *D. flagrans*, assessing its efficacy across livestock species, modes of administration, and environmental conditions. Studies consistently demonstrate its capacity to lower parasite burdens; however, key challenges remain. Optimizing fungal formulations, enhancing field-level consistency, and evaluating economic feasibility are critical hurdles. Research gaps include the need for long-term, multi-location field trials under a variety of climates, development of bio-encapsulated formulations to improve spore persistence, and robust cost-effectiveness analyses compared with chemical dewormers. Furthermore, integration of *D. flagrans* with complementary sustainable practices such as rotational grazing and selective breeding requires greater exploration. Addressing these gaps through multidisciplinary research will be essential for scaling up its use as a practical, farmer-friendly solution to GIN control. By applying the Kitchenham systematic review framework, this study consolidates evidence to guide best practices and inform future innovations. Ultimately, *D. flagrans* holds strong promise as part of integrated parasite management programs, offering livestock producers a long-term, environmentally responsible tool to mitigate the growing challenge of anthelmintic resistance.

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Pre-Slaughter Transport Stress Influences Rumen Microbial Communities and Predicted Microbial Function in Spanish Meat Goats. F. Atkins*, A. A. Pech Cervantes, Z. Estrada-Reyes, V. Bryant, M. D. Idowu, G. Kannan, and T. Terrill, CAFNR Research, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446; B. Kouaku College of Agricultural, Family Sciences, and Technology, Fort Valley State University, Fort Valley, GA 31030.

This study evaluated the effects of pre-slaughter transport stress on rumen fermentation and bacterial communities in growing meat goats. Fifty-four male Spanish goats (28.9 ± 4.5 kg) were stratified by body weight and randomly assigned to one of three treatments (n = 18): no transport (CON), 30-minute transport (LS), or 180-minute transport (HS). Blood samples were collected before and after transport to assess plasma cortisol levels. At the end of the trial, goats were slaughtered for carcass evaluation and rumen fluid collection to analyze pH, volatile fatty acids (VFA), and microbial composition via 16S rRNA sequencing. Functional predictions were made using PICRUSt. Both LS and HS significantly increased ($P < 0.01$) plasma cortisol compared to CON (27.5 vs. 130.1 and 117.7 ng/mL,

respectively). No differences were observed in carcass weights or VFA profiles ($P > 0.05$). Rumen pH was lower in HS than CON (6.44 vs. 6.77; $P < 0.05$). LS reduced the relative abundance of *Ruminococcaceae UCG-014* (LDA = 4.20; $P = 0.01$), while HS had no effect. Predicted microbial functions related to immune response, translation, and enzyme activity were downregulated in LS, while energy metabolism was reduced in HS. Compared to HS, LS also showed reduced functions related to immune and digestive systems. These findings suggest that transport stress, particularly prolonged exposure, alters rumen microbial functions associated with immunity, metabolism, and enzymatic activity in growing meat goats.

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Prevalence and Implications of Cestode Parasites in West Florida's Epinephelus Morio Fishery. A.R. Pickett*, G. Ozbay, One Health Lab, College of Agriculture, Science & Technology, Delaware State University, Dover, DE 19901; D. Jones, and E. Babcock, University of Miami Rosenstiel School of Marine, Atmospheric, and Earth Science, Miami, FL 33149.

Parasitic infections can affect both fish health and fishery economics. This study investigates the prevalence and abundance of cestode parasites in the Red Grouper (Epinephelus morio) fishery of the Gulf of America. Preliminary observations from the fishing community indicate that this parasitic occurrence may predate current Red Grouper management in U.S. waters. Due to life-history traits such as strong site fidelity, habitat modification, and a broad diet including crustaceans, Red Grouper may be particularly susceptible to cestode infection. Biological data were collected from Red Grouper, Red Snapper (Lutjanus campechanus), Lane Snapper (Lutjanus synagris), and Gray Snapper (Lutjanus griseus) in Apalachicola and St. Petersburg, Florida during June–July 2025. Findings indicate consistently higher prevalence and mean abundance of cestode parasites in Red Grouper compared with other reef species to complement biological sampling, a fishermen's survey was conducted to explore regional differences in parasite occurrence. Results suggest that many fishers target more Red Snapper and Gag Grouper due to the heavy parasite load observed in Red Grouper. Given the ecological and economic importance of these reef species, parasitology may be influencing harvest dynamics and market preferences across west Florida. This internship contributed to an ongoing study led by LMRSCS graduate students at the University of Miami Rosenstiel School of Marine, Atmospheric, and Earth Science.

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Comparison of One-Step Methyl Ester and Microwave-Assisted Fatty Acid Extraction using *Synodus foetens*
A. Colon-Zapata*, G. Ozbay, One Health Lab, College of Agriculture, Science & Technology, Delaware State University, Dover, DE 19901; K. Huckaby, and P. Chigbu, Department of Agriculture and Natural Sciences, University of Maryland Eastern Shore, Princess Anne, MD 21853.

Fatty acid (FA) profiles are vital biomarkers for assessing fish health, trophic dynamics, and environmental change. In aquaculture, FA profiling plays an important role in evaluating feed quality, broodstock condition, and long-term fish health. Reliable extraction methods are essential to ensure accurate quantification. The inshore lizardfish (*Synodus foetens*) serves as a useful model species for improving fatty acid extraction techniques that can be applied in aquaculture nutrition and management. This study compared two extraction methods, one-step methyl ester (OSME) and microwave-assisted extraction (MAE), using dorsal muscle tissue from *S. foetens* collected near New Orleans during the summer of 2023. Fatty acid methyl esters were prepared in duplicate and analyzed by gas chromatography and mass spectrometry to assess extraction efficiency and reproducibility between the two methods. Overall, differences were observed in the number and relative concentrations of fatty acids extracted by each method. OSME demonstrated greater overall recovery and consistency, while MAE extracted fewer compounds. Both procedures showed reproducibility in duplicate analyses, though OSME provided more complete and reliable results across fatty acid types. These findings indicate that OSME is a more effective approach for broad fatty acid quantification. By improving extraction performance and ensuring reproducible outcomes, OSME enhances the accuracy of fatty acid analysis and supports its application in aquaculture and fisheries research. Refining these methodologies with *S. foetens* contributes to better feed evaluation, identification of essential fatty acids, and improved monitoring of fish health and broodstock management in cultured species.

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Purinergic Receptor Signaling as a Novel Biomarker of Johne's Disease Progression in Goats: An Exploratory Study. O. Greenhoward*, J.C. Peel, R. Merkel, D.T. Woldemariam, H. Akbar. Sherman Lewis School of Agriculture and Applied Sciences, Langston University, OK 73050.

Johne's disease, caused by *Mycobacterium avium* subspecies *paratuberculosis* (MAP), is a chronic enteric infection that results in severe production losses and represents a major challenge to livestock health and productivity. Although the disease has been extensively studied, the early molecular mechanisms that drive infection and disease progression remain poorly understood. Recent studies suggest that extracellular ATP (eATP) and its associated purinergic receptors (PRs) play an important role in regulating host immune responses during intracellular infections. However, the involvement of PR signaling in MAP pathogenesis in goats has not been previously investigated. This exploratory study examined the expression dynamics of PR genes and their association with MAP infection and host immune responses in naturally infected goats. Eighteen goats from the Langston University herd were classified into two groups (n = 9 each): MAP-confirmed (ELISA+/PCR+) and uninfected controls (ELISA–/PCR–). Peripheral blood mononuclear cells were isolated for RNA extraction and used to assess MAP burden, purinergic receptor gene expression, and immune-associated transcripts using RT-qPCR. Data were analyzed using an unpaired Student's t-test. Preliminary results revealed significant regulation of several P1, P2X, and P2Y receptor genes, along with distinct modulation of immune-signature transcripts. These findings provide the first evidence linking purinergic signaling to MAP pathogenesis and highlight its potential as a novel biomarker pathway for early detection and future intervention strategies against Johne's disease in small ruminants.

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Effects of Forage Type and Concentrate Level on Methane Output and Heat Production in Meat Goats. R. Gilpin*, D. Tadesse, R. Puchala, S. Adekayode, H. Yirga, A.K. Patra & I. Tovar-Luna, Sherman Lewis School of Agriculture and Applied Sciences, Langston University, Langston, OK 73050.

Energy loss as methane (CH_4) can significantly reduce energy efficiency in ruminant animals and can be corrected through dietary means. This study evaluated the effects of forage type and concentrate level on methane and heat production (HP) in Spanish goats. Six forage types—alfalfa (AL), lespedeza (LS), an alfalfa–lespedeza mixture (AL–LS), bermudagrass (BR), mixed grass (MG) hay, and wheat straw (WS)—were offered in combination with six concentrate levels (10, 17, 24, 31, 38, and 45% of the total diet). Forage was provided at complementary rates relative to concentrate inclusion to meet 100% of maintenance energy requirements. During the third week of each period, animals were housed in indirect calorimetry systems to measure methane and other respiratory gases, from which HP was calculated. Dry matter intake (DMI) was affected by forage type and concentrate level. Goats fed AL, AL–LS, and BR consumed more feed than those fed LS, MG, or WS, and DMI increased with higher concentrate inclusion. Mean CH_4 production (g/day) and yield (g/kg DMI) were influenced by forage type, concentrate level, and their interaction. Feeding AL, AL–LS, BR, or LS resulted in lower CH_4 yield compared with MG and WS, despite greater total CH_4 output. Goats consuming higher-protein forages and greater concentrate levels exhibited lower HP per unit DMI than those fed medium- or low-protein forages. Overall, the results demonstrate that appropriate combinations of forage type and concentrate level can increase energy utilization efficiency by reducing CH_4 output per unit of feed intake.

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Analyzing Recreational Fisheries Catch Trends and Angler Perspectives: A Case Study of Dolphinfish (*Coryphaena hippurus)* and Blue Marlin (*Makaira nigricans)*. R. J. Rivera*, and G. Ozbay, One Health Lab, College of Agriculture, Science & Technology, Delaware State University, Dover, DE 19901; M. A. Fernandez, and E. A. Babcock, Rosenstiel School of Marine, Atmospheric, and Earth Science, University of Miami, Miami, FL 33149.

Recreational *Coryphaena hippurus* and *Makaira nigricans* fisheries in the Atlantic are ecologically and economically important. However, concerns about overfishing, environmental changes, and increasing fishing effort have raised questions about the sustainability of the fisheries. Standardized data does not always align with the observations of anglers on the water. To address this, perception surveys were conducted at the Blue Marlin Grand Championship in Orange Beach, Alabama, and compared with standardized Catch Per Unit Effort (CPUE) analyses of Marine Recreational Information Program (MRIP) data (1981–2024). Surveys indicated that most dolphinfish anglers perceived decreases in landings and average size, while half reported increased effort, including setting more hooks,

fishing deeper, or traveling farther offshore. In contrast, blue marlin anglers generally perceived stable or increasing landings and no change in size. CPUE modeling, conducted in R using a negative binomial generalized linear model, showed high variability for dolphinfish, while blue marlin perceptions aligned with the International Commission for the Conservation of Atlantic Tunas (ICCAT) 2024 Atlantic Blue Marlin Stock Assessment, which suggested a probable upward trend. These findings emphasize the value of integrating fisher perceptions with standardized data to enhance stock assessments. While dolphinfish results indicated variability and a potential decline, blue marlin populations appear stable, supporting current fishery management strategies.

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Development of an Artificial Intelligence Model for Automated Dairy Goat Identification Using Video Data. D. Lambeth[1]*, C. Alvarado[1], A. Green-Miller[2], and I. Condotta[2]. [1]Sherman Lewis School of Agriculture and Applied Sciences, Langston University, Langston, OK 73050; and [2]AIFARMS, University of Illinois Urbana-Champaign, Urbana, IL 61801.

Artificial intelligence (AI) holds new potential for precision livestock monitoring, enabling real-time detection and behavior analysis in animal production systems. This study is part of the USDA-NIFA Capacity Building Grant, Cultivating Agricultural Leaders: AI Applications in Livestock, which aims to integrate computer vision into dairy goat research under Protocol CA-25. The objective of this phase is to develop and train an AI model capable of identifying individual goats within the Langston University herd from fixed-position barn cameras. Four PoE-powered Amcrest and FLIR infrared cameras were installed at strategic points in the barn and milking parlor to collect synchronized video data under varying environmental and lighting conditions. Collected footage is being processed to create a labeled dataset for model training using convolutional neural networks (CNNs) optimized for livestock recognition. Model development involves feature extraction, bounding-box annotation, and accuracy validation against manually labeled ground truth. It is expected that the trained model will achieve a precision of over 90% in goat identification, enabling future integration with behavioral and productivity datasets to support health monitoring and informed management decisions. The results of this work will contribute to establishing a foundation for AI-assisted livestock observation systems designed for small ruminant research and sustainable dairy production.

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Effects of Housing Conditions on the Feed Intake of Alpine Goats in a Controlled Feeding Trial. S. Breshears*; C. Alvarado; F. Belkasmi. Sherman Lewis School of Agriculture and Applied Sciences, Langston University, OK 73050

Environmental factors can markedly influence the feeding behavior of dairy goats and, consequently, their productivity. This study examined the impact of key environmental conditions on feed intake in Alpine goats maintained under controlled experimental conditions. Forty Alpine does were housed in five pens over 160 days in an experimental barn equipped with three Hobo data loggers (MX1104) to continuously monitor ambient temperature (°C), relative humidity (%), dew point (°C), and light intensity (lux). Individual feed intake was recorded daily across five nutritional treatments using the Calan gate system, which allowed precise measurement by subtracting feed refusals from the total feed offered at 8 a.m. Environmental data were synchronized with individual intake records to assess potential associations. All analyses were performed in Python (using pandas, statsmodels, and pingouin) within an Anaconda Jupyter environment. Results revealed significant differences in feed intake among groups ($p < 0.001$) and significant correlations with variations in temperature and humidity conditions, indicating reduced consumption during warmer and more humid periods. Light intensity was moderately associated with feeding activity, suggesting behavioral adaptations to environmental changes. Notably, feed intake responded non-linearly to thermal load: on low-intake days, higher temperature and humidity were associated with increased intake, whereas on high-intake days, intake was suppressed, with no effect observed at median intake levels. In conclusion, thermal stress modulates feeding behavior in a complex, intake-dependent manner, highlighting the importance of tailored nutritional management strategies to optimize feed efficiency and productivity in dairy goats exposed to variable housing conditions.

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Detection of multiple bacterial presence in the mesentery lymph nodes of goats infected by the gastrointestinal nematode *Haemonchus contortus.* E. Clark*, K. Busby, J. Hegwood, and Y. Tilahun. School of Agriculture and Applied Sciences, Langston University, Langston, Oklahoma 73050.

Infection by a parasite, such as *Haemonchus contortus* (*H. contortus*), impacts a host's entire metabolism. This study identifies the metagenomic effects impacted by infection of *H. contortus*, particularly in the mesentery lymph nodes (MLN) of small ruminants, *Capra hircus* (the goat). We conducted a randomized, complete block-designed investigation using metagenomic methods to elucidate the effects of a gastrointestinal nematode (GIN) infection with H. contortus on the microbiomes of Alpine wethers. Metagenomic procedures completed on tissue samples of GIN-infected hosts provide evidence recognizing significantly different ($p < 0.05$) microbial species presence (upregulation or downregulation), indicating infection by GINs. We investigated the significant change in microbial species present in MLN samples of hosts. Poisson regression differential analyses revealed significant differences when cross-comparisons were made among subjects who were not infected (NI), infected only (IO), infected while also receiving zoledronic acid (ZA), and infected while being treated with an antibody (AB). The upregulation and downregulation of microbial species were evident, indicating that infection by H. contortus affects the microbiome of the MLN.

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Detection of multiple bacterial presence in the abomasum of goats infected by the gastrointestinal nematode *Haemonchus contortus.* J. Hegwood*, E. Clark, K. Busby, and Y. Tilahun. School of Agriculture and Applied Sciences, Langston University, Langston, Oklahoma 73050, USA

Infection by a parasite, such as *Haemonchus contortus* (*H. contortus*), impacts a host's entire metabolism. This study identifies the metagenomic effects of H. contortus infection, particularly in the abomasum of small ruminants, *Capra aegagrus hircus* (the goat). We conducted a randomized, complete block-designed investigation using metagenomic methods to elucidate the effects of a gastrointestinal nematode (GIN) infection with H. contortus on Alpine wethers. Metagenomics from collections of tissue samples provides evidence recognizing the significant difference ($p < 0.05$) in the change in the presence of microbial species (upregulation or downregulation), indicating the influence of GINs. We investigated the significant changes in the presence of microbial species in the abomasum samples of hosts. The treatments were cross-compared to determine if any significant differences were evident. Cross-comparisons were made between no infection (NI), infection only (IO), infection with an injection of zoledronic acid (ZA), and infection with an injection of an antibody (AB). The differential analyses of Poisson regression revealed that microbial flora were evidently influenced by the presence of *H. contortus.*

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Detection of multiple bacterial presence in the abomasum lymph nodes of goats infected by the gastrointestinal nematode *Haemonchus contortus.* K. Busby*, E. Clark, J. Hegwood, and Y. Tilahun. School of Agriculture and Applied Sciences, Langston University, Langston, Oklahoma 73050, USA

Haemonchus contortus (*H. contortus*) impacts a host's entire metabolism. This study identifies the metagenomic effects impacted by infection of *H. contortus*, particularly in the abomasum lymph node (ALN) of small ruminants, *Capra hircus* (the goat). We conducted a randomized, complete block-designed study to investigate the use of metagenomic methods in deciphering the effects of a gastrointestinal nematode (GIN) infection, H. contortus, on Alpine wethers. Metagenomics from collections of tissue samples provides evidence recognizing significantly different ($p < 0.05$) microbial species presence (upregulated or downregulated expression), indicating infection by GINs. We investigated the significant change in the presence of microbial species in ALN samples of hosts. A cross-comparison using the differential analysis tool, Poisson regression, to construct a Volcano plot, revealing the significant differences between the various treatments — no infection (NI), infection only (IO), infection with zoledronic acid injection, and infection with antibody treatment (AB) — was completed. Results showed significant differences between the treatments, indicating that H. contortus affects the microbiome of the abomasum lymph nodes.

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Effects of Natural Sources of Brackish/Saline Water on Milk Yield, Composition, and Blood Parameters in Alpine Dairy Goats. K, Mosley*, H. Yirga, D. Woldemariam, R. Puchala, D. Tadesse, A. K. Patra, C. Alvarado, and S. Adekayode. American Institute for goat research, Langston University, Langston, OK

This study evaluated the effects of different sources of brackish/saline water on milk yield, composition, and blood parameters of lactating Alpine dairy goats. Thirty-two goats were assigned to one of five drinking water treatments: fresh water (FRW; 383 Total dissolved solids (TDS)), West Pasture brackish water (BRW; 6385 mg/L TDS), group 2 (GR-2; 3099 mg/L TDS), group 3 (GR-3; 5410 mg/L TDS), and unclassified source (G-UC; 2567 mg/L TDS). Goats were fed a total mixed ration at 4% of body weight. Milk yield did not differ significantly among treatments ($P = 0.096$, SEM = 0.228), averaging 2.25, 2.53, 1.79, 1.82, and 1.88 kg/day for FRW, BRW, GR-2, GR-3, and G-UC, respectively. Goats receiving BRW tended to produce more milk than those on GR-2, GR-3, or G-UC ($P < 0.005$). Milk yield declined over time ($P < 0.001$; SEM = 0.117), from 2.30 kg/day (week 0) to 1.48 kg/day (week 6). Milk composition (butterfat, protein, lactose) was unaffected by treatment or time. Butterfat, protein, and lactose contents were 3.33–4.30%, 2.60–2.76%, and 4.35–4.54%, respectively. Milk urea tended to vary among treatments ($P = 0.055$) and increased over time ($P = 0.025$), averaging 18.96, 20.4, and 22.4 mg/dL at weeks 0, 3, and 6. Levels of blood parameters such as hemoglobin concentration, packed cell volume (PCV), and glucose were similar among water treatments ($P>0.005$). In conclusion, water quality had no significant effect on milk yield or composition, indicating that Alpine dairy goats are tolerant to varying drinking water salinity levels.

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Antibacterial Efficacy of Green-Synthesized Zinc Oxide Nanoparticles from Guava (*Psidium guajava* L.) Leaf Extract Against Mastitis-Causing Bacteria. A. Maxwell*, S. Woldesenbet, M. T. Nuñez de Gonzalez, A. Geremew, L. Carson and A. Mora-Gutierrez, Cooperative Agricultural Research Center, College of Agriculture, Food, and Natural Resources, Prairie View A&M University, Prairie View, TX 77446.

Mastitis is a common and severe inflammatory condition affecting the mammary glands of animals. It presents significant threats to animal health, farm productivity, milk yield, and milk quality. The disease's pathology can be fatal, especially when infectious agents such as *Staphylococcus aureus* and *Escherichia coli* are involved, potentially leading to sepsis if untreated. With the escalating prevalence of antibiotic resistance among mastitis-associated pathogens, there is an urgent need for alternative antimicrobial strategies. This study assesses the antibacterial efficacy of green-synthesized zinc oxide nanoparticles (ZnO-NPs) from guava (*Psidium guajava L.*) leaf extract (GLE) against mastitis-causing bacteria. ZnO-NPs from GLE were characterized by particle size, stability, functional group presence, light absorbance, and crystallinity using advanced analytical techniques. The synthesized nanoparticles, with a mean size of 66.8 nm and a zeta potential of -20.2 mV, displayed a UV-Vis absorption maximum at 372 nm, indicating favorable optical properties. Antimicrobial assays were conducted against *S. aureus* and *E. coli* at concentrations ranging from 50 µg/mL to 600 µg/mL, incubated at 36°C for 24 hours. The degree of inhibition was quantified using both colonies counting and manual calculations. The ZnO-NPs synthesized from GLE showed significant antibacterial activity against all tested strains, demonstrating concentration-dependent zones of inhibition and a reduction in bacterial viability. Notably, ZnO-NPs synthesized from guava leaf extract effectively inhibited the growth of both *S. aureus* and *E. coli*, underscoring their potential as a promising green alternative for mastitis management.

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Developing a Liver Abscess Model in Growing Calves. D.M. Davis*, Department of Agricultural Sciences, College of Agricultural, Human and Environmental Sciences, Southern University and A&M College, Baton Rouge, LA 70813; G. Combs, and L. Baumgard, Animal Science Department, Iowa State University, Ames, IA 50011.

Liver abscesses are a significant issue in ruminant nutrition, leading to reduced growth, decreased feed efficiency, and economic losses for producers due to liver condemnation at slaughter. Currently, there is no standardized research model to reliably induce liver abscesses in growing calves, making it challenging to study their development, prevention, and treatment. This project aims to establish a reproducible liver abscess model to facilitate future research on mitigation strategies. By simulating common dietary and microbial factors contributing to abscess formation, we hope to provide a controlled framework for studying this condition. The findings from this study could lead to improved management practices and nutritional strategies that minimize liver abscess occurrence in cattle production systems.

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Egg to Extraction: Exploring Poultry Life Cycle and Health Monitoring Through Field andLab Techniques. K. Faustin*, Animal and Veterinary Science, Program, Tuskegee University, Tuskegee, AL 36008; N. Jarrell, Department of Animal Science, North Carolina A&T State University, Greensboro, NC 27411; A. Abolude, C. Shili, and D. Collins, Department of Agriculture, Alcorn State University, Lorman, MS 39096.

Poultry production is a vital component of global agriculture, contributing significantly to food security through the supply of meat and eggs. Modern poultry systems rely on integrated practicesthat span from hatchery operations and processing techniques to advanced laboratory diagnostics. Understanding the entire production chain—from incubation and chick development to post- harvest handling and molecular-level health monitoring—is essential for producing safe, high- quality poultry products. Egg incubation and hatching require precise environmental control to optimize chick viability and performance, while poultry processing must adhere to strict hygiene and welfare standards to ensure meat quality and consumer safety. Beyond production, moleculartools such as RNA extraction from chicken muscle are increasingly used to assess immune responses, detect pathogens, and monitor poultry health at the genetic level. Hands-on experience in incubating eggs under controlled temperature and humidity, candling to monitor hatchability and RNA extraction enhanced.

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Nutritive Value of Industrial Hemp Plant Biomass and Spent Hemp Biomass as a Potential Protein Supplement for Goats. C. Roberts*, N. Kidane , A. Weerasooriya, and S. Woldesenbet, CAFNR Research, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, Texas 77446.

Hemp (*Cannabis sativa L)*, a multipurpose herbaceous crop, has been used for food and medication for centuries. It has been extensively used for CBD and oil extraction. Hemp extraction processes, in turn, produces a large volume of Spent Hemp Biomass (SHB). Although hemp seeds and flowers are high in macro and micronutrients essential in human diets, little information is available in the literature regarding the value of SHB as a feed for animals. Hence, the objective of this research was to evaluate the nutritive values of SHB as feed for goats. From November 2023 to April 2024, 12 hemp varieties were grown in separate pots in a greenhouse setting. Samples of trimmed leaves and stems were handpicked and stored in a refrigerator for further analysis. SHB samples of different mixes were obtained from a CBD processing company, oven-dried and then ground to 2-mm before determining dry matter (DM), crude protein (CP) and mineral contents. The results showed significant differences in CP contents among strains of hemp plants and SHB, while mineral contents showed no detectable differences. While the CP content of plant biomass was low, ranging between 7.8% and 18.4%, spent hemp biomass had higher CP%, ranging between 22.4% and 27.2%, the latter comparable to the CP contents of high-quality feeds, such as alfalfa. Thus, with a comparable CP%, SHB has the potential as a supplementary ingredient in ruminant diets. However, further research is warranted to determine the nutritional attributes, including digestibility and intake of hemp.

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Hybrid Meat Development through Incorporation of Plant-Based Ingredients for Health, Flavor, and Planet-Friendly Practices. R. Angel*, A. Bakhsh, Sherman Lewis School of Agriculture and Applied Science, Langston University, Langston, OK 73050.

The rising global demand for meat has raised concerns about extensive animal agriculture, welfare, and public health emergencies. Red meat consumption is linked to cardiovascular diseases and certain cancers. Although goat meat is nutritious, its distinct odor often limits consumer acceptance, especially in the American market. To address this challenge, hybrid meat products offer an innovative approach by combining goat meat with plant-based ingredients to balance nutrition, enhance sensory appeal, and mask undesirable odors associated with goat meat. Such hybrid formulations provide a health-conscious alternative that reduces overall meat content while maintaining desirable texture, flavor, and functional qualities. This project aims to develop and evaluate hybrid goat meat formulations by partially replacing goat meat with varying levels of textured vegetable protein (TVP). Goat meat will be replaced with TVP at the same levels, while maintaining consistent levels of other functional ingredients, including methylcellulose, garlic powder, yeast extract, black pepper, mushrooms, salt, coconut oil, canola oil, beet juice, molasses, smoked

flavor, and leghemoglobin. Physicochemical properties (pH, moisture, protein, fat, ash, and color), textural attributes (hardness, chewiness, gumminess, springiness, and cohesiveness), and water-holding capacity (cooking yield and water release) will be measured. Sensory evaluation will assess color, flavor, aroma, juiciness, tenderness, and overall acceptability. The expected results indicate that hybrid goat meat formulations with TVP will exhibit improved moisture retention, enhanced texture, and better flavor, along with reduced goat odor, leading to higher overall acceptability. These results will provide insights into developing nutritionally improved, sustainable, and palatable goat hybrid meat products.

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A Case Study: Lamb Performance During Four Consecutive Lambing Seasons (2022 to 2025) at the UMES Small Ruminant Farm. O. L. Ludolph*, K. Tyree-Castro, S. Kirongo, K. Braxton, P. Natarajan, and E.N. Escobar; Department of Agriculture, Food and Resource Sciences, University of Maryland Eastern Shore, Princess Anne, MD 21853.

The objective of this study was to provide intern undergraduate students working at the University of Maryland Eastern Shore's Small Ruminant Farm (38.21595^{O} N, 75.67918^{O} W), the opportunity to develop critical thinking, data organization and technical writing skills through the observation and data recording of the performance of sheep *(Ovis aries)* raised on the farm. The data was collected during the 2022, 2023, 2024, and 2025 lambing seasons (N = 79). Performance was evaluated by recording the Body Weight (BW) at birth, the sex of the newborns, the number of lambs per lambing (birth type), the BW at various ages, including at weaning. Finally, Average Daily Gain (ADG) was used to compare performance by sex and birth type. In total, data from lambs were collected, organized, and analyzed. In 2023, the death of three ewes and the loss of their lambs was attributed to pregnancy toxemia. Students also had the opportunity to observe how birth type (single = 1, twins = 2, or triplets = 3) and sex influenced birth weight and ADG. For instance, in 2025 at weaning (99 days), male lambs (n = 16) had slightly higher ADG (172 g) than female lambs (n = 18, 168 g). In 2023, ADG of all twin lambs (n = 9) averaged 267.1 g at 47 days. Overall, this project provided the students with valuable hands-on experience. They have enhanced their knowledge and analytical skills for their future professional careers.

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A Case Study: Goat Kids Performance During Four Consecutive Kidding Seasons (2022 to 2025) at the UMES Small Ruminant Farm. K. Tyree-Castro*, O.L. Ludolph, S. Kirongo, K. Braxton, P. Natarajan, and E.N. Escobar, Department of Agriculture, Food and Resource Sciences, University of Maryland Eastern Shore, Princess Anne, MD 21853.

This report outlines the training of upper-class Animal Science interns in critical thinking, data analysis, and technical writing through a study of goat (*Capra hircus*) kid performance at the University of Maryland Eastern Shore (UMES) Small Ruminant Farm, in Princess Anne, MD, 21853 - (38.21595^{O} N, 75.67918^{O} W). Data collected during the 2022 to 2025 kidding seasons (N = 144) were used to examine how sex, type of birth, and age influenced body weight, which was then used to calculate Average Daily Gain (ADG) as the primary performance indicator. *Type of birth* is a significant performance factor, since does can carry up to four kids at a time. For example, in 2025, male kids (n = 18) had a slightly higher ADG than females (n = 18) at weaning (146 g vs. 128 g). In 2024, single births (n = 1) averaged higher ADG (213 g) compared to twins (182 g, n = 10), triplets (160 g, n = 21), and quadruplets (132 g, n = 4). These results demonstrate how sex and type of birth influence growth performance in goat kids. Through participation in breeding, kidding, and data analysis, interns gained valuable hands-on experience evaluating growth performance and enhanced their analytical and technical writing skills for future careers in animal science.

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Microbiome Analysis to Improve Poultry Production. A. Cary*, M. Gandy, D.V. Ruiz Ramos, and E. May, Department of Natural Sciences, University of Maryland Eastern Shore, Princess Anne, MD 21853.

The poultry microbiome plays a key role in preventing common pathogens and supporting nutrient absorption. By combining gut microbiome data with environmental factors such as feed type, housing quality, and temperature, we can improve poultry production and performance. Figuring this out could help us move towards more sustainable

poultry farming that relies less on antibiotics. In this study, we are collecting feed, litter, and cecal samples from four commercial chicken houses over three seasons (Spring, Summer, Fall) to determine how poultry house conditions affect the microbiome and pathogen presence. DNA was extracted from the Summer and Fall samples (n = 40) using the QIAamp Fast DNA Stool Kit according to the manufacturer's protocols. DNA quality and concentration were assessed before sending samples for targeted amplicon sequencing (16S V4). Quantitative PCR (qPCR) will be used to quantify the presence of pathogens (*Salmonella*, *Campylobacter*). To detect pathogens such as *Salmonella* in our samples, we tested InvA, InvA2, Salm16S, hipO, hlyA, and hilA. For most of our fall 2025 samples, we have used InvA2 and Salm16S, both targeting *Salmonella* spp. InvA is designed to help verify results across different invA gene segments, which reduces false negatives. Summer 2025 samples included hipO, hilA, and hlyA. So far, preliminary results indicate target pathogens are absent from most of our samples for fall and summer, regardless of feed or litter, as they did not amplify during qPCR.

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Experiential Learning in Commercial Swine Production: Practical Exposure to Integrated Management Practices in a Commercial Farrow-to-Finish Swine Operation. K. Peprah*, M. Qureyin, R. Otwey, S. Chapagain, and J. Dhakal, Department of Agriculture, Food and Resource Sciences, University of Maryland Eastern Shore, Princess Anne, MD 21853.

Swine production is a vital sector of American agriculture, contributing over $28 billion annually to the U.S. economy and providing more than 25 billion pounds of pork each year. Effective swine management plays a critical role in ensuring herd health, welfare, and productivity while minimizing disease transmission. This experiential learning project involved a visit to a commercial farrow-to-finish swine farm and provided students with hands-on experience and practical exposure to modern swine management practices. Data were gathered through hands-on activity, direct observation, and discussions with farm personnel focusing on the relationship between management efficiency, biosecurity, and farm profitability. Learning activities involved topics such as piglet management, castration of male piglets (~1 week old), antibiotic and iron injections, tail docking, and assisting the farrowing of sows. Training also included the demonstration of artificial insemination (AI) techniques used to improve genetics and maintain breeding efficiency. Observations emphasized biosecurity protocols (including disinfection footbaths, use of disposable foot covers and coveralls, and restricted movement between units), automated and computerized feeding systems, ventilation, and waste management practices that support animal welfare and environmental sustainability. This field-based experience strengthened practical competencies and reinforced classroom learning on swine production and swine management in commercial settings.

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Sex-Specific Physiological and Hematological Profiles in Mature Rabbits. M. Duval*, G. Lunn, K. Prim, N. Ogunkunle, and M. Garcia, Animal Bio-Health Science Program, Department of Food and Animal Sciences, Alabama A&M University, Normal, AL 35762.

Understanding sex-specific physiology in New Zealand rabbits can improve health assessment, breeding strategies, and research accuracy. This study compared vital signs, blood parameters, and basic performance in mature males (n = 4) and females (n = 4) rabbits. Body weight, heart rate, and respiratory rate were recorded before blood collection. Blood was drawn from the auricular artery with a butterfly needle. Whole blood hemoglobin and hematocrit were measured with a handheld meter; plasma glucose and triglycerides were analyzed using commercial colorimetric kits. Data were analyzed in SAS (PROC MIXED); significance was set at $P \leq 0.10$ and tendencies at $0.10 < P \leq 0.25$. The findings revealed notable sex-based differences in several parameters, though most were numerical rather than statistically significant. Females showed higher triglycerides (+63.5%, P=0.35) and respiratory rate (+17.4%, P=0.45). Males tended to have higher hemoglobin (+12.1%, P=0.17) and hematocrit (+12.0%, P=0.17). Body weight was similar (males 3.31 kg vs. females 3.40 kg; P=0.65), as were heart rate and glucose. Although several parameters differed by >10%, the small sample size likely limited power to detect significance. These trends suggest biologically meaningful, sex-specific variation. Establishing breed and sex-specific reference ranges for vital signs and blood parameters could enhance clinical care and welfare in rabbits. Larger studies are needed to confirm these patterns and to probe underlying metabolic and physiological mechanisms.

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Age-Related Changes in Body Weight and Physiological Parameters in Turkeys from 3 to 59 days of age. K. Living*, K. Green, K. Prim, N. Ogunkunle, and M. Garcia, Animal Bio-Health Science Program, Department of Food and Animal Sciences, Alabama A&M University, Normal, AL 35762.

Understanding age-related physiological changes in turkeys is crucial for optimizing meat production and ensuring animal welfare. The objective of this study was to assess age-related changes in turkeys over time. Three-day-old turkey poults (n = 8) were monitored for 56 days and fed commercial diets ad libitum. Body weight was recorded weekly to monitor growth. Vital signs (heart and respiratory rates) and blood samples for hemoglobin, hematocrit, glucose, and triglycerides were collected on days 28 and 56. Data were statistically analyzed using the PROC MIXED procedure in SAS, with significance set at $P \leq 0.10$ and tendencies at $0.10 < P \leq 0.25$. Results revealed a substantial increase in weekly body weight from 95.4 g on day 0 to 4,453.8 g on day 56 ($P < 0.05$), reflecting expected growth patterns. Hemoglobin levels tended to decrease with age (8.49 and 8.10 g/dL at days 28 and 56, respectively, $P = 0.24$), with hematocrit showing a similar trend. Heart rate showed a slight numerical decrease (-7.8%, $P = 0.53$), while respiratory rate numerically increased (+25.2%, $P = 0.28$) from day 28 to 56. Blood glucose levels tended to increase with age (244.2 and 259.8 mg/dL at days 28 and 56, respectively; $P = 0.20$). Conversely, triglyceride levels tended to decrease (117.8 and 98.7 mg/dL at days 28 and 56, respectively $P = 0.24$). These findings demonstrate that turkeys reached targeted weights and exhibited physiological trends aligning with meat production goals, offering valuable insights for optimizing their performance, health, and welfare.

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RNA Sequencing Identifies Downregulation of Mitochondrial Metabolism as a Driver for Fetal Adaptation to Maternal Nutrient Restriction During Gestation in *Bos taurus.* K. M. Green*, Department of Food and Animal Sciences, Alabama A&M University, Normal, AL 35762; K. A. Elder, and C. O. Lemley, Department of Animal and Dairy Sciences, Mississippi State University, Mississippi State, MS 39762; and J. F. Odhiambo, Department of Food and Animal Sciences, Alabama A&M University, Normal, AL 35762.

Nutritional stress in beef cattle (*Bos taurus)* occurs when nutrient intake is inadequate or imbalanced, disrupting essential metabolic processes and growth. Such deficiencies are common in cow–calf operations and can have lasting impacts on fetal development. This study aimed to identify cellular pathways influenced by maternal nutrient restriction during gestation. Thirty-six fetuses were examined from dams receiving either a restricted (RES) or adequate (ADQ) diet from day 160 to 240 of gestation. At day 240, dams underwent Cesarean section for fetal removal and tissue collection. Liver samples were sequenced using Illumina platforms and analyzed with DESeq2 ($|\log2FC| \geq 1$, $Padj \leq 0.05$). A total of 2,327 genes were differentially expressed between groups. Around 1,106 upregulated and 1,221 downregulated in RES vs. ADQ fetuses. KEGG pathway analysis revealed significant downregulation in four mitochondrial metabolic pathways: oxidative phosphorylation (53 genes, 52 downregulated; $Padj < 5.07^{-10}$), thermogenesis (69 genes, 59 downregulated; $Padj < 8.08^{-9}$), non-alcoholic fatty liver disease (42 genes, 40 downregulated; $Padj < 5.18^{-6}$), and ribosome (76 genes, all downregulated; $Padj < 6.68^{-9}$).These findings indicate that fetal adaptations to maternal nutrient restriction are associated with suppressed mitochondrial metabolism, suggesting a shift toward energy conservation to sustain essential biological functions under limited nutrient conditions. Funded by NIFA CBG #2021-38821-34599.

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The Sustainability of Animal Furs in the World of Fiber Arts. D. Lee* and L. Davis, Department of Human Sciences, College of Agriculture, Tennessee State University, Nashville, TN 37209.

Animal furs in fiber arts lie at the intersection of cultural heritage, responsible material use, and environmental stewardship. When ethically sourced, these fibers remain a valued natural material due to their durability, renewability, and biodegradability qualities – increasingly important in a textile landscape dominated by synthetic alternatives. Sustainable sourcing practices typically include collecting naturally shed fibers, utilizing by-products from subsistence or regenerative agricultural systems, and harvesting from animals raised under high-welfare conditions. These methods help reduce ecological impact while supporting rural livelihoods and maintaining long-standing cultural traditions in the fiber arts community. The sustainability of fur-based materials, however, depends on transparency, traceability, and careful management of both animals and land. Ethical sourcing requires herding and production

systems that reduce animal stress, maintain biodiversity, and prevent habitat degradation. Localized and small-scale sourcing can strengthen supply-chain visibility, reinforce community-based oversight, and reduce transportation-related emissions. We examine strategies that fiber artists, producers, and consumers can use to evaluate and improve the ethical foundations of fur-based textiles, emphasizing the importance of rigorous certification standards, community-informed monitoring, and open dialogue about animal welfare and environmental responsibility. Such efforts are increasingly relevant as public debate continues around the role of animal-derived materials in modern textile production. When high-welfare practices, regenerative land management, and transparent sourcing are prioritized, animal furs can serve as renewable, low-impact fibers with long functional lifespans and full biodegradability at end-of-use. As a result, ethically sourced furs may offer a viable and sustainable option within a more circular and responsible fiber ecosystem.

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Evaluation of Crop Residues as Substrate for the Cultivation of *Oyster* Mushroom *(Pleurotus ostreatus)*. J. Mathews* and A. Yousuf, Agricultural Research Station, Virginia State University, Petersburg, VA 23806.

Crop residues, primarily lignocellulosic materials, constitute about 85% of total solid waste generated from agricultural operations, yet only a small fraction is effectively utilized. Oyster mushrooms (*Pleurotus* spp.), edible fungi capable of secreting cell wall–degrading enzymes, can convert these residues into nutritious food and valuable bioproducts. This study explored the use of corn stover (COST), edamame or vegetable soybean straw (EDST), and their equal mixture (COED) as substrates for oyster mushroom cultivation. The objective was to assess the nutritional quality and chemical composition of both the substrates and the resulting mushrooms. Mushrooms cultivated on EDST exhibited the highest crude protein, ash, and energy content, along with superior total yield and biological efficiency (B.E.) compared to other substrates. These findings indicate that EDST is a highly suitable substrate for oyster mushroom production and highlights its potential in recycling crop residues into sustainable, high-protein food sources while contributing to agricultural waste management.

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Comparison of Viral Prevalence in the Honey Bee (*Apis mellifera* L.) Colonies during Transportation. L.G.D. Ambrister*, Department of Agricultural and Life Science, Central State University, Wilberforce, OH 45384; R. Pudasaini, Z. Hubhachen, and H. Li-Byarlay, Agricultural Research and Development Program, Central State University, Wilberforce, OH 45384.

Honey bees (*Apis mellifera*) are the most important managed pollinators in U.S. agriculture, contributing billions of dollars to crop production annually. Almond pollination alone accounts for over $6 billion each year. To provide pollination services, colonies are frequently transported across the country, particularly to California, where they encounter multiple environmental and biological stressors. However, limited research exists on the molecular and physiological effects of transportation on bee health. This study investigates the impact of migratory beekeeping on pathogen prevalence and immune response in honeybees. RNA was extracted using the RNeasy Plus Mini Kit, and reverse transcription polymerase chain reaction (RT-PCR) analysis was used to detect viral pathogens and assess immune gene expression in transported versus stationary colonies. Preliminary findings indicate that transported colonies exhibit increased pathogen loads and altered immune gene activity compared to stationary hives, suggesting that transportation contributes to biotic stress and immune suppression. These results offer new insights into the molecular consequences of migratory beekeeping and highlight the need for improved colony management practices. Understanding how transportation affects honeybee health will help support sustainable pollination systems and strengthen the resilience of this critical pollinator species.

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Anatomical Acute Toxicity Assessment of Pesticides to Adult Worker Honey Bees (*Apis mellifera*). L. Louis*, Department of Agricultural and Life Sciences, Central State University, Wilberforce, OH 45384; B. Shannon, Department of Entomology, Ohio State University, Wooster, OH 44691; H. Li-Byarlay, Agricultural Research and Development Program, Central State University, Wilberforce, OH 45384; and R. Johnson, Department of Entomology, Ohio State University, Wooster, OH 44691.

Honey bees (*Apis mellifera*) play a crucial role in global pollination and food production, yet pesticide exposure continues to threaten their survival and health. Many standard risk assessment studies apply insecticides to the dorsal thorax as a proxy for exposure, but this uniform method overlooks the possibility that toxicity may differ among anatomical regions. To address this limitation, we conducted localized applications of two commonly used pesticides—Dimethoate, a neurotoxic organophosphate, and Cyantraniliprole, a ryanodine receptor (RyR) agonist—to eight distinct body regions of 3-day-old worker bees. Treatments were applied using a microapplicator, with acetone as a negative control, and mortality was recorded at 48 hours post-exposure to calculate LD_{50} values using the *drc* package in R. Results revealed significant variation in toxicity among body regions. For Dimethoate, mortality was highest when applied to the dorsal head and ventral thorax—areas rich in neural tissue and motor centers—while applications to wings caused the lowest mortality. In contrast, Cyantraniliprole induced greater mortality when applied to the ventral thorax and abdomen, which contain dense RyR-dependent muscle tissues, but showed reduced toxicity at the dorsal thorax. LD_{50} values determined for dorsal thorax applications (0.054 µg/bee for Dimethoate and 0.12 µg/bee for Cyantraniliprole) closely matched previously published values, validating the reliability of our methods. This is the first study to demonstrate that pesticide toxicity in honey bees depends strongly on the exposure site. Our findings suggest that risk assessments relying solely on dorsal thorax applications may underestimate potential hazards for some compounds. Future studies should incorporate multiple droplet sites and additional pesticide classes to better capture exposure variability and refine ecological risk models for pollinators.

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Effects of Octopamine Modulation on Foraging Behavior and Neural Plasticity in the Honeybee, *Apis Mellifera*. C. Woods*, Department of Agricultural and Life Sciences, Central State University, Wilberforce, OH 45384; J. Guo, and H. Li-Byarlay, Agricultural Research and Development Program, Central State University, Wilberforce, OH 45384.

Octopamine serves as a key neuromodulator influencing foraging, learning, and communication in insects. This study investigates the behavioral, physiological, and neuroanatomical responses of the honeybee, *Apis mellifera*, to octopamine and its inhibitor. We will treat bees in three treatments, octopamine-treated, octopamine inhibitor–treated, and control. Each group will contain 20 worker bees. Individual body weights will be recorded before and after treatment. Following treatment, bees will be introduced into a maze containing a food source. Post-trial weights will be measured to assess group-level foraging efficiency and food-sharing ability through changes in the mean and standard deviation of body weight. Behavioral observations will include the number of interactions between bees that locate food and their nestmates, as well as the frequency of visits to empty tubes, which reflects communication and learning behavior. Brain anatomical data will be collected from frozen sections to measure mushroom body (MB) volume using the Cavalieri method, and histological staining (DAPI and H&E) will be applied to examine MB morphology. It is anticipated that octopamine-treated bees will demonstrate increased foraging efficiency, greater social interaction, and larger MB volume compared with control and inhibitor-treated groups. These findings will contribute to understanding the neurochemical basis of collective foraging and support innovations in pollinator health and ecological resilience within agricultural systems.

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Screening for High Hygienic Behavior in Honeybee (*Apis mellifera*) Colonies in Ohio. H. Strachan*, Department of Agricultural and Life Sciences, Central State University Wilberforce, OH 45384; D. Kroh and H. Li-Byarlay, Agricultural Research and Development Program, Central State University, Wilberforce, OH 45384.

Hygiene is essential to the health and productivity of honeybee colonies. Hygienic behavior a natural defense mechanism allows bees to detect and remove diseased or dead brood, reducing the spread of pathogens such as American Foulbrood, Chalkbrood, and *Varroa* mites. This behavior helps maintain brood health, improves queen performance, and supports strong population growth. Because hygienic traits are heritable, they are valuable in selective breeding programs aimed at creating more resilient colonies. This study focuses on Ohio honeybee colonies and explores the potential link between two resistance traits: mite-biting and hygienic behavior. Specifically, we ask whether colonies with high *Varroa* mite-biting behavior also exhibit increased hygienic behavior. We hypothesize a positive correlation between the two traits, suggesting that selecting for one may enhance the other. To test this, we will use the Universal Bee/Odor (UBO) assay to measure hygienic behavior across all colonies, including feral, commercial, and Russian bees. Colonies will be grouped by known mite-biting behavior, and their UBO results will

be analyzed statistically. We expect high-biting colonies to show stronger hygienic responses, indicating a possible genetic or behavioral link. This research supports pollinator health by informing breeding programs that strengthen natural resistance traits, reduce reliance on chemical treatments, and improve pollination services vital to agriculture and ecosystems.

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Study of Antagonistic Effects of Select Probiotic Like Bacteria Against Enteric Antibiotic Resistant Bacteria Isolated from Ruminants. P. Taylor *, C. Kim, M. Minja, Z. Wang and E. Ndegwa. Agricultural Research Station, Virginia State University, Petersburg, VA 23806.

Antibiotic resistant bacteria (ARB) found in the gut of animals pose a global One health risk since antibiotic resistant elements are transmissible between humans and animals directly and also through the shared environment. There is therefore an urgent need and call for identification and evaluation of novel alternatives to antibiotics for use in both animals and humans. Much attention to molecules like bacteriocins and organic acids produced by lactic acid bacteria (LAB), *Bacillus* and *Bifidobacterium spp* have given hope due their potential in the prevention and treatment of diseases in animals and humans. In this study, we are evaluating bacterial isolates of known beneficial species of bacteria isolated from the gut of ruminants against antibiotic resistant bacteria isolated from the gut of farm animals. Our results indicate some isolates of the beneficial bacteria from our pool have broad inhibitory activities against drug resistant bacteria isolated from the gut of animals. These beneficial bacteria once validated have potential to be developed as alternatives to antibiotics with broad application in animal and human health.

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Design and Construction of a Bee Greenhouse. M.P. Torres*, N. Brown, D.Andrews-Brown, and L. K. Rutto, Department of Agriculture, Virginia State University, Petersburg, VA 23806.

Bee colony collapse continues to cause worry in Virginia and the greater US. This year alone, Virginia lost an estimated 60% of its honey bee population, a concerning statistic that highlights the urgent need for sustainable solutions. As a participant in the Beekeeping Ambassador Program at Virginia State University, I have tried to understand the main causes behind the decline in population of the Eastern European honeybee in Virginia. I discovered that among other reasons, stress, climate change, and the bees' inability to adapt to rapid weather fluctuations have contributed to their decline. Motivated by these findings, I began developing a concept for a 'Bee Greenhouse' designed to reduce stress and improve colony survival. The design is inspired by the Slovenian bee house but reimagined on a smaller scale with modern technology. Our version integrates artificial intelligence to automatically monitor and regulate internal temperature to reduce confusion and stress among the bees. Our presentation will include design plans and components of a bee greenhouse and a prototype to be tested under Virginia conditions.

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Assessing the Role of *Duddingtonia flagrans* in Mitigating Gastrointestinal Nematodes in Meat Goat Kids. J. Reese*, Department of Agriculture, Virginia State University, Petersburg, VA 23803; S. Wildeus, Agricultural Research Station, Virginia State University, Petersburg, VA 23803; K. Matthews, Department of Agriculture and Natural Resources, Delaware State University, Dover, DE 19901; and D. O'Brien, Cooperative Extension and Agricultural Research Station, Virginia State University, Petersburg, VA 23803.

Gastrointestinal nematodes (GIN), particularly *Haemonchus contortus*, pose a significant threat to sustainable and profitable small ruminant production in the U.S. The widespread overuse and misuse of anthelmintics have led to multi-drug-resistant GIN, complicating parasite control on many farms. This study evaluated the efficacy of the natural fungus *Duddingtonia flagrans* (Bioworma®, International Animal Health) in reducing GIN larval counts and other parasitological indicators in meat goat kids. Forty 4-month old Myotonic, mixed-sex kids were dewormed (day 0) and separated into two treatment groups (n = 20/group), split into three replications per treatment group, and placed on six pasture paddocks, after accounting for initial body weight and sex. Kids were then fed either a grain supplement (corn and soybean meal) with Livamol with Bioworma® (LIV) or without (CON) at 2% of their body weight daily for 84 days. To evaluate the effect of LIV treatment, body weight and body condition scores (BCS) were recorded every 2 weeks for 84 days. Blood and fecal samples were also collected for the determination of packed cell volume (PCV)

and fecal egg count (FEC). Pooled treatment group feces (day 0–84) were collected and cultured to determine GIN genera. Data were analyzed using repeated measures in a mixed model, and FEC were log-transformed before analysis. LIV with Bioworma® supplementation had no impact on BW, BCS, PCV, or FEC in this study. Bioworma® did not affect GIN indicators after 84 days of grazing. Further research will assess long-term effects on parasite load, performance, and pasture contamination.

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Impact of Worm Replacement on Levamisole and Ivermectin Resistance in Meat Goats. L. Covin*, T. Wright, S. Harmer, and K. Matthews**,** Department of Agriculture and Natural Resources, Delaware State University, Dover, DE 19901; E. Otchere, Department of Poultry Science, College Station, TX 77843; D. O'Brien, Virginia Cooperative Extension, Virginia State University, Petersburg, VA 23806.

The *Haemonchus contortus* parasite has been a major problem for the small ruminant industry. These parasites have developed resistance to current anthelmintics, which have been the main treatment. Hence, there is a need to develop new strategies to control these parasites. Recently, worm replacement has shown to be a promising approach that could address the problem of anthelmintic resistance. It involves replacing resistant populations of gastrointestinal nematodes with susceptible ones. A product (Livamol® with BioWorma®, International Animal Health Products, Australia) containing the fungus *Duddingtonia flagrans* offers a potential way to enhance this replacement. Consequently, this experiment aimed to evaluate the effect of a worm replacement protocol enhanced with Livamol® with BioWorma® on reversing resistance to Levamisole and Ivermectin in meat goats. Seventy-four meat goats were divided into four groups: Group 1 (n=30; breeding animals); Group 2 (n=8 kids; tracer 1); Group 3 (given susceptible *H. contortus*; n=26 kids); and Group 4 (n=10 kids; tracer 2). At the beginning and end of the study, a Drench Rite® larval development assay was performed to assess changes in anthelmintic resistance. Data indicated that the isolates' IC50 value for levamisole decreased from 10.7 to 7.4, and for ivermectin from 64.2 to 11.4, indicating a reduction in resistance levels. In conclusion, under the conditions of this study, *D. flagrans* combined with an effective worm replacement protocol successfully replaced a multidrug-resistant population of *H. contortus*.

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Assessing the Effectiveness of *Duddingtonia flagrans* in Reducing Parasitic Indicators in Breeding Meat Goats Over 90 Days. A. West*, T. Wright, S. Harmer, and K. Matthews**,** Department of Agriculture and Natural Resources, Delaware State University, Dover, DE 19901; E. Otchere, Department of Poultry Science, College Station TX 77843; D. O'Brien, Virginia Cooperative Extension, Virginia State University, Petersburg, VA 23806.

Gastrointestinal nematode (GIN) infections significantly threaten small ruminant farmers worldwide. Control of these parasites has primarily relied on anthelmintics. However, heavy reliance and misuse of these drugs have led to increased anthelmintic resistance. Hence, there is a need to develop new approaches to control these parasites. The product (Livamol® with BioWorma®, International Animal Health Products, Australia), containing *Duddingtonia flagrans*, offers an opportunity to reduce GIN on pastures and prevent reinfection in grazing animals. The objective of this experiment was to evaluate the effectiveness of Livamol® with BioWorma® in reducing parasitic indicators in meat-goat does. Thirty meat-goat does were placed on a research pasture after accounting for initial fecal egg count (FEC) and body weight (BW). The goats were fed a daily ration (corn and soybean meal) and supplemented with Livamol® with BioWorma® every day for 90 days based on the heaviest goat's BW. BW, fecal samples, and FAMACHA© scores were collected every 30 days. Data indicated that the goats' BW increased over the 90-day study period. The average BW was 49.5 ± 1.5 kg on day 0 and 53.8 ± 1.7 kg on day 90. Fecal egg counts increased, with day 0 FEC averaging 16.0 ± 3.8 EPG and day 90 averaging 136.6 ± 32.6 EPG. The average FAMACHA© score remained similar: day 30 = 2.8; day 60 = 1.9; day 90 = 2.7. In conclusion, feeding animals Livamol® with BioWorma® under the conditions of this study did not significantly impact parasitic loads in the animals.

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Assessment of *Duddingtonia flagrans* Effectiveness in Reducing Gastrointestinal Nematode Development in Breeding Meat Goats Over 90 Days A. Fitch*, T. Wright, and K. Matthews, Department of Agriculture and Natural Resources, Delaware State University, Dover, DE 19901. Virginia State University; E. Otchere, Department of Poultry

Science, College Station TX 77843; D. O'Brien, Virginia Cooperative Extension, Virginia State University, Petersburg, VA 23806.

A significant challenge hindering the growth of the small ruminant industry is parasitization by gastrointestinal nematodes. Anthelmintics have been the primary control measure for these GINs; however, they only target the small parasite population within the animal, not the large parasite population living on the pasture. Hence, there is a need to develop innovative strategic approaches to reduce the parasite population on pasture, which would correlate with a reduction in the parasite population within the animal. Livamol® with BioWorma® (International Animal Health Products, Australia), which contains *Duddingtonia flagrans*, provides an opportunity to reduce GIN on pastures and ultimately prevent reinfection in grazing animals. Therefore, the objective of this experiment was to evaluate the effectiveness of Livamol® with BioWorma® in reducing gastrointestinal nematode development in meat goat does. Thirty breeding meat-goats were placed on a research paddock after accounting for initial parasite load. Breeding meat-goats were fed a daily ration (corn and soybean meal) with Livamol® with BioWorma® every day for 90 days. Livamol® with BioWorma® was added to the ration based on the heaviest goat's BW. To evaluate the effects of treatment, fecal samples were collected every 30 days to set up larval cultures. Data indicated that larval culture samples contained 108 *H. contortus*, 67 *Trichostrongylus spp,* and three others on day 0 and 1999 *H. contortus*, 126 *Trichostrongylus spp,* and 16 others on day 90, indicating an increase. In conclusion, feeding animals Livamol® with BioWorma® under the conditions of this study did not reduce parasite loads in animals.

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Characterization of Biomarkers for Pregnancy and Lipid Metabolism in A_2A_2 Jersey Cattle Peripheral Blood Mononuclear Cells (PBMCs). C. Russell*, A. E. Kerr, and L. M. Mayo, Department of Animal Sciences, North Carolina Agricultural and Technical State University, Greensboro, NC 27411.

Early pregnancy detection is necessary for dairy cattle to reduce days open and return to the most profitable stage of lactation sooner. However, most early pregnancy detection research is performed with Holsteins between 25 and 32 days after breeding. The objective of this work was to find a reliable pregnancy biomarker before day 25 after breeding and a biomarker of lipid metabolism specific to Jersey cattle. The hypothesis was that selected pregnancy biomarkers could be detected as early as 14 days after breeding in Jersey cattle blood samples. A_2A_2 Jersey heifers (n = 12) and cows (n = 28) were enrolled into 5-d CIDR-Synch with GnRH and 2 $PGF_{2\alpha}$ or OvSynch 48 synchronization protocols, respectively. The day of timed artificial insemination (TAI) was considered day 0 and blood samples were collected 14, 18, 22, and 25 days after TAI for PBMCs, RNA isolation, and plasma progesterone. The expression of ISG15, PPARγ, and FAB3 was measured using PBMC total RNA. Pregnancy was confirmed with whole blood pregnancy associated glycoproteins (PAG) on day 25 or 28 and transrectal ultrasound on day 36 ± 4 after TAI. Statistical analyses were performed by ANOVA using the MIXED and GLIMMIX procedures in SAS Viya. There was no difference in PAG and ultrasound results ($P > 0.05$) with 33% (n=24), 25% (n=55), 56% (n=25), and 100% (n=2) pregnant for 106 services of heifers, first, second, and third parity, respectively. Preliminary results indicate that ISG15 can be used to detect non-pregnancy in Jersey cattle similar to Holsteins.

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Climate Season Impact on Litter, Size, Birth, and Weaning Weight on St. Croix Purebred Sheep in the Caribbean. E. Febres III* and A. Rios. University of the Virgin Islands, St. Croix, VI 00850.

This study evaluated the influence of climate season on the lambing performance in St. Croix purebred sheep (*Ovis aries*) raised in the Caribbean. Seventeen St. Croix purebreds (STX) were heat-synchronized over three years, spanning the spring, summer, and fall seasons. Litter size at birth and weaning was calculated for the three periods. Birth and weaning weight were recorded over the three years. Litter size at birth and weaning did not differ between the seasons. In contrast, lambs' birth weight was higher in ewes bred in summer and lambed in fall than in the other two seasons (Spring = 6.05 ± 0.26, Summer = 6.76 ± 0.26, and Fall = 5.31 ± 0.24; *P=0.0005*). Weight at weaning was 36% higher in ewes bred in spring than in summer (*P<0.0001*) and 34% higher than in fall. Summer and fall did not present significance. Single, twin, and triplet births were similar across the seasons. However, in spring, twins present an incidence of 53%, significantly higher than singles (41%) and triplets (6%) (*P=0.0496*). The incidence of falls among twins was 65%, compared to 24% among singletons and 11% among triplets (*P = 0.0194*). In the summer, the incidence of singletons was 41%; twins accounted for 59%, and triplets for 0%, with no difference noted. St. Croix

purebred ewes exhibit excellent lambing performance during the warm seasons of spring and summer and a higher incidence of twins during the fall.

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Extension Approaches to Helping Small and Limited Beef Cattle Farmers Prevent Bovine Respiratory Disease (BRD) and Bovine Viral Diarrhea (BVD). J. M. D. Ali*, J. H. Wells, J. J. Lay, and S. N. Carr, Department of Agriculture, Health, and Natural Resources, Kentucky State University, Frankfort, KY 40601.

Bovine Viral Diarrhea (BVD) Virus is a highly contagious virus that can cause symptoms, including diarrhea, pneumonia, abortions, infertility, and immunosuppression in cattle. The virus can be transient or lead to persistently infected cattle, which do not show symptoms but continually infect others. Because of this, educating producers of proper identification, biosecurity, and vaccination protocols is critical. This multi-phasic project sought to 1) conduct a beef cattle producer's knowledge assessment in preventing and curing BVD in their herds, and 2) educate both extension personnel and producers regarding the current best practices. The needs assessment indicated that beef cattle farmers who responded to the survey (n = 109) mostly isolated newly purchased cattle before introducing them into their herd. However, almost 70% of the farmers did not test newly purchased cattle for BVD before introduction. Only 20% of those who responded to the knowledge question could identify all the symptoms of BVD. Since the needs assessment, we have conducted 19 separate trainings reaching a combined total of 542 producers and agents, and distributed over 2,100 vaccination cards to feed and supply stores across the state of Kentucky. In follow-up surveys, producers have responded that it is very important (82%) or important (18%) to test for BVD, and they plan to do so using chute side tests (29%), the veterinary diagnostics laboratory (35%), or both (29%). Additionally, respondents indicated that vaccinating for BVD is either very important (76%) or important (24%), indicating successful implementation of this program in the state of Kentucky.

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Microbial Compositions Associated with High and Low Winter-Feeding Strategies in Nile Tilapia (*oreochromis niloticus)*. K. Leary*, R. L. Gayle, and O. C. Betiku, College of Agriculture and Food Sciences, Florida A&M University, Tallahassee, FL 32307.

Aquaculture is the fastest growing animal-producing sector globally. Currently, global supplies of seafood and other products from aquaculture for human consumption is higher than contribution from capture fisheries. Feed cost for intensive aquaculture production accounts for a majority of the operational costs and continues to increase; the opportunity to reduce feed costs through management strategies is a priority to fish farmers. Feeding frequency is known to help reduce cost of feed and prevent wastage from excessive feeding. Limited information is available on feeding frequencies to raise juvenile Nile tilapia to adult size during winter period. Hence, the reason for this study. To examine the influence of high and low feeding frequencies on growth and gut microbial profiles of tilapia (*Oreochromis niloticus)*, twenty juvenile Nile tilapia with an average weight of 116 ± 1.7 g were stocked in recirculating tanks with three tanks/feeding frequency. Fish were fed *ad libitum*, feeding intake was monitored weekly, and fish were weighed biweekly. Our data revealed significant differences in weight and specific growth rate in high feeding frequency. However, feed conversion ratio and body indices were not significantly different between the feeding strategies. Major microbial profiles include firmicutes and proteobacteria. Detailed. Information about their variation and other data due to feeding strategies will be presented.

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The Influence of Early Life Stress on FGF19 and Cortisol Concentration Levels. J. Price*, 1890 USDA National Scholars Program; S. Elefson, C. Vonderohe, G. Guthrie, J. Frontera, B. Stoll, V. M. Hebib, I. Didelija, and D. Burrin, USDA-ARS, Children's Nutrition Research Center, Baylor College of Medicine, Houston, TX 77030.

Fibroblast Growth Factor 19 and cortisol are critical hormones in the perinatal stage of infant development and growth. The objective of this study is to evaluate the correlation between FGF19 and cortisol, as well as determine whether early life stresses—birth modality (vaginal vs c-section birth) and transportation—significantly influences their production. Using piglet models for the study, a total of 4 treatment groups were used to acquire results. The treatment groups were the following: vaginally-birthed piglets with transportation, vaginally-birthed piglets without

transportation, c-section delivered piglets with transportation, c-section delivered piglets without transportation. Plasma was collected from each treatment group. Enzyme-linked Immunosorbent assay (ELISA) was used after plasma collection to quantify the concentrations levels of cortisol and FGF19. Results showed that birth modality significantly influences FGF19 and cortisol levels, more so than transportation. A positive correlation between transported groups and FGF19 levels were identified in this study.

Student Poster Presentation – Graduate Competition

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Investigation of Culturable Bacterial Species Found on Goat and Forestry Grazing Pasture. P. Karki*, F. Haruna, K.C. Dipsana, and T. Wuliji, College of Agriculture, Environmental and Human Sciences (CAEHS), Lincoln University of Missouri, Jefferson City, MO 65101.

Ticks carry various pathogens to infect wildlife, livestock, pets and humans. Three hard shell ticks including lone star tick (Ambloymma americanum), deer tick (Ixodes scapularis), and American dog tick (Dermacentor variabilis) were majorly responsible for infections in ruminant fever, Lyme, tick pyemia, Rocky Mt spotted fever, relapsing fever and paralysis. This experiment was conducted to investigate culturable bacterial species using common culture media, temperature, and incubation time for ticks infested on goats and forestry pastures. Using culture-dependent approaches on nutrient and selective media blood agar (BHA), MacConkey agar (MCK), tryptic soy agar (TSA), Mueller Hinton agar (MHA), de Man, Rogosa and Sharpe media (BRU, LB, PCA) resulted in 52 morphologically distinct bacterial isolates that were recovered and characterized from 45 specimens. Bacterial identification was performed using culture-based methods and MALDI-TOF Biotyper analysis. The culturable bacterial community was highly diverse, encompassing eight major families, dominated by Enterobacteriaceae (29%), Pseudomonadaceae (25%), Bacillaceae (17%), and Staphylococcaceae (12%). Approximately 68 % of isolates were Gram-negative and 32 % Gram-positive, with 75 % motile and 58 % facultative anaerobes. Several pathogenic bacteria were identified, including Enterobacter hormaechei, Citrobacter koseri, Acinetobacter pittii, Stenotrophomonas maltophilia, Proteus mirabilis, Achromobacter mucicolens, and Pseudomonas monteilii, underscoring potential animal and public-health implications. Beneficial or ecologically important taxa such as Bacillus thuringiensis, Lysinibacillus fusiformis, Pseudomonas chlororaphis, Priestia megaterium, and Bacillus mycoides were also detected, these likely play roles in biocontrol and soil nutrient cycling. This study demonstrates a complex and ecologically diverse culturable microbiota associated with ticks in forestry-based goat grazing systems.

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Assessment of Hematologic Parameters, Body Condition Score and Anemic Status in Katahdin Ewes. F. Haruna*, P. Karki, and T. Wuliji, College of Agriculture, Environmental and Human Sciences (CAEHS), Lincoln University of Missouri, Jefferson City, MO 65101.

The objective of this study is to evaluate the associative relationships between the body condition score (BCS), FAMACHA score (FMS), and hematocrit (HCT, Microhematocrit centrifuge) with full profile hematological parameters measured by HemaVet950 analyzer (Drew Scientific Inc) in adult Katahdin ewes. One hundred twenty-eight Katahdin ewes were recorded for live weight (LW) and subjectively assessed for BCS, which graded at five levels (1-5), where 1 is an indicator for the poorest condition. The FMS was assessed by comparing with a standardized eyelid color chart in redness level (1-5), but the highest score represents the most anemic status. Twenty-five ewes, five in each BCS were selected for comparing subjective FMS, hematocrit (HCT) tested by Microhematocrit Centrifuge (LW Scientific) and full hematological profile parameters measured with HemaVet950 Analyzer. Hematological profile parameters including white blood cell (WBC), red blood cell (RBC), hematocrit (HCT), corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), platelets (PLT), and blood cell types in ratios. LW and BCS positively correlated but these measures were negatively correlated with increasing FMS levels. BCS and FMS are subjective techniques that are popular with field operation assessments. Microhematocrit centrifuge is handy and cheaper for operating on farms even though it provides a single measurement of HCT. However, the full profile hematological parameters measured with HemaVet950 analyzer has provided more than 20 parameters including

WBC, RBC, HCT, MCV, MCH and other components, which show real time hematological profiles and a degree of acute anemic status in ewes.

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Evaluation of Forage Quality, Metabolomic Diversity and Soil Microbial Community in Silvopasture and Open Pasture Systems. K. C. Dipsana*, M. Imranuzzaman and T. Wuliji, College of Agriculture, Environmental and Human Sciences (CAEHS), Lincoln University of Missouri, Jefferson City, MO 65101.

Small ruminant livestock production requires a sustainable system to maintain ecological components and high productivity over time. This study conducted a comparative analysis for silvopastoral systems (SPS) and open pasture systems (OPS) located on farms of Lincoln University, Missouri. Pasture forage and soil samples were collected from the silvopasture paddocks of Busby Farm and the open pasture paddocks of Freeman Farm during grazing seasons. Forage samples were analyzed for acid detergent fiber (ADF), neutral detergent fiber (NDF), crude protein (CP), and in-vitro digestibility (IVD) using ANKOM system. Pasture forage plant secondary metabolites were analyzed using LC–MS spectrophotometry and culturable soil bacteria were identified by MALDI TOF MS Biotyper (Bruker). There were significant differences in ADF (20–25% in SPS and 35–45% in OPS), NDF contents (45–55% in SPS and 55 – 65% OPS), and IVD of the first year's samplings. However, SPS forage exhibited an increase in ADF and CP for the second year's samplings. Silvopasture recorded less biomass dry matter yield than OPS. Metabolomic assays detected plant metabolites, such as phenolic acids, flavonoids, terpenoids and epicatechin which were higher in SPS than OPS forages. SPS soil showed abundance of Gram-positive bacteria such as Bacillus, Paenibacillus and Lysinibacillus, those associated with cellulose degradation and nutrient cycling. The OPS soil contained an abundance of Gram-negative bacteria such as Pseudomonas and Enterobacter, which are commonly associated with rapid carbon turnover processes. These findings demonstrated that SPS system increases microbial diversity and benefit long-term soil fertility and sustainability.

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Alternative Approach: In Vitro Experimentation on Anthelmintic Plant Extract as Gastrointestinal Parasite Control Reagent for Small Ruminants. M. Imranuzzaman*, Dipsana K.C. and T. Wuliji, College of Agriculture, Environmental and Human Sciences (CAEHS), Lincoln University of Missouri, Jefferson City, MO 65101; and C. Ke, University of Missouri, Columbia, MO 65201.

Gastrointestinal nematodes (GIN) are a major parasitism threat in small ruminants, resulting in considerable economic and livestock production losses. The objective of this study is to investigate bioactive compounds in antiparasitic plants as prospective alternative for synthetic anthelmintics. The putative anthelmintic compounds in plants were prepared by water extraction methods. The plant extracts were obtained from eight varieties including Birdfoot trefoil (Lotus corniculatus), Chicory (Cichorium intybus), Goosefoot (Chenopodium album), Goat weed (Ageratum conyzoides), Lespedeza (Lespedeza sericea), Purple flower prairie clover (Dalea purpurea), Sainfoin (Onobrychis viciifolia) and Sweet wormwood (Artemisia annua). The major bioactive compounds in these extracts consisted of tannins, flavonoids, alkaloids and other secondary metabolites. The fresh fecal matters were collected from sheep and goats throughout observation period and provided coproculture larvae for in vitro anthelmintic experimentation. The results show that all eight plant extracts caused a significantly higher larvae mortality rate in vitro experiments compared to control at 12, 24, and 48 h for both low and high treatment levels. Mean mortality rate in low level extract treatment was 40.1, 66.1 and 86.8% compared to 61.1, 82.8, and 94.7% in high level extract treatment ($P<0.05$) at 12, 24, and 48 h respectively. Whereas goat weed and purple flower prairie clover were recorded at the highest larvae mortality rate. These assays suggest that these plants contain anthelmintic bioactive components which can be utilized as an organic nematode control reagent for small ruminants.

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Transcriptomic Analysis of Florida Cracker Sheep Infected with *Haemonchus contortus* During the Peripartum Period. J. O. Adebayo*, Department of Animal Science, North Carolina Agricultural and Technical State University, Greensboro, NC 27411; Z. Estrada-Reyes, and S. Ikuejamoye-Omotore, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446; A. Pech Cervantes, and T. Terrill, College of

Agriculture, Family Sciences, and Technology, Fort Valley State University, Fort Valley, GA 31030; and M. Harrison, Department of Animal Science, North Carolina Agricultural and Technical State University, Greensboro, NC 27411.

This study investigated the impact of *Haemonchus contortus* infection on the transcriptomic profile of periparturient Florida Cracker ewes. Twenty pregnant ewes were assigned to infected (INF; n = 10) or control (CTL; n = 10) groups at 90 days of gestation. At day 120, INF ewes received 10,000 L3 *H. contortus* larvae orally, while CTL ewes received 3 mL of distilled water. Blood samples were collected via jugular venipuncture at 0-, 3- and 6- hours, and at 2-, 7-, 14-, and 28-days post-infection (pi), and stabilized using RNAprotect tubes. Total RNA was extracted with the RNeasy Protect Animal Blood Kit (Qiagen), and libraries were prepared. Sequencing was performed on the Illumina NovaSeq 6000 platform. Quality filtering of FASTQ files was done using FastQC, and differential gene expression analysis was conducted with DESeq2. Comparative analysis revealed 5 DEGs at 3-hours pi, 16 DEGs at 6-hours pi, 3 DEGs at 2-days pi, 145 DEGs at 7-days pi, 2,916 at 14-days pi, and 130 DEGs at 28-days pi. The DEGs observed at 7-days pi were linked to pentose phosphate pathway, ferroptosis, oxidative phosphorylation, arachidonic acid metabolism, oxytocin signaling and thermogenesis. For 14-days pi, the DEGs were associated with peptide metabolism, amide metabolism, oxidative phosphorylation and thermogenesis. For 28-days pi, the DEGs were linked to porphyrin-containing compound metabolism, heme metabolism, tetrapyrrole metabolism, ferroptosis and defense response. Our results evidence the ability of Florida Cracker sheep to combat *H. contortus* infections during the peripartum period. Further studies are needed to understand these molecular mechanisms.

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Assessment of Pasture Quality and Abundance on A2A2 Jersey Feed Consumption While Visiting a Voluntary Milk System. A. Givan*, M. Akindoyin, T. Anthony, and L. M. Mayo, Department of Animal Sciences, North Carolina Agricultural and Technical State University, Greensboro, NC 27411.

Voluntary milking systems (VMS) offer dairy operations increased flexibility and automation benefits, but their integration with rotational pasture management requires optimization strategies that balance technological capabilities and feed offered in the VMS with grazing efficiency. The objective of this study was to assess how changes in pasture quality and abundance from May to October affected milk yield, milking frequency, and VMS feed consumption in A2A2 jersey cows. . The hypothesis was that milk yield and milking frequency would increase and VMS feed consumption would decrease during times of increased pasture abundance and nutrient density. To test this hypothesis, A2A2 jersey cows (n=26) with access to a total mixed ration (TMR) and pasture were assessed for efficiency and feed consumption in a VMS. Pastures were measured and sampled before and after cows entered a new paddock. Pasture and TMR samples were submitted for wet chemistry analysis of crude protein, energy, and other nutrient indicators. Statistical analysis included the MIXED and GLIMMIX procedures to evaluate the interactions of pasture abundance, nutrient content, milk yield, and cow traffic. Significant production decline occurred below 8 cm and above 20 cm pasture height ($P<0.05$). Multiparous cows consistently outperformed first-lactation cows across all pasture conditions ($P<0.001$) regardless of pasture abundance. Seasonal analysis revealed peak milk yield and milking frequency during May and June with a progressive decline in milk yield and milking frequency through October. Results demonstrate that VMS integration with pasture access can be successful but can vary by lactation number and season.

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Effect of Cynodon Dactylon (Bermudagrass) or Crotalaria Juncea L. (Sunn Hemp) on Meat Goats' Fecal Metabolomes with Different Levels of *Haemonchus Contortus* Infections. M. Hilaire*, S. Chaudhary, V. Kanyi, H. Abdo, I. Hossam, E. C. St. Preux, and B. R. Min, Department of Agricultural and Environmental Sciences, Tuskegee University, Tuskegee, AL 36088; B. Gines, and W. E. Collier, Department of Chemistry, Tuskegee University, Tuskegee, AL 36088; H. Wang, Department of Biology, Tuskegee University, Tuskegee, AL 36088; and M. Boersma, Department of Chemistry and Biochemistry, Mass Spectrometry Lab, Auburn University, Auburn, AL 36849.

Small ruminant diseases and their impact on the health of animals continue to be the major challenges that reduce production and lower farmer profitability worldwide. *Haemonchus contortus* can lead to anemia, weight loss, and death. Controlling this parasite burden remains a bottleneck in small ruminant production. Prior studies have investigated the relationship between metabolic profiles and animal health, emphasizing physiological alterations by identifying disease and nutrition biomarkers. This study aimed to correlate the metabolite signature of feces from goats, having two levels of *Haemonchus contortus* infection, grazing on two different forages (Bermudagrass and

Sunn Hemp). Fecal samples were collected from Spanish Boer goats grazing Bermudagrass or Sunn Hemp pastures with naturally variable *Haemonchus contortus* loads. Samples were analyzed via ^{1}H-NMR and LC/MS methods to compare metabolic profiles between low and high fecal egg count (FEC) groups under both forage conditions. Our findings identified ten significant discriminatory molecules for both Bermudagrass (glucose/sugars, succinate, and others) and Sunn Hemp (butyrate/Fas, arginine/lysine, and others) using 1H-NMR. In addition, we found 115 significant discriminatory features for Bermudagrass (gentisic acid and protocatechuic acid were the top two) and 113 in Sunn Hemp (testosterone propionate and trolox were the top two), using LC/MS. The findings suggested that *Haemonchus contortus* influenced several pathways associated with the metabolism of amino acids and energy conversion. The analysis of metabolome changes identified some possible biomarkers for *Haemonchus contortus* infection. Further study is required to validate these potential biomarkers before using them as diagnostic signatures of early parasite infection.

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Rumen Microbial Ecology and Methane Emission Modulation through Alternative Feedstuff in Boer Cross Spanish Goats. S. Chaudhary*, M. Hilaire, V. Kanyi, H. Ismael, H. Abdo, and B. R. Min, Department of Agricultural and Environmental Sciences, Tuskegee University, Tuskegee, AL 36064; and H. H. Wang, Department of Biology, Tuskegee University, Tuskegee, AL 36064.

This pilot study, conducted in Eldorado, TX, evaluated the effects of three feed supplements—control (an alfalfa-based diet), peanut meal (Arachis hypogaea L.), and sericea lespedeza (Lespedeza cuneata) pellets—on growth performance, enteric methane (CH_4) emissions, and gut microbial composition in 150 Boer cross Spanish goats (7–8 months old). Over a 60-day trial, goats were randomly assigned to three groups (n = 50 each). Animal growth, CH4 emissions, and rumen microbiome community diversity were analyzed using the GLM procedure in SAS. The control group had a higher average daily gain and final average body weight than the peanut and lespedeza groups ($P < 0.0001$). However, enteric CH4 emissions were significantly lower in goats fed peanut meal (1.92 ppm-m) and lespedeza pellet (2.43 ppm-m) compared to the control (6.98 ppm-m; $P < 0.0001$), indicating improved environmental performance without substantial productivity loss. Rumen microbiome analysis at the phylum level showed that Fibrobacteres, Acidobacteriota, Elusimicrobiota, Mycoplasmatota, and Ascomycota ($P<0.05$) were enriched in lespedeza-fed goats, suggesting fiber fermentation and biohydrogen regulation. Although Euryarchaeota abundance shows no significant difference among the diets, methane emissions declined, indicating functional inhibition rather than population reduction. At the species level, Xylanibacter brevis and Syntrophococcus sucromutans increased in peanut-fed goats ($P < 0.05$), both linked to carbohydrate fermentation and cross-hydrogen metabolism. Methanobrevibacter millerae showed no significant difference but may have reduced activity. These results demonstrate that peanut meal and Sericea lespedeza can influence the rumen microbial community by promoting fibrolytic and syntrophic groups, which may result in lower CH4 emissions from the goats. Combining microbiome indicators with emission and growth data offers a comprehensive approach to enhancing sustainable feeding strategies in semi-arid goat production systems.

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Comparison of Manual and Lidar Scan Measurements of Carcass Traits in Bovines. M. Baldwin*, M. Mkunga, and D. Burnett, Department of Agriculture and Environment Science, Tuskegee University, Tuskegee, AL 36088.

Precise carcass measurement is crucial for assessing meat yield and quality. Traditional manual methods, while precise, can be time-consuming. New technologies like Light Detection and Ranging (LiDAR) scanning provide an effective non-contact option that uses laser light. By measuring the length of the body, total length of carcass, ribeye area, and backfat thickness, this study compared manual and LiDAR methods. After the slaughter, five beef carcasses were separated into the right and left sides. Measurements were obtained using the manual method, using a tape measure for the carcass lengths, a USDA grid ruler to assess the thickness of the backfat, and a USDA dot plastic grid to measure the ribeye area. LiDAR was used with the Polycam ® application on an iPhone 14 Pro Max and an iPad Pro 11th generation. Scanning was done by capturing and analyzing 3D images of the carcass surface, including the ribeye area. The differences between the two approaches were examined using a paired t-test. The results did not reveal any significant differences between manual and LiDAR measurements, indicating that both methods can be used to assess linear measurements. However, more validation is required to assess LiDAR's potential in carcass evaluation.

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Quantum-Level Green Light-Emitting Devices: A Pilot Study on Immune Modulation in Largemouth Bass (*Micropterus salmoides*) Challenged with *Edwardsiella piscicida.* Z. McGowan*, C. Maoding, Q. Jiang, and G. Ramena, Department of Aquaculture and Fisheries, Department of Chemistry and Physics, University of Arkansas at Pine Bluff, Pine Bluff, AR 71601.

Light spectrum is increasingly being investigated as a modulator of fish immune function and stress physiology, with potential implications for disease resistance. Recent advances in nanomaterials have enabled the development of halide perovskite quantum devices ($CsPbBr_3$, Cs_4PbBr_6) capable of emitting highly pure green light (~530 nm). While these materials have shown promise in energy applications, their potential in aquaculture remains unexplored. This project proposes a 14-day feasibility trial to evaluate the biological effects of perovskite-based green light-emitting devices on largemouth bass (*Micropterus salmoides*) challenged with *Edwardsiella piscicid*a. The study will utilize 4–6 replicate tanks, each equipped with two light-emitting devices mounted externally above the water surface, allowing spectral exposure through the water column without submerging the devices. Tanks will be illuminated for 1–2 hours daily using overhead light sources, with treatment groups including UV (365 nm) exposure, combined UV and green light exposure, and a control under ambient light. Outcomes will assess disease progression, immune responses, and histopathological changes in liver, spleen, and kidney tissues following exposure to *Edwardsiella piscicida*. Particular attention will be given to evaluating whether specific light treatments, especially green wavelengths, modulate host resistance, reduce pathogen load, or mitigate tissue damage. The novelty of this work lies in merging nanotechnology with aquaculture practice, exploring perovskite LEDs as a precise and efficient means of wavelength control. Results will provide preliminary evidence of both feasibility and biological potential, with careful consideration of environmental safety through encapsulation of perovskite materials.

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A Modified Lipid Extraction Method for Integrated Targeted and Untargeted Lipidomic Profiling of Bovine Oocytes. E. V. Pearsall*, A. McDonald, J. Ellison, A. E. Kerr, U. Y. Anele, O. S. Isikhuemhen, and L. M. Mayo, College of Agriculture and Environmental Sciences, North Carolina Agricultural and Technical State University, Greensboro, NC 27411.

Lipids, made up of fatty acids, play a crucial role in bovine oocyte development, influencing metabolic signaling pathways and energy. However, an abundance of lipids can be detrimental and how much or which lipids is still unclear. The objective of this study was to validate lipid extraction and profiling techniques for bovine oocytes to establish a foundation for improved lipid metabolism analysis. The hypothesis was that a modified lipid extraction technique could aid in isolating oocyte samples for targeted or untargeted lipidomics. Bovine oocytes were aspirated from ovaries obtained from a local packing plant. Prior to LC-MS/MS analysis, previously frozen samples underwent a modified total lipid extraction using ice-cold methanol and chloroform to extract lipids. Extracted total lipids were dried, reconstituted, and analyzed for linoleic and linolenic acids. Untargeted lipidomic analysis was performed on a C30 column with a Vanquish Horizon UHPLC-Q Exactive-HF mass spectrometry system. Experiment 1 validated that linoleic and linolenic acids could be successfully extracted and quantified from bovine oocytes using the modified lipid extraction protocol with sample aliquots ranging from 5 to 50 oocytes. Experiment 2 identified 449 lipids in positive ion mode and 200 in negative ion mode, confirming that smaller sample sizes can generate comparable lipidomic profiles to larger ones. Together, these experiments demonstrate the feasibility of quantifying specific fatty acids and performing comprehensive lipidomic profiling from limited oocyte samples. These findings provide a framework for studying lipid metabolism and its influence on bovine oocyte maturation and developmental potential.

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Impacts of lycopene supplementation during IVM on nuclear maturation rates, fertilization status, and subsequent development of bovine oocytes. H. Balagoni*, A.M. Shahat, and A.R. Moawad, Fort Valley State University, Fort Valley, GA 31030**.**

During *in vitro* maturation (IVM) reactive oxygen species (ROS) are produced which negatively impacts oocyte developmental potential. Supplementation of antioxidants is imperative to mitigate these deleterious effects.

Lycopene, a potent antioxidant, is known to protect oocytes against oxidative injuries. Our aim was to evaluate the effects of supplementing IVM media with lycopene on bovine oocyte maturation, fertilization, and embryo development rates after IVF. Cumulus oocyte complexes (COCs) collected from slaughtered bovine ovaries were matured in IVM media supplemented with 0 (control), 0.2, 0.5, and 1.0 μM lycopene for 22 h at 38.0°C in 5% CO2. COCs were fertilized *in vitro* with frozen/thawed semen and presumptive zygotes were cultured for 8 days. Oocyte maturation and fertilization rates were assessed after IVM and IVF, respectively by Hoechst stain. Cleavage and blastocyst rates were recorded on day 3 and 8 post-insemination (pi), respectively. Oocyte recovery rate was 3.2 oocyte/ovary (710/222). Percentage of good-quality oocytes was 93.80% (666/710). No significant differences were observed in cumulus cell expansion (86% to 90%) and maturation rates (oocytes at metaphase-II stage, 66% to 100%) between control and lycopene groups. Fertilization rate (oocytes with 2 pronuclei) was lower ($P< 0.05$, Chi-square) in 1.0 μM lycopene group than other groups. Cleavage rate was comparable among the four groups (67% to 80%). Blastocyst rate was higher ($P< 0.05$) for 1.0 μM lycopene group (48.0%) than other groups (27.8% to 29.7%). In conclusion, supplementing IVM media with 1.0 μM lycopene enhanced blastocyst development rates after IVF and IVC in cattle.

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Design of CRISPR Target Loci and their PCR Amplification to Evaluate the Goat β-Lactoglobulin Gene-editing to Eliminate Milk Allergenicity. S. Hareem*, V. Nguyen and M. Singh, Fort Valley State University, Fort Valley, GA 31030.

Recent advances in genome engineering using site-specific endonucleases are revolutionizing biological sciences. The greatest impact of these technologies is expected to be in biomedical and agricultural sciences. The goal of this study is to modify β-Lactoglobulin **(**BLG) gene to eliminate goat milk allergenicity in humans by using CRISPR/Cas 9 technology. We designed and synthesized three single guide RNAs (sgRNA), two from early parts of exon 1, and one from exon 2 of goat BLG gene. We also designed three sets of forward and reverse primers to amplify the parts of BLG gene, flanking the CRISPR target genomic loci, using goat BLG gene sequence as a template. PCR amplification using the three primer sets and its analysis in 2% agarose gel revealed single bands of 655, 812, 502, and 437 bps, respectively. This result validates the effectiveness of the designed PCR primer sequences and their accuracy as expected from the known BLG gene sequence information. These PCR products, comprising of the targeted CRISPR loci, were purified through a column to eliminate impurities. The experiments are underway to complex these pure CRISPR genomic loci sequences (PCR products) with corresponding sgRNAs and Cas 9 endonuclease protein to pre-validate the cleavage reaction *in vitro*, prior to their transfection in cells, for *in vivo* genome editing. These validated reagents will be used to transfect fetal fibroblast cells as well as embryos to generate BLG knockout goats in our future experiments.

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Entomopathogenic Nematodes as Potential Biological Control Agents Against the Goat Biting Louse, *Bovicola caprae*. A. Mbata*, A. Siddique, and T. H. Terrill, Fort Valley State University, Fort Valley, GA 31030; S. Gulzar, and D. Shapiro-Ilan, USDA/ARS, Byron, GA 31008; J. M. Burke, USDA-ARS, Booneville, AR 72927; and J. A. van Wyk, University of Pretoria, Onderstepoort, South Africa.

Bovicola caprae, the goat biting louse, is a permanent ectoparasite that causes dermatitis, irritation, hypersensitivity, and reduced productivity in goats. Reliance on chemical insecticides for its control is increasingly problematic due to resistance development and environmental concerns, highlighting the need for sustainable alternatives such as biological control. This study evaluated the potential of five entomopathogenic nematode (EPN) species such as *Steinernema carpocapsae*, *S. feltiae*, *S. riobrave*, *Heterorhabditis bacteriophora*, and *H. indica* against *B. caprae* under laboratory conditions. We assessed host attraction, virulence across application rates, and nematode reproductive capacity within louse cadavers. All EPN species demonstrated the ability to locate, infect, and kill adult lice; however, mortality levels varied with nematode species, inoculation rate, and exposure duration. After 48 h, the greatest reduction in louse survival occurred with *S. riobrave* and *S. carpocapsae* at 200 infective juveniles (IJs) per insect, while *H. bacteriophora* and *H. indica* showed moderate virulence. In reproduction assays, *S. riobrave* yielded the highest number of IJs, followed by *S. carpocapsae*, *H. bacteriophora*, and *H. indica*. No reproduction was observed for *S. feltiae*. These findings confirm that EPNs can successfully infect and kill *B. caprae*, with *S. riobrave* and *S.*

carpocapsae, emerging as the most promising candidates for biological control. Future research should focus on validating their efficacy in live animal systems and exploring practical application strategies for goat production.

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Recovery of Live Cells and Ultrastructural Changes in Goat Skin Tissues after Different Days of Postmortem Storage at 4° C. R. Polasa*, X. Ma, A. Pawar, N. Joshee, V. Nguyen and M. Singh, Fort Valley State University, Fort Valley, GA 31030.

Postmortem tissue preservation represents a critical resource for stem cell recovery, germplasm conservation, and animal cloning. While previous studies have demonstrated fibroblast recovery from refrigerated livestock tissues for several days postmortem (dpm), the relationship between cellular ultrastructural changes and stem cell viability remains poorly understood. This study aims to evaluate the correlation between progressive tissue degradation and potential of live cell recovery in abattoir collected goat skin tissues stored at 4°C. Small explants (2mm dia., 5 explants/dish x 3 dishes/time point/animal) were cultured in DMEM media supplemented with 10% FBS in a CO_2 incubator after 0, 5, 10, 15, 20, and 30 days of storage. Recovery of cells was assessed by scoring outgrowth around explants after 10 days and cells cryopreserved upon reaching 80-90% confluence for further analysis. Outgrowth initiated as early as 5 days after culture in 0- and 6-dpm tissues and 95% confluence after 10 days. Parallel tissue samples were processed for transmission electron microscopy (TEM) to evaluate ultrastructural changes at 0-, 15-, and 30-dpm, focusing on organelle integrity, membrane structure, and nuclear morphology. Tissue samples were also flash-frozen in liquid nitrogen for evaluating DNA integrity. Recovered cells will be purified by serial passaging and characterized for growth, transfection efficiency, and chromosomal stability. This comprehensive approach will help us understand tissue degradation and stem cell recovery, providing critical insights for optimizing postmortem tissue banking. It will provide conservation strategies for endangered species and postmortem cell survival mechanisms, with potential applications in regenerative medicine and livestock genetic preservation.

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Effects of Outdoor Rearing System on the Growth Performance and Blood Parameters of Duroc Pigs. K. Hayes*, A. R. Gentry-Apple, S. Abousaad, D. J. Coble, and Y. Wang, Department of Animal Sciences, North Carolina Agricultural and Technical State University, Greensboro, NC 27411.

Outdoor rearing systems for pigs are gaining consumer interest due to benefits in animal welfare and sustainability. However, the physiological changes between outdoor environmental exposure and production efficiency are not fully understood. This study was conducted to compare the effects of outdoor (OUT) versus conventional indoor (IN) rearing on the growth performance and hematological profiles of pigs. A total of 25 3-month Duroc pigs were blocked by weight and randomly assigned to either the IN (n=13) or OUT (n=12) facility for a 45-day trial under similar environmental temperature and humidity. Both groups were fed standard commercial corn-soybean diets and had free access to feed and water. Growth performance was assessed by measuring body weight and feed consumption. On day 45, whole blood samples were collected to determine complete blood count parameters. Data were analyzed using a t-test. No significant differences were observed in growth performance, like Initial body weight, final body weight, and average feed intake. However, hematological profiles were significantly different. The OUT group had higher total white blood cell counts, as well as absolute counts of neutrophils, monocytes, and eosinophils. Furthermore, significant differences were found in red blood cell indices, including mean corpuscular volume and mean corpuscular hemoglobin concentration. These results indicate that while the outdoor environment stimulates a significant immune response in pigs, this heightened "immune activation" does not compromise growth performance or feed efficiency. Outdoor rearing may therefore produce pigs with a more robust immune system without compromising production efficiency.

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A Study on the Challenges of Goat Meat Processing and Marketing in Texas. P.A.M., Mbasogo***,** S. P. Dhoubhadel, and B. Khanal, CAFNR Research, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446.

Texas is home to the largest population of meat goats in the United States. While the demand for goat meat has been rising exponentially in recent years, the literature suggests that the marketing sector of goat meat is still facing significant challenges. Although there are some studies on the challenges faced by consumers and producers on the supply chain side, less is known about the challenges faced by the goat meat processors. To address this gap, we conducted a telephone survey among representative goat meat processors located in Texas. The survey included multiple questions about their capacity, labor availability, marketing techniques, and marketing challenges to assess the operational status of goat meat processors in Texas. This study identifies the major challenges in the processing and marketing of goat meat in Texas. Furthermore, this study also sheds light on the future of the goat meat industry from the perspective of goat meat processors. The seasonal nature of sales presents a major marketing challenge, while the lack of easy access to goats poses a significant processing challenge. Ultimately, a majority of goat meat processors do not believe that demand for goat meat will increase under the current scenario. This study aims to provide policy recommendations for relevant agencies, researchers, and extension agents in the goat meat industry.

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Comparison of Southern Pine Silvopasture and Open Pasture for Climate Parameters and Animal Stress during Summer. A. Acharya*, U. Karki, S. Acharya, and M. Dumre, Department of Agricultural and Environmental Sciences, Tuskegee University, Tuskegee, AL 36088.

Silvopasture is known to create milder microclimatic conditions for grazing animals. However, the potential of southern pine silvopasture in reducing heat stress in grazing goats (Capra hircus L.) during summer has not been evaluated. We hypothesized that goats reared in silvopasture would be less stressed compared to those in open pastures. The objective of the study was to evaluate the climate parameters and stress in goats grazing silvopasture vs. open pasture. Kiko does (n=20) were split into silvopasture and open pasture groups and rotated among respective plots from June to September 2025 for 70 days. Hourly ambient temperature and relative humidity of the silvopasture site were measured using a Govee Smart Thermo-Hygrometer. Open pasture climate parameters were downloaded from the nearby weather station. Photosynthetically active radiation was measured using a LI-191 quantum sensor, one or two days after each animal rotation in each grazing plot. Hair samples were taken from the flank region of all animals on the first day, every four weeks, and on the last day of the study, and analyzed for cortisol concentration using the commercial salivary cortisol ELISA kit to determine animal stress. Total solar radiation was lower and humidity was higher in silvopasture vs. open pasture. The silvopasture group had lower cortisol level vs. the open-pasture group on Day 70 of the study, despite similar results in the prior observations. These findings suggest that silvopasture systems can minimize stress in grazing animals during summer.

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Peptidoglycan Hydrolases (Pghs) as Alternative Antimicrobials for *Streptococcus iniae* Infections in Fish. Z. McGowan*, K. Bohara, A. Segree, and G. Ramena, Department of Aquaculture and Fisheries, University of Arkansas at Pine Bluff, Pine Bluff, AR, 71601; and D. Donovan, Department of Biology, Morgan State University, Baltimore, Maryland, MD 21251.

Streptococcus iniae is a gram-positive pathogen that causes streptococcosis in fish, resulting in high mortality and economic losses in aquaculture. The emergence of antibiotic resistance necessitates alternative therapeutics. Phage-derived endolysins, or peptidoglycan hydrolases (PGHs), enzymes that degrade bacterial peptidoglycan layer, are promising antimicrobials. In this study, we appended eleven cell-penetrating peptide (PTD) domains to two PGHs we previously shown to be active against eight *S. iniae* strains. PTDs are short peptides that facilitate translocation of PGHs across host cell membranes, enabling intracellular bacterial targeting. We tested these PGH-PTD constructs in OmB cells co-cultured with six *S. iniae* strains at an MOI of 1:100, treated with 10µg of each purified enzyme. PGH-PTDs lysin one: 7, 10, and 11 significantly reduced intracellular *S. iniae* strain 35Br, whereas PGH-PTD 12 was effective against strain ATCC 29178. PGH-PTD 7 also lysed strains ARS-9860 and MN15Br, and PGH-PTDs 8 and 9 were active against strains YV16 and BZ1. PGHs lacking PTDs showed minimal intracellular activity, underscoring the essential role of PTDs in enabling cellular uptake. These results demonstrate that PGHs, when fused with PTDs, can effectively target intracellular *S. iniae* and hold potential as environmentally friendly alternatives to antibiotics for controlling streptococcosis in aquaculture.

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Effect of *Necrotic Enteritis* on Breast Meat Quality in Broiler Chickens. L. Yang*, S. Suberu, K. Hayes, Y. Fasina, and Y. Wang, Department of Animal Sciences, North Carolina Agricultural and Technical State University, Greensboro, NC 27411; J. Ding, H. Feng, and R. Tahergorabi, Department of Family and Consumer Sciences, North Carolina Agricultural and Technical State University, Greensboro, NC 27411.

Necrotic enteritis (NE) remains a significant intestinal disease affecting commercial broilers and continues to threaten global poultry production efficiency. Although the negative impacts of NE on growth performance are well recognized, its influence on subsequent meat quality is not fully defined. This study evaluated the effects of a clinical NE challenge on breast meat quality characteristics of broiler chickens. A total of 240 one-day-old Ross 708 male chicks were randomly assigned to non-challenged control and NE-challenged groups, with six replicate pens per treatment. The NE challenge was induced using a high-dose coccidiosis vaccine followed by oral inoculation with *Clostridium perfringens*. On day 40, one bird per pen was selected for collection of the Pectoralis major muscle. The whole left breast and right breast were collected using a sample bag and stored in 4 ºC. The breast meat was evaluated for proximate composition (Protein, Water, and Fat), pH (24h), color (L*, a*, and b*), water-holding capacity, and texture (Puncture force). Jejunal lesion scores were assessed to confirm successful disease induction. The results showed that the breast meat from NE-challenged birds demonstrated decreased water-holding capacity, darker appearance, and increased toughness, whereas proximate composition and pH were not notably altered. These results indicate that clinical NE not only reduces production performance but also compromises broiler meat quality. The findings highlight the need for continued strategies to prevent NE, as its economic impact extends beyond flock health to reduced consumer product quality and market value.

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Effect of Aged Garlic on Gene Expression and Galectin Secretion in Bovine Whole Blood. P. Pande*, MD. R. Uzzaman, and M. Worku, Department of Animal Science, North Carolina Agricultural and Technical State University, Greensboro, NC 27411.

Aged garlic, a processed form of garlic with enhanced bioactive stability, has been shown to modulate immune function in humans. This study investigated the effect of aged garlic on gene expression and galectin secretion in bovine blood. Whole blood samples were collected from lactating Jersey cows (N = 8) using acid citrate dextrose as an anticoagulant. Samples were treated with aged garlic extract (10 µg) or phosphate-buffered saline (PBS) as control and incubated for 30 min at 37 °C. Total and live cell counts were determined using a TC20 cell counter (Bio-Rad). Plasma was separated for protein and galectin analysis, while cell pellets were preserved in TRIzol and processed for RNA sequencing (GENEWIZ, NJ, USA). Total protein concentration decreased in aged garlic-treated samples compared to control ($P = 0.0414$), while galectin-1, -3, and -9 expression and secretion were not significantly affected ($P > 0.05$). RNA sequencing generated 25.6 million reads for aged garlic and 24.9 million for PBS, identifying 246 differentially expressed genes (155 upregulated, 91 downregulated) at $p < 0.1$ and $|\log_2 FC| > 1$. Upregulated genes included IL12A, LGALS4, MAPK8IP2, AGER, and MAPK15, associated with immune signaling, stress response, and cellular communication pathways. Downregulated genes included CXCL9, IL2, HSPB8, CXCL8, and CD24, linked to pro-inflammatory cytokine signaling and immune activation. Aged garlic regulated immune-related genes, indicating a potential function in the molecular regulation of bovine immunological responses.

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The Prevalence Of Escherichia Coli 0157:H7 Within Goat Meat Along with the Physical Characteristics of Goat Jerky Due to the Makeup of a Goat's Feces, Hide, Carcass, And Hygiene, Goat Meat Is Very Prone to the Exposure Of E. Coli, Possibly Risking the Health of Humans That Encounter Such Meat. E. M. Broadnax-Jackson*, and C. Harris, Department of Agricultural and Environmental Sciences College of Agriculture, Environment & Nutrition Science, Tuskegee University Tuskegee, AL 36088.

Before transforming goat meat into jerky, the process of eliminating the exposure of E. coli must act beforehand. The objective of this project is to locate and count the number of E. coli bacteria within goat meat, eliminate those bacteria, and successfully transform goat meat into goat jerky, producing a healthier, leaner alternative to the known product, beef jerky. For the microbial standpoint, the use of Eosin Methylene Blue Agar, a versatile medium used for the differentiation of E. coli and Enterobacter aerogenes, but it also determines potential treatment for microbial

infections, will be used throughout this experiment. A series of trials over a 2-month span will include the process of serial dilutions, stomacher, and incubation with goat stew meat due to its leanness. It will be determined how much bacteria is contained within goat stew meat and how to effectively extract it. After successfully capturing the microbial aspect of E. coli 0157:H7 within goat meat, following will be the process of making goat jerky and comparing its physical characterizes from beef jerky. Looking closely at its color, texture, moisture and fat content will also contribute to making goat meat into a successful, but enjoyable snack product. In conclusion, this project will bring awareness of Escherichia coli presence in goat meat, but also an opportunity to create a sustainable protein snack for the future.

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Differential Growth and Antioxidant Responses of Broiler Chickens to Varying Durations of 1% Aqueous Clove Extract Administration. F. Okorie*, A.T. Abolude, R. Laing, and J. Davis, Department of Agriculture, Alcorn State University, Lorman MS 39096.

Phytogenic feed additives are increasingly explored as natural alternatives to antibiotic growth promoters in poultry production. Clove (*Syzygium aromaticum*) contains bioactive compounds with antimicrobial, antioxidant, and digestive-enhancing properties, but information on its efficacy in broilers under varying durations of administration remains limited. This study investigated the effects of aqueous clove extract on growth performance and serum antioxidant status of broiler chicks under different administration regimen. 240-day old broiler chicks were randomly assigned to four administration treatment regimens: Clove-0 (control, no extract), Clove-2 (administered for 2 weeks), Clove-4 (administered for 4 weeks), and Clove-6 (administered for 6 weeks) consisting of 5 replicates per treatment with 12 birds each. Birds were managed under standard conditions and monitored across starter (weeks 1–2), grower (weeks 3–4), and finisher (weeks 5–6) phases. Weekly body weight gain (BWG), feed intake (FI), body weight (BW) and feed conversion ratio (FCR) were recorded while at the end of the trial, serum antioxidant activity was evaluated using superoxide dismutase (SOD) concentration as a biomarker. Data generated were analyzed using ANOVA. At the end of the study, it was observed that the duration of aqueous clove extract supplementation exerts distinct, time-dependent effects on broiler growth and antioxidant status. While short-term administration suppresses early growth, extended supplementation (6 weeks) improves final weight gain, feed efficiency, and oxidative resilience. These findings suggest that clove extract could serve as a natural growth and health enhancer in broiler diets, particularly during the finisher phase.

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Monitoring Behavior, Hydration, and Reproductive Status in Cattle Using Allflex 701X XTPRO Tags and Water Sensors. J. Gaines*, and M. Mason-Montgomery, Department of Agriculture, Alcorn State University, Lorman, MS 39096.

Advances in precision-livestock technologies are transforming reproductive management in cattle herds by replacing labor-intensive visual heat checks with continuous, data-driven monitoring. Ear-mounted activity sensors such as the Allflex Heatime™/SenseHub™ and the GPS-enabled 701X xTPro tag combine accelerometry with rumination or location data to generate automated “heat alerts” that have been shown to shorten the interval from estrus onset to insemination and deliver favorable economic returns in both dairy and beef systems. When these behavioral data streams are paired with RFID-linked water-flow meters, managers can simultaneously track individual hydration patterns, a parameter that fluctuates around estrus and during heat stress, providing an additional, non-invasive indicator of cow well-being. Ten (n = 10) cyclically active, non-pregnant beef cows aged over 12 months were selected for this study. All animals were housed in a controlled pasture. The study duration spanned 60 consecutive days, capturing at least two complete estrous cycles per animal. Wearable ear-mounted sensors (701X XTPRO tags) were used to collect continuous behavioral and rumination data. RFID-linked water flow meters were installed for each animal to monitor daily water intake. Sensor data were compared with twice-daily visual estrus observations and validated against artificial insemination outcomes. Ambient temperature and humidity data were also recorded for thermal-humidity index (THI) calculations. Data were collected using manual inputs and data collected from sensors were uploaded automatically via Bluetooth to cloud-based software. All data were analyzed using R (version 4.3.0) and SAS 9.4. Descriptive statistics were calculated for all behavioral metrics (mean, SD, range). Results are pending.

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Effect of Moringa oleifera Supplementation on Growth Performance, Health Status, and Growth-Related Gene Expression Broiler Chickens. T. Evans*, Department of Agriculture, Alcorn State University, Lorman MS 39096; O. Judo, Department of Agriculture, Alcorn State University, Lorman MS 39096; O. Abidemi, Department of Agriculture, Alcorn State University, Lorman MS 39096; and C. Shili. Department of Agriculture, Alcorn State University, Lorman MS 39096.

The objective of the current study was to assess the effect of Moringa oleifera supplementation on growth indicators in broilers and analyze intestinal microbiota composition by examining the changes in the composition, abundance, and functionality of intestinal microbiota following Moringa leaf supplementation in feed, aiming to identify any positive shifts toward a healthier gut environment. Two hundred and forty-day-old male broiler chicks were weight-matched and assigned to 24 pens with 10 chicks/pen. Chicks were subjected to four dietary treatment groups (10chicks/pen and 6 pens/group), including (1) Control diet, (2) Control diet with 0.5% Moringa leaf powder, (3) Control diet with 1% Moringa leaf powder and (4) Control diet with 1.5% Moringa leaf powder. On days 14 and 42, Blood and tissue samples were taken for analysis. Feed intake and Growth measurements were analyzed; Antioxidant activity was measured using the Superoxide Dismutase Colorimetric Kit. In conclusion, moderate supplementation of Moringa leaf powder (1.0–1.5%) appears effective in enhancing early-stage intake and growth in broilers and tends to improve the antioxidant capacity. However, supplementing broiler diets with Moringa oleifera leaf powder at 0.5 %, 1.0 % and 1.5 % for two weeks did not produce any positive carry-over effect on overall body-weight gain, feed intake or feed-conversion ratio ($P > 0.05$) when compared with the chickens fed the control diet.

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Growth Performance and Digestibility of Fishmeal, Plant, or Insect Protein Diets in High Yield and Low Yield Genetic Line of Rainbow Trout (*Oncorhynchus mykiss*). T. L. Uwaezuoke*, J. N. Idenyi, and J.C. Eya, Department of Biology, West Virginia State University, Institute, WV 25112.

The rising demand for viable aquafeed ingredients necessitates the evaluation of alternative protein sources to moderately or completely substitute fishmeal. This study examined the growth performance and nutrient digestibility of genetic lines (high-yield (HY) and low-yield (LY)) of rainbow trout (*Oncorhynchus mykiss*) which fed four practical diets formulated with varying protein sources: fishmeal-based diet, plant-derived diet, insect meal-derived diet, and blended protein diet combining fishmeal, insect meal, and plant proteins. For 150 days, growth indices including percent weight gain (PWG), feed efficiency (FE), feed intake (FI), specific growth rate (SGR), and condition factor (CF) were evaluated across HY and LY genetic lines. Digestibility trials were conducted to assess crude protein (CP), crude fat (CF), and amino acids utilization. Results showed that diets had a significant effect ($P < 0.05$) on PWG, FI, FE, and SGR, with fishmeal and blended protein diets supporting superior growth compared to plant- and insect-based diets. Genetic line effects were generally non-significant, except for threonine digestibility, which significantly increased in LY than HY. Digestibility of essential amino acids, particularly valine, and non-essential amino acids such as alanine, serine, and proline, was influenced by dietary contents. Overall, the blended protein diet produced comparable growth and nutrient utilization to the conventional fishmeal, suggesting its potential as a viable option. These findings highlight the importance of integrating insect and plant proteins strategically into aquafeeds to reduce reliance on fishmeal while maintaining optimal performance in rainbow trout.

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Preliminary Identification of Superficial Muscles in Goat Carcass. M. Mkunga*, and D. Burnett, Department of Agriculture and Environment Science, Tuskegee University, Tuskegee, AL 36088.

Goat production in the U.S. is reported to be 2.62 million heads, with 80 percent being meat goat. Although there is an increase in demand for goat meat, the current supply fails to meet this growing demand, leading to a significant rise in the importation of goat meat in the United States. This trend highlights a significant domestic market gap, indicating an opportunity for domestic producers to meet the rising demand. To provide consistent quality and gain consumer confidence, other industries like beef and pork have benefited from comprehensive myology studies that have provided reliable information on optimal harvest, fabrication, value addition, and marketing of these products, indicating the value of knowing each muscle characteristic. While currently lacking a comprehensive investigation of this nature in meat goats, this preliminary study aimed to identify and document the major superficial muscles of the

goat carcass. Goat carcass was dissected, and the superficial muscles of the thoracic region, thoracic limb, and pelvic limb were exposed and identified using pins. Identified muscles included biceps brachii, brachialis, extensor carpi radialis, triceps brachii in the thoracic limb, trapezius, latissimus dorsi in the thoracic region, and semimembranosus, semitendinosus, gluteobiceps, gastrocnemius in the pelvic limb. This preliminary identification represents the first phase of goat myology reference that will support the future work on muscle profiling, fabrication, and marketing, which could ultimately improve consumer confidence and expand the goat meat market beyond niche markets.

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Effects of Plane of Nutrition on Pregnancy Performance, Metabolic Responses, and Reproductive Efficiency in Primiparous Ewes. D. Valles*, A. M. Aboulemagd, A. Mohamed, and B. Kouakou, Agricultural Research Station, College of Agriculture, Family Sciences and Technology, Fort Valley State University, Fort Valley, GA 31030.

Maternal nutrition plays a critical role in regulating metabolic hormones, fetal development, and overall reproductive success in sheep. This study evaluated how three gestational feeding levels 80%, 90%, and 100% of NRC requirements affect pregnancy outcomes, maternal metabolic-hormonal status, and early offspring development in hair sheep (*Ovis aries*). Thirty-five primiparous ewes were individually housed and fed a complete ration formulated with alfalfa meal, DDGS, soybean hulls, molasses, poultry fat, and monocalcium phosphate to achieve 18% crude protein, 3.0 Mcal DE/kg, and a Ca:P ratio of 2.3:1. Blood samples collected across gestation and postpartum will be analyzed for glucose, BUN, NEFA, oxidative stress markers, and key metabolic hormones including leptin, ghrelin, insulin, and IGF-1. Offspring will be monitored at birth, early postnatal stages, weaning, and puberty for growth, immune status, and metabolic development. Preliminary results analyzed using ANOVA indicate clear differences in pregnancy success among feeding levels. The group fed at 90% of their voluntary intake showed the highest pregnancy rate (92%), followed by the 80% restricted at 75% efficiency, while the full-fed group (100%) exhibited the lowest rate (64%). These findings suggest that moderate, near-maintenance feeding best supports hormonal balance and reproductive efficiency. This work demonstrates that relatively small adjustments in pre-gestational feeding level can meaningfully influence metabolic-hormonal regulation and reproductive outcomes in hair sheep. The results will help refine maternal nutrition strategies and improve productivity for producers.

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Evaluation Of Summer Cover Crops on Performance, Rumen Fermentation, And Carcass Characteristics of Grazing Meat Goats. V. Kanyi*, B. Min, M. Hilaire, I. Hossam, S. Chaudhary, and H. Abdo, Department of Agricultural and Environmental Sciences, Tuskegee University, Tuskegee, AL 36088.

Exploring sustainable forage options is essential for improving productivity in meat goat systems, particularly under challenging environmental conditions. This study examined the influence of two summer cover crops *Cynodon dactylon* (Bermudagrass) and *Crotalaria juncea L.* (Sunn hemp) on growth performance, rumen fermentation, and carcass characteristics of grazing goats. Forty-five Boer-Spanish (Capra hircus) crossbred kids, approximately three months old, were randomly distributed into two forage treatment groups and grazed for 75 days across four replicated plots. Goats had unrestricted access to water and mineral salt blocks, while body weights were recorded every two weeks. Severe drought experienced during July–August 2024 led to limited forage availability, necessitating supplemental Bermudagrass hay feeding. At trial completion, carcass traits were evaluated, and data were analyzed using the GLM procedure in SAS. No significant treatment effects were detected for body weight, rumen or carcass parameters. Although goats initially lost weight, they later recovered, likely due to adaptation and improved forage utilization. Overall, both forages supported comparable animal performance under drought stress. These findings highlight the potential of integrating leguminous cover crops like Sunn hemp into grazing systems to promote resilient and sustainable meat goat production.

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Effect of Cool Season Forages on Layer Performance and Egg Quality. J. M. Tate*, J. R. Bartlett, C. Blair, and G. Moore, Department of Agricultural and Environmental Sciences, Tuskegee University, Tuskegee, AL 36088

Chicken eggs are a popular food item for consumers worldwide. Egg production systems are highly industrialized to increase quantity and efficiency of production to meet demand. Consumers' demands have shifted towards eggs

produced in alternative systems, like pastured poultry. Performance and product quality are based on ingredients and nutrient composition of the feed. Therefore, it is important to identify and evaluate the types and quality of forages in the pasture. The objectives of this study were to evaluate performance and egg quality of layers raised on pasture containing different cool season forages. Three hundred 1-day old Rhode Island Red hens were assigned to four treatments (kale, chicory, white clover, control) with 75 birds per treatment and 3 replications of 25 birds. All birds were brooded indoors for six weeks, and then three groups placed on paddocks in pastured pens, while the control group remained indoors. Feed intake and body weights were monitored weekly and water offered ad libitum. Eggs were collected daily and measurements taken (yolk color, eggshell thickness, egg weight). Results showed no difference in body weight gain, feed intake, average daily intake, and average daily gain. Yolk color tended to be brighter in eggs from pastured birds. Control birds tended to have thicker eggshells. There was a tendency for birds consuming chicory to lay larger eggs. The outcome of this study will give consumers greater awareness of quality of eggs and provide farmers with information on suitable forages for their pastured poultry.

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Genomic Assessment of Nutrition on Honeybee, Apis mellifera (Hymenoptera: Apidae) Health. B. A. Obungu*, L. H. B. Kanga, and A. Sharma, Department of Entomology, Florida A&M University, Tallahassee, FL 32307; M. Haseeb, Center for Biological Control, Florida A&M University, Tallahassee, FL 32307; V. Chettri, Food Science Program; College of Agriculture and Food Sciences, Florida A&M University, Tallahassee, FL 32307; and I. Elsharkawy, Center for Viticulture and Small Fruit Research, Florida A&M University, Tallahassee, FL 32308.

Honeybees (*Apis mellifera*) are essential pollinators that sustain global ecosystems and agricultural productivity, contributing over $20 billion annually to the U.S. economy. However, colony losses have increased worldwide due to interacting stressors such as pests, pathogens, pesticides, and nutritional deficiencies. This study evaluated the influence of diet on honeybee health by assessing gene expression over a 63-day experimental period. Adult worker bees were fed four dietary treatments: basil, marigold, anise hyssop, or a control diet composed of a commercial pollen patty and sugar syrup. Expression levels of key genes related to immune function (*Immune deficiency, Spaetzle,* and *Cactus*), cellular defense and longevity (*Vitellogenin, Malvolio,* and *Prophenoloxidase*), brain function (*Single-minded homolog 2*), and energy metabolism (*Maltase*) were quantified using droplet digital PCR. Diet significantly affected gene expression profiles. *Vitellogenin* was upregulated in bees fed floral diets, suggesting enhanced resilience and longevity, whereas control-fed bees showed downregulation indicative of shorter lifespan. *Maltase* and *Malvolio* exhibited time-dependent upregulation across treatments. Expression of immune-related genes and *Single-minded homolog 2* varied among treatments, while *Prophenoloxidase* was elevated in bees receiving floral diets, supporting improved melanization defenses. Overall, floral diets enhanced immunity, metabolic efficiency, and longevity relative to the control diet. These findings underscore the importance of diverse floral resources in promoting honeybee health. Basil, anise hyssop, and marigold are recommended as companion plants to improve forage diversity, nutritional quality, and colony resilience during periods of floral dearth.

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Effects of Postmortem Storage Time on Quality, Textural, and Sensory Characteristics of Lamb Meat. F. Johnson*, A. Bakhsh, Sherman Lewis School of Agriculture and Applied Science, Langston University, Langston, OK 73050.

Goat and sheep meats are valuable sources of high-quality protein, essential amino acids, and minerals such as iron; however, they differ in tenderness, fat content, and connective tissue composition, which influence their overall eating quality. Understanding species-specific variations in muscle properties is crucial for enhancing consumer perception and improving the processing quality of small ruminant meats. This study aims to evaluate and compare the meat quality parameters, sensory attributes, and textural profiles of the longissimus dorsi muscle of Ovis aries (sheep). A total of 18 lamb carcasses, from which both the left and right longissimus dorsi muscles will be collected, will be analyzed to evaluate variations in key physicochemical characteristics. These measurements will include instrumental color parameters (L*, a*, and b* values), ultimate pH, and water-holding capacity, assessed through drip loss and cooking loss. Moreover, the proximate composition of the muscle samples will be determined, including moisture, ash, and intramuscular fat content, using standard analytical procedures. Additionally, a trained sensory panel will conduct a comprehensive evaluation of the meat's organoleptic properties, including color, flavor, aroma, juiciness, tenderness/texture, and overall acceptability. Standardized sensory protocols and controlled testing conditions will be

used to ensure consistency and reliability of the assessments. This sensory evaluation will provide consumer-oriented insights by linking postmortem storage–induced changes in physicochemical and textural properties with perceived eating quality and overall palatability of goat meat. The expected results are anticipated to reveal significant differences in the physicochemical composition, tenderness, and sensory quality of lamb longissimus dorsi muscles.

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Developing a Low-Sodium, Organic Plant-Based Meat Alternative Guided by the "Food is Medicine" Principle. J. Johnson*, A. Bakhsh, Sherman Lewis School of Agriculture and Applied Science, Langston University, Langston, OK 73050.

The contemporary market for plant-based meat analogs (PBMAs) presents a dichotomy: while offering ecological benefits, most commercial products are classified as ultra-processed, with high sodium and saturated fat content, thereby undermining the potential public health gains. This research addresses this gap by proposing the development of a Whole-Food Plant-Based Meat (WPBM) analogue guided by the "Food is Medicine" philosophy, specifically integrating principles of low-sodium, nutrient-dense formulation to create a product with therapeutic and preventative health benefits. This study aims to formulate a WPBM that is rich in dietary fiber, antioxidants, polyphenols, and high-quality plant proteins, while being low in saturated fats and free from cholesterol and synthetic additives. The addition of functional ingredients such as jackfruit and textured vegetable protein (TVP) as meat extenders, mushrooms as a taste and texture enhancer, molasses, garlic powder, and yeast extract as natural flavoring agents, and leghemoglobin as a color enhancer both nutritional and sensory quality. Methylcellulose will serve as a binding agent, while canola and coconut oils will act as emulsifiers to improve juiciness and mouthfeel. The expected results from the developed product will maintain desirable pH, moisture, and protein content, with favorable texture, juiciness, and flavor attributes, thereby indicating its potential as a viable alternative to conventional chicken meat. Therefore, the objective of this study is to analyze the physicochemical, sensory, and textural characteristics of the developed patties in comparison to traditional meat.

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Susceptibility of the Small Hive Beetle, Aethina tumida (Coleoptera: Nitidulidae), to Conventional and New Generation Insecticides. M. M. Farquharson*, L. H. B. Kanga, and A. Sharma, Department of Entomology Florida A&M University, Tallahassee, FL 32307; M. Haseeb, Center of Biological Control, College of Agriculture and Food Sciences, Florida A&M University, Tallahassee, FL 32307; I. Elsharkawy, Center for Viticulture and Small Fruit Research, Florida A&M University Tallahassee, FL, 32308; and A. Gaffke, USDA-ARS CMAVE, Tallahassee, FL 32308.

The small hive beetle (*Aethina tumida* Murray), native to sub-Saharan Africa, has become an invasive pest in the United States and is now established in 30 states. Its high reproductive potential and adaptability to diverse environments enable multiple generations per year, leading to serious colony damage and economic losses. Prolonged reliance on CheckMite+™ (coumaphos), the only approved in-hive pesticide, has reduced its efficacy and the development of resistant populations, underscoring the urgent need for alternative control measures. This study assessed the susceptibility of adult small hive beetles to selected conventional insecticides (coumaphos, cypermethrin, fluvalinate, chlorpyrifos, and malathion) and new generations insecticides (fenpyroximate, acetamiprid, imidacloprid, thiamethoxam, indoxacarb, and chlorfenapyr) using the glass vial technique. Among conventional insecticides, resistance to fluvalinate and coumaphos was consistent across field populations. Chlorpyrifos exhibited a sharp decline in effectiveness, whereas malathion and cypermethrin caused complete mortality (absence of resistant alleles) at higher diagnostic concentrations. Field populations of the small hive beetles showed variable levels of susceptibility to the newer insecticides, particularly fenpyroximate and chlorfenapyr. In contrast, acetamiprid, thiamethoxam, imidacloprid, and indoxacarb caused complete mortality (0% survival) throughout a three-month experimental period. Overall, malathion and cypermethrin (conventional) and acetamiprid, imidacloprid, thiamethoxam, and indoxacarb (new-generation) were highly effective against adult small hive beetles. These results identify promising alternatives for incorporation into integrated pest management programs aimed at mitigating resistance and sustaining effective control of this invasive species.

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Monitoring Emergent Plant Diseases for Food Security in the Americas (Dec 5th, 2024, Symposium Proceedings). K. Adams* and J. Epple-Farmer, College of Agriculture, Environmental and Human Sciences (CAEHS), Lincoln University, Jefferson City, MO 65101.

With the growing importance of trade as a component of the U.S. economy, the plant pests and diseases that affect our trading partners are of interest to the U.S. This means in our globally integrated world the growth and stability of our partners has significant implications to the U.S.'s national food security and to the global food system as a whole. We share with our Latin American partners the production of sweet potatoes and legume crops. It is this commonality of shared food where our symposium series builds, allowing us to address food security and defense in the Americas. These webinars cover a variety of information including pest and disease recognition, mitigation strategies, modern detection tools and disease monitoring. As a part of the Latin American cohort, programing was joined and contributed to by our colleagues in Guatemala, Mexico, as well as fellow 1890 institutions. This funded project is a part of the Center of Excellence for Global Food Security and Defense (CEGFSD). It is designed to foster international partnerships that strengthen agricultural integrity in developing countries and engage international researchers in addressing new and emerging plant pests and diseases.

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Nanosized *Laurus nobilis* Essential Oil as a Natural Rumen Modifier: Impacts on Fermentation Efficiency and Greenhouse Gas Reduction. Y. Shaw*, A. Kholif, and U. Anele, Department of animal Sciences, North Carolina Agricultural & Technical State University, Greensboro, NC 27411.

This study examined the effects of *Laurus nobilis* essential oil, applied in both normal and nano-emulsified forms, on ruminal fermentation characteristics using an in vitro batch culture technique. Dried *L. nobilis* leaves were extracted, and the nanosized form was produced by ultrasound-assisted emulsification. Treatments consisted of a control (0 μL/g DM) and three inclusion levels (10, 20, and 30 μL/g DM) of each oil form, incubated with a total mixed ration and rumen inoculum for 24 and 48 h. Gas production (GP) kinetics revealed that increasing levels of normal-size oil linearly (P=0.012) and quadratically (P=0.038) increased the rate of GP, while the asymptotic gas volume tended to decline (P=0.082). Nano-emulsified oil maintained relatively stable GP but showed higher microbial protein yield at all doses. Methane (CH_4) output declined with both oil forms, with significant linear (P=0.026) and quadratic (P<0.001) responses depending on dose and size. At 48 h, nano oil reduced CH_4 (P=0.048) and ammonia (NH_3; P<0.001) concentrations compared with normal oil. Normal oil inclusion quadratically (P=0.020) enhanced dry matter degradability at 24 h, while nano oil showed a linear trend (P=0.066). At 48 h, neutral detergent fiber degradability responded quadratically (P=0.024). Total volatile fatty acids (VFA) decreased linearly (P=0.015) with normal oil, yet the acetate-to-propionate ratio showed significant quadratic changes (P=0.040). Nano oil elevated branched-chain VFAs, particularly iso-butyrate (P=0.034), and maintained acetate and propionate proportions. In conclusion, nano-emulsified *L. nobilis* essential oil improved rumen fermentation efficiency by reducing CH_4 and NH_3 formation while sustaining nutrient degradability and VFA balance.

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Evaluation of Stress in Broiler Chickens Raised on Pasture Containing Cool Season Forages. C. Blair*, J. R. Bartlett, J. Thompson, K. Mitchell, E. Rush, and L. Shortnacy, Department of Agricultural and Environmental Sciences, Tuskegee University, Tuskegee, AL 36088.

The poultry industry primarily depends on the intensive production system to meet market demands. However, alternative production systems like pastured, cage free, and free-range operations, are gaining popularity. Consumers interested in animal welfare are concerned about the environment in which birds are raised. They believe that birds raised in an alternative system are less stressed than those raised in the intensive system. Therefore, the objective of this project was to evaluate the stress level of broiler chickens raised on pasture containing cool season forages, compared to those raised indoors. There were four treatments: Kale, Chicory, White Clover, and Control. This study was part of a larger project utilizing 300 Cornish Rock male chickens. There were 75 birds per treatment with 3 replications of each. Birds were raised indoors for 3 weeks before going to pasture. At the end of the 3 week brooding period indoors, blood samples were collected via brachial venipuncture from 5 birds per replication to establish baseline stress parameters (white blood cell differential count and Heterophil to lymphocyte ratio). Blood samples were collected again at the end of the study after birds were on pasture, to determine the impact of pasture on the stress

parameters mentioned above. Results from the heterophil to lymphocyte ratio at week 3 and week 7 showed no significant difference. There were no significant differences in white blood cell profile between the initial and final evaluations. The outcome of this project did not show any indicators of chronic stress levels among the treatments.

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Comparison of Ram Semen Motility Parameters Between Fresh and Chilled Collections. S.K. Hoskins* and J. Epple-Farmer, College of Agriculture, Environmental and Human Sciences (CAEHS), Lincoln University, Jefferson City, MO 65101.

The preservation of semen, via the chilling process, is essential for artificial insemination and other reproductive research analysis programs. However, chilling- induced changes in sperm quality have been known to compromise data collection outcomes, which is especially relevant given the known sensitivity of ram semen to external factors. This preliminary study was designed to compare sperm motility factors between freshly collected samples and 24-hour chilled samples to determine if the usage recommendation of chilled ram semen is viable for sensitive research semen analysis purposes. This was achieved via a detailed breakdown of the motility variations between ram semen samples that were freshly collected and the same collections that were chilled for 24 hours.

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Advancing Ruminant Nutrition Through Nano Technology: Efficacy of Sage (*Salvia officinalis*) Essential Oil on Ruminal Fermentation Efficiency and Greenhouse Gas Abatement. O.A. Oderinwale*, O.O. Adelusi, J.O. Alabi, J.M. Enikuomehin, C.C. Anotaenwere, M. Wuaku, Y. Shaw, J. Adebayo, K.A. Ike, A.E. Kholif, and U.Y. Anele, Department of Animal Sciences, North Carolina Agricultural and Technical State University, Greensboro, NC 27411.

Sustainable ruminant production demands nutritional interventions that enhance rumen fermentation efficiency while minimizing environmental emissions. This study investigated the effect of particle size and inclusion level of Sage (*Salvia officinalis*) essential oil (SEO) on *in vitro* rumen fermentation characteristics and greenhouse gas production. Rumen fluid was collected from four rumen-cannulated Holstein Friesian cows and incubated for 48 hours in 100-mL serum bottles containing 500 mg substrate (corn silage,(64.35%), alfalfa,(3.48%), concentrate,(32.17%)at a 3:1 v/v buffer-to-rumen fluid ratio. A 2×3+1 factorial design was used to compare two SEO particle sizes (normal and nano) at 0, 10, 20, and 30 µL/g DM alongside an unsupplemented control. Data were analyzed using the MIXED procedure of SAS with Tukey's test at $p<0.05$. Results revealed that nano-SEO significantly improved the rate of gas production, reduced lag time, enhanced metabolizable energy, decreased the microbial production efficiency at 48 hours, and increased gas yield (at 24 hours) and microbial crude protein, reflecting improved substrate degradation efficiency. Normal-SEO at 10 µL/g DM significantly reduced methane (CH_4) production at 24 hours, while nano-SEO reduced CH_4 (at 20 µL/g DM) and hydrogen sulfide (H_2S) emissions at 48 hours. Ammonia (NH_3) concentrations at both incubation periods were consistently lowered for nano-SEO. These findings indicate that nano-encapsulation enhances SEO bioavailability and functionality, leading to improved rumen fermentation and reduced greenhouse gas (CH_4, NH_3, H_2S) emissions. Overall, nano-SEO inclusion (especially at 20 µL/g DM) serves as an effective and environmentally sustainable feed additive strategy for ruminant production systems.

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Development of a Patient-Derived Zebrafish Xenograft Model for Glioblastoma. H. Wanjala *, G. Ramena, R. Cheriyan, and M. Muhia, Department of Aquaculture and Fisheries, University of Arkansas at Pine Bluff, Pine Bluff, Arkansas 71601; and A. Rodriguez, Department of Neurosurgery, University of Arkansas for Medical Sciences, Little Rock, Arkansas 72205.

Glioblastoma (GBM) is the most aggressive primary brain tumor, characterized by rapid proliferation, diffuse infiltration, and resistance to conventional therapies, resulting in poor patient prognosis (Figure 1). Preclinical evaluation of GBM relies heavily on rodent xenograft models; however, these systems are costly, labor-intensive, and often limit high-throughput applications. To address these challenges, we developed a zebrafish xenograft platform as a complementary in vivo model for studying glioblastoma biology. Human glioblastoma cell lines U87 (GFP-labeled) and U251 (mCherry-labeled) were transplanted into zebrafish embryos, enabling real-time visualization of tumor dynamics, including proliferation, migration, and angiogenic interactions within a transparent host environment. This

approach further provides a rapid and scalable system for testing therapeutic compounds and assessing tumor responses. By leveraging the advantages of zebrafish—optical accessibility, genetic tractability, and cost-effectiveness—this study establishes a versatile preclinical model that bridges the gap between in vitro assays and mammalian systems, with potential to accelerate glioblastoma research and drug discovery.

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Environmental Impacts of Incorporating *Pleurotus Ostreatus* Spent Mushroom Substrate into Corn Silage-Based Diets on Dry Matter Digestibility and Greenhouse Gas Emissions in a Simulated Rumen System (RUSITEC). C.C. Anotaenwere*, and O. S. Isikhuemhen, College of Agriculture and Environmental Sciences, North Carolina Agricultural and Technical State University Greensboro, NC 27411; P. A. Dele, Department of Pasture and Range Management, Federal University of Agriculture, Abeokuta, Ogun State, Nigeria; A. E. Kholif, and U. Y. Anele, College of Agriculture and Environmental Sciences, North Carolina Agricultural and Technical State University Greensboro, NC 27411.

This study evaluated the impact of incorporating *Pleurotus ostreatus* spent mushroom substrate (SMS) into corn silage-based diets on dry matter digestibility and biogas emissions using the Rumen Simulation Technique (RUSITEC). Corn silage and SMS were evaluated at ratios of 90:10 (T1), 80:20 (T2), and 60:40 (T3), respectively, compared to a control diet consisting of 100% corn silage. Significant improvements were observed in dry matter digestibility, which increased from 41.1% in the control to 46.9% and 48.1% in the T1 and T2 treatments, respectively. SMS inclusion significantly decreased methane (CH_4) emissions, with the 10% SMS treatment reducing CH_4 from 65.6 mg/g DM to 14.4 mg/g DM, a reduction of about 78%. Ammonia levels also declined significantly from 1025 mg/L in the control to 420 mg/L in T1 group. Hydrogen sulfide emissions showed a similar pattern, dropping from 7828 mg/L (control) to 1817 mg/L (20% SMS). These results indicate that replacing 10–20% of corn silage with *P. ostreatus* SMS can significantly enhance nutrient digestibility and reduce environmental emissions, without affecting fermentation characteristics. SMS is an economical, eco-friendly, and promising feed additive for sustainable ruminant farming.

Student Poster Presentation – Undergraduate Competition

Family, Youth, Community, and Economic Development

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Empowering Women and Families through Sustainable Smallholder Agribusiness Models Lessons from Experiential Learning in Kenya. S**,** Ellingburg*, J, Opiri, Department of Human Sciences, University of Arkansas Pine Bluff, AR 71601.

This project explores how sustainable smallholder agribusiness models can empower women and strengthen family well-being in Kenya. The purpose was to assess how integrated farming systems promote sustainable land utilization, enhance household resilience, and support gender equity within rural communities. The study was conducted through the 1890 Global Food Security and Defense Fellows Program in collaboration with Chuka University and local partners across Tharaka-Nithi, Embu, and Murang'a Counties. A field-based approach was used to document practices such as integrated crop–livestock–aquaculture systems, resource recycling, and cooperative market participation. Data were gathered through field visits, participant observations, and stakeholder interviews with women farmers and community leaders. Women gained greater participation in farm decision-making and leadership, while sustainable technologies reduced their physical labor burdens. Families experienced improved food and income security, and children benefited from enhanced nutrition, educational stability, and exposure to environmentally responsible practices. The implications highlight that sustainable smallholder agribusiness models can serve as powerful tools for advancing food security, gender equity, and rural resilience. Kenya's integrated approach provides a replicable framework for empowering resource-limited producers globally through sustainable intensification, cooperative networks, and inclusive value chain development.

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Advancing Smart Agricultural Systems Through Artificial Intelligence and IoT Integration: Environmental Sustainability and Food System Resilience. S. Chambo*, K. Harris, and O. Ogunbade, Department of Human Sciences, University of Arkansas at Pine Bluff, 1200 North University Drive, Pine Bluff, AR 71601.

Contemporary agriculture faces resource constraints, environmental pressures, and the need to produce safe food, motivating the integration of artificial intelligence (AI) and Internet of Things (IoT) to enable precise, data-driven management across irrigation, nutrition, and crop protection (Mansoor et al., 2025; Miller et al., 2025). Smart sensors, machine-learning models, and automated controls enable real-time monitoring and targeted interventions for soil moisture, nutrient status, and pest/disease incidence, thereby improving efficiency and environmental outcomes (Sandhya, 2025; Morchid et al., 2024). Within this framework, food-system resilience and sustainability can be advanced by linking sensing and analytics to site-specific actions at the field scale (Miller et al., 2025). This study examines how AI and the IoT enhance precision agriculture by promoting environmental sustainability, improving resource efficiency, and strengthening food production resilience. Through this exploration, the study seeks to enhance understanding of food safety and how artificial intelligence supports modern agricultural systems.

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Developing Educational Materials to Support Workforce Training and Information Dissemination in the Gulf South VECTOR Program. R. Germany*, A. Sharma, Entomology, College of Agriculture and Food Sciences, Florida Agricultural and Mechanical University, Tallahassee, FL, 32307; C., Riegel, City of New Orleans Mosquito, Termite, Rodent Control Board, New Orleans, LA, United States; and R. Paine, Virginia Tech, Blacksburg, Virginia, 24061

Vector-borne diseases continue to rise across the Gulf South, underscoring the need for accessible, standardized information that can be effectively communicated to diverse stakeholders involved in vector control. The Gulf South Vector Education Center for Training, Outreach, and Resources (Gulf South VECTOR), funded in 2023 by the Centers for Disease Control and Prevention (Cooperative Agreement NC50CK000638), was established to strengthen regional workforce capacity by improving training resources, communication pathways, and knowledge-sharing networks. As part of this initiative, students played a key role in developing educational materials by creating visually engaging flyers intended to disseminate essential vector-control information across multiple audiences, including students, mosquito control personnel, public health workers, and community partners. These student-produced materials align with Gulf South VECTOR's standardized information and were designed through a structured process involving content drafting, scientific review, graphic design, and final program approval. The materials simplify complex operational concepts and promote consistency in messaging throughout the region. By distributing these flyers across partner institutions, the project supports improved communication, enhances training effectiveness, and broadens the reach of critical vector-management information. This poster presents multiple educational flyers, outlines the content development process, and highlights the importance of targeted, visually accessible materials for disseminating vector-control information to a wide range of stakeholders across the Gulf South.

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Move More, Eat Better: Expanding Community Wellness Through Participant Voices. E. Clay, Department of Agricultural Sciences and Technology, College of Agricultural, Human and Environmental Sciences, Southern University and A&M College, Baton Rouge, LA 70813.

SU Together Move More, Eat Better is a community-focused wellness initiative developed by the Center of Excellence to help adults ages 18 and older take control of their health through better nutrition and regular physical activity. To better understand how to make this program more inclusive, supportive, and accessible for a diverse community, participant surveys that will focus on barriers, needs, and preferences related to health and wellness are conducted. Feedback gathered through these surveys highlighted the importance of flexible scheduling, culturally relevant nutritional information, welcoming fitness environments, and consistent motivational support. Using these insights, the program emphasizes practical strategies that meet people where they are whether they are just beginning their wellness journey or working to stay consistent with their goals. Through gathering feedback from each event, this research demonstrates how listening directly to community members can strengthen wellness efforts and create programs that truly reflect the people they serve. *SU Together* continues to bring participants together to move more, eat better, and build healthier, more inclusive lifestyles one step at a time.

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Blight to Opportunity: Mapping Brownfields and Socio-Economic Disparities in Alabama Communities. K. Woods*, A. Williams, C. Johnson, D. Olaborode, C. Cummings, S. Hatchett, Z. Afanou, Department of Regional and Urban Planning, Alabama A&M University, Normal, AL 35762, K. Johnson, J. Ellington, J. Whisenhunt, E. Nall, W. Garrett, C. Williams, A. Williams, M. Dunford, E. Moss, Department of Natural Resources and Environmental Sciences, Alabama A&M University, Normal, AL 35762.

Brownfields are abandoned or underutilized properties where redevelopment is hindered by the potential presence of hazardous substances or pollutants. This study identified and evaluated Brownfield sites across six Alabama counties—Cullman, Jackson, Lauderdale, Limestone, Madison, and Sumter—to support future remediation and sustainable redevelopment. The objectives were to develop a comprehensive Brownfield inventory, assess cleanup and reuse potential, provide data to stakeholders, and analyse socio-economic disparities associated with site distribution. Through a partnership between the Alabama Department of Environmental Management (ADEM) and Alabama A&M University, windshield surveys, site prioritization analyses, and Phase I Environmental Site Assessments (ESAs) were conducted. Historical and geological data from the Environmental Risk Information Service (ERIS), along with Geographic Information System (GIS) mapping and Google Earth imagery, were used to visualize sites, population density, and socio-economic indicators. Several Brownfield properties with strong redevelopment potential were identified, and Phase I ESAs confirmed multiple sites as eligible for further remediation and revitalization. Analysis revealed that many Brownfields are located in socio-economically vulnerable areas, emphasizing the importance of equity-centered redevelopment. Community visioning sessions were also held to enhance public engagement and awareness. This collaboration between ADEM and Alabama A&M University demonstrates the effectiveness of academic–government partnerships in addressing environmental disparities while advancing sustainable redevelopment and environmental justice across Alabama.

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Tapping into Trends: Insights into Maple Syrup Production in West Virginia (2014–2024) J. Tickle*, S. Bandara, Dept. of Business & Social Sciences, West Virginia State University, Institute, WV 25112

This study examines trends in maple syrup production in West Virginia and its neighboring states between 2014 and 2024, utilizing secondary data sources. Findings reveal notable year-to-year fluctuations in production volume and market value, largely shaped by weather conditions, forest resource availability, and shifting consumer demand. Comparisons across states highlight differences in production patterns, showing regional strengths and weaknesses in output. The analysis also identifies emerging opportunities and challenges for producers in the region. Overall, the results offer valuable insights into the economic and agricultural significance of maple syrup production, highlighting its potential to support rural economic diversification, strengthen local agribusiness networks, and contribute to the development of small-scale producers in West Virginia and surrounding areas.

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Student-Led Case Study of Local Food Production and Applied Agricultural Training in Spencer, Oklahoma. N. Peoples1*, T.L. Payton1, A. Woods2, and J. Arati1 . 1Department of Agriculture and Natural Resources, Sherman Lewis School of Agriculture and Applied Sciences, Langston, OK, 73050. 2Bigger Than Food Foundation, Spencer, OK, 73084

This case study documents the applied agricultural training experience of a Langston University senior completing an internship at a local food production operation in Spencer, Oklahoma. Conducted in collaboration with the Sherman Lewis School of Agriculture and Applied Sciences and a local nonprofit organization, the project focuses on student participation in crop production, recordkeeping, and distribution activities associated with a small-scale farming operation. By the end of 2025, the operation is projected to harvest and distribute approximately 11,000 pounds of agricultural products through direct distribution channels. The internship offered hands-on training in crop planning, soil management practices, yield monitoring, and data collection for production. These activities contributed to improved understanding of production efficiency and operational planning at the farm level. In addition to supporting student skill development, the project offers a practical example of experiential learning within an applied agriculture

curriculum. The findings demonstrate how student-led training experiences can contribute to local food production activities while supporting workforce preparation and applied learning objectives in agricultural education programs.

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Analysis of Enrollment and Persistence Patterns Among Students with Caregiving Responsibilities at Langston University. K. Robinson*; B. Kitchin; M. Malone. Sherman Lewis School of Agriculture and Applied Sciences, Langston University, OK 73050.

Recent national data indicate declines in enrollment and completion rates among certain categories of nontraditional students compared with the general student population. Institutional records at Langston University (LU) similarly show changes over time in enrollment among students with caregiving responsibilities. This study examines enrollment patterns, persistence indicators, and academic progression associated with this student group using a mixed-methods approach. Quantitative data from LU Institutional Records were analyzed to evaluate year-to-year enrollment trends, while qualitative data were collected through interviews using open-ended questions to identify factors influencing academic progression and time to degree completion. Preliminary institutional data indicate a reduction in enrollment counts over a two-year period. Ongoing qualitative data collection is focused on identifying logistical and academic factors associated with enrollment continuity and persistence. The findings from this study aim to support institutional assessment efforts by providing data-driven insights into enrollment patterns and factors influencing academic progression, with the goal of informing future institutional planning and student success initiatives.

712

Examining Experiences of Youth Aging Out of Foster Care. A. Hildago*, J. Smith-Pietri. School of Agriculture and Applied Sciences, Langston University, Langston, Oklahoma 73050

In the United States, 19,000 teens age out of the foster care system each year. Many of the young adults aging out of foster care desire to enroll in institutions of higher education. However, statistics show that less than 15% earn a degree by their late 20s. Former foster care youth can face many challenges, such as housing instability, joblessness, academic challenges, and substance abuse. Additionally, these young adults also have increased challenges with behavior, mental, and physical health. These challenges can make it difficult to complete a college degree. This study examines the experiences and outcomes of teens aging out of the foster care system. This study uses secondary data analysis to explore the challenges they face in areas such as education, employment, housing stability, mental health, and social support networks. This study uses both quantitative data and qualitative interviews. The data is being analyzed, and we anticipate there will be a correlation between financial and housing stability, academic success, and emotional supports. This study aims to inform stakeholders on how to improve support systems and develop targeted interventions that enhance the well-being and long-term success of students who have exited foster care.

713

Weather Shocks and Cropping Patterns: Evidence from Southeastern US. O. Davis*, Department of Agriculture, Alcorn State University, Lorman, MS 39096; T. Hargrave, Department of Agriculture, Alcorn State University, Lorman, MS 39096; and J. Zhang, Department of Agriculture, Alcorn State University, Lorman, MS 39096.

In this study, we examine how weather fluctuations impact cropping patterns in the Southeastern United States. While existing research often delves into how climatic factors affect crop yields in the context of weather change, the link between these factors and cropping choices remains relatively unexplored. Weather change can reshape the agricultural sector's comparative advantage, leading to shifts in crop allocation that might help mitigate overall weather change impacts. Understanding the extent of agricultural adaptation through cropping pattern adjustments is essential for designing effective weather change adaptation policies. To investigate the relationship between climatic factors and cropping patterns empirically, we employ a panel fixed effects model, utilizing county-level data from 1980 to 2019 in the Southeastern United States. Our focus on this region is justified as it ranks as the third-largest exporter of U.S. agricultural products and contributes nearly 20% to the nation's farmworker population. However, this region is particularly susceptible to severe weather events and experiences variable inter-annual weather conditions. Our findings reveal that rising temperatures have led to increased corn and soybean acreage. In terms of semi-elasticities,

a uniform 0.1°C rise in the 30-year average growing-season temperature corresponds to a 0.9% reduction in acreage for both corn and soybeans.

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Effect of Weather Shocks on Soybean Yield: Evidence from Mississippi. D. Tribble*, Department of Agriculture, Alcorn State University, Lorman, MS 39096; T. Hargrave, Department of Agriculture, Alcorn State University, Lorman, MS 39096; and J. Zhang; Department of Agriculture, Alcorn State University, Lorman, MS 39096.

In this study, we investigate the impact of weather fluctuations on soybean yield in Mississippi. Despite a substantial 25% increase in soybean production from $1.2 billion in 2020 to $1.49 billion in 2021, long term changes in weather conditions pose an escalating threat to this crucial crop due to rising temperatures and droughts. While prior studies have established a connection between long term temperature trends and agricultural yield for crops like cotton, corn, and soybeans, they primarily focused on nationwide data, potentially obscuring regional differences. However, it's important to note that regional disparities do exist due to varying natural resources and farming practices. To address this issue, our study focuses on Mississippi. We employ a panel fixed effects model using data spanning from 1980 to 2019 in Mississippi. We find that a 100-degree increase in normal growing degree days leads to a 3.25% increase in soybean yields, while a similar increase in overheated growing degree days results in a 0.62% reduction in yields. By mid-century we anticipate a 12-48% decline in Mississippi's soybean yield, contingent on the specific weather change scenario considered. This research underscores the importance of examining localized impacts of weather fluctuations on crop production to better inform agricultural strategies and adaptation measures.

715

What Impact Does Environmental Change Have on Agriculture in Mississippi. T. Graves*, Department of Agriculture, Alcorn State University, Lorman, MS 39096; A. Joseph, Department of Agriculture, Alcorn State University, Lorman, MS 39096; D.T. Adu, Department of Agriculture, Alcorn State University, Lorman, MS 39096; and J. Hudson, Department of Agriculture, Alcorn State University, Lorman, MS 39096.

Environmental change is an ever-present reality. We all feel the effects, especially small farmers. Environmental change affects agriculture and those who rely on it by weakening environmental health, undermining production, killing crops and livestock and making it difficult to earn a living. Environmental change significantly impacts agriculture in Mississippi. The state faces several challenges due to changing weather patterns, which affect crop yields and farming practices. Mississippi is one of the largest producers of cotton, soybeans, and corn which are most vulnerable to extreme weather conditions (environmental change). Therefore, the objective of this study is to investigate how people feel about the extreme weather conditions (environmental change) affecting small scale rural farmers from selected Mississippi Counties. It is important to understand the economic impact of how crop losses significantly affect local economies and the farmers' livelihoods. Data was collected by means of face-to-face survey questionnaires. Information from this study about environmental change may be helpful to small-scale rural farmers.

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Effect of Weather Shocks on Crop Abandonment: Evidence from Southeastern US. Z. Polk*, Department of Agriculture, Alcorn State University, Lorman, MS 39096; and J. Zhang, Department of Agriculture, Alcorn State University, Lorman, MS 39096.

In this study, we investigate the impact of weather fluctuations on crop abandonment in the South-eastern United States. While the effects of climatic factors on crop yields have been extensively examined in the literature on climate change impacts, their influence on decisions to abandon crops is not well understood. To empirically estimate the relationship between climatic factors and crop abandonment, we employ a panel fixed effects model using county-level data from 1980 to 2019 in the South-eastern United States. We focus on this region because it is the third-largest exporter of U.S. agricultural goods and accounts for nearly 20 percent of the nation's total farmworkers. However, it is particularly prone to catastrophic weather events and is affected by inter-annual climate variability. Our findings indicate that corn's harvested ratios, which defined as the proportion of harvested acres compared to total planted acres, exhibit a pronounced sensitivity to extremely high temperatures, specifically those exceeding 37°C. Nevertheless, there is no substantial indication of a significant adverse impact when the crop is exposed to

temperatures slightly above 30°C. As extreme weather events become more frequent, we predict that weather-induced crop abandonment will disproportionately increase, potentially causing substantial social welfare losses.

717

Effect of Temperature on Labor Productivity: Evidence from Socioeconomically Vulnerable Communities in the US. J. Goings*, Department of Agriculture, Alcorn State University, Lorman, MS 39096; and J. Zhang, Department of Agriculture, Alcorn State University, Lorman, MS 39096.

This paper estimates the effects of the increasing incidence of heat on labor productivity, with a particular focus on socioeconomically underserved vulnerable communities. Extensive literature has already linked long term weather changes to many economic outcomes, including industrial and national output, agricultural yield, total factor productivity, worker productivity, to name a few. However, little is known about the effects of how temperature affects economic outcomes in socioeconomically vulnerable communities. socioeconomically vulnerable communities often lack the necessary resources, technological advancements, infrastructure, and support systems to withstand and recover from the adverse effects of extreme weather events. Consequently, the impacts on economic outcomes in these areas may be significantly different from those observed in more developed regions. We utilize annual county-level labor productivity proxied by average employee compensation, historical weather, and social vulnerability index data, along with the panel fixed effects estimation framework, to identify the sensitivity of labor productivity to rising temperatures. We perform our analysis for the contiguous United States over 2001–2019. We find that labor productivity is largely insensitive to changes in the frequency of cool-to-moderate maximum daily temperatures. However, as temperatures shift above 18 Celsius, the effects on productivity turn increasingly negative, particularly affecting socioeconomically vulnerable communities to a greater extent. Given existing projections, we predict that future extreme temperatures would further deepen worker productivity inequality among socioeconomically vulnerable communities and more developed regions.

718

Mapping Downstream Cost Pressure from Beef Price Increases in Oklahoma: An IMPLAN Cost-Push Analysis. S. Mosley *, B.A. Atilola. Sherman Lewis School of Agriculture & Applied Sciences, Langston University, Langston, OK 73050

When producer-level beef prices rise, added costs do not stop at the plant gate; they pass to the Oklahoma businesses that buy beef and then ripple through their suppliers. This study maps that transmission. We apply the Jan–Aug 2025 vs Jan–Aug 2024 change in the USDA wholesale beef (Choice) value within IMPLAN to the commodity representing meat (except poultry) produced in slaughtering plants. We report four decision-ready metrics: (1) the Total Annual Cost Increase associated with the targeted meat commodity, (2) the Annual Direct Cost Increase borne by industries that purchase beef, (3) the Annual Indirect Cost Increase carried by their supply chains, and (4) a downstream industry breakdown that also shows cost-increase-as-a-percent of each industry's total output. Our findings indicate that the meat processing and food service industries exhibit prominent direct exposure to higher beef input costs, while some manufacturing and service sectors display comparatively larger indirect exposure as the shock moves through by-product channels, distribution, facilities, and contracted services. Retail food, wholesale trade, and logistics have significant downstream effects, and several non-food institutions emerge through procurement and support services. Expressed as a share of sector output, the ranking highlights where price pressure is most intense, even when absolute dollars differ. These findings provide a concise map of where producer-price pressure impacts Oklahoma's economy and a practical basis for procurement, pricing, and supplier-development strategies when protein markets tighten.

719

Langston University's Student Spending and Local Ripple Effects in Logan County. S. Brown *, B.A. Atilola; Sherman Lewis School of Agriculture & Applied Sciences, Langston University, Langston, OK 73050

Small towns rely on "anchor institutions" to stabilize demand, retain talent, and attract outside dollars. In Logan County, Langston students' everyday spending is a steady source of local dollars. Understanding this source of spending is crucial for local businesses setting inventory levels, public agencies assessing tax capacity, and community leaders pursuing downtown vitality and year-round resilience. This study analyzes Langston University's FY 2023–

2024 student spending economic footprint using an input–output framework (IMPLAN). Spending profiles for resident and non-resident students are constructed based on living arrangements (on-campus, off-campus with relatives, or off-campus independently) using national student expenditure benchmarks and local market rent data. To avoid double-counting, on-campus room and board, as well as bookstore purchases, captured under university operations, are excluded. County-level retention ("localization") factors are applied to reflect the share of student purchases captured within Logan County versus those that are leaked to other counties or online vendors. Our findings reveal that student spending supports business revenue, local jobs, labor income, and value added across various sectors, including retail trade, food services, rental housing, transportation, healthcare, and personal services. Living arrangement shapes the pattern of effects, with independent off-campus students spreading expenditures more broadly across local industries. Enrollment composition means that non-resident students contribute slightly more to the overall impact than resident students. Overall, student spending represents net new or retained dollars, not a reshuffling of existing demand, making a strategic lever for strengthening Logan County's economic base and informing practical actions reducing leakage and enhancing local capture.

720

Unity in Immunity: A Social Marketing Campaign for Vaccine Awareness. T. Morris*, T. Williams. Sherman Lewis School of Agriculture and Applied Sciences, Langston University, Langston, OK, 73050.

According to the Centers for Disease Control and Prevention (CDC), less than half of Oklahomans are vaccinated against common preventable diseases. Communities with disproportionately high rates of chronic health conditions and poverty are least likely to get vaccinated. Langston University's Expanded Food and Nutrition Education Program (EFNEP) received funding from The Extension Collaborative on Immunization Teaching and Engagement (EXCITE) to develop a social marketing campaign aimed at increasing vaccine awareness in low-uptake areas of the Oklahoma City Metro. The project leveraged relationships with trusted community messengers and community-based organizations to conduct outreach and education. Working with trusted messengers, we developed the “Unity in Immunity” campaign to emphasize the collective benefits of vaccination. Vaccines were promoted through radio advertisements, a social media campaign, a bus wrap, a newspaper article, and digital billboards. To identify areas of greatest need, vaccine uptake rates, median household income, total population, and poverty levels of zip codes across the OKC Metro were obtained from the Oklahoma State Department of Health and the Oklahoma School Board Association. Zip codes with the lowest vaccine uptake and highest socioeconomic need were prioritized. The four-month campaign generated over 10 million impressions and built partnerships with faith-based organizations, schools, and health groups. Based on publicly available data, during the campaign period, MMR vaccination rates increased by 25%, while vaccination rates among children in Oklahoma County remained stable. Framing vaccination as a collective responsibility helped raise awareness and foster community trust. Future research could explore campaign's direct impact on vaccination behavior.

721

From Farms to Silicon Valley: How Stock Market Trends Shape Marketing Strategies in Agribusiness and Leading Tech Firms. K. Bruce*, N. De Silva: Department of Agriculture and Natural Resources, Sherman Lewis School of Agriculture and Applied Sciences, Langston University, Langston, OK 73050

This study examines how fluctuations in stock market performance influence marketing strategies across two major sectors of the U.S. economy—agribusiness and leading technology firms. While blue-chip tech companies, such as Apple, Microsoft, and Amazon, often adjust their marketing initiatives in response to investor sentiment and market expectations, agribusiness firms operate within more cyclical and commodity-driven environments, where financial signals may shape their marketing behaviour differently. By comparing these sectors, the research investigates whether changes in stock returns, market volatility, and financial indicators serve as signals for firms to adjust their expenditure on marketing, promotional intensity, and brand communication strategies. Using a panel data regression framework and firm-level financial and marketing data from 2015 to 2024, this study explores the extent to which stock market dynamics influence corporate marketing decisions. Preliminary findings suggest that stock market trends have a more immediate and pronounced impact on marketing investments in technology firms, whereas agribusiness firms demonstrate a more measured and long-term strategic adjustment. The results contribute to understanding how financial markets and investor perceptions shape corporate marketing behaviour across distinct industries. Insights

from this study can help both agribusiness and technology firms align their marketing strategies with financial signals, thereby enhancing strategic adaptability and competitiveness in an increasingly interconnected global economy.

722

Bridging Regional Differences: Economic and Demographic Indicators and Economic Development Challenges in Oklahoma's Rural Counties. D. Jordan*, N. De Silva, S. Giscombe, W. Whittaker. Department of Agriculture and Natural Resources, Sherman Lewis School of Agriculture and Applied Sciences, Langston University, Langston, OK 73050

Rural Oklahoma faces ongoing economic and demographic challenges reflected in population decline, aging demographics, variations in educational attainment, and income levels across counties. At the same time, several regions demonstrate resilience driven by energy, agriculture, and proximity to metropolitan centers. This study examines the key economic and demographic indicators that influence economic development across Oklahoma's rural counties, with the objective of identifying factors associated with regional growth and resilience. As economic growth is a precursor to economic development, identifying such factors is vital to provide policy guidance that could help promote economic development. Using county- and place-level secondary data from 2000 to 2025, the research employs descriptive trend analysis, spatial mapping, and regression modeling to assess the relationships among population dynamics, labor force participation, income levels, educational attainment, broadband access, and agricultural productivity. Results reveal substantial regional variation in economic performance, with broadband infrastructure, workforce participation, and education levels emerging as significant predictors of economic vitality. Counties with more diversified economic bases and greater access to digital infrastructure experienced stronger growth outcomes compared to those dependent on a narrower set of industries. Findings provide empirical insights to inform economic planning, extension programming, and investment strategies that support long-term economic development across Oklahoma’s rural counties.

723

Understanding Student Well-Being & Perceived Support. L. Luckey, * A. Vick, E. Maytubby. Family & Consumer Sciences Department, Langston University, Langston, OK 73050.

According to a study conducted on nearly 375 colleges, more than 60% of college students described having at least one mental health challenge during the 2020-2021 school year. Most study participants revealed that their mental health negatively impacted their academic performance. While it is important to understand the impacts of student mental health, it is equally important to explore student well-being holistically. Student Well-being (SWB) encompasses not only mental health but also physical, psychological, and social dimensions. Studies also emphasize the importance of individualized support systems, especially when students face unique challenges and strengths. This study utilizes a mixed-methods approach, with quantitative surveys and qualitative interviews to investigate student well-being and perceived support on campus. The surveys ask students to share their experiences related to mental and physical health, academic experience, campus mental health resources, and perceived support. A smaller sample of students provides more information about their well-being on campus. It is expected that the data will confirm the existence of correlations between students' well-being, academic performance, and existing resources and support.

724

Consumers’ Sensory Preferences for Barbecued Goat meat. E. Carter*, M. Ibrahim, N. Pattanaik, F. Hollis, J. Lee, and B. Cornish, College of Agriculture, Family Sciences and Technology, Fort Valley State University, Fort Valley, GA 31030; B. Onyango, Darr School of Agriculture, Missouri State University, Springfield, MO 65897.

The increasing ethnic population and health-conscious consumers seeking lean red meats have contributed to growing demand for goat meat in the United States. However, goat meat remains unfamiliar to many mainstream Americans. This study aimed to introduce goat meat to U.S. consumers and assess their sensory preferences. A sensory evaluation was conducted during the Sunbelt Ag Expo in Moultrie, Georgia, from October 14–16, 2024. A total of 120 participants evaluated barbecued goat meat based on appearance, juiciness, texture, flavour, and aftertaste using a 9-point hedonic scale (9 = like extremely, 5 = neither like nor dislike, 1 = dislike extremely). Results indicated that 63% of participants had previously tasted goatmeat, while 37% were first-time consumers. Overall, 56% of participants rated flavour as

"like extremely," followed by appearance (50%), juiciness (45%), texture (42%), and aftertaste (42%). Male participants represented 60% of the sample, and female participants 40%. Differences in preference by gender were observed for texture, while other attributes showed no gender-based variation. These findings suggest consumer acceptance of goat meat and highlight opportunities for expanding its market among U.S. consumers.

725

Factors Influencing the Demand for Value-Added Goatmeat. S. Davis*, M. Ibrahim, N. Pattanaik, and B. Cornish, College of Agriculture, Family Sciences and Technology, Fort Valley State University, Fort Valley, GA 31030.

Consumer demand for value-added meats is often shaped by flavour, convenience, and new food experiences. Consumer interest in jerky, patties, burgers, and sausages continues to rise, and meat processors are responding with greater product variety. Goat meat demand has grown rapidly in recent years, creating opportunities for value-added processing. A national consumer survey was conducted to determine factors influencing demand for value-added goat meat products. This study assessed consumer willingness to purchase goatmeat-based products including jerky, patties, burgers, and sausages. Results indicated that multiple socioeconomic factors influenced preferences and willingness to purchase, with goat meat jerky showing the highest acceptance potential. These findings suggest that value-added processing could play an important role in expanding the goat meat market and meeting evolving consumer demands.

726

Seasonal Price Trends of Sheep and Goat Meat Cuts in the U.S. G. E. Nunes de Souza*, M. Nkosi and Y. Su, College of Agriculture, Environmental and Human Sciences (CAEHS), Lincoln University of Missouri, Jefferson City, MO 65101.

The U.S. small ruminant industry relies on accurate market information for both producers and consumers. To evaluate recent pricing patterns, monthly auction data for sheep and goat meat cuts were compiled from 2024 through mid-2025. Data were analysed to identify general seasonal fluctuations and potential differences between species. Results indicated that prices for both lamb and goat showed consistent peaks during major religious and cultural holidays, followed by moderate declines in the subsequent months. Goat prices exhibited slightly higher volatility compared to lamb, particularly in the spring and early summer periods. Overall, while both markets demonstrated resilience, differences in seasonal demand created distinct pricing dynamics across the two species. These findings suggest that producers and market stakeholders can benefit from adjusting marketing strategies in anticipation of predictable demand cycles.

727

Cultivating Futures: The Impact of the BAYOU Summer Program on Student Success at Southern University and A&M College. A. Houston, Z. Smith*, S. Marshall, J. Brown, H. Mellieon, Jr., Department of Agricultural Sciences and Technology, College of Agricultural, Human and Environmental Sciences, Southern University and A&M College, Baton Rouge, LA 70813.

This study explores the summer bridge program, Beginning Agricultural Youth Opportunities Unlimited (BAYOU) Program, influences student retention, recruitment, and engagement at Southern University A&M College. BAYOU provides an opportunity for rising high school seniors and incoming freshmen to gain "first-hand" knowledge about career opportunities in Agriculture, Family Consumer Sciences and related disciplines. Using peer reviewed literature and program description materials, the paper synthesizes evidence that short term residential and non-residential bridge experiences increase college readiness, improve first year persistence, and encourage students to pursue targeted majors. Several studies show an increase in placement scores and enrolment in credit bearing courses after participants complete bridge programs. Other research links mentoring cohort models and residential living with a stronger sense of belonging and higher graduation rates among underrepresented groups. The BAYOU program's purpose is to help expose the selected participants to various careers in agriculture and family sciences. This is achieved by mirroring the college experience through housing assignments, providing meals, and making a conducive learning environment via academic workshops, at absolutely no cost. Participants will also take part in departmental tours, industry excursions, immerse themselves in a collegiate classroom environment, and laboratory experience in the form of a short-term research project. Although the BAYOU outcome is not included here, this summer program

aligns with evidence-based features that support recruitment and retention. The paper closes with recommendations for program practice and suggestions for future evaluation to document long term impacts.

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Student Workforce Development Program Promoting Experiential Learning for the Meat and Poultry Industry. C. Johnson*, L. Kinman, L. Garcia, M. Franklin, T. Tolen, and M. Daley. Department of Animal Science, Ohio State University, Columbus, OH 43210. CAFNR Research, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446.

The growing global demand for food has intensified the shortage of skilled labour in the meat and poultry industry. To address this issue, this study implemented a two-part workforce development initiative in collaboration with Prairie View A&M University (PVAMU) and The Ohio State University (OSU), Meat Science Extension. The first component, the PVAMU Meat Master Training Program, was a week-long residential experience for high school students (n=13) focusing on carcass fabrication and processed meat development. Pre- and post-program assessments showed significant gains in carcass processing knowledge, the average score increased from 1.14 (pre) to 3.57 (post) on a 5-point scale. This represents 213% relative increase and 63% of the possible improvement achievable on the scale. The average confidence rating rose from 1.43 (pre) to 3.71 (post) on a 5-point scale. This represents 159% relative increase and 59.5% possible improvement on the scale. The second component sent PVAMU undergraduate students to Ohio State University for a three-week experiential learning program. Anecdotal evidence indicated growth in technical knowledge and communication abilities. Overall, these programs were highly effective in improving student understanding in carcass skills and building student confidence in meat processing. The collaboration between PVAMU and OSU demonstrates an effective model for addressing labour shortages in the meat and poultry sector. By integrating hands-on training, leadership development, and inter-university collaboration, this approach strengthens the agricultural workforce pipeline and prepares students for careers in the meat industry.

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Stigma Surrounding Farmers Markets: Are Consumers Missing Out on Available Resources? C. J. Williams*, C. J. Hile and K.A. Cash, College of Agriculture, Environmental and Human Sciences (CAEHS), Lincoln University, Jefferson City, MO 65101.

Farmers markets can reduce food insecurity by providing healthy food but are seen as spaces for affluent white shoppers. Approximately half of farmers markets in the U.S. are in urbanized areas. Counties with at least one market, both metro and non-metro areas showed fewer markets per capita in places with higher poverty or larger Black and Hispanic populations. Income is tied to more markets in non-metro areas, while higher poverty, more minority residents, and increased fast-food outlets contribute to fewer farmers markets in metro areas. This points to potential disparities in access to farmers' markets in low-income centres, even when EBT or SNAP benefits can be utilized. Urban market managers were mostly white and were women, whereas rural markets are more likely to have male managers as comparatively. Markets may range from a few vendors to hundreds of vendors, filling stalls weekly. For this research a mixed answer survey gathered basic demographic information on age, ethnicity, gender, annual income, and individual consumer opinions such as availability of local farmers' markets, knowledge of farmers markets, consumer value, and frequency of visits. The survey was distributed to individuals (n =100) at farmers' markets and on social media. Fewer individuals had knowledge of local farmers' markets available and did not attend farmers' markets. Consumers believe that the expense for goods and fresh produce exceeded their financial budget for groceries, even with a moderate household income.

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Participant Knowledge and Confidence Levels After Modification of the Agriculture Literacy Lab Program. C.N. Cooper* and K. A. Cash, College of Agriculture, Environmental and Human Sciences (CAEHS), Lincoln University, Jefferson City, MO 65101.

As the population has become further removed from food sources by demography, they have become increasingly deficient in agriculture knowledge as a consumer. Due to an increase in urban youth seeking a degree in Agriculture programs, the need for expanded exposure to agriculture practices has been identified. The purpose of this study was

to determine if modification to the original Agricultural Literacy Lab Day program over to 8-weeks of weekly labs, designed to introduce incoming freshmen, increased student knowledge, participation, and confidence level in Agriculture Literacy. The original single day program included thirty-five (n = 35) freshmen participants from Lincoln University of Missouri, registered in the Bachelor of Science in Agriculture degree program. During year-two (n = 36) and year-three (n = 20) of the program we shifted to weekly Agriculture Literacy Labs, coinciding with the first week of classes. Students gathered weekly during a two-hour period to explore areas of agriculture sciences. The original focus was to introduce students to as many disciplines in agriculture as possible in a single day. The extension of that program was to continue demonstration of similar and different disciplines to students, building on prior knowledge. The program is suggested for freshman students but is available to all agriculture students. A percentage of year-one, year-two, and year-three students continued to join the agriculture literacy lab program weekly. Additionally, this program allowed students the opportunity to meet as a community and build connecting relationships.

Student Poster Presentation – Graduate Competition

Family, Youth, Community, and Economic Development

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Food Insecurity Among Historically Black Colleges or Universities Alabama. A. Paul* and J. Jimmeh Integrative Public Policy and Development, Tuskegee University, 1200 W Montgomery Rd, Tuskegee, AL 36088.

Food insecurity, the lack of access to nutritionally adequate food that would support a healthy and active lifestyle, is a concern for a significant proportion of the United States. The objective of this study is to ascertain the prevalence of food insecurity among students enrolled at Historically Black Colleges or Universities (HBCU) institutions in the state of Alabama. The study was conducted as part of an ongoing investigation into the challenges faced by college students. Food insecurity has been shown to have a significant impact on mental health, leading to a significant number of students experiencing depression regarding food and food resources. The findings of this study indicate that a significant proportion of the student body is experiencing food insecurity. It is evident that the majority of individuals in this study were dependent on food pantries and employed various strategies to maximize the efficiency of their food budget. The study recommends that universities implement preventative measures by fortifying food stamp programs at Historically Black Colleges and Universities (HBCUs) campuses. The promotion of optimal health and mental well-being among college students ought to be a priority not only for students themselves but also for the administration of various universities among clinical staff in on-campus health facilities.

732

Quantifying Financial Risk Reduction Through Circular Economy Models in Smallholder Agriculture. A. S. Aloka*, and G. Ejimakor , Department of Agribusiness, Applied Economics, and Agriscience Education, North Carolina Agricultural and Technical State University, Greensboro, NC 27411.

Smallholder farmers in the Southeastern United States face increasing income volatility driven by climate variability, rising input costs, and market shocks. Although circular economy practices such as on-farm waste recycling, compost-based fertilizer production, and water reuse have been promoted for sustainability, their quantifiable impact on financial risk has received limited attention. This study develops a quantitative risk assessment framework to measure how circular resource systems affect the financial resilience of smallholder farms. Using Monte Carlo simulation and farm-level economic data, the model estimates risk-adjusted profit variability and input cost distributions under conventional and circular production systems. Preliminary findings indicate that substituting synthetic inputs with biofertilizers and closed-loop water systems can reduce income variability while improving gross margins and lowering dependency on volatile external inputs. These findings demonstrate that circular practices act as both ecological and financial hedges, mitigating exposure to market and environmental uncertainty. The research contributes to agricultural risk management by introducing an empirical, data-driven method for linking circular innovation to measurable economic stability, offering valuable insights for policy design and financial institutions seeking to promote climate-smart, low-risk farming systems in vulnerable regions.

733

Financial Stress and Coping Strategies among Maryland Adults: The Role of Financial Education in the Post-COVID-19 Era. S. S. Thagunna*, L. B. Karki, and E. N. Escobar, Department of Agriculture, Food and Resource Sciences, UMES Extension, University of Maryland Eastern Shore, Princess Anne, MD 21853.

Financial well-being remains a significant challenge for adults in Maryland, who are confronted with rising living costs, increasing debt, and inconsistent levels of financial preparedness. This study explored the economic health of Maryland's adult population, emphasizing debt burdens, savings capacity, and financial fragility. Verified data from USA Facts (2024), the Federal Reserve (2025), and other sources indicate that the average debt per Maryland resident is approximately US$79,800 with monthly per-person spending $1,860 on loan repayments and credit obligations. Housing affordability remains a concern; in Maryland, only 53% of households above the "ALICE" threshold reported having emergency savings sufficient to cover three months of expenses, while just 32% of households below the threshold did so. Approximately 59% of Maryland adults report moderate to severe stress related to inflation, while nearly 900,000 households continue to experience financial insecurity post-COVID-19. The average credit card debt stands at $9,047, and only 70.8% of adults demonstrate basic knowledge of interest rates. Targeted financial education shows measurable benefits, as 92% of seniors (17,727 out of 19,317) reported feeling better prepared after attending the financial education sessions. These findings highlight the critical role of adult-focused financial education in debt management, savings strategies, and budgeting, thereby strengthening Marylanders' financial resilience and reducing economic stress in the post-pandemic era.

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Sidewalk-Level Urban Thermal Risk Assessment Using High-Resolution Microclimate Modeling in Huntsville, Alabama. S.R. Morshed*****, F. Dutt, Department of Community and Regional Planning, Alabama A&M University, Normal, AL 35762.

This research aims to investigate how land use, vegetation cover, surface materials, and urban form influence local heat and cold exposure by evaluating spatial and temporal variations in sidewalk-level thermal risk across Huntsville, Alabama, using high-resolution urban microclimate modeling. The SOLWEIG model within the UMEP framework is employed to simulate the Universal Thermal Climate Index (UTCI), integrating air temperature, wind speed, humidity, and mean radiant temperature. The input data includes meteorological variables from the ERA5 (C3S) dataset, LiDAR-derived Digital Surface Models (DSMs), the Tree Canopy Model (TCM), and land-use/land-cover data. Sidewalks serve as the spatial analysis unit, enabling the assessment of micro-scale thermal conditions and identification of extreme exposure zones. Population and age-group data from the U.S. Census are incorporated to evaluate vulnerability among children, adults, the elderly, and individuals with health conditions. Preliminary simulations reveal that commercial corridors and low-canopy residential blocks exhibit elevated UTCI values during summer afternoons, while shaded, tree-lined sidewalks demonstrate substantially improved thermal comfort. These patterns will guide targeted cooling interventions in high-vulnerability areas. GISbased spatial analysis maps thermal "hotspots," informing mitigation strategies such as expanding vegetation cover, applying reflective paving, and enhancing shading. Findings will support cooling strategies along critical pedestrian routes within and around the Alabama A&M University campus, particularly in North Huntsville's neighborhoods, where sparse vegetation and dense built-up surfaces intensify sidewalk-level heat exposure.

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Identifying Students Perspectives on Study Abroad to Improve Faculty-led Global Opportunities G. Sorola*, N. M. Estwick, Ph.D., O. Ojumu, Ph.D., G. Osho, Ph.D., D. Stoddart, Ph.D., CAFNR Research, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446.

The purpose of this research was to assess students' perspectives on studying abroad. The research team used the findings to contribute to the body of knowledge surrounding the importance of studying abroad in the academic journeys of diverse undergraduate students. We conducted research to gain knowledge about the individual experiences and perceived impacts of a May 2023 study abroad experience to the Bahamas. In recent years, globalization has been a buzzword that has driven the creation of international programs to enhance students' education, especially among institutions that serve diverse student populations. Traditionally, studying abroad amongst diverse student populations has been low. Programs such as the Broadening Global Learning Opportunities Building Academic Leaders (B-GLOBAL) at Prairie View A&M University sought to create global learning communities in

undergraduate student. The team used a mixed methods case study design for the research. The study was predicated on the idea that students traveling and studying abroad gain self-awareness, global awareness, cultural knowledge, and valuable lessons in social responsibility. Overall, the study abroad experience had a significant impact on respondents' career interests, cultural awareness, personal growth and understanding of the community, and social responsibility. The faculty researchers gained insight into how to improve faculty-led programs, and the university is better equipped to infuse international opportunities into their academic programs.

Student Poster Presentation – Undergraduate Competition

Food Safety, Nutrition and Health

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Assessment of Total Polyphenols and Antioxidant Capacity in Muscadine Grape Components in Red and White Varieties. L. Johnson*, Food Science Program, College of Agriculture and Food Sciences, Florida A and M University, Tallahassee, FL 32307; O.O. Sangokunle, Food Science Program, College of Agriculture and Food Sciences, Florida A and M University, Tallahassee, FL 32307.

Muscadine grapes (MG), native to the southeastern United States, are known for their rich polyphenolic content and potential health benefits. This study aimed to determine the total polyphenol levels and evaluate the antioxidant capacity of MG seeds, pulp, and skin from both red and white varieties. Samples of each component were manually separated into seed, pulp, and skin, collected, and freeze-dried for 24 h. (Harvest Ready). An aliquot sample was prepared in methanol (1mg/mL), vortexed, and subjected to extraction for an hour under continuous agitation (600 rpm) using a thermomixer. The total polyphenol content was quantified using the Folin-Ciocalteu method, while antioxidant capacity was assessed through 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging assays in 96-well microplates. The absorbance of total polyphenols and antioxidants was measured at 765 nm and 512 nm, respectively. White grape seeds exhibited the highest overall polyphenol concentration among all components analyzed from both grape cultivars. When comparing seeds, pulp, and skin, polyphenol levels were significantly higher in the seeds than in the other groups. Red grape skin and pulp contained higher polyphenol content than those of white cultivars. Muscadine grape seed extract showed significantly greater antioxidant capacity compared to both pulp and skin, with the white cultivar exhibiting superior capacity relative to the red cultivar. These findings suggest potential application of MG seeds and skins as functional ingredients with potent antioxidant properties, which could be beneficial for developing health-promoting food products. Research into the bioavailability and synergistic effects of MG-components is recommended for their application in food formulations.

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Muscadine Grape Seeds in Granola Bars: A Good Choice for Type-2 Diabetes. K.M. Anderson*, Food Science Program, College of Agriculture and Food Sciences, Florida A and M University, Tallahassee, FL 32307 O.O. Sangokunle, Food Science Program, College of Agriculture and Food Sciences, Florida A and M University, Tallahassee, FL 32307.

Type 2 diabetes mellitus (T2DM) is a major global health issue, driving the search for functional foods that help manage blood sugar levels. Muscadine grape seeds are recognized for their high soluble fiber content and diverse bioactive compounds, which can influence the digestion of starches and the texture of food products. Nevertheless, muscadine grapes have yet to be widely utilized in the food industry and food systems, despite their well-documented health, nutritional, and functional benefits. Muscadine grape seed can enhance the nutritional value of granola bars and help regulate glucose release, supporting its use in healthy foods. This study examined the effect of incorporating muscadine grape seed into granola bars on their texture and digestibility. We formulated granola bars with muscadine grape seeds and a control (without muscadine grape seeds). *In vitro* digestion was performed by incubating a granola bar with an enzyme suspension (5% Rat intestinal acetone powder, 50 U/mL pancreatic alpha-amylase, 0.0005% ampicillin, at pH 6.8) and digested for 4 hours. The glucose released was measured at 0, 60, 120, 180, and 240 minutes and quantified using D-glucose oxidase/peroxidase (GOPOD) assay kit (Megazyme, Bray, Ireland). The total polyphenol content (DPPH method), dietary fiber, texture, and sensory analysis were measured to assess the quality of the granola bar. Muscadine grape seed increased dietary fiber content, altered texture, and slowed starch-to-glucose

conversion compared to the control. Adding this ingredient to granola bars can enhance health benefits, improve functionality, and support blood sugar management for individuals with type 2 diabetes.

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Dietary Biomarker-Based Reconstruction and Immune Health Outcomes. I. Murdock and B. Quinn. School of Arts and Sciences, Langston University, Langston, OK 73050

The complex interplay between diet and immune function is a critical determinant of human health, yet accurately assessing dietary intake is often limited by subjective self-reporting. Objective, biomarker-driven methods are essential to mechanistically link nutritional patterns with immune status. This project introduces an application-focused framework to objectively reconstruct dietary patterns from circulating biomarkers and correlate them with functional immune health outcomes. We will utilize untargeted Fourier Transform Ion Cyclotron Resonance (FT-ICR) mass spectrometry to generate high-resolution metabolomic profiles from blood plasma or serum. These data will serve as the foundation for machine learning models designed for dietary pattern prediction. A key component of this approach involves robust food source mapping, which will backtrack specific metabolite signatures identified in the plasma to their original dietary origins. Concurrently, this project will assess immune health by using multi-parameter flow cytometry to analyze the functional capacity and activation status of key immune cell populations, such as T-cells. By integrating these advanced analytical platforms, this research will establish a novel, data-driven methodology to link objectively-defined dietary patterns with measurable immune cell phenotypes. The anticipated outcome is a powerful predictive tool capable of elucidating how specific dietary constituents modulate immune readiness, paving the way for targeted nutritional interventions.

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In-vitro Evaluation of the Vascular Aging Potential of the Rice Bran Extract Derived from the Arkansas-Grown Diamond Rice Cultivar. T. Hulum*, P. Yadav, S. Devarajan, Nutrition and Food Science Program, Department of Human Sciences, School of Agriculture, Fisheries and Human Sciences, University of Arkansas at Pine Bluff, AR 71601; S. Mu, Department of Pharmacology & Toxicology, College of Medicine, University of Arkansas for Medical Sciences, Little Rock, AR 72205.

Arkansas is one of the significant rice-producing states in the USA, accounting for approximately 40% of the nation's rice production. Rice bran is a nutrient-rich outer layer of dehulled rice, a byproduct of milling, and is incredibly rich in several bioactive compounds and phytochemicals. The unique bioactives in rice bran include gamma-oryzanol (ferulic acid esters of triterpene alcohols), flavonoids, phenolic acids, vitamins, and fatty acids. These are known for their antioxidants, anti-inflammatory, and anti-aging properties. Our study aims to investigate the impact of the ethanolic extract of a diamond rice bran variety on its antioxidant and anti-aging properties in vascular endothelial cells EA.hy9266). The maceration method was employed to prepare the ethanolic extract of diamond rice bran (DRBE), which was subsequently converted into a powdered extract using a freeze dryer. The DRBE has shown a dose-dependent increase in its phenol content. The DPPH radical scavenging assay indicated that DRBE has 85% potential to scavenge free radicals and exhibits dose-dependent antioxidant activity. The cell viability results showed that the DRBE had no severe toxicity even at a concentration of 100 μg/mL. Also, the DRBE exhibits protective action against oxidative stress-mediated vascular aging in EA.hy926 cells by inhibiting reactive oxygen species (ROS). The study's results highlight the promising potential of rice bran in preventing cellular damage and for the future development of anti-aging nutraceuticals.

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Analysis of Nitrosamine Levels in Sandwich Meats Using GC-MSC. Morgan* and L. Davis Department of Chemistry and Physical Sciences, Langston University, Langston, OK 73050

Nitrosamines are nitrogen-containing compounds that occur in a variety of foods, including cured meats, cheeses, processed fish, and alcoholic beverages. These compounds are of interest due to their documented biological activity and widespread dietary exposure. Nitrosamines commonly form through reactions between secondary amines and nitrosating agents during food processing and storage. Recent research has suggested that dietary nitrosamines may influence immune-related pathways, highlighting the importance of understanding exposure levels from commonly

consumed foods. This study aims to quantify nitrosamine concentrations in commercially available sandwich meats using gas chromatography–mass spectrometry (GC-MS). By characterizing nitrosamine levels in these products, this work seeks to provide ameatnalytical data that may support future investigations into the biological and health-related relevance of dietary nitrosamine exposure. The findings may contribute to broader efforts aimed at improving food quality assessment and understanding chemical constituents of processed meats.

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Dehydration Time impacts the Weight Loss from Jerky Prepared from Asian Carp Meat. E. Smoot, O. Ayoola, L. Alagbe, C. Wang. College of Agriculture, Health and Natural Resources, Kentucky State University, Frankfort, KY 40601.

Production of jerky from Asian carp meat may help to increase the consumption of Asian carp in the U.S. Dehydration is a critical step in jerky production. The objective of this study was to determine the effect of dehydration time on the weight loss from jerky prepared from Asian carp meat. Silver carp were harvested from Lake Barkley and deboned through a drum with 3 mm orifice. A total of 1000 g of deboned Asian carp meat was mixed with spices, extruded into 5 mm thick and 32 mm wide jerky strips, and assigned into 4 treatment groups varying in dehydration times with 6 replicates. The jerky was dehydrated at 145 °F for 3, 4, 5, or 6 hours before they were removed from the dehydrator and cooled to room temperature. The final weight loss was calculated from the equation (initial weight-final weight)/Initial weight x 100%). Average weight loss ranged from 31% to 48%. As dehydration time increased, weight loss also increased. Final weight loss was correlated linearly with water activity of the jerky strips. These results indicate that weight loss increased linearly with dehydration time.

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Effects of Dehydration Time on Weight Loss and Water Activity of Jerky Prepared from Asian Carp Meat. J. Woodson*, O. Ayoola, L. Alagbe, C. Wang. Land-Grant Program, Kentucky State University, Frankfort, KY 40601.

Water activity is important for the safety and stability of jerky products. The objective of this study was to determine the effects of dehydration time on the water activity of jerky prepared from Asian carp meat. Silver carp were harvested from Lake Barkley and deboned through a drum with 3 mm orifice. A total of 1000 g of deboned Asian carp meat was mixed with spices, extruded into 5 mm thick jerky strips, and assigned into four treatment groups varying in dehydration times with 6 replicates. The jerky was dehydrated at 145 °F for 3, 4, 5, or 6 hours before they were removed from the dehydrator and cooled to room temperature. The water activity of each jerky strip was determined on a water activity analyzer. The water activity ranged from 0.77 to 0.88. As dehydration time increased, water activity decreased and weight loss from each strip increased. These results indicate that dehydration time needs to be optimized to achieve a water activity level to assure the safety and quality of jerk prepared from Asian carp meat.

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Essential Oils as Eco-Friendly Alternatives for Reducing Bacterial Contamination on Carpeted Flooring. B. D. Dargan*, Family Consumer Sciences, North Carolina Agricultural and Technical State University, Greensboro, NC, 27411; A. A. Ayad, and L. L. Williams, Center for Excellence in Post-Harvest Technologies (CEPHT), North Carolina Agricultural and Technical State University, North Carolina Research Campus, Kannapolis, NC 28081.

Carpeted and vinyl surfaces, commonly found in public and food-handling environments, can retain harmful bacteria after contamination by bodily fluids such as vomit. Traditional disinfectants may not always provide effective microbial control, prompting investigation into alternative strategies. Our study evaluates the antimicrobial efficacy of three essential oils (tea tree, lemon, and clove) at different concentrations against foodborne pathogens on flooring materials. Simulated vomit was prepared and inoculated with *Staphylococcus aureus* ATCC 6538, *Bacillus cereus* ATCC 14579, and *Escherichia coli* ATCC 11229 at an initial level of approximately 2.5 log CFU/mL, then incubated at 37 °C for 4 hours. Flooring samples (vinyl and carpet) were treated with essential oils at 0%, 5%, and 10%. Two industry-standard disinfectants, Clorox (10%) and Nu-Foam (4%), were used as positive controls. Following treatment exposure, bacterial recovery was quantified using standard plating techniques, and colony counts were converted to log CFU/mL. Results showed a significant reduction ($P < 0.01$) in bacterial colonies in samples treated with higher essential oil concentrations compared to untreated samples and positive controls. Clove and tea tree oils at 10%

demonstrated the strongest antimicrobial activity, achieving up to 1 Log reductions across both flooring types. These findings suggest that essential oils may serve as natural, effective alternatives for reducing bacterial contamination on surfaces, with potential applications in public health, sanitation, and food safety.

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Developing Functional Yogurt with Tea and Mint Extracts: Toward Healthier Fermented Food Innovations. N. A. Bell*, Family Consumer Sciences, North Carolina Agricultural and Technical State University, Greensboro, NC 27411**;** A. A. Ayad, and L. L. Williams, Center for Excellence in Post-Harvest Technologies (CEPHT), North Carolina Agricultural and Technical State University, North Carolina Research Campus, Kannapolis, NC 28081.

Yogurt, like other traditional fermented foods such as kimchi and kombucha, has long been valued for its health benefits. Recently, consumer interest in fermented foods has risen sharply. Combining tea extracts with yogurt may enhance both its nutritional and sensory characteristics. Our study aimed to evaluate the impact of adding tea and mint extracts on the physicochemical and microbiological properties of yogurt during refrigerated storage. Yogurt and MRS broth media (200 mL each) were prepared under six treatment conditions and one control. Treatments included: control (no additive), two different concentration (0.5, 1.0 (w/v%) from three different tea leaves (green tea, black tea, and mint leaves). Samples were analyzed over 15 days at 7-day intervals for microbial activity, titratable acidity, pH, phenolic content, thickness, and viscosity. Throughout storage, microbial activity decreased progressively in all yogurt samples, while no significant variations were observed between milk and MRS. The pH, and acidity were significantly decreased by nearly 50% across treatments. Our findings suggested that the addition of tea and mint powders did not markedly alter the core chemical composition of yogurt but may have influenced microbial dynamics. Incorporating tea and mint extracts into yogurt presents promising potential for developing functional fermented products. Future studies should identify specific microbial strains involved in fermentation, assess their influence on flavor and texture, and examine the effects of temperature variations. Investigating the health benefits associated with these formulations could contribute to the creation of enhanced probiotic yogurts aligned with growing consumer interest in functional and wellness-focused foods.

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Effects of Oviposition Media Types on Differential Attraction of Mosquitoes to Gravid Traps. A**.** Khurram*, N. Diggs, M. Dolce, A. Martin, M. Okulate and D. A. Elnaiem, Department of Natural Sciences, University of Maryland Eastern Shore, Princess Anne, MD 21853.

Mosquitoes are the most important vectors of diseases, affecting the health of humans and livestock. Monitoring mosquito populations is essential for designing and implementing effective control measures. This study was compared the efficacy of gravid traps baited with water, hay infusion, and chicken manure/hay infusion in sampling different mosquito species in Somerset County, Maryland. Traps baited with the three types of media were deployed side by side overnight, between July 4th to October 9th, 2025, in two areas: an open space adjacent to a chicken farm and a dense pine and bush vegetation in a house backyard. Captured mosquitoes were killed by deep freezing and identified to the species level. The number of mosquitoes captured in each trap type was tabulated in Excel. To increase the sample size, records from two similar experiments conducted in summer 2023 and 2024 were added to the database. Statistical analysis was conducted to compare the number of each mosquito species sampled by different trap types at different microhabitats. A total of 22 species were collected during the study period. In descending order, the most abundant mosquitoes captured in all traps were *Culex pipiens*, *Aedes albopictus,* and *Cx. restuans*. Other species were captured in small numbers. Traps baited with chicken manure/hay infusion attracted significantly higher numbers of these three species than traps baited with hay infusion, which in turn, captured significantly higher numbers of mosquitoes than the water baited traps. The results are discussed in relation to mosquito surveillance in Maryland.

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The Role of Nutrigenomics in Obesity and Chronic Disease Prevention: A Gene–Diet Interaction Approach. P. Gupta, Agricultural Research and Development Program, Central State University, Wilberforce, OH 45384; and S. Munroe, * Agricultural Research Development Program, Central State University, Wilberforce, OH 45384

Obesity and chronic diseases remain major U.S. public health challenges, with 42.4% of adults classified as obese and over 60% living with at least one preventable chronic condition (CDC, 2023). Nutrigenomics—the study of gene–diet interactions—provides a precision approach to understanding how genetic differences influence nutrient metabolism and disease susceptibility. This study evaluated 120 adults (≥18 years) using a genomic profiling panel to identify single-nucleotide polymorphisms (SNPs) linked to metabolic efficiency, lipid metabolism, inflammation, and nutrient utilization. MTHFR (C677T, A1298C) variants were identified in 37% of participants, associated with impaired folate conversion and elevated homocysteine, aligning with NHANES data showing 10–15% of adults have suboptimal folate status. APOE ε4 variants (19%) correlated with higher LDL levels and elevated cardiovascular risk, consistent with NIH data indicating ~20% prevalence. FTO (rs9939609) variants were found in 41% of subjects and associated with increased BMI and appetite dysregulation. Participants with TCF7L2 variants showed reduced insulin secretion and susceptibility to type 2 diabetes, supporting CDC estimates that one in three adults has prediabetes.
Other notable SNPs included CETP (lipid transport), GST (detoxification), PPARγ (adipogenesis), MC4R (appetite regulation), COMT (stress metabolism), and VDR (vitamin D regulation). Nutritional recommendations were personalized accordingly, emphasizing folate- and B12-rich foods, omega-3 supplementation, low-glycemic diets, and higher-protein, lower-saturated-fat diets. Integrating genomic and lifestyle data provides a framework for precision nutrition, enabling individualized interventions to reduce risks of obesity, cardiovascular disease, and metabolic dysfunction. Findings aligned with national public health trends, underscoring nutrigenomics as a promising tool for community-based chronic disease prevention.

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Genetic Determinants of Weight Management and Nutrient Metabolism: Integrative Nutrigenomic Profiling for Personalized Lifestyle Strategies. P. Gupta, Agricultural Research and Development Program, Central State University, Wilberforce, OH 45384; and S. Charles*, Agricultural Research and Development Program, Central State University, Wilberforce, OH 45384

Precision nutrition applies genomic insights to tailor individualized diet and lifestyle strategies that prevent obesity and metabolic disorders. This nutrigenomic study analyzed 125 adults (≥18 years) to identify genetic variants affecting weight regulation, macronutrient metabolism, micronutrient utilization, and exercise response. Genotyping focused on single-nucleotide polymorphisms (SNPs) across four biological domains: (1) weight and satiety—*FTO, PPARG, TCF7L2, BDNF, MTNR1B, ABCB11*; (2) nutrient utilization—*IRS1, FGF21, PPARG, APOA5, CRY2*; (3) micronutrient metabolism—*MTHFR, GC, NADSYN1, CYP2R1, NBPF3*; and (4) exercise response—*ADRB2, LPL, APOE, LIPC*. Results revealed a below-average tendency toward weight loss (62%) and a higher risk of weight regain (48%) linked primarily to *FTO* (rs9939609) and *BDNF* (rs6265) variants, aligning with CDC data showing that 42.4% of U.S. adults are obese and that genetic factors account for up to 40–70% of BMI variability. Carbohydrate utilization efficiency was elevated (68%), whereas fat oxidation capacity was reduced (53%), consistent with NHANES 2017–2020 trends reporting higher carbohydrate dependency among overweight populations. Micronutrient gene profiling identified potential deficiencies in the vitamin D (GC, CYP2R1) and vitamin B6 (*NBPF3*) pathways, mirroring NIH reports that 35% of U.S. adults have suboptimal vitamin D levels. Exercise-related genotypes (*PPARG, LIPC*) suggested limited insulin-sensitivity response to endurance training but enhanced lean-mass gains from resistance activity. This integrative nutrigenomic analysis demonstrates that incorporating genotype-specific insights into dietary and exercise interventions can improve metabolic resilience. Public data comparisons validate these findings within national trends, underscoring the translational potential of precision nutrition in community-based obesity prevention and health promotion.

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Lactiplantibacillus plantarum from Fermented Vegetables Mitigates Metabolic Dysfunction in Diet-Induced Obese Mice. M. Jones*, T. Walter, J. Barouei. CAFNR Research, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446.

Obesity has become a global epidemic, contributing to a surge in chronic diseases and placing immense pressure on healthcare systems. Previous studies suggest that microorganisms involved in food fermentation may play a role in mitigating the adverse effects of obesogenic diets. The objective of this study was to evaluate the metabolic effects of supplementation with *Lactiplantibacillus plantarum*, an essential bacterial fermenter for many plant-based food fermentations, in the context of a high-fat diet using a mouse (*Mus musculus*) model of diet-induced obesity. In this

study, male C57BL/6J mice were fed a high-fat diet (providing 45% of energy from fat) for eight weeks, with or without oral supplementation of *L. plantarum*. Serum metabolic hormones, adipose tissue gene expression and cecal content microbiota were analyzed using LC-MS, qPCR and 16s rRNA V4 sequencing, respectively. While no significant differences were observed in body or organ weights, and the cecal microbiota composition remained unchanged, notable metabolic effects were detected. Specifically, *L. plantarum* supplementation led to a significant reduction in serum levels of glucose-dependent insulinotropic polypeptide), a hormone typically elevated in individuals with obesity. Additionally, *L. plantarum* administration was associated with downregulation of adipose tissue dysfunction, evidenced by decreased expression of peroxisome proliferator-activated receptor γ, a key regulator of lipid metabolism, inflammation, and insulin sensitivity. These findings suggest that *L. plantarum* may alleviate metabolic dysfunction prior to observable phenotypic changes. This study supports the potential of *L. plantarum* as a functional probiotic, even in the context of an obesogenic diet.

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Inhibition of Reducing Sugar-Induced Oxidative (NO) Stress in Pancreatic Beta Cells by Nitric Oxide. A.H. Penn*, Agricultural Research and Development Program, Central State University, Wilberforce, OH 45384; and K. N. Islam, Agricultural Research and Development Program, Central State University, Wilberforce, OH 45384

Diabetes is a leading cause of morbidity and mortality. Elevation of oxidative stress is a common complication in diabetic patients that leads to excessive production of free radicals. Nitric oxide (NO) is a gasotransmitter that has many health benefits, and it also has an antioxidant property. b-cells are specialized endocrine cells located in the pancreas that play crucial roles in regulating blood sugar levels via secreting insulin. The present study investigates the effects of $NaNO_2$, a donor of NO, on glucose-induced oxidative stress in pancreatic b-cells from a Chinese hamster. First, we determined the effects of dose responses of glucose (25 to 150 mM) on the induction of oxidative stress as it was measured by the formation of thiobarbituric acid reactive substances (TBARS) in serum-starved b-cells. We observed marked oxidative stress in the serum-starved b-cells by the treatment with 75 mM of glucose. Later, we tested the effect of $NaNO_2$ on glucose-induced oxidative stress in serum-starved b-cells, and we found that $NaNO_2$ markedly antagonized glucose-induced oxidative stress in serum-starved b-cells. Treatment with $NaNO_2$ caused significant induction of cell viability and a marked reduction of cellular cytotoxicity in starved b-cells incubated without or with glucose. In addition, $NaNO_2$ treatment of b-cells antagonized expression levels of inflammatory cytokines, TNF-a, and inhibited the activation of the transcription factor, NF-kB signaling pathway. Our findings suggest that NO or NO donors may be used as therapy to cure diabetes via inhibiting oxidative stress, thereby decreasing blood sugar levels in diabetic patients.

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Evaluation of the Antioxidant Properties of Macerated Green Leaves of *Chenopodium quinoa* Willd. M. Renfroe*, J. Adu*., M. U. Ijaz., S. Pathan, A. Dudley, Land Grant Program, College of Agriculture, Virginia State University, MT Carter Annex, Virginia State University, Virginia 23806

Natural remedies from plants have come from the use of plant botanical parts such as the leaves, flowers and stems that have been utilized for their bioactivity with focus on the antioxidative properties. Consumers desire natural antioxidant sources and one such is Quinoa (*Chenopodium quinoa* Willd.). Quinoa leaves are an emerging dietary source of bioactive phytochemicals with potential roles in promoting human health. Although Quinoa grains are well established as a functional food, the antioxidant properties of its green leaves remain underexplored. This study evaluated three genotypes' Ames 13724 (U.S.), PI 614885 (Chile), and PI 665275 (Bolivia) to determine genotype-specific differences in antioxidant activity. Young leaves were macerated with 80% ethanol and analyzed for total phenolic (TPC), flavonoid (TFC) contents, and antioxidant activity (DPPH, ABTS) Significant ($p \leq 0.05$) differences were observed among genotypes. PI 665275 exhibited the highest phenolic (~42 mg GAE/g DW) and flavonoid contents, with strong ABTS radical-scavenging activity, identifying it as the antioxidant-forward line suitable for functional food applications. Collectively, these findings position Quinoa leaves as a novel functional food supporting antioxidant defense and use in functional food applications.

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Impact of Environmental Factors on *E. coli* Antibiotic Resistance in Central Virginia. K. Johnson*, Department of Family and Consumer Sciences; E. Ndegwa and C. Kim, Agricultural Research Station, Virginia State University, Petersburg, VA 23806; A. Riley, Department of Agriculture, Food and Resource Sciences, University of Maryland Eastern Shore, Princess Anne, MD 21853

Although environmental factors are known to influence antimicrobial resistance (AMR) in bacteria, many aspects of antibiotic pollution and resistance in natural settings remain unclear. *Escherichia coli* (*E. coli*) is widely recognized as a reliable indicator of environmental antimicrobial pressure. This study investigated AMR patterns in *E. coli* isolated from various environmental sources in Central Virginia, including animal feces, wastewater treatment plants (WWTPs), and drainage areas across different land use types. A total of 450 isolates collected between August 2020 and February 2021 were tested for susceptibility to 12 FDA-approved antimicrobial agents. Results showed that 87.8% of isolates were resistant to at least one antibiotic, and 3.1% exhibited multi-drug resistance. Streptomycin resistance was most prevalent (73.1%), while chloramphenicol showed the highest susceptibility (97.6%). Notably, one WWTP isolate was resistant to seven antibiotics. AMR was most common in WWTP samples, followed by those from drainage areas, wild birds, and livestock. Among livestock, horses showed the highest resistance levels, while cattle had the lowest. No significant differences in AMR were observed across land use systems. These findings highlight potential environmental hotspots for resistant *E. coli* and underscore the need for further research into the environmental dimensions of AMR. The study provides a scalable model for understanding *E. coli* resistance ecology and offers valuable insights for researchers and policymakers aiming to address knowledge gaps in AMR's environmental impact.

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Metabolomic Insights into Blueberry Peel and Pulp Responses to Postharvest Cold Storage. Arinzechukwu C Egwu*, Molla F. Mengist. Agricultural Research Station, Virginia State University, Petersburg, VA 23806

Blueberries are rich in health-promoting bioactive compounds, contributing to their nutritional and economic value. Postharvest cold storage is essential for maintaining fruit quality but also triggers biochemical changes that alter metabolite accumulation in different tissues, particularly the peel and pulp. Understanding these tissue-specific metabolic responses is critical for improving fruit quality and preserving bioactive compounds. We conducted global metabolite profiling using widely targeted metabolomics on peel and pulp tissues of the 'Duke' blueberry cultivar at harvest and after six weeks of cold storage. In total, 2,178 metabolites were identified, with flavonoids, phenolic acids, and amino acids as the most abundant classes. Multivariate analyses (PCA and PLS-DA) revealed that both tissue type and storage duration significantly affected metabolite profiles, with tissue type exerting the strongest influence. Based on *LIMMA* and Machine learning–based feature selection identified key metabolites that discriminated samples by tissue and storage time. Pathway enrichment analysis revealed tissue-specific functions: flavonoid biosynthesis was concentrated in the peel, while protein-related pathways, including purine, tryptophan, and phenylalanine metabolism, were more active in the pulp. Cold storage induced pronounced metabolic shifts, particularly in the peel, where flavonoid and glutathione pathways decreased, while linolenic acid, alpha-linolenic acid, and cyanoamino acid metabolism increased. The pulp showed reduced glutathione metabolism and increased linolenic acid metabolism, highlighting a clear tissue-specific response to cold stress. These results provide mechanistic insights into postharvest metabolic dynamics in blueberry tissues and identify candidate pathways and metabolites to guide strategies for enhancing fruit quality, preserving bioactive content, and optimizing postharvest management.

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Inhibitory Effects of Garlic Scape Extract on Intestinal Carbohydrate Digestion and Absorption *In Vitro.* A. Pezzano*, O. Balogun, A. Tuladhar, and H. Kang, Department of Family and Consumer Sciences, North Carolina Agricultural and Technical State University, Greensboro, NC, 27411; S. Gu, and P. L. Coffey, Cooperative Extension, Virginia State University, Petersburg, VA, 23806.

Hyperglycemia increases the risk of developing type 2 diabetes and other metabolic complications. Regulation of carbohydrate digestion and glucose transporters in the intestine is critical for controlling postprandial blood glucose. Garlic scapes (Allium sativum L.), the flower stalks of garlic plants, are commonly discarded as agricultural byproducts. However, it contains valuable nutrients and bioactive compounds with potential health-promoting effects. This study identified the best garlic scape cultivar for North Carolina and examined its extract on intestinal

carbohydrate digestion and glucose uptake. Twenty-four hard-neck garlic cultivars were evaluated for scape yield traits and total phenolic content (TPC). Scapes were digested *in vitro* and extracted with 70% ethanol to obtain digested garlic scape extract (dGSE). Bioactive compounds of the dGSE were analyzed by LC-MS/MS and SPME-GC-MS. The dGSE's effects on *in vitro* intestinal carbohydrate-hydrolyzing enzyme activity, glucose uptake, and the expression of sodium-glucose cotransporter 1 (SGLT1) and glucose transporter 2 (GLUT2) in Caco-2 cells were examined using enzymatic, fluorescence, quantitative PCR, and western blot analysis, respectively. Music was selected as the best cultivar, with allicin and deoxyalliin as major bioactive compounds. dGSE inhibited the carbohydrate-hydrolyzing enzymes α-glucosidase, sucrase, maltase, glucoamylase, and α-amylase in a dose-dependent manner, with inhibition comparable to or greater than that of 1 mg/mL acarbose at low concentrations. dGSE at 40 μg/mL decreased SGLT1 and GLUT2 by 32% and 30%, respectively. Consistent with this, glucose uptake was inhibited by dGSE, regardless of the presence of sodium. Taken together, garlic scapes may be a potential food for alleviating postprandial hyperglycemia.

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Influence of Hydrocolloids on the Rheological Properties of 3D-Printable Plant-Based Chicken Breast Formulation. T. Tate*, V. Madala, L.S. Kassama, Department of Food and Animal Sciences, Alabama A&M University, Normal, AL 35762.

3D printing is transforming sustainability practices, protein-rich food designs, and manufacturing. This study examined the influence of hydrocolloids (Xanthan gum, and Methylcellulose) on the rheological characteristics of a plant-based chicken breast formulation made from soy protein isolate, water, coconut oil, and sunflower lecithin formulation. Therefore, the objective of 3D printing plant-based chicken breast was to use three ratios of Xanthan gum and Methylcellulose were prepared, including Control formulations. The rheological properties, such as the relationship between shear stress and shear rate and viscosity, were measured using a Discovery Hybrid Rheometer (DHR-2) at shear rates from 0 to 100 s^{-1}. Data were analyzed using SPSS 27 software, with an analysis of variance (ANOVA) at a 5% significance level. The flow behavior of the samples was studied at 25°C, over a shear rate range of 1 to 100 s^{-1}. Results showed a decrease in apparent viscosity as the shear rate increased. The xanthan gum formulation exhibited a distinct shear-thinning behavior compared to the control and methylcellulose formulations. The control sample, which did not contain hydrocolloids, exhibited minimal shear-thinning. All formulations displayed shear-thinning characteristics, which are advantageous for smooth extrusion during the 3D printing of plant-based meat analogs. These findings highlight the importance of shear-thinning behavior in achieving effective extrusion and precise layer deposition in 3D-printed chicken breasts which is the foundation for developing next-generation plant-based chicken with optimal texture and production efficiency, contributing to a more sustainable food production system.

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Influence of Soy Protein Isolate on the Rheological Properties of Cookie Dough for 3D-Printing. T. Whitt*, V. Madala, L. Kassama, Department of Food and Animal Sciences, Alabama A&M University, Normal, AL 35762.

Soy protein isolate (SPI) is a nutritionally complete protein that supplies all essential amino acids, thereby enhancing both the nutritional profile and functionality of food formulations. Its incorporation into cookie dough not only increases protein density but also alters the dough's rheological and printing behavior, which are critical parameters for additive manufacturing (AM). The present study investigated the rheological characteristics of cookie doughs containing varying levels of SPI to determine their suitability for 3D printing applications. Four formulations were prepared using all-purpose flour, SPI, water, butter, eggs, baking powder, xanthan gum, and vanilla extract, with flour-to-SPI ratios of 100:0, 90:10, 80:20, and 70:30. Rheological measurements were performed using a Discovery Hybrid Rheometer (DHR-2, TA Instruments, New Castle, DE, USA) at 25 °C across a shear rate range of 0-100 s^{-1}. All the samples were 3D-printed at room temperature using a 4mm nozzle. Statistical analyses were executed using SAS software (version 9.4), applying analysis of variance (ANOVA) at a 5% significance level. All samples exhibited shear-thinning behavior, where viscosity declined with increasing shear rate due to molecular alignment and reduced internal friction. The control sample (100:0) demonstrated the most pronounced shear-thinning, whereas SPI-fortified doughs displayed enhanced structural uniformity, attributed to protein network formation upon hydration. Overall, the findings highlight that SPI fortification improves rheological consistency and printability, confirming its potential as a functional ingredient for producing nutritionally enriched, 3D-printed cookie products.

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Exploring the Functional and Sustainable Potential of Classic and Shiitake Mushrooms as Natural Antioxidant Sources. T. Herring*, H. Singh, J. Herring, Nutritional Biochemistry Laboratory, Department of Food and Animal Sciences, Alabama A&M University, Normal, AL 35762, W. Tadessee, Department of Natural Resources and Environmental Sciences, Alabama A&M University, Normal, AL 35762, M. Verghese, Nutritional Biochemistry Laboratory, Department of Food and Animal Sciences, Alabama A&M University, Normal, AL 35762.

Mushrooms are increasingly recognized as sustainable sources of bioactive compounds with potent antioxidants and health-promoting properties. This study evaluated and compared the polyphenolic content and antioxidant potential of two edible mushroom varieties Classic (*Agaricus bisporus*) and Shiitake (*Lentinula edodes*) using two solvents, 80% ethanol and distilled water. Total phenolic content (TPC), total flavonoid content (TFC), and antioxidant activities were analyzed using Ferric Reducing Antioxidant Power (FRAP), 2,2-diphenyl-1-picrylhydrazyl (DPPH), Nitric Oxide Radical Scavenging (NORS), and Trolox Equivalent Antioxidant Capacity (TEAC) assays. Shiitake extracts exhibited slightly higher phenolic content than Classic mushrooms, with TPC values of 532 mg GAE/100 g (ethanolic) and 476 mg GAE/100 g (aqueous) compared to Classic mushrooms (516.52 mg GAE/100 g and 401.32 mg GAE/100 g). Classic mushrooms had higher TFC in aqueous extracts (35.12 mg QE/100 g) than in ethanolic (24.28 mg QE/100 g), whereas Shiitake had opposite trend, showing 283.04 mg QE/100 g (aqueous) and 105.2 mg QE/100 g (ethanolic). FRAP values were higher in Classic ethanolic extracts (132 mM Fe (II)/100g) compared to Shiitake aqueous extracts (98.85 mM Fe (II)/100g), while DPPH scavenging activity was markedly higher in ethanolic extracts of both mushrooms 85.28% (Classic) and 86.86% (Shiitake) than their aqueous counterparts. Both Classic and Shiitake mushrooms exhibit rich phenolic and flavonoid content, contributing to strong antioxidant potential. Ethanol extracts showed higher bioactive recovery, emphasizing solvent polarity's role. Mushroom cultivation also supports sustainability by utilizing agro-waste in eco-friendly systems. Future studies should optimize growth and environmental conditions to enhance bioactive yields and functional food potential.

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E**valuating the Efficiency of Sanitizers Using the Kirby-Bauer Well Diffusion Method.** V. Moore*, P. Bwalya, A. Jackson-Davis, Department of Food and Animal Sciences, Alabama A&M University, Normal, AL 35762.

Salmonella and *Escherichia coli* (*E. coli*) are foodborne pathogens that can cause illness. These pathogens are commonly found on produce and illness can occur through consumption when produce contains the pathogen. The use of sanitizers can play a role in controlling foodborne pathogens on produce. The purpose of this study was to determine which sanitizer was the most effective at controlling foodborne pathogens on agar plates determined by the Kirby-Bauer Well Diffusion Method. Two Tryptic Soy agar plates were divided into four labeled quadrants. One plate was inoculated with *E. coli* and another plate was inoculated with *Salmonella*. A sterile pipette was used to create wells in the center of each quadrant aseptically. *E. coli* and *Salmonella* cells were spread on petri dishes using a sterile swab. Following this, 100 µL of each sanitizer and control was placed into each labeled well. Plates were incubated at 37°C for 24 h to observe bacterial growth and zones of inhibition. After a 24 h incubation period, the plates were observed for their zones of inhibition as well as differences between *E. coli* and *Salmonella* reactions to the sanitizers. Sanitizer A had the largest zone of inhibition for both *E. coli* and *Salmonella*, indicating strong antibacterial activity against both pathogens when compared to Sanitizer B. Controls C and D had very little to no zones of inhibition. These results of the study demonstrate the importance of sanitizers in the produce industry.

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Commercial Essential Oils as Alternative Antimicrobial Agents against *Shewanella* Species. Y. Dunn***,** T. Johnson, A. J., Punchihewage-Don, S. Parveen. Department of Agriculture, Food and Resource Sciences, University of Maryland Eastern Shore, Princess Anne, MD 21853.

Shewanella species are emerging seafood pathogens with rising multidrug resistance (MDR). The study aimed to evaluate the antimicrobial activity of five commercial essential oils (Eos) —black pepper, clove, cinnamon, oregano, and thyme against *Shewanella* collected from oysters and seawater at four sampling sites in the Mid-Atlantic region, USA. Isolates were exposed to five dilutions of each EO and compared to three control antibiotics: ciprofloxacin,

gentamicin, and imipenem using standard methods. Oregano and thyme had the largest Mean Inhibition Zone (MIZ); 32.5 mm and 30.7 mm, respectively, often matching or exceeding the effects of gentamicin and imipenem. Based on MIZ values at 100% concentration, oregano (32.5 mm), thyme (30.7 mm), clove (24.6 mm), cinnamon (24 mm), and black pepper (13.6 mm), indicating a clear ranking in antimicrobial efficacy against *Shewanella* isolates. No significant susceptibility difference was found between oyster and seawater isolates. Hemolysin group significantly influenced MIZ, with β-hemolytic isolates showing greater susceptibility to certain essential oils, depending on oil type, while dilution had no significant effect. *S. khirikhana* was more susceptible than *S. algae* to black pepper oil at all dilutions and to thyme oil at the fourth dilution. *S. marisflavi* and *S. litorisediminis* were susceptible to undiluted thyme oil. These results support the potential of phenolic-rich EOs as natural antimicrobial agents to control MDR *Shewanella* in seafood, an emerging public health concern.

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Consumer Acceptability of Sweet Potato Coffee Cakes. A. Austin*, M. Johnson, Department of Human Sciences, College of Agricultural, Human and Environmental Sciences, Southern University and A&M College, Baton Rouge, LA 70813; F. Malekian, and G. Rodriguez, Southern University Agricultural Research and Extension Center, Baton Rouge, LA 70813.

Sweet potatoes (*Ipomoea batatas*) are rich in vitamins A and C and dietary fiber. They are a relatively inexpensive, nutrient-dense crop available year-round in fresh or processed forms. Incorporating sweet potatoes into food products has the potential to enhance diet quality and contribute to health promotion. The purpose of this study was to pilot the development and consumer evaluation of a sweet potato-based baked product. Sweet potato coffee cakes were formulated using boiled fresh sweet potatoes, all-purpose flour, baking soda, salt, sugar, butter, eggs, milk, vanilla extract, and spices. A control coffee cake and two variations containing ½ cup and 1 cup of sweet potato were prepared. Samples were evaluated for appearance, aroma, flavor, texture, aftertaste, and overall acceptability using a 7-point hedonic scale. Sweetness, sweet potato flavor, chewiness, and moistness were evaluated using a 5-point just-about-right scale. Overall preference and purchase intent were also examined. A convenience sample of untrained panelists participated in sensory evaluations during the initial recipe formulation phase. Although the control sample received slightly higher overall ratings, the 1-cup sweet potato cake scored higher for aroma, texture, aftertaste, and overall acceptability, as well as for sweetness, flavor, chewiness, and moistness. These findings indicate strong potential for developing sweet potato–based baked products, pending optimization of sensory attributes. As the demand for health-promoting, sustainable foods grows, this research highlights opportunities to use sweet potatoes in consumer-friendly products that support dietary quality, food security, and chronic disease prevention.

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Development and Evaluation of Sweet Potato-Based Products for Human Health Improvement. V. Holder*, M. Johnson, Department of Human Sciences, College of Agricultural, Human and Environmental Sciences, Southern University and A&M College, Baton Rouge, LA 70813; F. Malekian, G. Rodriguez, Southern University Agricultural Research and Extension Center, Baton Rouge, LA 70813.

Despite the 2001 U.S. Surgeon General's "Call to Action," obesity remains a critical public health crisis, worsening since the COVID-19 pandemic. Louisiana ranks among the top ten states for childhood and adult obesity prevalence, with significant disparities affecting minority communities, lower socioeconomic populations, and physically inactive individuals. While research in southeast Louisiana shows that higher-quality food environments reduce obesity risk, the epidemic persists as largely "unexplained", particularly among individuals living in compromised food environments with limited access to nutritious food options. Therefore, the development of value-added products to enhance the food environment is necessary to improve human health. This project evaluates the sweet potato, an easily cultivated, readily available crop commonly consumed throughout Louisiana, as a functional food to improve health outcomes. The first phase of the project involves the development and sensory evaluation of sweet potato-based products. This research shows that replacing common ingredients with culturally familiar and locally available foods, such as sweet potatoes, may be an effective strategy to improve diet quality, overall health and reduce obesity in at-risk communities. By aligning nutrition science with local food preferences and agricultural resources, the study promotes a community-based approach to enhance diet quality. The findings are expected to provide practical strategies to help people reach a healthier weight, eat better, and improve overall metabolic health in Louisiana residents.

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Investigating the Antimicrobial Activity of Essential Oils on MDR Foodborne Pathogens. L. Campbell*, L.Y. London, Department of Biological Sciences, Alabama A&M University, Normal, AL 35762.

The rise of multi-drug resistant (MDR) foodborne pathogens poses a significant threat to global public health and food safety. As antibiotic efficacy continues to decline, there is growing interest in identifying alternative antimicrobial agents derived from natural sources. This study investigates the antimicrobial effects of selected essential oils—including *oregano (Origanum vulgare)*, *thyme (Thymus vulgaris)*, and *cinnamon (Cinnamomum verum)*—against MDR strains of *Escherichia coli*, *Salmonella enterica*, and *Listeria monocytogenes*. The essential oils were evaluated using agar disk diffusion and broth microdilution assays to determine zones of inhibition, minimum inhibitory concentrations (MIC), and minimum bactericidal concentrations (MBC). Preliminary results indicate that all tested essential oils exhibited measurable antimicrobial activity, with oregano and thyme oils showing the most potent inhibitory effects. These findings suggest that essential oils hold promise as potential natural antimicrobials for controlling MDR foodborne pathogens and enhancing food preservation strategies. Further research is warranted to explore their mechanisms of action, synergistic effects, and applicability in food processing systems.

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Capsiate Confers Health Benefits in *C. elegans* via TRP Channels. H. Zaman*, M. Amirthalingam, and U. K. Reddy, Gus R. Douglass Institute, West Virginia State University, Institute, WV, USA.

Capsiate, a non-pungent analogue of capsaicin in the capsinoid family, shares structural similarity with capsaicin but activates sensory receptors without eliciting the characteristic burning sensation. This study investigates the mechanistic basis of capsiate's beneficial effects using *Caenorhabditis elegans* as an in vivo model. Toxicological screening confirmed that capsiate is non-toxic up to 160 μM, while supplementation with 10 μM significantly increased lifespan by 27.7% under standard culture conditions. Genetic analysis demonstrated that *osm-9* (TRPV) and *trpa-1* (TRPA1) channels are essential for capsiate-mediated lifespan extension and stress resilience, as double mutants lacking both genes failed to respond. Capsiate treatment induced nuclear localization of DAF-16/FoxO and SKN-1/Nrf2 transcription factors, activating downstream stress-response and longevity pathways. Moreover, treated worms exhibited enhanced intestinal barrier integrity and reduced age-related pigment accumulation. These findings establish capsiate as a potent, non-pungent nutraceutical that promotes lifespan extension and stress adaptation through TRP channel-dependent mechanisms, offering potential applications for health span improvement and aging research.

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Exploring the Therapeutic Efficacy of L-Citrulline in Caenorhabditis elegans Models of Alzheimer's Disease. *A.* Zaman*, A. Southern, M. Amirthalingam, and U. K. Reddy, Gus R. Douglass Institute and Department of Biology, West Virginia State University, Institute, WV, USA.

Alzheimer's disease (AD) is a progressive neurodegenerative disorder marked by amyloid-β (Aβ) plaque formation, tau hyperphosphorylation, and cognitive decline. Beyond these hallmarks, nitric oxide (NO) dysregulation has emerged as a central contributor to neurovascular dysfunction, oxidative stress, and synaptic failure. L-citrulline, a non-proteinogenic amino acid and NO precursor, has shown promise as a neuroprotective agent through improved endothelial function and mitochondrial support. This study employs *Caenorhabditis elegans* (C. elegans) as a model to evaluate the therapeutic effects of L-citrulline on aging and AD-related phenotypes. Despite lacking endogenous nitric oxide synthase, C. elegans responds to exogenous or bacterially derived NO via conserved signaling cascades, enabling exploration of NO-linked and NO-independent pathways. Wild-type (N2) and transgenic AD strains (CL2006, CL4176, GRU101, GRU102) were subjected to L-citrulline supplementation, and phenotypes such as lifespan, reproduction, motility, stress resistance, and gut integrity were quantified. Preliminary findings indicate that low-dose L-citrulline (5 mM) enhances survival without reproductive compromise and confers increased resilience under osmotic and thermal stress, suggesting hormetic benefits. Ongoing transcriptomic profiling aims to identify molecular pathways underlying these effects. This study advances understanding of L-citrulline's role in modulating nitric oxide signaling and aging-associated neurodegeneration, providing a translational framework for NO-targeted therapeutic interventions in Alzheimer's and related disorders.

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Buckwheat Protein - Polyphenol Interactions in Film-Forming Solutions: Dialysis-Guided Elucidation Technique. V.A.N. Nicholas-Okpara, T. Shelton*, and A. Sarker, Agricultural and Environmental Research Station, West Virginia State University, Institute, WV 25112, USA.

There is paucity of information on research relating to rutin (bioflavonoid) and buckwheat protein (BWP) interactions. This study investigated the extent of coupling of rutin (1% and 2%) within 0-4 hours with BWP at pH 9.0 followed by a dialysis technique (3.5KDa MWCO (molecular weight cut off)). Standard methods were used to quantify unbound rutin in the dialysate, total phenolic content (TPC) of the dialyzed freeze-dried film forming solution (FFS) using rutin equivalents and antioxidant potential of the FFS. A dose-dependent increase in calculated total bound rutin from 0 to 4 hours for 1% and 2% inclusion was observed with values of 98.56-111.17 mg and 198.17-232.56 mg, respectively. 2% rutin FFS showed the highest total phenolic content ($P < 0.0001$) with % increase from 240.04 to 577.37 while 1% rutin FFS had % increase from 202.68 to 493.53 from 0 to 4 hours. There was a slight increase (0.32%) of trolox antioxidant equivalent observed in 2% rutin-2 hour compared to control-2 hour. FTIR spectroscopy of different rutin treatments revealed alterations in functional group vibrations and shifts in protein amide bands as a function of concentration and reaction time. This study suggests further investigation regarding the experimental conditions and optimization of the extracting solvent to increase complexes formation and antioxidant capacity. Besides, adopting confirmatory tests such as HPLC-DAD for binding efficiency and fluorescence quenching or circular dichroism to determine suitability of the rutin-incorporated FFS as a functional agent for food packaging application remains as a future scope of the study.

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Identification of *Aspergillus flavus* Infection in Mississippi Corn Using Morphological and Molecular Techniques. C. L. Posey*, Department of Biological Sciences, Alcorn State University, Lorman, MS 39096; C. Meeks, Department of Biological Sciences, Alcorn State University, Lorman, MS 39096; M. M. Masud, Department of Agriculture, Alcorn State University, Lorman, MS 39096; A. Emran, Department of Agriculture, Alcorn State University, Lorman, MS 39096; and S. Waliullah, Department of Biological Sciences, Alcorn State University, Lorman, MS 39096.

The fungus *Aspergillus flavus* poses a major threat to corn yield and quality due to aflatoxin contamination. Aflatoxins are potent hepatotoxins and carcinogens, associated with severe liver damage and other health risks. This highlights the critical need for rapid and reliable detection of *A. flavus* in infected samples. In this study, harvested corn samples were collected from six counties across Mississippi to confirm the presence of *A. flavus*. Samples were cultured on selective media to promote fungal growth, and multiple subcultures were performed to obtain pure isolates. Morphological identification was conducted by observing colony color, growth pattern, and microscopic features. To confirm infection, molecular identification was carried out using species-specific primers (FLA1/FLA2) on extracted DNA samples. Culture results revealed colonies ranging from light yellowish to greenish with characteristic spore-bearing structures such as conidiophores and conidial heads typical of *A. flavus*. All isolates were further confirmed by PCR amplification using FLA1 and FLA2 primers, producing a distinct 497-bp DNA fragment. This combination of morphological and molecular analyses provides strong evidence for the presence of *A. flavus* in Mississippi corn. These findings establish a critical baseline for understanding *A. flavus* prevalence in the region. The confirmed isolates will serve as the foundation for future studies focusing on aflatoxin biosynthetic gene cluster analysis and toxin quantification.

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Evaluation of radioactivity levels in fertilizers commonly used in the Southern USA. A. Jefferies*, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096; D. Addae, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096; J. Billa, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096; J. Adjaye, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096; and M. Bollugallu Padmayya, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096.

Naturally occurring radioactive materials (NORM) such as ^226Ra, ^232Th, and ^40K are present in fertilizers due to the geological origin of their raw materials. Continuous fertilizer use can lead to the buildup of these radionuclides in agricultural soils, posing potential radiological risks to farmers, consumers, and the environment. This study aimed to quantify the levels of ^226Ra, ^232Th, and ^40K in three commercial fertilizers—phosphate (0–46–0), potash (0–0–60), and NPK (13–13–13)—commonly used in the southern United States. Gamma spectrometry was used to determine activity concentrations and to calculate radiological hazard indices, including radium equivalent activity, absorbed dose rate, and annual effective dose. Results showed that phosphate fertilizers had the highest ^226Ra activity, while potash contained the greatest concentration of ^40K. Although a few samples exceeded recommended limits for certain radionuclides, the overall radiation doses associated with typical fertilizer application remained within international safety standards. It is recommended that fertilizer products be periodically monitored for NORM concentrations to ensure radiological safety in agricultural practices. Additionally, awareness programs should be developed to inform farmers about the long-term environmental impacts of continuous fertilizer use.

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Biotechnology Evaluation of the Impacts of Added Sugar on Type-2 Diabetes. T. Brown*, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096; and S. O. Nwaneri, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096.

In dietary specifications, added sugar refers to sugar and/or syrup condiments that are used to increase the sweetness of a food product, enhance the textural appeal, or extend food product shelf time. Added sugar gets into the human food systems through: , syrup, Sugar from honey; 4. Sugars from concentrated fruit, and 5. Sugar from artificial vegetable juices. Added sugar physically gets into ready-to-eat foods or drinks, during food processing and preparation. This project examined white and brown sugars in coffee, sugar in doughnuts, sugar via honey in tea, brown sugar/honey in bread, including artificial sweeteners. According to the American Heart Association, the maximum amount of added sugar for adult male consumption per day is 36 grams. This translates to about 9 teaspoons. For adult female consumption per day is 24 grams or 6 teaspoons. On the contrary, average American adult consumes about 70 grams of added sugar per day. This translates to about 60 pounds of added sugar per year. The concern is the consumption happens at faster rates, due to sugar crash. This study applied a Time Delay Sugar Integration (TDSI) method. Blood sugar or glucose spikes relate to the pancreas for hormonal insulin presence, which most likely results in a sugar crash (craving more sugars) instead. The significance of sugar crash is that it happens so fast after food consumption, leaving the individual craving for more sugar (glucose). This study found that added sugar telegraphs the pancreas for more glucose faster than natural sugar does.

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Community-Guided Development of a Nutrition App Prototype for SNAP Families. J. Vicks*, S. Tate*, C. Alvarado, T. Williams. Sherman Lewis School of Agriculture and Applied Sciences, Langston University, Langston, OK, 73050.

The use of mobile applications has emerged as a ubiquitous outlet for health and nutrition information. Part of a mobile application's appeal is its ease of use and accessibility. Although numerous community-based nutrition applications exist, many are created without engaging the intended users, resulting in low adoption rates, poor usability, and limited engagement. This project aimed to develop a mobile nutrition application (app) prototype tailored specifically for Oklahoma SNAP-eligible families, based on feedback from a community needs assessment survey. Survey questions were developed through a review of literature on community-based mobile nutrition application interventions to identify common app features and existing gaps. Community members were also consulted to ensure the appropriateness of the questions. This process resulted in three survey constructs: use of internet/mobile applications, nutrition and health behaviors, and community health challenges. The final survey consisted of 32 multiple-choice and open-ended questions. Data were collected from 108 SNAP-eligible individuals across five rural and urban counties in Oklahoma. Seventy-nine percent of respondents reported never using a health app. When asked about important health app features, 58% preferred easy recipes, healthy meal plans, and smart food choices; 59% valued cultural relevance. Overall, 92% used the internet and 64% used smartphones to access health information. When asked about barriers to app use, 26% cited difficulty understanding them, 23% privacy concerns, 15% lack of internet access, and 12% high cost. Mobile nutrition applications offer a solution for delivering research-based nutrition and health information to SNAP-eligible Oklahomans, but several key considerations are needed.

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Beyond the Grocery Aisle: Consumer Awareness and Willingness to Pay for Alternative Meats — Evidence from Southern U.S. States. A. Butler*, N. De Silva, W. Whittaker, S. Giscombe. Department of Agriculture and Natural Resources, Sherman Lewis School of Agriculture and Applied Sciences, Langston University, Langston, OK 73050.

The rising demand for alternative protein sources, with varied production systems and cultural relevance, has created new market opportunities for specialty livestock products, such as goat and lamb. This study examines consumer awareness, attitudes, and willingness-to-pay (WTP) for alternative meats across four Southern U.S. states: Oklahoma, Texas, Florida, and Georgia. Using data from a structured consumer survey on goat meat preferences, supplemented with secondary demographic and expenditure data from the U.S. Department of Agriculture's Economic Research Service, this research identifies key factors influencing purchasing behavior. Econometric models, including regression and willingness-to-pay estimation, are employed to analyze how income, age, education, cultural background, and product attributes shape consumer choices. Results reveal that awareness and familiarity with alternative meats remain limited but are significantly higher among younger consumers and those from varied cultural backgrounds. The analysis further indicates that locally sourced, production-oriented, and health-branded meat options command a measurable price premium. Findings highlight potential marketing strategies for small farmers and producers to strengthen local meat value chains and enhance consumer outreach through targeted education and promotional campaigns. By linking consumer perception data with economic modeling, this study contributes to understanding how alternative meat markets may expand in response to evolving dietary preferences and regional agricultural market conditions in the Southern United States.

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Comparative Analysis of Perceived and Actual Sleep Quality on Delaware Food Safety Manager Test Scores V. Truong*, Department of Chemistry, Delaware State University, Dover DE 19808; A. Diaz-Martinez, Department of Chemistry and Department of Human Ecology, Delaware State University, Dover DE, 19901; A. Armah, College of Agriculture Science and Technology, Delaware State University, Dover DE 19901; W. A. Lewis, Department of Human Ecology, Delaware State University, Dover DE 19901; A. Roeper, Psychology Department, Delaware State University, Dover DE; J. Brownlow, Sleep, Stress, and Neuroscience Lab, Delaware State University, Dover DE 19901, and W. Long III, Department of Human Ecology, Delaware State University, Dover DE 19901.

Food safety performance is shaped not only by technical training but also by psychosocial factors such as perceived and workplace stress. While certification programs like ServSafe® are widely used to assess food safety knowledge, little research has examined how stress affects these outcomes among food service employees. This study investigates associations between employee stress levels and food safety assessment performance in Kent County, Delaware. A cross-sectional design pairs ServSafe® exam results with data from a validated questionnaire measuring both perceived stress and workplace stressors, including workload, time pressure, and staffing challenges. Participants include food service workers across various establishments, with demographic and occupational data collected to control for confounding factors. Although analysis is ongoing, it is anticipated that higher perceived and workplace stress levels will be associated with lower ServSafe® exam scores. These findings could highlight stress as a modifiable factor influencing food safety competency and underscore the importance of integrating stress management and employee well-being into food safety training programs. This research aims to inform interdisciplinary efforts that link occupational health and food safety education, ultimately supporting a more resilient workforce and improved public health protection.

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Investigation of the Antimicrobial Efficacy and Safety of Syzygium *aromaticum* (Clove Oil) Wash Treatments Against *Salmonella* Typhimurium and *Escherichia coli* on Roma Tomatoes and in Produce Effluent. A. Diaz-Martinez*, Department of Chemistry and Department of Human Ecology, Delaware State University, Dover DE 19901; A. Armah, College of Agriculture Science and Technology, Delaware State University, Dover DE 19901; W. A. Lewis, Department of Human Ecology, Delaware State University, Dover DE 19901; and W. Long III, Department of Human Ecology, Delaware State University, Dover DE 19901.

Salmonella Typhimurium and *Escherichia coli* infections are frequently associated with the consumption of ready-to-eat produce. During postharvest processing, the repeated use of wash water can facilitate microbial persistence and cross-contamination. With increasing consumer demand for natural alternatives to synthetic sanitizers, essential oils have gained attention for potential application in produce washing. This study evaluated the antimicrobial efficacy of clove oil (*Syzygium aromaticum*) as a natural wash treatment for Roma tomatoes stored at room temperature (21 °C). Clove oil's antimicrobial activity was first assessed using the Kirby-Bauer disk diffusion method. Roma tomatoes were inoculated with approximately 9 log Colony Forming Units (CFU) of each pathogen, air dried for 24 hours, and washed for 5 minutes using sterilized water, 0.25%, or 1.00% clove oil. Bacterial counts were monitored on days 1, 2, 6, and 7 post-wash, and wash water samples were analyzed on days 1, 2, 6, 7, 13, and 14. Clove-treated tomatoes consistently exhibited lower pathogen levels compared to those washed with water alone, and clove oil effectively reduced microbial loads in wash water. Tomatoes treated with 1.00% clove oil and stored at 21 °C or ~6 °C were further evaluated for sensory quality using a five-point hedonic scale. Although clove oil treatments reduced microbial contamination, participants preferred the flavor and aroma of unwashed or water-washed tomatoes. These findings suggest that lower clove oil concentrations may optimize microbial safety while maintaining consumer acceptability.

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Design and Implementation of a Nutrition Education Web Portal. K. Rolle2*, F. Fondjo-Fotou2, and C. Alvarado1. 1Sherman Lewis School of Agriculture and Applied Sciences, Langston University, Langston, OK 73050. 2 School of Arts and Sciences, Langston University, Langston, OK 73050.

Using results from an initial survey of 108 participants conducted under the NHWQL subaward initiative, this project involved designing and implementing a web-based platform to support nutrition education. Informatics and human–computer interaction principles were applied to translate participant-identified nutrition education needs into a functional and user-friendly digital tool. The system architecture was developed using HTML, CSS, and JavaScript frameworks to produce a mobile-friendly interface optimized for accessibility and ease of use without requiring user login credentials. The platform integrates an application programming interface (API) that enables dynamic presentation of recipes, nutrition information, and video demonstrations aligned with user-defined priorities such as affordability, familiarity with foods, and simplicity of language. Following internal testing, educational content developed by a team of nutrition experts was incorporated into the system, resulting in a fully operational educational resource. Usability evaluations conducted with participant users demonstrated strong performance in navigation, clarity, and perceived usefulness. This project demonstrates how engineering and computing students can apply data-driven design approaches to develop practical nutrition communication technologies that improve access to nutrition education resources and support informed dietary decision-making.

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Integrating Gardening and Lifestyle Education to Promote Student Competence in Nutrition, Physical Activity, and Sleep. N. Onyeani Bosio*, P. Dunyo, K. Ofori-Panyin, R. Agbolegbe, M. Udodirim Guimaraes, L. Amo Gyau, O. Akwaa Harrison, and J. Antwi, CAFNR Research, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446.

The Pathways to Early Childhood Obesity Prevention (PECOP) Fellowship program was designed to equip students with applied knowledge in community nutrition and early-life health promotion. Eight fellows completed an eight-week summer training that combined lessons on nutrition, physical activity, sleep, and gardening with outreach to mother-child dyads in the community. Pre- and post-program assessments measured learning outcomes in nutrition, lifestyle behaviors, and gardening skills. Participants demonstrated clear knowledge gains in nutrition, physical activity, and sleep concepts, including improved understanding of balanced diets, daily movement, and rest as determinants of child health. Self-reported evaluations also indicated significant increases in gardening proficiency across ten domains, from seed acquisition and planting to harvesting and post-harvest handling. Notably, students reported heightened confidence and appreciation for the link between food production and nutrition education. This experiential fellowship effectively enhanced both scientific and practical competencies relevant to obesity prevention. By integrating classroom learning with hands-on community engagement, the program cultivated student readiness for leadership in nutrition, sustainable food systems, and public health practice.

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Enhancing Student Knowledge in Gut Microbiome and Machine Learning through the Pathways to Early Childhood Obesity Prevention (PECOP) Fellowship. M. Udodirim Guimaraes*, N. Onyeani Bosio, P. Dunyo, K. Ofori-Panyin, R. Agbolegbe, L. Amo Gyau, O. Akwaa Harrison, and J. Antwi, CAFNR Research, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446.

The Pathways to Early Childhood Obesity Prevention (PECOP) Fellowship program aimed to strengthen students' interdisciplinary knowledge in childhood nutrition, science, and community health. Eight undergraduate fellows participated in an eight-week experiential learning program that integrated research, education, and outreach on early childhood obesity prevention. Educational modules covered the gut microbiome, machine learning, nutrition, and behavioral health topics. Pre- and post-program assessments were used to evaluate students' knowledge gains in gut microbiome and machine learning. Overall, participants demonstrated marked improvement in understanding microbial function, host interactions, and applications of computational tools in nutrition and health. Knowledge scores in gut microbiome concepts showed consistent increases across participants, indicating strong comprehension and retention of key material. Improvements in machine learning knowledge were more variable but reflected growing familiarity with algorithmic principles, data interpretation, and model use for health-related applications. These findings suggest that experiential, interdisciplinary training combining biological sciences and computational learning effectively enhances foundational knowledge among undergraduate students. Incorporating both laboratory and applied data analysis exposure within community-based research can strengthen student preparedness for emerging careers in health sciences and data-driven public health.

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Associations of Supplement Use, Exercise, and Nutrition Knowledge with Abdominal Obesity among Southern University Participants and Surrounding Areas. G. York*, Department of Human Sciences, College of Agricultural, Human and Environmental Sciences, Southern University and A&M College, Baton Rouge, LA 70813; G. Rodriguez, Southern University Agricultural Research and Extension Center, Baton Rouge, LA 70813; M. Johnson, Department of Human Sciences, College of Agricultural, Human and Environmental Sciences, Southern University and A&M College, Baton Rouge, LA 70813; F. Malekian, Southern University Agricultural Research and Extension Center, Baton Rouge, LA 70813.

Despite the widespread consumption of dietary supplements, their relationship with abdominal obesity and health behaviors remains inadequately understood. This study examined associations among nutritional supplement use, waist circumference, exercise frequency, and nutrition knowledge in a diverse sample of Southern University employees, students, and community members. Participants completed surveys assessing nutritional and workout supplement consumption, exercise habits, and nutrition knowledge, while waist circumference was measured using standardized protocols. Results revealed notable sex-based differences. Among females, waist circumference showed a significant positive correlation with nutritional supplement use and a negative correlation with exercise frequency, suggesting that regular physical activity was associated with reduced abdominal fat. Nutritional supplement use exhibited no meaningful relationships with either nutrition knowledge or exercise frequency. Among males, most correlations were weak and non-significant, although a statistically significant but negligible association was found between waist circumference and workout supplement use. Overall, exercise frequency emerged as a stronger predictor of abdominal obesity than both supplement use and nutrition knowledge. These findings challenge assumptions that nutritional and workout supplements promote healthier lifestyle patterns or contribute meaningfully to abdominal fat reduction. The results suggest that public health interventions prioritizing regular physical activity may yield greater benefits for reducing abdominal obesity and improving metabolic health than strategies emphasizing nutritional supplementation alone. This research underscores the importance of evidence-based approaches to obesity prevention that focus on behavioral modifications, particularly increased physical activity, rather than reliance on dietary supplements.

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How Long Can Inoculated *Escherichia coli* in Cow Manure Persist in a Strawberry Field Soil? C. Dixon*, M. Kim, P. Ampim, and J. Barouei, Cooperative Agricultural Research Center, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446.

The use of Biological Soil Amendments of Animal Origin (BSAAO), such as raw animal manure, provides a low-cost alternative to synthetic fertilizers for improving soil fertility and quality. However, applying raw or insufficiently treated manure can introduce human pathogens to crops. The objective of this study was to observe the persistence of rifampin-resistant *Escherichia coli* (*rE. coli*), a surrogate for *E. coli* O157:H7, in cow manure-amended soil used for strawberry production. Soil amended with composted cow manure was inoculated with r*E. coli* at 8.60 log CFU/g in triplicate. Soil samples were collected every four weeks for 24 weeks for r*E. coli* enumeration. Data were analyzed using ANOVA followed by Tukey's post hoc test to determine significant differences ($P < 0.05$) among sampling weeks. The initial average population of r*E. coli* (8.60 log CFU/g) declined steadily, reaching the detection limit by week 24. The population decline plateaued after week 5, with no significant differences ($P > 0.05$) among weeks 5, 8, and 12. By week 24, the r*E. coli* population had decreased by approximately 7 log CFU/g from the initial level, representing a significant reduction ($P < 0.05$) compared with earlier sampling points. Our results indicate that r*E. coli* can persist in strawberry field soil for up to six months, exceeding the USDA-recommended 90-120 day interval between raw manure application and harvest. These results show the potential microbial risks associated with direct manure use and can be used as a database for studies aiming to improve food safety.

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Marigold-Mediated Silver Nanoparticles: Unveiling the Role of Size and Source in Enhancing Antimicrobial, Antioxidant, and Antidiabetic Activities. A.R. Gary*, A. Geremew, E. Peace, L. Carson, CAFNR Research, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446.

The increasing prevalence of microbial resistance, oxidative stress-related disorders, and diabetes has intensified the search for novel, eco-friendly therapeutic agents. Nanotechnology, particularly the use of silver nanoparticles (AgNPs), has emerged as a promising approach due to their broad-spectrum biological activities. Green synthesis of AgNPs using plant extracts offers a sustainable alternative to conventional chemical methods, leveraging phytochemicals for reduction and stabilization. *Tagetes erecta* (marigold), a medicinal plant rich in flavonoids, terpenoids, and phenolic compounds, presents a valuable source for nanoparticle synthesis. However, the influence of plant part (leaf vs. flower) and nanoparticle size on biological efficacy remains underexplored. This study aims to synthesize two different sizes of AgNPs from marigold leaves and flowers and evaluate their antimicrobial, antioxidant, and antidiabetic activities, thereby unveiling the role of size and botanical source in enhancing therapeutic potential. The biosynthesized AgNPs were characterized using UV-Vis spectroscopy, dynamic light scattering (DLS), and electron microscopy to determine their size, morphology, and stability. The biological activities of the nanoparticles were evaluated through antimicrobial assays against selected bacterial strains, antioxidant activity using DPPH radical scavenging method, and antidiabetic potential via α-amylase inhibition assay. Comparative analysis revealed that both the source (leaf vs. flower) and particle size significantly influenced the biological efficacy of AgNPs. Smaller-sized nanoparticles generally exhibited enhanced antimicrobial and antioxidant activities, while flower-derived AgNPs showed promising antidiabetic effects. These findings suggest that marigold-mediated AgNPs hold potential as multifunctional agents in biomedical applications, with their activity modulated by both plant part and nanoparticle size.

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Multifunctional Nanocarrier Systems for Streptomycin: Integrated Antimicrobial, Antioxidant, and Antidiabetic Therapeutics, A.S. S. Hardy*, A. Geremew, E. Peace, and L. Carson, CAFNR Research, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446.

The growing challenge of antibiotic-resistant foodborne pathogens has significantly reduced the efficacy of conventional antibiotics such as streptomycin, necessitating innovative solutions to safeguard public health and food safety. This study investigates the development of multifunctional nanocarrier systems designed to enhance the therapeutic potential of streptomycin by leveraging nanotechnology-based delivery approaches. Silver nanoparticles (AgNPs) were biosynthesized using white mushroom stem extract and subsequently complexed with streptomycin (AgNPs-SM) via controlled low-temperature stirring, optimizing antibiotic loading and stability. Comprehensive physicochemical characterization including UV-Vis spectroscopy, dynamic light scattering (DLS), FT-IR spectroscopy, energy-dispersive X-ray analysis (EDX), and X-ray diffraction (XRD), confirmed the formation of spherical nanoparticles averaging 62.5 nm for AgNPs and 84.5 nm for AgNPs-SM. FTIR analysis revealed distinct

functional groups contributing to nanoparticle formation and drug loading. The AgNPs-SM complex demonstrated superior antimicrobial efficacy against foodborne pathogen strains of *Staphylococcus aureus*, *Listeria monocytogenes*, *Salmonella typhimurium*, and *Escherichia coli*, outperforming both free antibiotics and AgNPs alone. Additionally, the nanocomplex exhibited remarkable antioxidant activity, with DPPH scavenging rates of 96.5 ± 1.5% and α-amylase inhibition of 84.5 ± 1.8% at 400 µg/mL, highlighting its potential antidiabetic properties. These findings underscore the synergistic benefits of integrating streptomycin with AgNP-based nanocarriers, offering a promising strategy for overcoming antimicrobial resistance while also providing antioxidant and antidiabetic therapeutic effects. This approach paves the way for advanced interventions in food safety and multidimensional disease management.

Student Poster Presentation – Graduate Competition

Food Safety, Nutrition and Health

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Distribution and Abundance of Pathogenic *Vibrio parahaemolyticus* in Farmed and Wild Oysters in the Chesapeake Bay. A. Riley*, S. Parveen, M. Snow, K. Williams, Department of Agriculture, Food and Resource Sciences, University of Maryland Eastern Shore, Princess Anne, MD 21853; J. Bowers, US Food and Drug Administration, College Park, MD 20742. L. Silva, Wellesley College, Wellesley, MA 02481. J. Jacobs, A. Ellett, NOAA Oxford Lab, MD 21654.

Vibrio parahaemolyticus (Vp) is a naturally occurring marine bacterium of public concern that can cause gastroenteritis in humans from consuming contaminated seafood, such as oysters. Oysters, as filter feeders, bioaccumulate *Vp*; environmental factors, such as temperature, salinity, and aquaculture practices, influence its abundance. However, there is limited data on the prevalence of pathogenic *Vp* in oysters produced under different aquaculture practices in the Chesapeake Bay. This study aimed to address this gap. From April to October 2024, ten oysters and one liter of water were collected at three sites representing farmed and wild aquaculture practices. Samples were analyzed for total (*tlh*$^+$) and pathogenic (*tdh*$^+$ and *trh*$^+$) *V. parahaemolyticus* using the MPN-qPCR method. Environmental parameters such as salinity, temperature, turbidity, etc., were also recorded. The *tlh*$^+$ gene was detected in 87% of oysters log MPN/g/mL: –0.45 to 5.41 and 94% of water samples –2.44 to 2.36. Pathogenic genes (*tdh*$^+$ and *trh*$^+$) were higher in water at 43% and 59% than in oysters at 33% and 48%. In farmed oysters, *tlh*$^+$, *tdh*$^+$, and *trh*$^+$ were detected in 86%, 31%, and 43% of samples, with corresponding water rates of 92.5%, 45%, and 62%. Wild oysters showed higher detection rates *tlh*$^+$: 90%; *tdh*$^+$: 33%; *trh*$^+$:48% and 95%, 38%, and 52% for water. No significant differences were observed among the different aquaculture practices, while temperature and salinity were strongly correlated with *Vp* levels. These results provide insight into the distribution of pathogenic *Vibrio parahaemolyticus* in the Chesapeake Bay, supporting evidence-based seafood safety.

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Baseline Assessment of Water Quality and Leafy Green Performance in Aquaponics for Microbial Safety Evaluation. B. Oninku*, One Health Lab, College of Agriculture, Science, and Technology, Delaware State University, Dover, DE 19901; F.M. Hashem, Department of Agriculture, Food and Resource Sciences, University of Maryland Eastern Shore, Princess Anne, MD 21853; C. Acheamfour, G. Ozbay, One Health Lab, College of Agriculture, Science, and Technology, Delaware State University, Dover, DE 19901

Aquaponics integrate aquaculture and hydroponics into a sustainable, closed-loop system in which fish waste supplies nutrients for plant growth while plants help maintain water quality. This approach offers a promising solution to food security by promoting efficient resource use. However, ensuring the microbial safety of aquaponics-grown produce remains a key challenge. This study established baseline data on water quality dynamics and crop growth performance within a shipping-container aquaponics system cultivating tilapia with Swiss chard, lettuce, and basil. Over nine weeks, daily water quality parameters including temperature (20–31 °C), dissolved oxygen (6.95–9.31 mg/L), salinity (0.12–0.30 ppt), and pH (6.34–7.54) were monitored. Weekly spectrophotometric analyses measured ammonia (0.02–0.44 mg/L), nitrite (0.01–0.515 mg/L), nitrate (2.9–29.0 mg/L), and iron (0.02–1.01 mg/L). Results indicated that water quality remained within optimal ranges for tilapia survival. Nutrient cycling showed increased nitrate levels, while ammonia and nitrite concentrations remained low. Among crops, Swiss chard demonstrated the most vigorous growth, lettuce showed moderate development with slight browning, and basil exhibited comparatively weaker

performance. These findings provide essential preliminary data on system stability, nutrient dynamics, and plant response in aquaponics environments. The outcomes will support ongoing research on microbial safety, risk assessment, and improved management strategies for sustainable aquaponics production.

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Genomic Insights from Whole-Genome Sequencing of Multidrug-Resistant Specific Spoilage Organisms: Implications for Antimicrobial Resistance and Aquatic Food Quality. C. Cannon*, Integrative Agricultural, Food and Environmental Sciences Program, College of Agriculture, Science and Technology, Delaware State University; Dover, DE 19901; J. L. Lee, DNA and Data Science Core; Food Science and Biotechnology Program, College of Agriculture, Science and Technology, Delaware State University; Dover, DE 19901

The escalating prevalence of antimicrobial resistance (AMR) in aquaculture systems, particularly concerning fish spoilage and the emergence of multidrug-resistant specific spoilage organisms (MDR-SSOs), poses a significant threat to global food security and public health. This challenge is exacerbated by the intensive use of antibiotics in aquaculture, which can drive the selection and dissemination of those AMR determinants through HGT within microbial communities. The United States catfish industry, a major sector of freshwater aquaculture, is particularly vulnerable to the challenges posed by AMR, with inadequate antibiotic stewardship contributing to economic losses and the spread of MDR-SSOs. This study, therefore, aims to elucidate the genomic architecture of MDR isolates from catfish aquaculture through high-throughput whole-genome sequencing and integrative bioinformatic analyses, with a focus on investigating antimicrobial resistance and virulence factors associated with the MDR-SSOs. This genomic framework facilitates a deeper understanding of the genetic determinants influencing resistance phenotypes and pathogenicity, offering crucial insights for enhanced AMR mitigation strategies.

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Sodium Butyrate Enhances 5-Fluorouracil Cytotoxicity by Reversing Senescence and Promoting Apoptosis in Colorectal Cancer Cells. I. Mayo*, Department of Agriculture, Alcorn State University, Lorman, MS 39096; S. Bhattacarya, Department of Biomedical Sciences, Texas A & M University, College Station, TX 77840; J. Bonds, Department of Biological Sciences, Alcorn State University, Lorman, MS 39096; D. Roy, Department of Biological Sciences, Alcorn State University, Lorman, MS 39096

Colorectal cancer (CRC) remains a major public health concern, with increasing incidence in younger adults and challenges posed by treatment failure and recurrence due to therapy-resistant, senescent cell populations. Short-chain fatty acids (SCFAs), like microbially derived butyrate, exhibit anti-tumorigenic properties. Sodium butyrate (NaB), a functional analog, acts as an epigenetic regulator with the potential to influence therapeutic response. This study investigated the effects of NaB and the standard chemotherapy agent, 5-fluorouracil (5-FU), on human CRC HCT116 cells. Our preliminary findings indicate that, 1) NaB inhibits cancer cell growth and triggers apoptosis in HCT116 cells; 2) Co-treatment with NaB and 5-FU produced enhanced cytotoxicity compared to 5-FU alone, demonstrating that NaB sensitizes HCT116 cells to 5-FU; 3) NaB also reverses 5-FU-induced senescence, shown by a marked reduction in canonical senescence markers when both agents were used together. Senescent cells can contribute to chemoresistance and tumor relapse. We conclude that NaB can enhance the chemosensitivity of 5-FU in CRC cells while reducing the 5-FU-mediated senescence that is critical to tumor survival and recurrence. NaB may prolong the benefit of 5-FU by decreasing the pool of surviving senescent cells after chemotherapy. The data supports further investigation of NaB as a chemopreventive adjuvant to enhance the effectiveness of standard chemotherapy.

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TRPV1-Independent and Sex-Specific Behavioral Neurotranscriptomic Basis of Capsaicin Sensation in Drosophila. **G. Flores-Iga*, M. Amirthalingam, P. Kayastha, R. Saha, C. Lopez-Ortiz, and U. K. Reddy, Gus R. Douglass Institute, West Virginia State University, Institute, WV, USA**

Capsaicin, the principal phytochemical responsible for chili pepper pungency, elicits distinct sensory and behavioral responses across species. While the transient receptor potential vanilloid subtype 1 (TRPV1) mediates capsaicin detection in mammals, Drosophila melanogaster lacks this receptor, offering a model to explore TRPV1-independent chemosensory signaling. Here, we show that gustatory Gr64f^{+} neurons initiate capsaicin perception and subsequent

feeding habituation, a sensory-driven adaptation independent of metabolic cues. Single-nucleus RNA-seq analysis of fly brains revealed sex-specific neurotranscriptomic signatures: females exhibited dopaminergic activation with enrichment in synaptic, TGF-β, and AstA signaling pathways within memory centers, whereas males displayed FOXO-associated regulation alongside WNT, NPF, and Dh31 signaling, driving rapid desensitization and energetic adjustment. Dsk mutants failed to habituate to capsaicin, highlighting a neuroendocrine link between gustatory signaling and insulin-producing cells. Gut transcriptomic and microbiome analyses further demonstrated that capsaicin modulates mating behavior, suggesting dual central and peripheral effects. Collectively, these results establish Drosophila as a model for dissecting TRPV1-independent capsaicin sensing and reveal sex-specific neural and molecular circuits underlying chemosensory adaptation.

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Peppers in Diet: Genome-Wide Transcriptome and Metabolome Changes in *Drosophila melanogaster.* A. Wong*, J. I. Flores, C. Lopez-Ortiz, R. Saha, P. Nimmakayala, and U. K. Reddy, Gus R. Douglass Institute and Department of Biology, West Virginia State University, Institute, WV, USA.

The habanero pepper (*Capsicum chinense*) is an increasingly important spice and vegetable crop worldwide because of its high capsaicin content and pungent flavor. Diets supplemented with the phytochemicals found in habanero peppers might cause shifts in an organism's metabolism and gene expression. Thus, understanding how these interactions occur can reveal the potential health effects associated with such changes. We performed transcriptomic and metabolomic analyses of *Drosophila melanogaster* adult flies reared on a habanero pepper diet. We found 539 genes/59 metabolites that were differentially expressed/accumulated in flies fed a pepper versus control diet. Transcriptome results indicated that olfactory sensitivity and behavioral responses to the pepper diet were mediated by olfactory and nutrient-related genes including gustatory receptors (*Gr63a, Gr66a, and Gr89a*), odorant receptors (*Or23a, Or59a, Or82a, and Orco*), and odorant-binding proteins (*Obp28a, Obp83a, Obp83b, Obp93a, and Obp99a*). Metabolome analysis revealed that campesterol, sitosterol, and sucrose were highly upregulated and azelaic acid, ethyl phosphoric acid, and citric acid were the major metabolites downregulated in response to the habanero pepper diet. Further investigation by integration analysis between transcriptome and metabolome data at gene pathway levels revealed six unique enriched pathways, including phenylalanine metabolism; insect hormone biosynthesis; pyrimidine metabolism; glyoxylate, and dicarboxylate metabolism; glycine, serine, threonine metabolism; and glycerolipid metabolism. In view of the transcriptome and metabolome findings, our comprehensive analysis of the response to a pepper diet in *Drosophila* have implications for exploring the molecular mechanism of pepper consumption.

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Improving Sweetpotato Starch Isolation Through Optimized Drying Parameters V. NGABONZIMA1*, P. Gichuhi1, K. Kpomblekou-A, A.C. Bovell-Benjamin,1* Department of Food and Nutritional Sciences (FNS), College of Agriculture, Environment and Nutrition Sciences (CAENS), Tuskegee University, Tuskegee, AL 36088 .

Sweetpotato (Ipomoea batatas [L.] Lam) serves as a major global source of starch with diverse food and industrial applications. The physicochemical attributes of isolated starch are significantly influenced by post-harvest processing, particularly drying temperature and time. This study optimized the drying temperature and time of a previously developed sweetpotato starch for target moisture levels critical to starch functionality and shelf life during storage. Sweetpotatoes were washed, peeled, shredded, and homogenized in a 1:2 ratio (sweetpotato: distilled water). The homogenized slurry was centrifuged at 3,000 rpm for 20 minutes. Centrifugation was followed by three sequential washes at 15, 15, and 20 minutes respectively. The starch precipitates were re-slurried in a 1:2 ratio and the centrifugation process was repeated followed by three washes. Starch precipitates (200 g per tray) were dried at five condition sets (70°C/12 h, 45°C/12 h, 45°C/6 h, 70°C/6 h, and 45°C/4.5 h). Samples were withdrawn at one-hour and fifteen-minute intervals and moisture loss kinetics evaluated. Initial starch moisture content ranged from 71.2% to 81.6%. Final moisture contents of the starch varied between 5.1% and 47.6%. Drying at 45°C for 4 to 4.5 hours consistently produced starch with 8.0 to 15.0% residual moisture. The final moisture contents achieved were optimal for functionality and shelf stability of commercial starches. These findings support the standardization of drying parameters in starch processing and highlight the importance of precise thermal control to enhance product quality.

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The Effects of Extracts from *Liriodendron tulipifera* Against Foodborne Pathogens. R. Oke*, M. Afolabi, Department of Biological Sciences, Alabama A&M University, Normal, AL 35762, Z. Xiao, Department of Electrical Engineering and Computer Science, Alabama A&M University, Normal, AL 35762, Q. Yuan, Department of Biological Sciences, Alabama A&M University, Normal, AL 35762.

Medicinal plant extracts have shown antibacterial activity against various bacterial species. This study examined the antibacterial effects of extracts from *L. tulipifera* leaves against foodborne bacteria and explored their potential as natural food preservatives. The methanolic leaf extract of *L. tulipifera* was sequentially partitioned into hexane, chloroform, ethyl acetate, and butanol fractions, and each fraction was assessed for antibacterial activity against multiple foodborne pathogens. Our preliminary findings showed that the chloroform fraction had an inhibitory effect on *L. monocytogenes*, *S. aureus*, *E. coli*, *S. enterica*, and *V. parahaemolyticus*. Notably, *S. aureus*, *E. coli*, and *V. parahaemolyticus* are strains that are resistant to antibiotics. The chloroform fraction displayed the strongest inhibition on the growth of *V. parahaemolyticus* by reducing growth 70% at 0.025 μg/μL and exhibited a minimum bactericidal concentration of 1.5 μg/μL. It inhibited *S. aureus* by approximately 10^5 fold at 1.5 μg/μL and suppressed *E. coli* by 44 % and 85 % at 1 and 2 μg/μL, respectively. GC/MS and antioxidant assays revealed a high level of bioactive antioxidants in this fraction. The observed antimicrobial activity may be attributed to mechanisms involving membrane damage and efflux pump inhibition. These findings suggest that the chloroform fraction of *L. tulipifera* leaves has the potential as a natural food preservative, enhancing food safety and extending shelf life.

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Cyanidin 3-Glucoside Modulates Lipid Raft-Dependent Inflammatory and Proteostatic Signaling Following ECVC Exposure. A. Amoliga*, D. Mutyala, M. Thakur, R. Kondati, G. Dupree, S. Batra, Laboratory of Pulmonary Immunotoxicology, Department of Environmental Toxicology, College of Agricultural, Human and Environmental Sciences, Southern University and A&M College, Baton Rouge, LA 70813; M. Contin Ortega, Southern University Agricultural Research & Extension Center, Baton Rouge, LA 70813; P. Kim, Department of Biology, Grambling State University, Grambling, LA 71270.

Lipid rafts are dynamic membrane microdomains enriched in cholesterol and sphingolipids that organize key signaling and proteostatic proteins. Disruption of raft integrity alters mitogen-activated protein kinase (MAPK) signaling and proteasomal activity, driving inflammation and oxidative stress. We observed that e-cigarette vapor condensate (ECVC) exposure disrupts lipid raft-associated MAPK and proteasomal pathways, and that anthocyanins counteract these effects. ECVC markedly induced MAPK signaling, as evidenced by increased transcription of p38, JNK, and ERK1/2, alongside elevated expression of 20S core and 19S regulatory proteasome subunits and immunoproteasome components (LMP2, MECL-1, LMP7) in A549 cells. Concurrently, ECVC upregulated Caveolin-1 and -2, and Flotillin-1 and -2, reflecting altered lipid raft composition and clustering. These results indicate that disruption of lipid raft integrity underlies ECVC-induced activation of MAPK and proteasomal pathways. Pre-treatment with cyanidin 3-glucoside, the principal anthocyanin tested and a naturally occurring pigment abundant in colorful fruits and vegetables, attenuated ECVC-induced MAPK activation, reduced proteasomal and immunoproteasomal subunit expression, and restored lipid raft homeostasis by normalizing raft-associated proteins. Collectively, cyanidin 3-glucoside stabilized lipid raft architecture, suppressed MAPK hyperactivation, and re-established proteostatic balance, underscoring its potential as a potent nutraceutical mitigator of ECVC-induced inflammation and oxidative stress.

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Microbial Characterization of Skin-on and Skinned Goat Meat. D. Mugabo*, A. Appiah Darkwah, J.J. Quinlan and T.N. Tolen. Food Security Research Center, CAFNR Research, College of Food, Agriculture and Natural Resources, Prairie View A&M University, Prairie View, TX 77446, USA.

E. coli O157:H7, a Shiga-toxin-producing strain of *E. coli* (STEC), is a foodborne pathogen of concern in the United States. *E. coli* bacteria reside in guts of live goats and can contaminate goat carcasses when shed in feces. This study aims to assess the presence of bacteria and the survival rates of *E. coli* O157:H7 on the surface of skinned and skin-on goat meat under various storage conditions and decontamination treatments. For the baseline, skinned and skin-on goat meat samples will be collected from stores around Houston, Texas, and enumerated for bacteria (both commensal and pathogenic) to assess their microbial profiles. For shelf-life study, skinned (48) and skin-on (48) goat meat samples will be collected from goat carcasses. Half of the samples will be randomly inoculated with a suspension of *E. coli*

O157:H7, and half will serve as controls. All samples will be stored under refrigeration at 4 °C and will be enumerated for *E. coli* O157:H7 on days 0, 4, 7, and 11. For the decontamination study, skin-on (24) and skinned (24) goat meat samples will be inoculated with *E. coli* O157:H7. Samples will then be randomly assigned to four treatments (water, 2% lactic acid, bacteriophage solution, and no treatment). Survival of *E. coli* O157:H7 will then be enumerated. All experiments will be replicated three times. Data collection is scheduled to begin in mid-October. We expect to have all results for the shelf-life study, as well as preliminary results for antimicrobial treatment by March 2026.

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Theoretical Mapping of Community Wellness Programming: A Study in Partnership with PVAMU Wellness in Houston. A. Williams*, J. Robinson, CAFNR Research, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446

Community wellness programs are essential for helping people build healthier lifestyles through education, outreach, and support. This project, completed in partnership with Extension: PVAMU Wellness in Houston, examined how their programs aligned with two health behavior frameworks: the Social Ecological Model (SEM) and the Social Cognitive Theory (SCT). The SEM focuses on how individual, social, and environmental factors influence health, while the SCT emphasizes confidence, learning, and motivation for behavior change. Cross-sectional surveys were distributed to PVAMU Wellness in Houston Extension program agents, who used structured checklists to identify how their activities fit within SEM and SCT constructs. Each program was categorized by SEM levels, including individual, interpersonal, organizational, community, and policy. Programs were also mapped to SCT constructs such as self-efficacy, observational learning, reinforcement, behavioral capacity, goal setting, outcome expectations, and social support. Descriptive statistics were used to summarize how activities were distributed across both models. Results demonstrated that programs primarily targeted individual and community levels, emphasizing direct behavior change and local engagement, with limited focus on organizational and policy strategies. Expanding efforts at these higher levels could enhance sustainability and systemic impact. Consistent application of behavioral capacity, observational learning, and self-regulation indicates strong grounding in behavior change principles, though greater emphasis on self-efficacy and social support may further strengthen and maintain long-term outcomes.

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A Biopolymer-Based Indicator Film for Food Packaging in Visually Monitoring Food Freshness. M. Wells*, Department of Agriculture, Alcorn State University, Lorman, MS 39096; A. Sobhan, Department of Agriculture, Alcorn State University, Lorman, MS 39096; L. Wei, Department of Agricultural & Biosystems Engineering, South Dakota State University, Brookings, SD 57007.

Food safety is a worldwide public concern that has recently gained increased attention due to the emerging outbreaks of foodborne diseases. Therefore, there is a pressing need to make simple, cost-effective, and environmentally friendly methods for packaged foods to food their freshness and spoilage in real time. The aim of this study is to develop a biodegradable indicator film for food packaging combining with cellulose-nanofiber/chitosan dyed with methyl red synthesis (CCM) as a pH indicator film and followed by a single layer coating of polylactic acid (PLA) on its surface, named PLA/CCM film. The microstructural properties of PLA/CCM films were studied using scanning electron microscopy (SEM) and results showed that PLA effectively adhered to the surface of CCM film. The microbial response to PLA/CCM film was determined via a bacterial plating method. It was found that the contact of film with the microbes caused a substantial color change in the film. The coating of PLA upon the CCM film decreased the percentage of the water vapor transmission rate (WVTR). The color of the film vividly altered from slightly red to yellow in response to a pH change in the range of 4–8. The PLA/CCM film was applied to monitor the spoilage of beef and fish at room temperature (23 °C) and revealed the onset of food spoilage by displaying the color change from red to yellow after 1 day. The total viable counts (TVC) of microorganisms and pH of the tested beef sample were determined.

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Potential Anti-Obesity Effects of Ochlocknee Rabbiteye Blueberry by Ameliorating Blucose Uptake and Attenuating Fatty Acid Synthesis in Insulin-Resistant HEPG2 Cells. S. Jones*, Agricultural Research Station,

Virginia State University, Petersburg, VA 23806, and H. Li, Agricultural Research Station, Virginia State University, Petersburg, VA 23806

The global prevalence of obesity has been steadily rising, posing serious threats to public health and placing a significant burden on society. Obesity and type 2 diabetes are closely linked metabolic disorders that represent major health challenges worldwide. The onset and progression of type 2 diabetes are strongly associated with overweight and obesity. In the early stages of the disease, insulin secretion is elevated; however, over time, target cells become less responsive to insulin, leading to insulin resistance and hyperinsulinemia. Blueberries (Vaccinium corymbosum), members of the Ericaceae family, are well known for their pleasant flavor and exceptional health-promoting properties, exhibited potential to regulate glucose and lipids homeostasis. In this study, northern highbush, southern highbush, and rabbiteye blueberry varieties were evaluated for their total phenolic content (TPC), total anthocyanin content, and antioxidant capacities. Among these, the Ochlocknee rabbiteye blueberry demonstrated the highest phenolic, anthocyanin, and antioxidant levels. To investigate its metabolic effects, we examined the molecular mechanisms of Ochlocknee rabbiteye blueberry extract using an insulin-resistant HepG2 hepatic cell model induced by high glucose and dexamethasone (DXMS). The extract significantly enhanced glucose uptake, inhibited α-glucosidase activity, and reduced fatty acid synthesis, indicating its potential to regulate glucose and lipid metabolism. Mechanistically, Ochlocknee blueberry extract downregulated the expression of long-chain and medium-chain acyl-CoA synthetases (ACSLs), thereby suppressing lipogenesis. A future study using a high-fat diet–induced obesity and diabetes mouse model will further validate these effects and elucidate the pathways through which Ochlocknee rabbiteye blueberry exerts its anti-obesity and anti-diabetic benefits.

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Microbial Evaluation of Salmonella-Inoculated Fresh Meat Utilizing Advanced Imaging Technologies K. Davis* and C. Harris, Department of Agricultural and Environmental Sciences, Tuskegee University, Tuskegee, AL 36088.

The objective of this study is to evaluate microbial contamination in inoculated fresh meat using advanced imaging technologies to enhance food safety and preservation methods. Fresh meat samples are inoculated with Salmonella spp. and analyzed using a fluorescence spectroscopy system to monitor cell activity and morphology. Fluorescence imaging is employed to assess microbial growth behavior, while advanced visualization tools are used to examine cell morphology in ground meat. Preliminary results indicate that cell morphology remains intact under the conditions tested, suggesting stability in cellular structure despite microbial inoculation. This study highlights the importance of integrating advanced imaging systems into microbial analysis to achieve rapid, non-destructive, and real-time monitoring of contamination. The findings contribute to a better understanding of microbial behavior in meat products and support the development of innovative approaches to improve quality assurance and food safety practices. Ongoing work focuses on refining imaging parameters and expanding applications to diverse food products to improve detection accuracy and efficiency.

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Aptamer-Gold Nanoparticle Colorimetric Sensor for Rapid Detection of Aflatoxin B1 in Peanuts Mariam Dauda*, Divya Shrestha, and Hari Singh, Nanotechnology Laboratory, College of Agriculture, Family Sciences and Technology, Fort Valley State University, Fort Valley, GA 31030.

Aflatoxin B1 (AFB1), a toxic and carcinogenic secondary metabolite produced by *Aspergillus* species, remains a threat to major staples like peanuts, a key global staple crop which affect their production, consumption, trade and public health worldwide. Conventional detection methods such as chromatography and ELISA provide high sensitivity but are costly, labor-intensive, and not well-suited for rapid or field-based applications. To address these limitations, a nanotechnology-based biosensing strategy that exploits unique properties gold nanoparticles (AuNPs), in combination with an AFB1-specific aptamer and 3,3′,5,5 -tetramethylbenzidine (TMB) will be used to develop a colorimetric aptasensor. The sensor will leverage the peroxidase-like catalytic activity of AuNPs to oxidize 3,3′,5,5 -tetramethylbenzidine (TMB) in the presence of hydrogen peroxide (H_20_2), generating a distinct colorimetric response visible to the naked eye. Experimental conditions, including nanoparticle size, aptamer concentration, aptamer binding time to aflatoxin B1, pH of the assay, and incubation time, will be systematically optimized to maximize sensitivity, specificity and selectivity. The assay will be evaluated using known concentrations of AFB1 as well as contaminated peanut samples, and analytical performance parameters such as detection limit (LOD), linear range, and recovery rate

will be determined. This study aims to develop a simple, low-cost, and sensitive aptasensor for aflatoxin b1 detection while enabling rapid on-site detection of contamination in addressing a critical need for food safety, trade assurance, and public health protection.

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Smallholder Farmers' Management Strategies and Aflatoxin Risk in Sorghum and Pearl Millet Production in Northern Ghana. Z. Mahamuda*, Food Engineering Laboratory, College of Agriculture, Family Sciences, and Technology, Fort Valley State University, Fort Valley, GA 31030; R.A. Atuna, N. Opoku, F.K. Amagloh, Department of Food Science and Technology, University for Development Studies, Tamale, Ghana; and H.L. Degala, R. Gyawali, A.K. Mahapatra, Food Engineering Laboratory, College of Agriculture, Family Sciences, and Technology, Fort Valley State University, Fort Valley, GA 31030.

Aflatoxin intake in countries dependent on cereals, especially corn (*Zea mays*), remains a public health concern. In Ghana, corn is a staple in most dishes for all populations, but it has the highest risk of aflatoxin contamination among cereals. However, there are alternative indigenous cereals, including sorghum (*Sorghum bicolor*), that could be adapted to reduce dietary intake of this harmful mycotoxin. The attitudes and practices towards mold growth and aflatoxin contamination of sorghum and iron-rich millet in Northern Ghana were assessed. The study used a descriptive cross-sectional design, with 395 smallholder farmers randomly sampled from 15 districts across the Northern, Upper West, and Upper East Regions of Ghana. The findings revealed that just over half (56%) of the smallholder farmers were familiar with aflatoxins. However, about 83% of the participants were aware of the presence of fungi. Additionally, only 8.3% rated themselves as having high knowledge of the health effects of aflatoxin. Although about 66% of smallholder farmers regarded aflatoxin contamination as a significant health hazard, only 45% had altered their handling behavior, and just 32% had received training on aflatoxin management. The study recommends that agricultural extension services develop and execute targeted educational campaigns, specifically addressing the dangers of aflatoxin and effective prevention strategies.

795

Effects of Freeze-drying on Microbial Quality and Phytochemical Stability of Microgreens. A. Panthy*, Biotechnology Program, West Virginia State University, Institute, WV 25112; E. Tanner, Department of Chemistry, West Virginia State University, Institute, WV 25112; T. Ochoa Bernal, Agricultural and Environmental Research Station, West Virginia State University, Institute, WV 25112; Y. Jung, Agricultural and Environmental Research Station, West Virginia State University, Institute, WV 25112.

Microgreens, valued for their richness in bioactive compounds yet highly susceptible to microbial contamination and nutrient degradation due to their high moisture content and delicate tissues, require effective preservation strategies. This study evaluated the effects of freeze-drying and subsequent storage on microbial quality and phytochemical stability in borage, cabbage, and mustard microgreens. After harvesting the microgreens, a subset of samples was freeze-dried; fresh samples were stored at 7 °C for 7 days, while freeze-dried samples were stored at room temperature for 30 days to assess aerobic plate count, yeasts and molds, coliforms, total phenolic content (TPC), flavonoids, DPPH scavenging activity, vitamin C, chlorophyll, and carotenoids. Freeze-drying significantly reduced microbial loads ($p < 0.05$), achieving 1.5-3.2 log CFU/g reductions compared with fresh samples. Microbial levels in freeze-dried samples remained unchanged during the first 7 days ($p > 0.05$) across all microgreen types but showed significant reductions in coliforms and yeasts and molds in borage and mustard by Day 30 ($p < 0.05$). Freeze-drying did not significantly affect flavonoids, chlorophyll, or carotenoids compared with fresh samples, whereas vitamin C decreased in freeze-dried cabbage and mustard, and TPC decreased in freeze-dried borage ($p < 0.05$). During storage of freeze-dried microgreens, TPC, DPPH activity, and flavonoids showed significant declines after Day 15 ($p < 0.05$), while chlorophyll and carotenoids remained stable throughout 30 days. Overall, freeze-drying provided immediate microbial reduction and maintained several phytochemicals, demonstrating its potential as a postharvest method to preserve the quality of microgreens.

796

Exploring the Syndemic Relationship Between Food Insecurity, Sleep Quality, and Type 2 Diabetes in Rural Georgia. L. Felder, Fort Valley State University, Fort Valley, GA 31030

Type 2 diabetes (T2D) disproportionately affects rural and low-income communities in Georgia, where food insecurity and poor sleep quality are common. These conditions interact in what researchers describe as a syndemic—where multiple social and biological challenges overlap to worsen health disparities. Limited access to healthy foods, financial strain, and psychological stress can compromise both nutrition and sleep, exacerbating T2D management. This cross-sectional quantitative study focuses on adults in Southwest Georgia diagnosed with T2D. Data collection employs validated survey tools: the USDA Six-Item Food Security Survey Module and the Pittsburgh Sleep Quality Index (PSQI), along with demographic questionnaires. Surveys are administered electronically and on paper through community health organizations and clinics. Statistical analysis will use Pearson's correlation and multiple regression to examine associations between food insecurity and sleep quality. Emerging data suggest that individuals experiencing higher levels of food insecurity also report poorer sleep quality. These patterns indicate that stress from food scarcity not only disrupts dietary intake but also contributes to sleep disturbances, compounding the difficulty of managing blood glucose levels. Rural residents cite limited healthcare access, transportation barriers, and financial strain as contributing factors. This study highlights the syndemic relationship between food insecurity, poor sleep, and diabetes outcomes in rural Georgia. Addressing these interconnected issues through targeted public health interventions—such as food access programs, stress management supports, and rural healthcare resource expansion—can improve diabetes care and reduce inequities in underserved populations.

797

Vegetable Consumption Patterns Among Middle School Students in a Low-Income School Setting: Preliminary Findings from Ballard Hudson Middle School, Macon, Georgia. A. Lynch, Fort Valley State University, Fort Valley, GA 31030

Adolescent vegetable consumption remains below national dietary recommendations, particularly in low-income communities. School cafeterias represent critical access points for improving dietary quality and reducing disparities in nutrition-related health outcomes. This observational study was conducted at Ballard Hudson Middle School, a Community Eligibility Provision (CEP) school in Macon, Georgia. Data collection focused on the frequency and type of vegetables selected during school lunch periods, alongside cafeteria-related factors influencing selection behavior. No direct student interaction occurred, and all procedures adhered to Fort Valley State University IRB-approved ethical protocols. Early observations indicate that fewer than 30% of students selected a vegetable item with their lunch. Dark green vegetables were chosen significantly less often than starchy vegetables. Vegetable selection increased modestly when incorporated into mixed dishes compared to stand-alone servings. Factors such as food placement, presentation, and peer influence were noted as key determinants of choice. Findings suggest that environmental strategies in school cafeterias—such as strategic placement, improved presentation, and incorporating vegetables into popular entrée items—may enhance vegetable uptake among students in low-income school settings. These insights contribute to nutrition equity efforts and inform interventions that align with USDA school meal standards.

798

Exploring the Lifestyle Behaviors of College Students at Alabama A&M University. A. Knight*, E. Jones, Department of Family and Consumer Sciences, Alabama A&M University, Normal, Alabama, 35762.

Health-risk behaviors such as physical inactivity, poor diet, tobacco use, excessive alcohol consumption, and inadequate sleep significantly contribute to chronic diseases like heart disease, cancer, and diabetes—the leading causes of death in the U.S. The transition to college marks a formative period during which young adults establish lifestyle habits that can influence their long-term health outcomes. This study explored the association between physical and social activities and various health indicators among college students. A total of 314 students from Alabama A&M University completed a self-reported questionnaire assessing behaviors such as physical activity, social engagement, sedentary behavior, diet, tobacco use, weight perception, and sleep patterns. Key findings indicate that female students were significantly less physically active, and physical activity was positively associated with better-perceived health. There was an increased fruit intake, frequent breakfast consumption, and higher fruit juice intake. Students who perceived themselves as overweight were less likely to be physically active. Non-traditional students were less socially engaged, and higher GPA was correlated with lower social engagement. Additionally, better sleep quality, and more frequent napping were linked to higher physical activity levels, while increased fatigue

during the week was negatively associated. These findings highlight the importance of promoting physical and social engagement for healthier college lifestyles.

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Synergistic Effects of Oleogelators on the Functional Properties of Oleogels Structured Through Distinct Gelation Mechanisms. N. Mahmud*, M. J. Ferdaus, L. C. Aragon-Alegro, and R. C. da Silva, Department of Family and Consumer Sciences, North Carolina Agricultural and Technical State University, Greensboro, NC 27411.

Structuring unsaturated oils into oleogels offers a promising approach to reduce dependence on conventional solid fats; however, individual gelators such as candelilla wax (CDW), β-sitosterol/γ-oryzanol (BS/OR), and ethyl cellulose (EC) present limitations related to rigidity, storage stability, or processing temperature. Combining gelators that function through distinct structuring mechanisms may overcome these drawbacks and enhance performance. In this study, mono-, binary-, and ternary oleogels composed of EC, CDW, and BS/OR were developed using a Simplex Centroid Experimental Design at a fixed 10% (w/w) oleogelator concentration in canola oil to evaluate their physical, rheological, thermal, and oxidative properties. Results showed that, OBC and hardness followed similar trends, with EC-dominant systems showing the lowest values ($p < 0.05$), while CDW- and BS/OR-dominant formulations exhibited no significant differences ($p > 0.05$). Ternary oleogels demonstrated intermediate hardness and oil binding capacity, reflecting balanced structural strength and oil retention from synergistic interactions among gelators. Color analysis revealed that mono systems appeared lighter and more yellow, whereas ternary systems exhibited enhanced yellowness from the combined influence of multiple gelators. Rheological and thermal analyses indicated viscoelastic and phase-transition behaviors comparable to conventional solid fats, confirming favorable structural and thermal functionality. PV and TBARS analyses showed higher oxidation in EC-dominant systems, likely due to elevated processing temperatures, while CDW- and BS/OR-dominant oleogels exhibited greater oxidative stability ($p < 0.05$). Overall, ternary oleogels achieved balanced mechanical, structural, and oxidative stability, demonstrating their potential as healthier fat alternatives with potential to address limitations of mono- and binary systems.

800

Preliminary Evaluation of Association between Food Safety Stakeholders Insomnia and Food Safety Manager Test Scores in Kent County, Delaware. A. Roeper*, Department of Psychology, Delaware State University, Dover DE 19901; V. Truong, Department of Chemistry, Delaware State University, Dover DE 19808; A. Diaz-Martinez, Department of Chemistry and Department of Human Ecology, Delaware State University, Dover DE 19901; A. Armah, College of Agriculture Science and Technology, Delaware State University, Dover DE 19901; W. A. Lewis, Department of Human Ecology, Delaware State University, Dover DE 19901; J. A. Brownlow, Sleep Stress and Behavioral Neuroscience Program, Delaware State University, Dover DE 19901, and W. Long III, Department of Human Ecology, Delaware State University, Dover DE 19901.

Sleep quality plays a vital role in cognitive performance and occupational effectiveness. In professions such as food safety management, especially where attentiveness, decision-making, and regulatory compliance are essential, insomnia may directly affect certification outcomes and on-the-job performance. This study works to examine the relationship between insomnia severity and food safety manager certification test scores among food stakeholders in Kent County, Delaware. Currently, nine certified food safety managers ($n = 9$) completed the Insomnia Severity Index (ISI) and the Delaware Food Safety Certification Examination. Nonparametric correlation analyses were performed to evaluate associations between insomnia levels and exam performance. Results indicated a negative trend between ISI scores and test outcomes, suggesting that participants with higher insomnia severity tended to score lower on certification exams. Although this relationship did not reach statistical significance due to the small sample size, the findings align with existing research linking poor sleep to reduced cognitive functioning. These preliminary results underscore the importance of addressing sleep health as part of workforce wellness and training initiatives. Enhancing awareness of sleep's impact on cognitive performance and safety trends could strengthen both employee well-being and public health outcomes. This study will continue with larger and more diverse participant groups thus to further investigate these associations and inform targeted interventions within the food safety field.

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Assessing Bacterial Diversity in Irrigation Water Using Biolog Analysis: Evaluating Potential Food Safety Risks. A. Ompong*, Department of Human Ecology, Delaware State University, Dover DE 19901; C. Acheamfour Department of Biology, Delaware State University, Dover DE 19901; W. Long III, Department of Human Ecology, Delaware State University, Dover DE 19901.

Foodborne diseases remain a significant global public health challenge, with pathogens such as *Salmonella enterica*, Shiga toxin–producing *Escherichia coli* (STEC), *Listeria monocytogenes*, *Campylobacter spp*., norovirus, and hepatitis A among the leading causes of outbreaks. Irrigation water is increasingly recognized as a reservoir and transmission route for these pathogens, particularly in fresh produce systems. However, data on the microbiology of irrigation water in Delaware remains limited. This study characterized bacterial isolates recovered from irrigation water samples collected at four agricultural sites in Delaware using Biolog phenotypic microarray technology. Thirty (30) pure cultures of unknown bacteria were isolated through selective and differential plating and analyzed with Biolog GEN III MicroPlates to assess carbon source utilization and chemical sensitivity. Out of 30 Biolog-tested irrigation water isolates, comparison with the Biolog reference database yielded successful species-level identification for 19 isolates (63.3%), representing eight distinct species. The majority belonged to the Enterobacteriaceae family (94.7%), including *Klebsiella pneumoniae* (36.8%), *Enterobacter aerogenes* (21.1%), *Salmonella enterica* (15.8%), *Raoultella planticola*/ornithinolytica (15.8%), *Enterobacter cloacae* (10.5%), Citrobacter spp. (10.5%), *Klebsiella oxytoca* (5.3%), and Acinetobacter soli (5.3%). This study provides a snapshot of Delaware's irrigation water microbiology, highlighting the prevalence of Enterobacteriaceae and the presence of clinically significant foodborne pathogens, including *Salmonella enterica*. These findings underscore the crucial importance of monitoring irrigation water to safeguard produce and protect public health.

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Associations Between Workplace Stress Levels and Food Safety Assessment Outcomes in Kent County, Delaware. A. Armah*, College of Agriculture Science and Technology, Delaware State University, Dover DE 19901; A. Diaz-Martinez, Department of Chemistry and Department of Human Ecology, Delaware State University, Dover DE 19901; W. A. Lewis, Department of Human Ecology, Delaware State University, Dover DE 19901; A. Roeper, Psychology Department, Delaware State University, Dover DE; J.A. Brownlow, Sleep Stress and Behavioral Neuroscience Program, Delaware State University, Dover DE 19901; and W. Long III, Department of Human Ecology, Delaware State University, Dover DE 19901

Stress can influence concentration, decision-making, and adherence to safety protocols, all of which are critical in ensuring food safety. Elevated stress degrees among food industry stakeholders may interfere with compliance with hygiene and operational standards, potentially negatively affecting overall food safety performance. This study explored the relationship between workplace stress levels among food stakeholders (e.g. Nutritionists, Farmers, Cooks, Food Safety Specialists) and food safety manager test outcomes in Kent County, Delaware. Between May and November 2025, food stakeholders participated in the study. Participants used the Perceived Stress Scale (PSS-10) and a workplace stress inventory to complete validated stress assessments. Food safety outcomes were measured using the ServSafe® Manager Examination, a standardized assessment of food safety knowledge and practices. Statistical analyses were conducted to examine associations between stress levels and food safety performance. Preliminary findings suggest an inverse relationship between elevated stress and food safety assessment outcomes. Stakeholders reporting higher perceived or workplace stress tended to demonstrate lower performance on select food safety evaluations. These results indicate that occupational stress may influence food safety knowledge, compliance, and decision-making. Incorporating stress-reduction and well-being strategies into food safety training and workplace management may support improved performance and public health outcomes. Continued research with larger and more diverse groups is needed to confirm these preliminary findings.

803

The National School Lunch and Breakfast Programs (NSLBP): A Study on Plate Waste, Nutritional Quality and its Impact on Working Memory and Active Attention. A.J. Gross*, B. H. Chester, Department of Family and Consumer Sciences, Alabama A&M University, Normal, AL 35762.

The National School Lunch and Breakfast Programs (NSLBP) are vital in delivering nutritionally balanced meals to students across the United States. This study investigates the nutritional adequacy of NSLBP meals and their influence

on cognitive functions, specifically working memory and sustained attention, among seventh-grade students. Employing a mixed-methods design, the research analyzed school menus for macro- and micronutrient content, observed consumption patterns, and administered cognitive performance assessments before and after lunch. A sample of 100 students from two socioeconomically and geographically diverse schools participated. Correlational analyses revealed significant associations between food waste behaviors and cognitive or behavioral outcomes. Students who left food on their plates or consumed disliked foods were more likely to need reminders to complete tasks. Female students were more likely to feel bad about wasting food, which correlated with eating disliked items. Throwing away food due to boredom or unpleasant smell showed mixed emotional responses. Notably, leaving food on the plate was linked to increased movement or talking during times when students were expected to remain still. Regression models indicated that food waste behaviors, particularly leaving food uneaten, predicted the need for reminders and behavioral restlessness, explaining 15.1% and 6.7% of the variance, respectively. However, no significant predictors were found for in-the-moment distraction. These findings offer empirical insights into how school meal consumption and waste behaviors relate to students' cognitive and behavioral functioning, informing policy efforts to enhance nutritional standards for improved academic outcomes.

804

Packaging Techniques for Improving the Shelf Life of Pecans. M. Kaur*, H.L. Degala, R. Gyawali, and A.K. Mahapatra, Food Engineering Laboratory, College of Agriculture, Family Sciences, and Technology, Fort Valley State University, Fort Valley, GA, 31030.

Pecans are rich in oil, antioxidant properties and nutritional profile. However, due to their high initial moisture content, metabolic processes accelerate, resulting in lipid hydrolysis, discoloration, and increased perishability. To reduce moisture and to improve the shelf life of pecans, treatments such as pasteurization, roasting, irradiation, and drying are commonly applied. These methods often degrade sensory attributes and reduce levels of phenolic compounds, antioxidant capacity, and monounsaturated fatty acids. Therefore, precise heat control and effective post-processing packaging are critical to maintain the quality and extend storage stability. This study investigates sustainable packaging approaches to improve pecan preservation along with addressing environmental concerns associated with petroleum-derived plastics. Biopolymer- based packaging (BP) and edible coatings (ECs) have identified as eco-friendly solutions. These materials, derived from safe and renewable resources, offer chemical stability, adaptability to processing, and are non- toxic and edible. Recent studies have emphasized the combination of BP and ECs with modified atmosphere packaging, vacuum packaging, nanotechnology, and cold plasma treatments as part of hurdle strategies to further enhance preservation effectiveness. Experimental studies show their effectiveness, for instance, pecan kernels coated with carboxymethyl cellulose proved reduction in hexanal accumulation- a key rancidity marker. Similarly, cactus mucilage coatings supplemented with ascorbic acid have been found effective in preserving the color, hardness, total plate count, preserving the quality of pecans kernels. Research on sustainable packaging strategies highlights its potential to preserve nutritional quality, improve shelf life, and enhance consumer acceptability while offering eco-friendly alternatives to conventional petroleum-derived plastics.

805

Observational Study of Fruit and Vegetable Purchases Among SNAP Participants in Perry, Georgia. A. Davis, Fort Valley State University, Fort Valley, GA 31030

Despite the role of the Supplemental Nutrition Assistance Program (SNAP) in reducing food insecurity, evidence suggests that SNAP participation does not always translate into healthier food choices. Low-income households often face barriers such as limited grocery access, transportation challenges, and cost concerns, which may contribute to diets low in fruits and vegetables. This study examines purchasing patterns of SNAP participants in Perry, Georgia, with attention to store environment and payment methods. An observational design was implemented at a Publix grocery store in Perry, GA. Using a structured tally sheet, purchases of fruits and vegetables were recorded for both SNAP and non-SNAP shoppers, along with demographic characteristics (age, gender) and payment method. Observations were conducted unobtrusively in a public setting with no identifiers collected. Ethical oversight was secured under an exempt IRB protocol. Data analysis includes chi-square tests to compare observed versus expected purchasing frequencies between groups. Early data suggest that SNAP recipients purchase significantly fewer fruits and vegetables compared to non-SNAP shoppers. On average, fewer than 25% of observed SNAP transactions included a fruit or vegetable item, compared to nearly 45% among non-SNAP shoppers. Store environment factors—

particularly product placement near checkout aisles and pricing of convenience foods—appeared to further influence purchasing decisions. Preliminary findings underscore persistent disparities in fruit and vegetable purchasing among SNAP participants. These results point to the potential value of incentive structures, improved store environments, and policy interventions aimed at increasing access and affordability of fresh produce.

806

Poultry Farming Practices and Flock Health Management Among Poultry Farmers in Lee County, Alabama. O. Watters, Fort Valley State University, Fort Valley, GA 31030

In 2022, the highly pathogenic avian influenza strain H5N1 was detected in U.S. commercial poultry, and by 2025 it has affected over 168 million birds nationwide. Outbreaks have resulted in culling millions of birds, increased food insecurity, and direct threats to public health. As poultry is a major protein source in the U.S., flock health management practices are central to ensuring a safe and secure food system. This study explores how poultry farmers in Lee County, Alabama, manage flock health and mitigate disease risks, with implications for One Health and local food system resilience. This qualitative cross-sectional study targets 20 commercial and backyard poultry farmers in Lee County. Data are collected through semi-structured interviews using the "Health and Safety Practices of Poultry Farmers" instrument. Interviews are analyzed with NVivo to identify common patterns, practices, and themes related to disease prevention, veterinary care, and biosecurity. Emerging themes suggest that while farmers recognize the importance of biosecurity, access to veterinary services is limited and often underutilized due to cost and availability. Preventive practices such as sanitation, isolation of sick birds, and vaccination strategies vary widely between commercial and backyard operations. Farmers' self-reliance, coupled with socioeconomic constraints, may increase risks of disease spread, with potential consequences for local food security and public health. The findings highlight the need for greater veterinary support, extension education, and accessible biosecurity resources for rural poultry farmers. Strengthening disease prevention at the farm level not only improves flock health but also protects community food systems and aligns with a One Health framework linking animal, human, and environmental health.

807

Modeling Temperature and Time-Based Risk of *Vibrio Parahaemolyticus* in *Crassostrea Virginica*: Applications for Delaware's Oyster Aquaculture Industry. K. Martin*, A. Todd, One Health Lab, College of Agriculture, Science & Technology, Delaware State University, Dover, DE 19901; C. Acheamfour, Department of Biological Science, College of Agriculture, Science & Technology, Delaware State University, Dover, DE 19901; G. Ozbay, One Health Lab, College of Agriculture, Science & Technology, Delaware State University, Dover, DE 19901

In Delaware, the Department of Natural Resources and Environmental Control (DNREC) enforces a *Vibrio parahaemolyticus* (V*p*) Control Plan for Eastern Oyster (*Crassostrea virginica*) harvesting from June 1 to September 30 to reduce the risk of vibriosis, a gastrointestinal illness from consuming raw or improperly cooked oysters. The plan establishes post-harvest temperature control measures, including icing, shading, and resubmergence, to limit V*p* growth, which increases rapidly at temperatures above 10°C. Oysters may encounter fluctuating temperatures during harvest, transport, or market handling, which can increase contamination risk. This study aims to identify optimal post-harvest handling and storage conditions to minimize V*p* growth and provide evidence-based recommendations for farmers, harvesters, and dealers. Understanding how time, temperature, and environmental factors influence V*p* proliferation will help refine current risk models and enhance food safety strategies. Multiple analytical methods, including bacterial counts and Polymerase Chain Reaction confirmation, will be employed to quantify V*p* growth under controlled and field-relevant conditions. This data will inform practical guidelines for critical handling stages, enabling targeted interventions to reduce contamination. The study is expected to deliver clear recommendations on necessary and optimal post-harvest practices that minimize V*p* growth, reduce health risks for consumers, and support safer and more sustainable oyster aquaculture. By linking experimental results to DNREC standards and industry best practices, this research aims to improve the overall management of oyster safety while sustaining productive aquaculture operations.

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Harnessing Plant-Derived Oils from *Moringa oleifera* and *Syzygium aromaticum* to Suppress Pathogen Persistence on Green Peppers and in Wash Water Effluent. W. A. Lewis*, Department of Human Ecology,

Delaware State University, Dover DE 19901; A. Diaz-Martinez, Department of Chemistry and Department of Human Ecology, Delaware State University, 19901; A. Armah, College of Agriculture Science and Technology, Delaware State University, Dover DE 19901; and W. Long III Department of Human Ecology, Delaware State University, Dover DE 19901.

Growing concern over chemical residues in foods has fueled consumer demand for natural, sustainable alternatives in food processing. One promising approach is the use of plant-derived antimicrobials as natural sanitizers for produce washing. This study investigated the effectiveness of *Moringa oleifera* and *Syzygium aromaticum* (clove) essential oils as natural antimicrobial wash treatments for reducing *Salmonella Typhimurium* and *Escherichia coli* contamination on green peppers and in wash water. Fresh produce often harbors foodborne pathogens that threaten public health. Although washing is a critical control step, the reuse of wash water can allow pathogens to spread among produce and onto equipment. This study aimed to determine whether *Moringa* and clove oils could both suppress bacterial growth in wash water and eliminate contamination on the surface of peppers, offering a dual line of defense. Antimicrobial activity was first evaluated using the Kirby-Bauer disk diffusion assay. Inoculated green peppers were then washed with each treatment, stored for up to two weeks, and periodically analyzed for microbial survival using standard plating methods. Sensory testing was conducted to evaluate appearance, texture, and overall acceptability following treatment. Results demonstrated that both *Moringa oleifera* and clove oils significantly reduced populations of S. typhimurium and *E. coli* while maintaining acceptable sensory quality. Clove oil showed slightly stronger inhibitory effects, while *Moringa* demonstrated consistent performance across storage periods. These findings support the potential of essential oils as safe, effective, and eco-friendly alternatives to chemical sanitizers, promoting cleaner and more sustainable food safety practices.

809

Deep Learning Framework for Physicochemical Property Estimation in Strawberries from Hyperspectral Data. K.V.R Jammuladinne*, A. Maiti, Department of Mathematics, Engineering and Computer Science; and A. Sarker, Agricultural and Environmental Research Station, West Virginia State University, Institute, WV, 25314.

This study presents an automated pipeline for predicting key physicochemical properties of strawberries from hyperspectral images. The dataset includes samples imaged under varying lighting conditions and backgrounds, with both single and multiple fruits per frame. These factors introduce noise and spatial variability, making accurate prediction from raw hyperspectral data a challenging task. The pipeline addressed these challenges by using a superpixel-based segmentation approach, followed by a deep learning model trained on clean spectral data. Segmentation was performed using the Simple Linear Iterative Clustering (SLIC) algorithm. Each image in the dataset had 204 spectral bands. To reduce the number of dimensions, Principal Component Analysis (PCA) was applied and first three components were retained. From this preprocessed data, the pipeline automatically selected superpixels corresponding to strawberry tissue and isolated them from complex backgrounds. The resulting masks were used to extract fixed-size spectral patches from the hyperspectral images. Each patch contained only relevant fruit pixels. These spectral patches were passed to a neural network model trained to predict properties such as pH, titratable acidity, total soluble solids (TSS), firmness, and weight loss. The pipeline generalized well across different imaging conditions and fruit arrangements. The results showed consistent prediction accuracy, with the system effectively handling noise and spatial complexity without requiring manual preprocessing. The proposed pipeline provides a reliable, scalable method for quality prediction of strawberries from hyperspectral images.

810

In Silico Design of Nanobodies Against Ara h 2 for Therapeutic Prevention of Peanut Allergy. S. Rahman*, Dr. S. M. Islam, Department of Chemistry, Delaware State University, Dover, DE 19901, USA.

Peanut allergy represents a significant public health concern, affecting millions worldwide and often leading to severe anaphylactic reactions. The conglutin-like 2S albumin Ara h 2 is a major seed storage protein from the peanut, *Arachis hypogaea,* which is responsible for eliciting IgE-mediated responses in over 80% of sensitized individuals. In this study, three distinct computational strategies were employed to design a nanobody library targeting Ara h 2 to interfere with its binding to IgE. First, a deep-learning framework, RFantibody was utilized to design 100,000 nanobody variants, and the top candidates were selected based on predicted align error (pae<5) and predicted local distance difference test (pLDDT>87) values. Next, an in-silico mutagenesis tool, Rosetta Flex-ddG identified several hotspot

residues in Complementarity-determining regions (CDRs) to enhance the targeted antigen binding affinity. More than 50 nanobody variants were designed by combining these hotspot mutations from which top candidates were selected based on Rosetta score. Finally, Rosetta Coupled Moves protocol suggested several variant sequences that might increase the binding affinity to the allergen. More than 30 nanobody variants were designed using suggested favorable amino acid residues in CDRs. The selected top variants of designed nanobodies from the three different strategies were evaluated through replicate long-timescale molecular dynamics (MD) simulations for structural stability and dynamics. Relative binding free energies estimated using Molecular Mechanics with Generalized Born Surface Area (MM/GBSA) revealed a significant increase in binding affinity compared to the wild-type variant.

811

Fortification of Shortbread Cookies with Hydrolyzed Peanut Flour to Enhance Its Nutritional Value and Organoleptic Properties. W. Kwarteng*, M. A. Farooq, and J. Yu, Department of Family and Consumer Sciences, North Carolina Agricultural and Technical State University, Greensboro, NC 27411.

Shortbread cookies are popular low-moisture baked products. They are high in carbohydrates, particularly, sugar, but lower in protein. Peanut flour is rich in protein (~50%), dietary fiber, vitamins, minerals, and phytosterols, and the protease hydrolyzed peanut flour (HPF) is also rich in bioactive peptides. This study investigated the effects of partial substitution of all-purpose flour with HPF on the nutritional composition and organoleptic characteristics of shortbread cookies. Peanut flour was hydrolyzed with Alcalase for 1- 6 hours and then freeze-dried. The degree of protein hydrolysis, water-holding capacity (WHC), oil-binding capacity (OBC) and viscosity of HPFs were measured. Cookies were made by substituting 5–20% of all-purpose flour with HPF, and the cookie without HPF served as control. The proximate composition, color and texture of cookies were determined. The protease hydrolysis reduced the WHC and viscosity but increased OBC of peanut flour. The protein, lipid and ash contents of cookies increased significantly with increasing concentration of HPF ($P<0.05$), while moisture and carbohydrate contents declined ($P<0.05$). Increasing the concentrations of HPF enhanced brownness of cookies but the duration of hydrolysis had little effect on cookie color. The hardness of cookies decreased with increasing level of peanut flour and degree of hydrolysis ($P<0.05$). Additionally, higher HPF levels slightly reduced the thickness but increased diameter of the cookies. Overall, up to 15% replacement of all-purpose flour with HPF resulted in cookies with improved nutritional profile and acceptable organoleptic properties, indicating that HPF has great potential as a value-added, sustainable ingredient for low-moisture baked products.

812

Impact of a Pilot Fruit and Vegetable Prescription Program on Anthropometric and Metabolic Parameters among Students at a TAACU. P. Dunyo*, K. Ofori-Panyin, R. Agbolegbe, N. Onyeani Bosio, M. Udodirim Guimaraes, L. Amo Gyau, O. Akwaa Harrison, and J. Antwi, CAFNR Research, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446.

Despite expanding studies on produce-prescription programs to improve metabolic health, little attention has been paid to college students, particularly those attending Traditionally African American Colleges and Universities (TAACUs). Prior research has found that TAACU students experience significant levels of food insufficiency and are at a higher risk of developing metabolic disorders. The purpose of this study was to assess the influence of a fruit and vegetable prescription program on the anthropometric and metabolic health parameters of a TAACU student population. A pre-post 12-week intervention on anthropometric and metabolic health in 55 students (intervention = 28, control = 27). Fasting blood glucose (FBG) and HbA1C levels were taken using a PTS Diagnostics CardioChek Plus and A1CNow+ kit, percentage body fat was measured with an Omron equipment, and BMI, waist-to-hip ratio (WHR), and Cardiovascular Health (CVH) scores were calculated. The intervention group received five fresh produce pickups. All attendees went to nutrition education workshops and cooking demonstrations. The intervention's impact was examined using Pearson's chi-square and independent t-tests. The intervention group had a marginally greater proportion of moderate CVH scores (better health) than the control group. There was less excess body fat in the intervention group than in the control group, although the difference was not statistically significant. The other factors showed no statistically significant differences between the groups. Although brief, the intervention showed potential for improving cardiovascular health scores among TAACU students, with results approaching statistical significance. Longer-term interventions are required to confirm their impact.

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Caregivers' Experiences with a Community-Based Nutrition and Produce Program: Evidence from the Pathways to Early Childhood Obesity Prevention (P.E.C.O.P) Fellowship. L. Amo Gyau, R. Agbolegbe, P. Dunyo, K. Ofori-Panyin, N. Onyeani Bosio, M. Udodirim Guimaraes, O. Akwaa Harrison, and J. Antwi, CAFNR Research Center, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446.

The Pathways to Early Childhood Obesity Prevention (P.E.C.O.P) Fellowship was developed to empower mothers and caregivers with practical nutrition knowledge and access to fresh produce to improve household dietary behaviors. This qualitative study explored caregivers' perceptions before and after participating in a 4-week online nutrition education program that included cooking demonstrations and weekly produce provision. Two focus group discussions were held, one at baseline and another at endline. The data were analyzed using thematic content analysis based on the Socio-Ecological Model framework. Baseline results revealed limited understanding of Body Mass Index (BMI), inconsistent use of MyPlate, dependence on WIC and local agencies for nutrition information, and contextual barriers such as time, cost, and weather that hindered healthy meal preparation and activity. At endline, participants reported greater familiarity with MyPlate, improved meal planning and portioning, healthier cooking practices, and increased child engagement in physical activity. Caregivers highlighted family support and consistency as key facilitators of change, though continued reliance on assistance programs and limited awareness of broader policy influences remained. The P.E.C.O.P model successfully improved caregivers' nutrition literacy, confidence, and household health behaviors. Strengthening institutional and community support systems is critical to sustain these behavioral gains and reduce early childhood obesity risk.

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Assessing the Feasibility and Acceptance of a Tailored Produce Prescription Program among Students at a TAACU. K. Ofori-Panyin*, R. Agbolegbe, P. Dunyo, N. Onyeani Bosio, M. Udodirim Guimaraes, L. Amo Gyau, O. Akwaa Harrison, and J. Antwi, CAFNR Research, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446.

Food insecurity is prevalent among college students, particularly those attending Traditionally African American Colleges and Universities (TAACUs), and contributes to increased risks for diet-related chronic diseases. This study assessed the feasibility and acceptability of a modified produce prescription program designed to promote healthier eating behaviors among students. A 12-week pre- and post-controlled intervention was conducted among 55 food-insecure students aged 18 years and above who were managing diabetes, prediabetes, high blood pressure, or overweight/obesity. The intervention group received preferred fruits and vegetables through a structured "Produce Prescription" program in addition to nutrition education and cooking demonstrations. The control group participated in education and demonstrations only. Program feasibility was assessed through implementation fidelity, attendance, and participant engagement, while acceptability was evaluated using structured satisfaction and feedback questionnaires. Findings indicated that the program was feasible to implement within a college environment and was well-accepted by participants. Students valued the personalized produce selections, hands-on cooking sessions, and culturally relevant nutrition education. Positive feedback highlighted the program's relevance, convenience, and potential for wider application across TAACUs. This pilot demonstrates that a culturally tailored, campus-based produce prescription program is both feasible and acceptable among HBCU students. Future studies should explore scaling strategies and delivery methods to enhance participation and sustainability in similar academic settings.

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Assessing the Rural Foodscape of Texas Using the Nutrition Environmental Measurement Survey. C Suttles*, Y.O. Olawuyi, J.J. Quinlan, Food Security Research Center, CAFNR Research, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446.

Access to healthy, affordable foods remains a critical public health challenge in rural Texas, where geographic isolation, financial and social unfairness contribute to persistent food insecurity. This study assessed the retail food environment across 51 rural stores using the validated Nutrition Environment Measurement Survey (NEMS) tool in 8 rural counties in Southeast Texas. Data collection in store over a three-month period evaluated the availability, pricing, and quality of 13 food categories. The data was scored using the tool to quantify healthier food choices' availability,

quality, and pricing. The NEMS- CS scores were analyzed to identify disparities, comparing average scores between different counties. Results revealed limited access to healthy options, with fresh fruits (47.1%) and vegetables (11.8%) found in fewer stores compared to the widespread availability of canned vegetables (94.1%) and processed snacks (90%+). Mean NEMS scores reflect these inequities, with availability averaging 10.2±3.7 (of 37), pricing at -0.2±1.9 (of 18), quality at 1.3±1.8 (of 6), and an overall mean total score of 11.4±4.8 (of 61). Dollar stores had a higher mean score of 14.4±6.7 than gas stations (10.5±3.4) and miscellaneous stores (2.0±3.9), yet all scored low. Differences emerged across counties, with Montgomery County performing highest (17.5±8.5) and Liberty, Colorado, and Burleson scoring lowest (<9.0). These findings highlight the structural barriers rural communities face in accessing healthy food, underscoring the need for targeted interventions, policy reform, and community-based strategies to reduce nutrition-related health disparities.

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Assessment of Antibiotic-Resistant Bacteria and Genes in Retail Wild-Caught Gulf Shrimp and Farm-Raised Shrimp Available to Consumers in Texas. A. Appiah Darkwah*, M. Fadamiro, D. Mugabo, M. Moussavi, J.J. Quinlan, Food Security Research Center, CAFNR Research, College of Agriculture, Food, and Natural Resources, Prairie View A&M University, Prairie View, TX 77446.

Shrimp is an increasingly vital and popular food source, with consumption in the US steadily rising. Globally, it is a key source of proteins, vitamins, and healthy, low-saturated fat. This demand is largely met by imported, farm-raised shrimp, which introduces potential public health risks related to antibiotic resistance. The indiscriminate use of antibiotics in global aquaculture has led to the proliferation of antibiotic-resistant bacteria (ARB) and antibiotic resistance genes (ARGs), which can be transferred to human pathogens, complicating the treatment of infectious diseases. This pilot study aims to conduct a comparative analysis of the prevalence and variety of ARB and ARGs in wild-caught Gulf shrimp and imported farm-raised shrimp available in retail markets in Houston, Texas. Using a comprehensive quantitative and experimental design, we will collect 30 shrimp samples over a six-month period. We will employ microbiological methods to isolate and enumerate aerobic plate count (APC), coliform, Escherichia coli, Enterococcus spp., Pseudomonas aeruginosa, Aeromonas spp., Acinetobacter spp., and Salmonella spp. Antimicrobial susceptibility testing (AST) will be performed to determine resistance profiles, and high-throughput real-time PCR (HT-qPCR) will be used to detect ARGs. The anticipated results will provide preliminary data on the ARB burden in shrimp sold in Texas, identify the shrimp types that require more safety measures, promote sustainable farming practices, inform consumers about healthy options, and contribute to the development of evidence-based food safety policies and regulations. To date, a total of 18 wild-caught Gulf and farm-raised shrimp samples have been collected, and analysis has been initiated.

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Food Safety and Microbial Quality in Retail Establishments Across Communities with Differing Financial and Social Conditions. M. Fadamiro*, A. Appiah Darkwah, D. Mugabo, M. Moussavi and J.J. Quinlan**,** Food Security Research Center, CAFNR Research, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446.

Food safety remains a significant public health concern in the United States, causing an estimated 48 million illnesses annually. Data indicate that consumers residing in areas with limited retail infrastructure experience higher rates of foodborne illness than the general population. Additionally, individuals living in urban areas with limited grocery availability face increased food safety risks and reduced product quality due to reliance on smaller grocery stores and corner stores. Retail food establishments in lower financial and social areas often have limited resources and inadequate storage conditions. However, comprehensive data comparing the microbial quality of foods between retail environments with differing financial and social conditions, particularly in rural areas, are still lacking. This study addresses this gap by conducting a comparative analysis of selected perishable foods from different retail establishments. Over a 15-month sampling period, samples including fresh salad greens, fruits, lunch meat, ground beef, milk, and cheese will be collected. Samples will be tested for indicator organisms including aerobic plate count (APC), total coliforms, yeast and mold counts, and for presence of *Escherichia coli*, and *Salmonella* spp. Preliminary results from four financially constrained grocery stores and one well-resourced grocery store showed higher CFU/g counts in salad greens, ground beef, and fruits from the constrained retail settings. Sampling and analysis from additional retail establishments are ongoing. The findings will provide insights into the relationship between microbial

quality, contamination levels, and community access, supporting data-driven strategies to enhance food safety and equity in retail environments.

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Evaluation of Drinkable Yogurt Flavored with Date Fruit. D. T. Farrior*, Family Consumer Sciences, North Carolina Agricultural and Technical State University, Greensboro, NC, 27411**;** A. A. Ayad, and L. L. Williams, Center for Excellence in Post-Harvest Technologies (CEPHT), North Carolina Agricultural and Technical State University, North Carolina Research Campus, Kannapolis, NC 28081.

The popularity of fruit-flavored drinkable yogurts with probiotics has been steadily rising. Date fruit powder (DFP), rich in nutrients, offers a natural source of dietary fiber that could enhance the nutritional profile of yogurt drinks and stirred yogurts. Our study aimed to investigate the microbiological, physicochemical, and rheological properties of drinkable yogurt fortified with DFP. Fresh milk, used as a control, was inoculated with 1.3 g/L (w/v) of Y5 starter culture and supplemented with various concentrations of DFP (0.4%, 0.8%, 1.0%, and 1.5%) during a 15-day storage period at 5-7°C. The pH of the control and DFP-fortified samples (initial values of 4.8, 4.86, 4.62, 4.55, and 4.58) decreased slightly overtime, stabilizing between 4.54 and 4.66. Microbiological analysis indicated a significant increase in initial yogurt culture counts (8.34 to 8.83 Log CFU/mL) with higher DFP concentrations, followed by a gradual decline (6.25 to 8.00 Log CFU/mL) during storage. Rheological analysis demonstrated shear-thinning behavior in all samples, with DFP-fortified yogurts showing increased viscosity compared to the control (27 Pa·s), particularly in samples fortified with 0.4% and 1% DFP, which reached 282 and 1162 Pa·s after 15 days, respectively, compared to 16.7 Pa·s in the control. Additionally, DFP supplementation enhanced the yogurt's color, significantly increasing redness (a*) and reducing lightness (L*), with the 1.5% DFP sample showing the highest redness (1.31±0.16) and lowest lightness (83.85±0.09). Overall, our results suggest that DFP enhances the viability of yogurt cultures, acidity, and physicochemical properties, improving the functional characteristics of fruit-flavored drinkable yogurt.

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Metabolomics Profile in Diabetes and Blood Glucose Regulation. A. O. Adejoh* Q. S. Abbah and J. O. Onuh Department of Food and Nutritional Sciences, Tuskegee University

Diabetes mellitus (DM) is a chronic, non-communicable human metabolic disorders of public health concerns globally, emphasizing the need for early diagnosis and deeper metabolic understanding. The disease is characterized by impaired glucose regulation, due to insulin resistance, increased glucagon production as well as insufficient insulin production. Metabolomics has been identified as a comprehensive technique adopted to profile small molecules in biological systems and offers a highly effective approach to better understand the molecular mechanisms underlying diabetes and its complications. This review aims to examine how metabolomics helps reveal the complex processes that govern blood glucose control and diabetes regulation. Major metabolomic platforms such as NMR, LC-MS, GC-MS, and CE-MS are assessed, with a comparative analysis between targeted and untargeted analytical techniques. We found that human biofluids and tissues have revealed specific metabolic biomarkers linked to prediabetes, Type 1 and 2 diabetes, and insulin resistance. Metabolites involved in glucose, lipid, and energy metabolism such as fatty acids, ceramides, and glycerophospholipids offer insights into the disease's mechanisms and potential early biomarkers. The review also explores the clinical and nutritional impacts of metabolic profiling in the management of dietary intake, therapeutic interventions, and optimization of precision nutrition. A critical evaluation of existing limitations in metabolomic research and recommendations are put forth to guide the integration of these findings into clinical practice for biomarker discovery as well as prediction of diabetes onset. Understanding metabolic alterations through metabolomics not only advances diabetes research but also supports food-based strategies for prevention and management of the disease.

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Effects of Chicken's Feet Gelatin-Hydrogel on Toxic Compound Formation and the Physicochemical Properties of Deep-Fat Fried Chicken Nuggets. R.B. Awuku*, R. Adedeji, W. Oyom, S. Valizadeh, H. Faraji, A.Y. Aydar, and R. Tahergorabi, Department of Family and Consumer Sciences, North Carolina Agricultural and Technical State University, Greensboro, NC 27411.

Deep-fat frying is one of the most popular cooking methods in the United States, influencing the high consumption rate of fried chicken nuggets. While deep-fat frying enhances crispiness and flavor, it also accelerates lipid oxidation and Maillard reactions, generating toxic compounds such as advanced glycation end-products (AGEs) and 5-hydroxymethylfurfural (5-HMF). These compounds are associated with type 2 diabetes, cardiovascular disease, kidney disease, neurodegenerative disorders, and cancer. The increasing prevalence of these chronic conditions contributes substantially to the public health and economic burden in the U.S., emphasizing the need for healthier frying strategies. This study evaluated gelatin hydrogel (GH), a water-swollen protein network formed through chicken feet gelatin coil-helix cross-links, in combination with rosemary extract (RE), a heat-stable antioxidant rich in carnosic acid, carnosol, and rosmarinic acid. Chicken nuggets coated with GH, with or without RE (0.5%, 1%, or 2% v/v), were fried at 180 °C for 3 minutes. GH+RE coatings significantly reduced toxic indicators , lowering Nε-carboxymethyl lysine from 8.05 to 1.22 micrograms (µg)(/100 g, Nε-carboxyethyl lysine from 4.02 to 2.43 µg/100 g, and 5-HMF from 38.48 to 24.94 mg/100 g. Treatments enhanced physicochemical properties by improving moisture retention, reducing oil uptake, and suppressing lipid oxidation, with peroxide values reduced from 0.12 to 0.02 milliequilvalent (meq)/100 g and thiobarbituric acid reactive substances (TBARS) from 0.81 to 0.33 mg MDA/kg. Overall, GH combined with 2%RE offers a scalable, clean-label strategy to reduce toxic compounds and improve oxidative stability, supporting healthier diets while preserving the overall sensorial properties of fried foods.

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Enhancing Fried Chicken Quality and Safety Using Electrosprayed Curcumin Coatings. E. Boafo*, R. Tahergorabi, Department of Family and Consumer Sciences, North Carolina Agricultural and Technical State University, Greensboro, NC 27411.

Deep-fat frying gives desirable flavor and texture to food products. Still, it often leads to excessive oil absorption and the formation of undesirable compounds, including lipid oxidation products and toxic compounds such as 5-hydroxymethylfurfural (HMF). Frequent consumption of fried products may lead to serious health issues such as cancer, heart disease, and diabetes. Natural antioxidants, such as curcumin (the main bioactive compound in turmeric), have been shown to mitigate these harmful effects. However, direct addition of these antioxidants to foods is often inefficient due to degradation and limited bioavailability. Edible coatings offer a promising strategy for delivering antioxidants, and the method of application plays a crucial role in their effectiveness. Electrospraying is a relatively novel technique that produces nano-sized coatings with efficient encapsulation of bioactive compounds. This study evaluated the effect of electrosprayed curcumin (0%, 0.1%, 0.5%, and 1.0%) on the physicochemical properties of batter-coated chicken nuggets. Results demonstrated that nuggets coated with electrosprayed curcumin exhibited significantly lower lipid oxidation and HMF content ($p < 0.05$) compared to both samples that were not electrosprayed and electrosprayed samples without curcumin. Electrosprayed samples retained higher moisture and lower fat content. Color analysis indicated improved preservation of yellowness (b*) and lightness (L*), while texture measurements showed reduced hardness. The formulation containing 1% curcumin provided an optimal balance of texture, fat content, and moisture retention. These findings suggest that electrosprayed curcumin coatings are an effective, natural approach to improving the quality and safety of fried chicken products.

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Chemical and Sensory Characterization of Traditional *Murcha Raksi* from Finger Millet. S. Khanal*, R. Tahergorabi, Department of Family and Consumer Sciences, North Carolina Agricultural and Technical State University, Greensboro, NC, USA, 27411.

Raksi is a traditional distilled alcoholic beverage of Nepal, widely consumed for cultural and social purposes. In Western distillation, cereal saccharification relies on malt-derived amylases, whereas traditional Asian fermentation uses amylolytic starter cultures prepared from mold growth on cereals. In Nepal, these starters are known as *Murcha*. This study investigated the influence of microbial culture sources on the physicochemical and sensory properties of *Murcha*-based *Raksi* produced from finger millet. Four *Murcha* samples were collected from different areas of Nepal like Barahakshetra (A), Letang (B), Vishnupaduka (C), and Dharan (D), and used in separate fermentations of 12 days followed by traditional distillation. Gas chromatography was employed to analyze alcohols and volatile compounds, while sensory evaluation assessed aroma and overall acceptance. Significant differences were observed in higher alcohols (1-pentanol, 2-methylpropanol, isobutanol, 3-methylpropanol, 2-propanol), ketones (acetone, 4-methyl-1-

butanone), esters (ethyl acetate, ethyl 2-methylbutyrate), and other volatiles (benzene, acetonitrile) among the samples. Sample A exhibited superior sensory quality, attributed to its lower acetaldehyde content (0.87 mg/L) compared to Sample B (2.18 mg/L), as acetaldehyde contributes to off-flavors. This study highlights the chemical diversity among traditional *Murcha Raksi* samples and provides insights for optimizing production practices to improve quality and minimize undesirable compounds.

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Bay Leaf Extract-Mediated Green Synthesis of Iron Oxide Nanoparticles for Sensitive Glucose Detection. S.S. Chowdhury*, N. Ibnat, M. Azad, and S. Islam, Department of Agriculture/Agricultural Regulations, University of Arkansas at Pine Bluff, 1200 North University Dr., Pine Bluff, AR 71601.

The development of nanozymes, nanomaterials that mimic enzyme activity, has gained significant attention due to their stability and broad applicability in biological sciences. The green synthesis of nanozymes offers an eco-friendly, cost-effective, and biocompatible alternative to conventional physical and chemical methods. In this study, *Laurus nobilis* (bay leaf) extract was utilized for the green synthesis of iron oxide (Fe_2O_3) nanoparticles (NPs) through the Soxhlet extraction process. The iron chloride precursor was reduced using the plant extract under continuous stirring, resulting in the formation of Fe_2O_3 NPs with uniform morphology. The synthesized NPs were thoroughly washed and calcined to remove organic residues, ensuring purity and stability. Structural and morphological analyses using scanning electron microscopy (SEM), X-ray diffraction (XRD), and X-ray photoelectron spectroscopy (XPS) confirmed the formation of spherical Fe_2O_3 NPs with an average diameter of approximately 80 nm. XRD patterns confirmed the crystalline nature of iron oxide, while XPS analysis identified the elemental composition and oxidation states. Brunauer–Emmett–Teller (BET) analysis revealed the porous nature of the particles, thereby enhancing their surface reactivity. The Fe_2O_3 NPs exhibited strong peroxidase-like activity, comparable to that of horseradish peroxidase (HRP), as reflected in similar Km values. These nanozymes were successfully employed in a colorimetric glucose detection assay, demonstrating high sensitivity, reproducibility, and operational stability. Overall, the study highlights a sustainable and innovative approach for fabricating biofunctional nanomaterials with potential applications in biosensing, environmental monitoring, and biomedical diagnostics.

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Non-Thermal Laser Elicitation: A Novel Strategy to Enhance Germination, Antioxidant Activity, Bioactive Compounds, and Micronutrient Content in *Beta vulgaris* L. Sprouts. H. Sadeghi, G. Yildiz, and H. Feng, Department of Family and Consumer Sciences, North Carolina Agricultural and Technical State University, Greensboro, NC, 27411.

Beta vulgaris L. (Beet) sprouts are valued for their rich bioactive compounds, but traditional germination methods can be slow and inefficient. This study investigates the application of Low-intensity long-time (LILT) laser treatment as an innovative, non-thermal elicitation method to enhance the germination, growth performance, and nutritional value of beet sprouts. Beet seeds were exposed to LILT at wavelengths of 405 nm (4.5 mW), 635 nm (7.0 mW), and 980 nm (9.8 mW) for 12,000 s (405 and 635 nm) and 6,000 s (980 nm). After treatment, the seeds were sprouted for five days and freeze-dried. Among all treatments, exposure to the 635 nm laser produced the most pronounced biological responses, achieving a germination rate of 98.7% and an average sprout length of 15 mm. Antioxidant capacity was markedly enhanced, as shown by DPPH (18.8 μmol TE/g), FRAP (86.7 μmol TE/g), and ORAC (138.3 μmol TE/g) assays. Moreover, 635 nm irradiation led to significant increases in total phenolic (27.8 mg GAE/g) and flavonoid contents (45.9 mg QE/g), betalains (betacyanins: 7.6 μmol/g; betaxanthins: 4.4 μmol/g), carotenoids (3.2 μmol/g), and vitamin C (19.5 mg/100 g). Enzyme activities, including phenylalanine ammonia-lyase (15.2 mg/100 g) and myrosinase (0.9 μmol/g/min), were substantially elevated, along with enhanced γ-aminobutyric acid (8.9 mg/100 g), total soluble sugars (82.6 mg/g), and nitrate (193.6 μmol/g). This study demonstrates the potential of LILT laser treatment, as a novel non-thermal, eco-friendly, and energy-efficient technology for beet sprouts. It offers a promising strategy for enhancing germination, nutritional content, and bioactive properties of beet sprouts.

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Towards Food Security: Improving Cassava Flour Nutrition Using Finger Millet and Quinoa Blends. A. Nwagwu*, C. Nindo, F. Orech, Department of Agriculture, Food and Resource Sciences; and N. Burton, UMES Extension. University of Maryland Eastern Shore, Princess Anne, Maryland 21853.

Food insecurity is a leading global and national challenge, especially in places where people rely on starch-based staple diets, which are deficient in vital nutrients. This research aims to develop new gluten-free value-added products from cassava-finger millet-quinoa composite flour that enhances nutritional value and dietary diversification. Cassava (*Manihot esculenta*), despite being a principal staple in Africa, Asia, and Latin America, is mainly a source of energy with minimal protein and few micronutrient contents. Finger millet (*Eluesine coracana*), with its high content of calcium and dietary fiber, and quinoa (*Chenopodium quinoa*), which has high-quality protein and trace elements, were added to cassava flour in two formulations: 50:30:20 and 40:30:30 after preliminary blend trials. Cassava flour nutrient composition was determined from USDA FoodData Central database records to assess the carbohydrate, protein, fat, fiber, and mineral contents per 100g of flour. The 40:30:30 formulation presented maximum protein content (~6.13g) as well as potassium content (~366.90mg), while both blends exhibited improvements in protein (~5-7 times) and higher mineral contents compared to 100% cassava flour. The findings reveal that the blending of cassava with finger millet and quinoa improves nutritional quality and is a viable approach to the production of accessible, gluten-free, nutrient-dense food products to mitigate undernutrition and enhance food security. Nutritional analysis and sensory evaluation of value-added products prepared from these flour formulations is currently underway to determine the quality and nutritional attributes of the new products.

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Effects of Edible Coating on Post-Harvest Quality of Day-Neutral Strawberry. E. K. Aduteye*, N. K. Dixit, C. Nindo. Department of Agriculture, Food, and Resource Sciences, University of Maryland Eastern Shore, Princess Anne, Maryland 21853.

Strawberries (*Fragaria x ananassa*) are one of the most widely cultivated small fruits and are valued for their high nutritional content and economic significance. They are highly perishable and have a short shelf life that often leads to significant loss of quality during storage. Edible films and coatings have emerged as a promising method to enhance the postharvest quality of fruits. This study investigated the effectiveness of edible odorless fish gelatin coatings on the postharvest quality of a day-neutral strawberry (Seascape). Strawberries were coated with fish gelatin edible film and stored at 4°C for 15 days. Quality parameters, including Brix, pH, weight loss, firmness, and microbial load (yeast and mold) counts were measured. Brix decreased with time but was higher in coated strawberries (7.72 ± 0.90) compared to uncoated strawberries (7.31 ± 0.07) on day 15. Coated strawberries showed lower weight loss (8.86 ± 0.99%) than uncoated strawberries (16.65 ± 1.04%) and retained greater firmness (2.26 ± 0.02 N vs. 2.07 ± 0.05 N). Although pH increased over time, coated fruit remained more acidic (3.51 ± 0.02 vs. 3.68 ± 0.02 on day 15). Total yeast and mold count on day 15 were 4.49 ± 0.08 and 6.24 ± 0.03 $\log_{10}$ CFU g^{-1} in coated and uncoated fruit, respectively. Our findings demonstrate the potential of edible films as a practical and sustainable solution to preserve strawberry quality and extend marketability.

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Synergistic Effects of Ginger and Turmeric in Functional Muffin Development. T. Thatipamula*, H. Singh, K. Medabalimi, J. Boateng, M. Verghese, Department of Food and Animal Sciences, Alabama A&M University, Normal, AL 35762.

Spices, Ginger(G) and Turmeric(T) contain phenolic substances with strong anti-inflammatory and antioxidant properties. Studies suggest antioxidant and carbohydrate and lipid metabolizing enzyme inhibitory effects by ginger and turmeric, spices that are not commonly incorporated into typical Western diets. Combining G&T may produce synergistic effects, enhancing functional bioactivity and utilization in the food industry for additional health benefits. Objective was to develop a Functional Food product utilizing Ginger and turmeric in combination. Physiochemical analyses were performed and total phenolic content (TPC), total flavonoid content (TFC), 1,1-diphenyl-2-picrylhydrazyl radical scavenging activity (DPPH), and Ferric reducing antioxidant power (FRAP) were evaluated. Four muffin formulations were prepared: a control (no spices), 3%Ginger and 1%Turmeric (3G+1T), 6%Ginger and 2%Turmeric (6G+2T), and 9%Ginger and 3%Turmeric (9G+3T). Consumer panelists assessed sensory attributes for four muffin formulations using a 5-point Hedonic scale, ranging from 1 (Dislike very much) to 5 (Like very much).

The 2T+6G formulation was the most favored due to its optimal balance of sensory attributes, higher antioxidant activity, and overall acceptability. DPPH % inhibition of the muffin extracts ranged from 15.92% to 51.95%, with the 2T+6G formulation exceeding the 50% threshold for radical-scavenging activity. 2T+6G had high FRAP values (103.12 ± 1.1 mM Fe (II)/100 g DW), indicating remarkable stability compared to other samples. Ongoing shelf-life studies will further evaluate product's stability and its potential for commercialization. Results demonstrate that Ginger and Turmeric act synergistically to enhance antioxidant potential and sensory acceptability, highlighting their efficacy in developing health-promoting functional foods.

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Development of functional pastry products targeting celiac disease: antioxidative potential of alternative flours
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Celiac disease and gluten intolerance have increased demand for safe, nutritious, and appealing gluten-free baked products. This study aimed to develop and evaluate functional gluten-free pastry formulations enriched with nutrient-dense and antioxidant-rich ingredients to enhance product quality and sensory appeal. Five cake formulations (chocolate chia, avocado matcha, almond oat, sweet potato lava, and coconut carrot) were produced using optimized blends of rice, sorghum, almond, and tapioca flours. Products were analyzed for proximate composition, pH, water activity (Aw), texture profile analysis (TPA), and antioxidant potential using DPPH, FRAP, Total Phenolic Content (TPC), and Total Flavonoid Content (TFC) assays. Among the cakes, avocado matcha exhibited the highest antioxidant activity DPPH Inhibition of 84.2%, while sweet potato lava and almond oat showed superior moisture retention and softness. Sweet potato demonstrated optimal textural characteristics. A focus group evaluated appearance, flavor, texture, and overall acceptability. The sweet potato lava cake was most preferred. These findings indicate that incorporating functional ingredients into gluten-free pastries enhances nutritional quality, antioxidant potential, and consumer acceptance. As consumer demand for gluten-free products continues to rise, this research will contribute to enhancing their accessibility and market viability.

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Protective Effects of Curry leaves (*Murraya Koenigii*) on Primary Aortic Endothelial Cells: In Vitro Studies on Reduction of Oxidative Stress, Inflammation, and Adhesion Markers Relevant to Atherosclerosis Prevention.
K. Medabalimi*, H. Singh, R. Kaur, J. Boateng, M. Verghese, Nutritional Biochemistry Laboratory, Department of Food and Animal Sciences, Alabama A&M University, Normal, AL 35762.

Atherosclerosis, a major contributor to cardiovascular diseases, primarily arises from endothelial dysfunction characterized by oxidative stress, inflammation, and upregulation of adhesion molecules. *Murraya koenigii* (curry leaves) is rich in bioactive compounds with known antioxidant and anti-inflammatory properties, suggesting its potential role in mitigating atherosclerotic processes. In this study, primary aortic endothelial cells were cultured and exposed to hydrogen peroxide (H_2O_2) to induce oxidative stress, followed by treatment with dried curry leaf ethanolic extracts (125–2000 µg/mL). Cell viability assays were used to determine non-toxic concentrations for further evaluation. Cytotoxicity was quantified by using lactate dehydrogenase (LDH) release, cell viability was determined by MTT (3-(4,5-Dimethylthiazol-2-yl)-2,5-diphenyltetrazolium Bromide) and antioxidant capacity was assessed through activities of superoxide dismutase (SOD), catalase, glutathione (GSH), and glutathione peroxidase (GPx). Inflammatory and adhesion responses were determined using cyclooxygenase-2 (COX-2), intercellular adhesion molecule-1 (ICAM-1), and vascular cell adhesion molecule-1 (VCAM-1) expression using standard kits (Invitrogen). Moderate extract concentrations (200–400 µg/mL) enhanced cell viability (83.04–72.78%) and increased catalase (20.28–34.98 µM) and GSH (3.09–3.65 µM) levels, whereas higher concentrations (800–1000 µg/mL) reduced viability (58.89–45.18%) and antioxidant enzyme activity. Notably, post H_2O_2 exposure, catalase activity significantly increased (73.29 µM at 200 µg/mL), indicating substantial protection against oxidative injury. These results demonstrate that curry leaves extract alleviates oxidative stress, inflammation, and endothelial adhesion, thereby exhibiting strong atheroprotective potential. *M. koenigii* may serve as a promising natural intervention for preventing endothelial dysfunction and the progression of atherosclerosis.

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Enhancing Printability and Structural Fidelity of Plant-Based Meat Analogs via 3D Printing Parameter Optimization. S. Madala*, L. Kassama, Department of Food and Animal Science, Alabama A&M University, Normal, AL 35762.

Three-dimensional (3D) printing is emerging as a transformative technology in food manufacturing, enabling the creation of customized, sustainable, and nutrient-dense plant-based meat analogs. This study focused on optimizing printing parameters for formulations incorporating soy protein isolate (SPI) and texturized vegetable protein (TVP), enhanced with functional ingredients such as beetroot powder, mushroom powder, coconut oil, and corn starch to improve nutritional density and sensory appeal. Three formulations with SPI:TVP ratios of 100:0 (F1), 50:50 (F2), and 0:100 (F3) were evaluated under varying printing speeds (1500 and 3000 mm/min), temperatures (25°C and 75°C), and flow rates (5.1 and 5.5). Key performance indicators included printing precision, rate, and structural error. Results showed that SPI-rich formulations (F1 and F2) achieved the highest printing precision (95.65% and 95.16%, respectively), while F3 exhibited reduced fidelity (93.67%). A printing speed of 3000 mm/min significantly improved throughput (4.09 g/min), whereas lower speeds reduced efficiency. Ambient temperature (25°C) minimized structural errors (0.59%), in contrast to elevated temperatures (75°C), which increased deformation (6.93%). Statistical analysis confirmed the significant ($p < 0.05$) influence of formulation and process parameters on printability. These findings underscore the potential of 3D printing to produce high-quality, protein-rich, and visually appealing plant-based meat alternatives. By integrating nutrient-dense components and optimizing processing conditions, this work advances the field of precision food manufacturing and supports scalable, sustainable solutions for future food systems.

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Anti-Obesity Potential of Dates in 3T3-L1 Adipocytes: Mechanisms of Lipid Metabolism and Inflammation. H. Singh*, J. Boateng, K. Medabalimi, R. Al Hazaimeh, M. Verghese , Nutritional Biochemistry Laboratory, Department of Food and Animal Sciences, Alabama A&M University, Normal, AL 35762.

The global rise in obesity is closely linked to chronic diseases, driving interest in natural compounds that can modulate lipid metabolism and inflammation. This study explores the anti-obesity potential of *Phoenix dactylifera* (date) fruit extracts (DE) using 3T3-L1 adipocytes as an in vitro model. DE were extracted using aqueous solvent and characterized for their bioactive constituents. Differentiating and mature adipocytes were treated with DE at concentrations of 10, 20, 40, and 80 mg/ml during the differentiation (Day 4) and maintenance (Day 6) stages. Key assays evaluated lipid metabolism, inflammation, and oxidative stress, including Oil Red O staining, triglyceride and glycerol-3-phosphate dehydrogenase (GPDH) assays, lipolysis, apoptosis (caspase-3), and antioxidant enzyme activity (glutathione, catalase). DE treatment caused higher LDH release during differentiation (31–60%) compared to the maintenance stage (13–40%), indicating greater cytotoxicity in developing adipocytes. Correspondingly, cell viability (MTT) decreased from 78–40% and 86–58% in the differentiation and maintenance stages, respectively, suggesting that DE effectively inhibited adipogenesis. Apoptosis increased at higher concentrations, confirming activation of programmed cell death pathways. DE treatment also downregulated COX-2 and IL-6 expressions, indicating significant anti-inflammatory effects. Antioxidant analysis revealed enhanced glutathione and catalase activities at the differentiation stage, implying protection against oxidative stress, although catalase activity decreased at higher DE concentrations. Overall, date fruit extracts demonstrated anti-obesity potential by inhibiting lipid accumulation, promoting lipolysis, inducing apoptosis, and attenuating inflammation in adipocytes. These findings support the therapeutic relevance of date fruits as functional foods for obesity management and warrant further in vivo validation.

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Non-thermal (NT) Plasma -Activated Water (PAW): Enhanced Food Safety and Quality. M. Sanmartin*, L. Kassama, Department of Food and Animal Sciences, Alabama A&M University, Normal, AL 35762.

Plasma Activated Water (PAW) is an innovative non-thermal disinfection method that involves exposing water to cold plasma, generating reactive oxygen and nitrogen species (ROS and RNS) such as hydroxyl radicals, ozone, hydrogen peroxide, nitric oxide, and nitrate compounds. These reactive species possess potent antimicrobial properties, making PAW a promising alternative to traditional thermal and chemical disinfection methods. PAW's potential in food safety is particularly noteworthy due to its sustainable, chemical-free, and energy-efficient nature. Hence, this study aims to evaluate the efficacy of PAW in inactivating common foodborne pathogens, including Escherichia coli, Listeria

monocytogenes, and Salmonella spp., while preserving the sensory and nutritional qualities of fresh produce, meat, and seafood. The antimicrobial activity of PAW will be evaluated by examining physicochemical parameters such as Oxidation Reduction Potential (ORP), conductivity, and pH. These parameters reflect the concentration of reactive species, and the antimicrobial capacity will be tested against various microorganisms. Expected outcomes include microbial reductions of 3 to 5 log CFU/mL across various food matrices and an extension in shelf life by 2 to 7 days, depending on the food type and storage conditions. The study will also address challenges related to the consistency of PAW's antimicrobial performance, variability in treatment systems, and the lack of standardized protocols, which currently hinder large-scale implementation. Additionally, toxicological evaluations will be conducted to ensure the safety of plasma-treated foods. By addressing these issues, PAW has the potential to prove a scalable solution for enhancing food safety and extending the shelf life of various food products.

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Anti-Oxidative and Anti-Obesity Potential of Bioactive Compounds in Spirulina Microalgae and Bilberry in 3T3-L1 Adipocytes. K. Boyle*, M. Verghese, Department of Food and Animal Sciences, Alabama A&M University, Normal, AL 35762.

Spirulina (S), protein-rich cyanobacterium and Bilberry (B), a dark berry are known for their medicinal purposes. Aim was to identify potential antioxidant and anti-obesity properties of S & B using mammalian cell model: 3T3-L1 adipocytes for utilization in natural color food product development. 3T3-L1 cells were treated with 80% ethanol S&B extracts in pure and combination (50S+50B,75S+25B, & 25S+75B) and grown in two stages: differentiation (DS) (immature) and maintenance (MS) (mature). Lactate Dehydrogenase (LDH), 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide) (MTT), Catalase (CAT), Glutathione (GSH), and other antioxidant assays using different concentrations (500 µg/ml, 1000 µg/ml, 2000 µg/ml, 3000 µg/ml, 4000 µg/ml, 5000 µg/ml, 6000 µg/ml, 8000 µg/ml, 10000 µg/ml), were conducted using standard protocols. LDH in cells treated with 100 S ranged from 51.42% – 68.56%, and 100 B 11.76% – 76.30%. CAT results in DS with 100S ranged from 59.86 – 93.88 U/g total protein, and 100 B from 43.94 – 80.91 U/g total protein. CAT results for MS with 100S ranged from 74.19 – 102.77 U/g total protein, and 100 B from 92.46 – 114.25 U/g total protein. GSH results in DS with 100S ranged from 3.80 – 4.28 nmol/mg, and 100 B from 3.68 – 4.04 nmol/mg. GSH results for MS with 100S ranged from 15.64 – 19.77 nmol/mg, and 100 B from 13.01 – 16.00 nmol/mg. The significance of this research is to determine the applicable use of S and B in the prevention of obesity utilizing adipocytes from a mammalian cell culture model, considering the recent increase in childhood obesity.

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Evaluating the Survival & Growth of *Salmonella* on Sliced Cucumbers and Quantifying the Effects of a Sanitizer. L. Strong*, P. Bwalya, L. Kassama, A. Jackson-Davis. Department of Food and Animal Sciences, Alabama A&M University, Normal, AL 35762.

S*almonella* is a Gram-negative bacterial pathogen that if consumed, can be extremely harmful. Fresh cucumbers have been increasingly involved in foodborne illness outbreaks linked to *Salmonella enterica*. Cucumbers are typically consumed raw, thus providing no kill step to reduce microbial contamination. The Produce Safety Rule, introduced under the Food Safety Modernization Act, was designed to prevent such contamination through science-based standards for water quality, soil amendments, worker hygiene, and postharvest sanitation. The objective of this study was to evaluate the survival and growth of *Salmonella* on sliced cucumbers and to assess the survival of pathogens exposed to a sanitizer. After whole cucumbers were purchased from a local retailer, the product was sliced into 10 g portions. The samples were then inoculated with *Salmonella* and treated with a sanitizer. After treatment, 0.1mL of samples were plated on Standard Plate Count (SPC) agar in duplicate following incubation at 37°C for 24 h. Inoculated plates were evaluated for survival of organisms and the results showed that product exposed to the sanitizer demonstrated some microbial reduction.

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Efficacy of a Chemical Sanitizer for the Inactivation of *Salmonella* on Surface Inoculated Tomatoes. P. Bwalya*, L. Strong, L. Kassama, A. Jackson-Davis, Department of Food and Animal Sciences, Alabama A&M University, Normal, AL 35762.

Salmonella enterica is a significant foodborne pathogen commonly associated with tomato-related outbreaks. Identifying effective postharvest interventions is critical for enhancing the safety of this product. The Food Safety Modernization Act's Produce Safety Rule establishes science-based standards for minimizing microbial hazards on fresh produce. This study evaluated the efficacy of sanitizer against *S. enterica* on tomatoes to provide data supporting compliant postharvest interventions. A Kirby-Bauer well diffusion assay was used initially to screen sanitizers. For the tomato trials, surfaces were spot-inoculated with a 9.0 $\log_{10}$ CFU/mL suspension of *S. enterica* and air-dried for 20 min. The tomatoes were exposed to the sanitizer for 2 min. Surviving pathogens were recovered in 0.1% peptone water, serially diluted, and plated onto Standard Plate Count Agar. Results showed that the Kirby-Bauer method successfully identified the best performing sanitizer via the zone of inhibition. On tomatoes, the sanitizer alone achieved a 2.9-log reduction. This reduction meets the benchmark for effective sanitizers and supports the use of such treatments within a validated postharvest sanitation program. This approach combined with another decontamination method may prove to be a robust intervention strategy to mitigate microbial risks in the tomato industry.

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Small-Scale Farms as Reservoirs of Antimicrobial Resistance: Insights from Metagenomic Surveillance. E. Ayilaran* and A. Kilonzo-Nthenge, Department of Agricultural Sciences and Engineering, College of Agriculture, Tennessee State University, Nashville, TN 37209.

Antimicrobial resistance (AMR) poses a critical challenge to global health, with food-animal production systems recognized as significant reservoirs of antimicrobial-resistant bacteria. This study evaluated the prevalence and distribution of antimicrobial resistance genes (ARGs) and virulence factors (VFs) across small-scale poultry and cattle farms. A total of 468 samples (soil, feces, water, and natural land soil) were collected from four farms and analyzed using shotgun metagenomics. *Proteobacteria* (34.91%) were the dominant phylum across environments, followed by *Cyanobacteria* (15.67%), *Actinobacteria* (14.95%), *Firmicutes* (10.57%), and *Bacteroidetes* (8.69%). Tetracycline (33.41%) and beta-lactam (30.30%) resistance genes were the most abundant, with macrolide (9.32%) and aminoglycoside (8.39%) resistance also detected. Both tetracycline- and beta-lactam-resistance genes were significantly enriched across sample types ($p < 0.05$). The detection of diverse VFs alongside ARGs highlights the pathogenic potential of bacterial communities in these production systems. Collectively, the findings reveal that small-scale animal farms are reservoirs of AMR with implications for public health through foodborne transmission. Targeted surveillance and control measures are necessary to prevent the dissemination of ARGs into the broader food chain and to safeguard both human and animal health.

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Carbapenem Resistance in Tennessee Agroecosystems Elevates Public Health Risk. G.B. Olakanmi*, and A. Kilonzo-Nthenge, Department of Agricultural Sciences and Engineering, College of Agriculture, Tennessee State University, Nashville, TN 37209.

Antimicrobial resistance threatens food safety and consumer health. A key challenge is that resistance to carbapenems, last-resort antibiotics approved only for use in clinical care, is being increasingly reported beyond hospitals. Food production can contribute to microbe exposure through irrigation water, manure applications, soil contact, and handling of fresh produce. We assessed Tennessee agroecosystems across multiple farms and reference sites to determine whether carbapenemase-producing Gram-negative bacteria and their genes occur in fresh-produce systems and connected matrices. We collected the following samples: 40 fresh produce, 54 soil, 68 water, and 12 manure. Following non-selective enrichment, cultures were isolated on CHROMagar mSuperCARBA and purified. Across all matrices, 1,185 carbapenemase-producing bacteria were recovered: 33.2% from produce, 35.4% from water, 27.4% from soil, and 3.9% from manure. Presumptive phenotypes included *E.* coli-like colonies (9.1%), the *Klebsiella/Enterobacter/Citrobacter* group (69.6%), and *Pseudomonas/Acinetobacter* (21.3%), reflecting diverse carbapenem-resistant populations across production environments. Carbapenemase activity was evaluated using the modified and EDTA-modified Carbapenem Inactivation Methods (mCIM/eCIM). Gene-level screening by multiplex qPCR targeted blaKPC, blaNDM, blaVIM, blaIMP, and blaOXA-48-like in banked isolates and selected community DNA. Signals of carbapenemase activity and gene detections occurred across multiple site types and matrices, indicating its dynamics along the farm-to-food continuum. Ongoing capture-based metagenomics will resolve gene families and plasmid contexts and will be integrated with geospatial covariates to relate detections to management

factors. Our findings will provide a focused, practice-relevant basis for water-quality management, manure handling, and post-harvest measures that support fresh produce safety and consumer protection.

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Valorization of Muscadine Grape Seeds for Bioactive Peptides and Lipids. M. Busarapu*, M. Yakubu, S. Ogutu, R. Al Hazaimeh, J. Boateng, Department of Food and Animal Sciences, Alabama A&M University, Normal, AL 35762.

Muscadine grape (*Vitis rotundifolia*) is an American grape species native to Southeastern United States, particularly Carlos and Noble cultivars. These grapes are widely utilized in wine making producing substantial byproducts such as pomace and seeds. The seeds are rich sources of polyphenols; proteins and lipids but remain largely underutilized. This study aimed to valorize muscadine grape seeds (MGS) for bioactive ingredients, i.e., bioactive peptides and lipids. The solvent extraction method (hexane) was used to extract oil from muscadine grape seeds, and polyphenols from the oil were extracted and analyzed to quantify total polyphenols, flavonoids, anthocyanins, and antioxidant activities. Protein concentrate was extracted from the defatted seed flour using pH differential method. The concentrate was subjected to enzymatic hydrolysis to generate bioactive peptides, and microbial hydrolysis of MGP seeds were generated using *S. cerevisiae.* Peptide recovery and yield were quantified spectrophotometrically. Particle size distribution was performed using dynamic light scattering (DLS) and degree of hydrolysis (DH) was to assess the efficiency of hydrolysis. Results indicated Noble and Carlos varieties yielded high oil content. The extracted phytochemicals from MGSO indicated high TPC content for both varieties, compared to TFC. Antioxidant activity was found to be high in Carlos. Protein yield was increased with elevated pH (pH 11) in both varieties. These results suggest a feasible approach for enhancing the value of muscadine grape seeds as a functional food ingredient or nutraceutical.

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Effects of Selected Processing Methods on Antioxidants, Phytochemical Content, Metabolizing Enzymes and Antinutrients of Tiger Nut (*Cyperus esculentus*). M. Martinez*, K. Boyle, E. Baidoo, J. Herring, M. Verghese, Nutritional Biochemistry Laboratory, Department of Food and Animal Sciences, Alabama A&M University, Normal, AL 35762.

Tiger nut is the edible tuber of Cyperus esculentus L., a perennial sedge plant native to North Africa and widely cultivated today in Spain and West Africa for its nutritional and functional properties. Tiger nuts contain bioactive compounds, including polyphenols (phenolic acids and flavonoids), phytosterols and are rich in fiber/resistant starch. These components are associated with antioxidant activity, potential favorable prebiotic effects and potential cholesterol-lowering effects. Common processing techniques such as boiling, blanching, roasting, drying, and fermentation can leach, degrade, transform, or liberate phenolics, generate Maillard reaction-derived antioxidants, and decrease antinutrients through leaching or enzymatic hydrolysis. However, comparative research in tiger nuts remains limited and few studies connect chemical composition changes to functional outcomes. Overall aim was to evaluate the effect of commonly used processing methods on the phytochemical, metabolizing enzymes and antinutrient content. Aqueous (AQ) and 80% ethanol (ET) extracts of processed tiger nuts were prepared using standard protocol. Phytochemical content was determined using total flavonoid content (TFC) and total phenolic content (TPC) assays. Antioxidant potential was determined using 2,2-diphenyl-1-picrylhydrazyl (DPPH), Ferric Reducing Antioxidant Potential (FRAP), Trolox Equivalent Antioxidant Capacity (TEAC), and Nitric Oxide Radical Scavenging Ability (NORS) assays. α-Amylase, α-Glucosidase, and lipase inhibition were determined. The significance of this research is to determine the effect of common processing methods on retention of tigernut bioactive compounds, antioxidant capacity, digestive-enzyme inhibition, and antinutrient reduction, thereby identifying processing conditions that optimize functional quality. Findings will provide guidance on industrial processing and formulation of tiger nut-based foods and beverages.

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Evaluation of Venison Sausages Formulated with Selected Concentrations of Quinoa. S. Cravens*, J.L. Herring, Department of Food & Animal Sciences, Alabama A&M University, Normal, AL 35762.

The growing demand for healthier meat products has prompted the exploration of alternative ingredients that enhance nutritional profiles without compromising sensory qualities. This study investigates the incorporation of quinoa as a fat substitute in venison sausage formulations. Venison, known for its low fat and high protein content, offers a lean base for sausage production; however, traditional sausage formulations rely heavily on animal fat for texture, flavor, and juiciness. Quinoa, a nutrient-dense pseudo-cereal rich in essential amino acids, dietary fiber, and unsaturated fats, was evaluated as a functional ingredient at varying levels. Physicochemical properties, including moisture content, pH, moisture, water activity, and color, were measured alongside sensory attributes such as flavor, texture, juiciness, maintained acceptable texture and flavor profiles while significantly reducing total fat and overall acceptability. Sausages with quinoa demonstrated improved nutritional value, including a better lipid profile and higher antioxidant capacity, without compromising microbial stability during storage. Texture profile analysis indicated that quinoa contributed to a moister and more tender product compared to the control. The study concludes that quinoa is a promising fat alternative for formulating healthier venison sausage, particularly at 15%-20% addition levels, balancing improved health benefits with sensory qualities. Further research may explore quinoa's interaction with binding agents or emulsifiers to optimize texture at higher substitution levels.

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Utilization of Functional Foods in Reducing the Incidence and Severity of PCOS. R. Fennell*, N. Montgomery II, E. Baidoo, M. Verghese, Department of Food and Animal Sciences, Alabama A&M University, Normal, AL 35762.

Polycystic Ovary Syndrome (PCOS) is a common endocrine disorder that affects 5–10% of women of reproductive age and is characterized by hormonal imbalance, insulin resistance, and chronic inflammation. Functional foods incorporating bioactive ingredients have the potential to improve metabolic health and reduce PCOS-related symptoms. This study developed a Sweet Potato Turmeric Cheese Stick designed to support insulin regulation and reduce inflammation. Two flour combinations were evaluated: all-purpose flour with cassava flour and all-purpose flour with almond flour. The formulations were assessed for physicochemical properties (pH, color, texture and water activity) and consumer acceptability using a focus group (n=8). The all-purpose + cassava flour formulation demonstrated lighter color (L* (lightness) ≈ 55.93 ± 0.25), mild acidity (pH ≈ 5.30 ± 0.11), and water activity (aW) of 0.84 ± 0.05, indicating good shelf stability and product uniformity. The all-purpose + almond flour formulation exhibited a darker tone (L* ≈ 46.00 ± 0.06), slightly higher pH (≈ 5.96 ± 0.09), and comparable aW (≈ 0.83 ± 0.03), maintaining desirable texture and moisture balance. Focus group evaluations revealed positive consumer acceptance for both formulations, with the all-purpose + almond product receiving higher ratings for flavor, texture, and aroma. These results demonstrate that incorporating sweet potato and turmeric into functional snack formulations can yield nutrient-dense, consumer-accepted products that support dietary management of PCOS and promote overall metabolic wellness.

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Evaluation of Soaking Induced Changes on Physicochemical and Functional Properties of Pinto and Black Beans. M. Yakubu*, E. Baidoo, M. Busarapu, N. Ogunkunle, R. Al Hazaimeh, J. Herring, J. Boateng, Department of Food and Animal Sciences, Alabama A&M University, Normal, AL 35762; E. Cebert, X. Kuang, Department of Natural Resources and Environmental Sciences, Alabama A&M University, Normal, AL 35762.

The quality of Common beans (*Phaseolus vulgaris L.*) is influenced by their chemical and physical characteristics, which processing seeks to enhance or preserve. Soaking is used to reduce hard-to-cook phenomenon and eliminate undesirable compounds in beans; however, previous research focused on post-cooking changes, with limited attention to its standalone effects on key attributes. This study therefore investigated the influence of soaking with and without salts on the chemical and physical properties of pinto and black beans. Pinto and black beans were soaked in water, 1% $NaHCO_3$, 1% $NaHCO_3$+1%NaCl, 2%$NaHCO_3$, and 2%NaHCO3+1%NaCl solutions. Polyphenol content (total polyphenol content-TPC, total flavonoid content-TFC), antioxidant capacities (ferric reducing antioxidant power, DPPH- % radical scavenging activity, IC_{50}, and Trolox equivalent antioxidant capacity), hardness, and color, were analyzed at intervals of 6, 12, 18, and 24 hours. Soaking reduced TPC and TFC by varying percentages in relation to time of soaking for both pinto and black beans. The addition of salts intensified these decreases, with corresponding reductions in antioxidant capacities; TEAC however, remained largely unchanged. Soaking generally reduced the hardness of beans with black beans, showing greater percentage losses than pinto beans. Soaking in water alone caused

significant color loss in beans whereas soaking in salt solutions improved color retention. These findings provide critical insights for refining pre-processing methods in commercial bean production.

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Role of ATP-Citrate Lyase Subunits *ACL1* and *ACL2* in Lipid Metabolism of *Yarrowia lipolytica.* K. Jackson*, A. Odunsi, S. Fakas, Department of Food & Animal Sciences, Alabama A&M University, Normal, AL 35762.

ATP citrate lyase (ACL) is indispensable for lipid biosynthesis. It catalyzes the ATP-dependent conversion of citrate to acetyl-CoA, a key intermediate in both fatty acid and triacylglycerol (TAG) biosynthesis pathways. The *Yarrowia lipolytica* ACL is a heterodimeric enzyme consisting of catalytic Acl1 and regulatory Acl2 subunits. Furthermore, the ablation of *ACL1* or *ACL2* leads to a global transcriptional reprogramming, impacting the expression of thousands of genes. To investigate the specific contributions of each subunit, we complemented *ACL1* and *ACL2* in their respective mutant strains. Strains were cultured in glycerol-based lipogenic media, and their growth and lipid profiles were analyzed by thin-layer chromatography coupled with gas chromatography-mass spectrometry. Complementation of the catalytic subunit *ACL1* in the *acl1*Δ mutant led to a substantial restoration of lipid accumulation, particularly in TAG content. TAG levels in the complemented strain reached or even exceeded those of the wild-type strain expressing native ACL. In contrast, deletion of *ACL1* caused approximately a 50% decrease in total fatty acids and a 75% reduction in TAG levels, underscoring the critical role of Acl1 in lipid biosynthesis. Complementation of the regulatory subunit *ACL2* produced a similar recovery in lipid and TAG accumulation, comparable to wild-type levels. These results collectively indicate that Acl1 serves as the primary catalytic driver of TAG synthesis, while Acl2 contributes to a supporting regulatory function. Consistent with these observations, ACL activity assays revealed that both *ACL1*- and *ACL2*-complemented strains exhibited enzymatic activity comparable to the wild-type strain, further confirming the functional restoration of the ACL complex.

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Functional Analysis of *ACL1* in Lipid Metabolism of *Yarrowia lipolytica.* E. White*, O. Aina, S. Fakas, Department of Food & Animal Sciences, Alabama A&M University, Normal, AL 35762.

Yarrowia lipolytica is an oleaginous yeast known for its ability to accumulate lipids, making it a promising candidate for biotechnological applications such as producing food lipids and biofuels. This yeast's ability to accumulate lipids makes it an excellent model organism for studying lipid biosynthesis. One of its key metabolic features is the activity of ATP-citrate lyase (ACL). The ACL enzyme, composed of subunits *ACL1* and *ACL2*, catalyzes the conversion of citrate into acetyl-CoA, a critical precursor for lipid synthesis. Understanding ACL function is crucial because its key role in lipid synthesis makes it a critical target for biotechnological applications. The objective of this work was to investigate the function of *ACL1* using complementation analysis. An *acl1*Δ strain was complemented by reintroducing the *ACL1* gene under its native promoter. Enzyme activity assays and lipid analyses are underway on the complemented, deletion, and wild-type strains to determine whether reintroduction of *ACL1* restores lipid metabolism to wild-type levels. These experiments aim to provide evidence for the essential role of *ACL1* in maintaining lipid production and overall metabolic balance. Building on these findings, future work will involve generating *ACL1* truncation mutants to probe conserved regions and functional domains predicted to be critical for catalytic activity. These studies will further elucidate the structural features underlying *ACL1* function and its regulation of lipid biosynthesis in *Y. lipolytica*.

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Growth and Molecular Characterization of ATP-Citrate Lyase Subunit Mutants in *Yarrowia lipolytica.* A. Odunsi*, S. Fakas, Department of Food & Animal Sciences, Alabama A&M University, Normal, AL 35762.

ATP-citrate lyase (ACL) in *Yarrowia lipolytica* is a heterodimeric enzyme composed of the catalytic subunit Acl1 and the regulatory subunit Acl2. ACL catalyzes the conversion of citrate into acetyl-CoA and oxaloacetate, linking carbohydrate metabolism to lipid biosynthesis. Previous studies have shown that deletion of ACL subunits (*acl1*Δ or *acl2*Δ) restricts growth and lipid accumulation, suggesting that both subunits are essential for maintaining acetyl-CoA availability. Strains were cultivated under standard and elevated temperature conditions (34 °C) to examine the roles of Acl1 and Acl2 in growth regulation. We also tested whether low-level acetate supplementation could restore the

growth phenotype. Growth curves, biomass accumulation, and generation times were compared among wild-type, deletion, and complemented strains to evaluate temperature sensitivity. Both *acl1*Δ and *acl2*Δ mutants exhibited significantly slower growth and extended generation times at elevated temperature compared to the wild type, indicating that the ACL complex supports cellular adaptation under thermal stress. Complementation strains expressing TEF-driven ACL1 or ACL2 recovered growth performance to near wild-type levels, confirming that each subunit contributes distinctly yet cooperatively to maintain normal physiology and metabolic balance. Notably, acetate supplementation also rescued the growth phenotype of the mutants, further linking ACL activity to intracellular acetyl-CoA availability and growth under stress conditions. Complementary molecular analyses are underway to investigate ACL subunit expression and activity dynamics during these conditions. Overall, these findings provide new insight into the physiological roles of Acl1 and Acl2 in maintaining metabolic balance and growth efficiency in *Y. lipolytica* during temperature stress.

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Probing a Conserved Catalytic Region in *Yarrowia lipolytica* ATP-Citrate Lyase (Acl1). O. Aina*, S. Fakas, Department of Food & Animal Sciences, Alabama A&M University, Normal, AL 35762.

In *Yarrowia lipolytica*, ATP-citrate lyase (ACL) is a heterodimeric enzyme that links carbohydrate metabolism to lipid biosynthesis by converting citrate into acetyl-CoA and oxaloacetate. The ACL complex consists of a catalytic subunit (Acl1) and a regulatory subunit (Acl2). Acl1 activity directly influences acetyl-CoA availability for lipid accumulation. Multiple sequence alignment of *Y. lipolytica* Acl1 with human and other mammalian ACLY homologs revealed a conserved region at the C terminus spanning residues 503–510 that includes a histidine residue (H506) predicted to be catalytically important. Sequence alignment also shows that H506 corresponds to H491 in *Chlorobium limicola* ACL, which was reported to be essential for enzymatic activity. To investigate the functional significance of this conserved region, two Acl1 variants were generated: an H506A point mutant and a Δ503–510 deletion. Mutants were created using Q5-based site-directed mutagenesis and verified by sequencing. Expression of wild-type and mutant constructs in *E. coli* and *Y. lipolytica* is currently in progress. Planned analyses include immunoblotting, enzyme activity assays, and lipid quantification to evaluate the effects of these mutations on Acl1 function. This ongoing study aims to elucidate the catalytic role of the conserved 503–510 region within the ACL heterodimer and provide

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Tricetin Biogenic Amination as a Novel Pathway Linking Flavonoid Metabolism to Ammonia Detoxification. J. Sackey*, S. Zhang, S. Sang, Center for Excellence in Post-Harvest Technology, North Carolina Agricultural and Technical State University, North Carolina Research Campus, Kannapolis, NC 28081.

Tricetin is a flavone type of dietary flavonoid found in eucalyptus honey, pomegranate, and wheat with high anti-inflammatory, antioxidant, and neuroprotective activities. However, its role remains largely unexplored in nitrogen metabolism. In this study, chemical and biological amination of tricetin was investigated to elucidate potential pathways linking tricetin metabolism to ammonia detoxification. In vitro, tricetin was reacted with ammonium hydroxide to produce aminated products and reaction progress was tracked by HPLC-DAD. The main aminated product was purified by preparative RP-HPLC and structurally characterized by high-resolution ESI-MS and NMR (^{1}H, ^{13}C, HMBC, and HSQC). The aminated derivative was confirmed as 4′-aminotricetin ($C_{15}H_{11}NO_6$), showing an upfield shift of the ipso carbon ($\Delta\delta C_{4'}$ = -4.9 ppm) and characteristic MS fragments (*m/z* 151.0039, 107.0140) corresponding to retro-Diels-Alder fragmentation of the flavone core. To assess in vivo formation, male CD-1 mice were orally administered tricetin (50-200 mg/kg body weight), and urine and fecal metabolites were analyzed by LC-MS/MS. Aminated tricetin was detected exclusively in fecal samples, indicating microbial or enzymatic catalysis of nitrogen incorporation. Additional tricetin metabolites, including methylated, sulfated, and hydrogenated metabolites, were also identified, indicating that amination occurs alongside conventional Phase I and Phase II biotransformation pathways. The findings provide the first evidence of biogenic amination of tricetin and suggest that tricetin may serve as a transient ammonia acceptor or scavenger to detoxify ammonia under elevated nitrogen conditions. This novel pathway introduces a potential biochemical mechanism linking tricetin and other dietary polyphenols to ammonia detoxification and nitrogen homeostasis in the gut-liver axis.

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Assessment of Lead Leachability from Cristal D'Arques Glassware at Varying pH Levels. S. Artigue and A. Jain, Center for Water Resources, College of Agriculture and Food Sciences, Florida A&M University, Tallahassee, FL 32307

The potential leaching of lead from Cristal D'arques glassware and its implications for human health remain a concern. This study aimed to evaluate the influence of various beverages with differing pH levels on lead leaching from Cristal D'Arques glassware. Seven liquids were tested: deionized water, tap water, pulp-free orange juice, wine, beer, Coca-Cola, and apple cider vinegar. The pH of each liquid was measured using an Accumet pH meter. Each glass vessel was filled with 250 mL of the assigned liquid, sealed to prevent evaporation and contamination, and sampled at regular intervals over a one-month period. All samples, except deionized water and tap water, were digested with nitric acid and hydrogen peroxide using a microwave digester to break down the organic matter. The samples were stored at 4˚C until analysis. Lead concentrations were subsequently determined using a Thermo Element E2 inductively coupled plasma mass spectrometer (ICP-MS). The results showed that pH had a significant effect on lead leaching. Beverages with lower pH values exhibited higher lead concentrations, and the amount of lead leached increased over time.

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Fruit and Vegetable Intake Outcomes from a Modified Produce Prescription Program at a TAACU: A Pilot Study. R. Agbolegbe*, P. Dunyo, K. Ofori-Panyin, N. O. Bosio, M. U. Guimaraes, L. A. Gyau, O. A. Harrison, and J. Antwi, CAFNR, Research, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446.

At Traditionally African American Colleges and Universities (TAACUs), in particular, access to Fruits and Vegetables is difficult for rural groups. Studies show that Produce Prescription Programs with Fresh Produce incentives improve diets and reduce Food Insecurity. This Pilot Study examined how a TAACU's Modified Produce Prescription Program affected students' intake of Fruits and Vegetables. The Pre-Post-Controlled Intervention lasted 12 weeks and involved 55 individuals with food insufficiency at a TAACU. In addition to receiving personalised Produce Bags, the Intervention Group (n=28) and Control Group (n=27) also received Cooking Demonstrations and Nutrition Education. Dietitian advice was used to customize the produce choices using MyPlate Guidelines, Recipes, and Goal Setting. To measure Fruit and Vegetable consumption, the Fruit and Vegetable Consumption (Short 10-Item Dietary Assessment Tool) was employed. Data was analysed using Descriptive Statistics and Pearson's Chi-Square Test. The proportion of students reporting consuming cooked beans 2-3 times/month improved more in the Intervention group than in the Control group, according to the comparative analysis of fruit and vegetable intake. Compared to the Control group, a greater percentage of the Intervention group consumed non-deep-fried vegetables 3-4 times/week, indicating a trend towards significance. Notably, only the intervention group reported within-group increases in intake of 100% fruit juice, fruits, cooked beans, pizza, and tomato sauce. Thus, highlighting the potential of produce prescription programs to promote healthier eating habits in underserved college populations. Future studies should use larger samples, longer durations, and more robust interventions.

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Estimating Public Preferences for Forest Ecosystem Services in Alabama. P. Baidoo*, Department of Agricultural and Environmental Sciences, Tuskegee University, Tuskegee, AL 36088; R. Chen, Department of Agricultural and Environmental Sciences, Tuskegee University, Tuskegee, AL 36088; and A. Xu, Department of Agriculture, Fort Hayes State University, Hays, KS 67601.

Alabama's forests, covering over 23 million acres (approximately 71% of the state), provide vital ecosystem services, including carbon sequestration, biodiversity conservation, and recreational opportunities. This study quantifies the economic value of these services using a discrete choice experiment (DCE) with a representative sample of 784 residents from Alabama. A mixed logit model was employed to estimate public valuations, accounting for individual preference heterogeneity. Results indicated a strong willingness to pay (WTP) for various forest ecosystem services. Marginal WTP (MWTP) values were highest for afforestation at $16.30 and reforestation at $15.53, indicating strong public support for forest restoration. Biodiversity enhancements were also valued, with MWTP of $6.51 for a 10% increase and $11.12 for a 20% increase. For forest carbon sequestration, the public expressed a WTP of $5.63 for a 10% increase and $6.41 for a 20% increase. Recreational access to forests was valued at $7.96, highlighting the importance of accessible natural spaces to Alabamians. Under a multi-benefit policy simulation scenario, the average

WTP reached $41.02, translating into an aggregate WTP of approximately $164 million for Alabama's forest ecosystem services. These results demonstrate strong public support for restoration and conservation, providing critical insights for policymakers to inform the development of integrated forest policies that balance environmental protection, climate mitigation, and economic development.

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Amaranthus-Derived Nanoparticles Functionalized with Antibiotics for Triple Action as Antioxidant, Antidiabetic and Antimicrobial Agents. J. Jeffery*, A. Geremew, E. Peace, and L. Carson, CAFNR Research, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446.

The rise in multidrug-resistant bacterial infections, oxidative stress-related disorders, and diabetes mellitus presents a critical challenge to global health. Conventional therapies often address these conditions in isolation, limiting their effectiveness and contributing to complications such as antimicrobial resistance and chronic hyperglycemia. This study explores a sustainable, integrative approach using plant-based nanotechnology. Silver nanoparticles (AgNPs) were synthesized via a green synthesis method using Amaranthus seed extract, rich in phytonutrients, as a natural reducing agent. The nanoparticles were further functionalized with penicillin (Pn-AgNPs) to enhance antimicrobial potency. Characterization of AgNPs was performed using Fourier-transform infrared spectroscopy (FTIR), UV-Visible spectrophotometry and scanning electron microscopy (SEM) coupled with energy dispersive spectroscopy (EDS). The therapeutic efficacy of the synthesized nanoparticles and functionalized with the antibiotic was evaluated for antidiabetic, antioxidant, and antibacterial activities across varying concentrations. Results demonstrated that both AgNPs and Pn-AgNPs exhibited concentration-dependent enhancement in all three therapeutic domains. Notably, the Pn-AgNPs showed superior antibacterial activity, indicating a synergistic effect. These findings suggest that Amaranthus-mediated AgNPs offer a promising multifunctional platform for the simultaneous management of metabolic disorders and resistant bacterial infections, with potential applications in sustainable healthcare solutions.

Student Poster Presentation – Undergraduate Competition

Plant Health and Production and Plant Products

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Involvement of HBCU Students in Regional and National Programs- The Case of Tuskegee University Participating National Collegiate Soil and Landscape Contests. Z. Bowles*, W. Rhimyr, J. Williams, A. Denkins, M. Dyson and A. S. Kumi, College of Agriculture, Environment and Nutrition Sciences, DAES. Tuskegee University, Tuskegee, AL 36088.

Students from the College of Agriculture, Environment and Nutrition Sciences (CAENS) have been participating in the National Collegiate Soil Judging Contest for almost a decade. It has come to the attention and realization of these students and faculty about Tuskegee University Students alone regularly participating in these contests with the Alabama A&M University. Majority of the schools participating are 1860s Institutions with 1890s institutions conspicuously absent from these activities. In the same vein, the National Collegiate Landscape Contest (NCLC) also points to the same scenario with only Tuskegee University participating nationally in the whole of U.S. These scenarios clearly indicate the absence of students from HBCUs from National, State and Regional Policy decision-making on technical pedological issues and shortchanging themselves from nationally multi-billion industry employment opportunities from these two important sectors of the American economy. Our goal is to train, advocate and expose students from Tuskegee University and other HBCUs to these technical fields and the vast employment opportunities that avail in these fields and thereby guide them to policy decision-making avenues in the near future. So far, Tuskegee University has about 30 students who have participated in these two National Programs and have seen the employable opportunities and working in important different national sectors of the American Economy. We do believe that exposing students to these avenues of science and technicalities, which they cannot fully grasp in the classrooms whilst in school; enhances their employability skills and readiness for the job markets for technical jobs and employers.

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Expression, and characterization of a flavonoid glycosyltransferase gene family from *Vitis rotundifolia*. S. Maul*, A. Ananga, Food Science Program, College of Agriculture and Food Sciences, Florida A & M University, Tallahassee, FL 32307, V. Georgiev, Laboratory of Cell Biosystems, Institute of Microbiology, Bulgarian Academy of Sciences, Plovdiv, Bulgaria; V. Tsolova,, Center for Viticulture and Small Fruit Research, College of Agriculture and Food Science, Florida A&M University, Tallahassee FL 32317.

Glycosylation of flavonoids affects solubility, stability and bioavailability and is mediated by the glycosyltransferase (GT) family. Majority of the structural genes involved in flavonoid biosynthesis have been isolated in grapes, but an important gene encoding UDP-glucose:anthocyanin 5-O-glucosyltransferase (5GT) remained to be identified in muscadine grapes. 5GT is responsible for the modification of anthocyanins to more stable molecules in complexes for co-pigmentation, thus resulting in a purple hue. Based on protein sequence data and RT-PCR, a full-length cDNA encoding 5-GT was obtained from a cDNA library. The 5-GT cDNA displayed homology to previously published glucosyltransferase sequences. The open reading frame encodes a polypeptide of 464 amino acids with a calculated molecular mass of 51.4 kDa. A phylogenetic tree based on amino acid sequences of the family of glycosyltransferases from various plants shows that Vr5GT is closer to the *Vitis vinefera* 5-GT. The mRNA expression of both *5GT* increased in the veriason stages of berry developmental, reaching the maximum at the physiologically mature stage. To our knowledge, this is the first time 5GT gene is cloned in *V. rotundifolia*. This study will help to improve metabolic engineering in muscadine grapes cell lines for nutritional enhancement of bioavailability of grape products.

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Preliminary Development of Autonomous Spraying System for Muscadine Vineyards. R. E. Henry*, A. D. Cason, J. J. Williams, C. G. Harper, R. D. Williamson, and J. Chen, Biological Systems Engineering, College of Agriculture and Food Sciences, Florida A&M University, Tallahassee, FL, 32307.

Muscadine vineyards often use continuous blanket fungicide spraying, increasing chemical use, drift, labor needs, and worker exposure. To address these challenges, we propose an autonomous spraying system that employs real-time muscadine grape leaf detection using a deep learning model to enable selective spraying only when targets are present. This targeted approach aims to reduce input, enhance safety, and improve spraying efficiency. The system integrates real-time inference on vineyard imagery, target distance estimation, and spray duration modulation. It features a mobile rover equipped with two cameras for navigation and targeting, a fungicide tank with a solenoid-controlled sprayer, and a mobile base. An Arduino Nano will activate the sprayer based on detection signals, while a Raspberry Pi will process the detection pipeline and provide performance data. The detection model, based on YOLOv11, will be trained on muscadine grape imagery collected at the FAMU Center for Viticulture and Small Fruit Research. Training will incorporate data augmentation, class-balanced sampling, and field-adjusted confidence and non-maximum suppression thresholds. System performance will be evaluated by detection efficiency (mAP@0.5, precision, recall) under different lighting and canopy conditions, inference speed (target ≥10 FPS on Raspberry Pi), and spray accuracy (percentage of intended leaf coverage, overspray, and miss rate). Results will be compared against a baseline fixed-rate, continuous-spray protocol at matched travel speed and nozzle configuration. Outcomes will quantify chemical savings, drift reduction, labor efficiency, and safety improvements. This low-cost platform has the potential to support precision viticulture through real-time vision–guided selective spraying in muscadine vineyards.

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Investigating Native and Nonnative Plants in Tallahassee Trailways. M. Moore*, A. Forde, M. Newman, and I. Roberts, Student Success Workforce Development. Florida A&M University, Tallahassee, FL 32301.

Florida is renowned for its high plant biodiversity, but invasive plants pose a significant threat by displacing native flora, disrupting the food chain, and reducing overall ecosystem health. This study surveyed the vegetation along three unpaved Tallahassee trailways—Indian Head Acres Park, Mission San Luis Park, and Myers Park—to identify flora, ascertain the uses of native species, and inform the public about their ecological importance. The research involved collecting and identifying abundant plant specimens along the trails. A total of 32 plant species were collected and categorized: 53.1% native, 21.9% non-native exotic, and a concerning 12.5% invasive. The most common plant families were Asteraceae and Oxaliaceae. Four species were identified as invasive, including Tradescantia auminensis and Iris pseudacorus, which form dense thickets and outcompete native flora. Notably, several collected native plants,

such as Sambucus canadensis and Stachys floridana, have traditional medicinal and culinary uses, highlighting the functional value of native flora. The survey concluded that native plants still represent the majority of flora in the selected Tallahassee trailways, indicating continued support for a biodiverse ecosystem. However, the dense presence of invasive species underscores an ongoing ecological threat. The findings emphasize the critical need for public awareness regarding Tallahassee's diverse plant life and the importance of adapting landscapes to support native species and manage invasive threats.

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Evaluating Soil and Hydroponic Cultivation: A Comparative Study of Culinary Herb Growth. A. Green*, I. Young, D. White, T. White, R. Nedd. School of Agriculture, Fisheries and Human Sciences, University of Arkansas at Pine Bluff, Pine Bluff, AR 71601.

The present study compares the growth performance of four commonly cultivated herbs, namely basil (Ocimum basilicum), cilantro (Coriandrum sativum), mint (Mentha spp.), and thyme (Thymus vulgaris), under two cultivation systems: traditional soil-based growing and hydroponic production. This is primarily aimed at determining which one yields better results in both quality and quantity. Key growth parameters measured are plant height and growth rate, total biomass yield, essential oil concentration, which is indicative of aromatic quality, and water consumption efficiency. Preliminary analysis aims to determine whether hydroponic cultivation offers advantages over soil cultivation in terms of growth rates and resource efficiency, while also evaluating any potential trade-offs in flavor. The findings of this study will be useful in optimizing herb production, with implications for both commercial and small-scale farmers, and provide a means of promoting sustainable agricultural practices.

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Diversity and Abundance of Insects Fauna Associated with *Cannabis sativa* (Cannabaceae) under Different Management. J.N. Smith*, M. J. S. Cabral, S. O. Laird, A. M. S. Robinson-Baker and M. Haseeb, Center for Biological Control, College of Agriculture and Food Sciences, Florida A&M University, Tallahassee, FL 32307.

The cultivation of *Cannabis sativa* L. (Cannabaceae) is gaining increasing economic, scientific, and industrial importance due to its diverse applications in medicinal, fiber, and value-added product markets in Florida and other U.S. states. Despite its rapid expansion, limited knowledge exists about the insect fauna associated with hemp and their interactions under varying management systems. Understanding these ecological relationships is crucial for developing integrated pest management (IPM) strategies and ensuring sustainable crop production. This study evaluated the diversity, abundance, and distribution of insects associated with *C. sativa* grown under different management treatments, using three collection methods: sticky traps, pitfall traps, and manual sampling. Insects were sampled across three experimental areas, resulting in 12 treatment–trap combinations. A total of 666 insect specimens were collected, representing five major insect orders including Diptera, Hymenoptera, Coleoptera, Hemiptera, and Orthoptera and nine dominant families: Carabidae, Muscidae, Formicidae, Cicadellidae, Pentatomidae, Coccinellidae, Gryllidae, Vespidae, and Curculionidae. Two-way analysis of variance (ANOVA) indicated a significant effect of management treatment on total insect abundance ($p = 0.028$). Trap type also influenced capture rates, with sticky traps yielding the highest counts, followed by pitfall traps and manual collections. These findings demonstrate that management practices and microenvironmental conditions influence insect composition and abundance in hemp cultivation. This research provides one of the first quantitative assessments of insect diversity in *C. sativa* systems under experimental conditions in Florida and highlights the importance of continuous entomofaunal monitoring and IPM implementation to maintain ecological balance and reduce pest pressure in hemp production systems.

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From Vineyard to Wine: Harvest and Juice Analytical Insights into Muscadine Grape Cultivars. J. L. Brown*, K. R. Badger, D. S. Jones, Biological Systems Engineering, College of Agriculture and Food Sciences, and A. F. Humphries, V. M. Tsolova, Center for Viticulture and Small Fruit Research, J. Chen, Biological Systems Engineering, College of Agriculture and Food Sciences, Florida A&M University, Tallahassee, FL, 32307.

This study focused on the harvest and processing of muscadine grape cultivars, Noble, Floriana, and A27 from a precision engineering system monitored vineyard experiment at the FAMU Center for Viticulture and Small Fruit

Research. The immediate objective was to characterize fruit yield and enological parameters. Grapes were processed using a crusher/destemmer and bladder press to obtain juice for analysis. Standard analytical tools, including a refractometer, pH meter, and titration setup with 0.1M NaOH and bromothymol blue indicator, were used to measure soluble solids (°Brix), pH, and titratable acidity. Samples were also prepared with a vacuum pump and filter for advanced analysis on the Lyza 5000 Wine Analyzer, providing comprehensive enological data. Harvest weights were recorded by cultivar and vine, with Noble, Floriana, and A27 showing distinct differences in gross and net yields. Juice analyses revealed variation in soluble solids, acidity, and pH across cultivars, reflecting genetic differences and vineyard conditions. These parameters are critical indicators of grape ripeness, fermentation potential, and wine quality. Looking forward, these results provide a foundation for integration with precision engineering monitoring systems for canopy, climate, soil, and management practices. Together, such datasets will enable cultivar-specific insights to guide harvest timing, optimize processing, and refine winemaking strategies to advance precision viticulture in muscadine grapes.

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Occurrence of *Amrasca biguttula* (Hemiptera: Cicadellidae) and Associated Predators in Okra, Cotton, and Roselle Crops in north Florida. J. J. Simmons*, M. J. S. Cabral, S. O. Laird, A. M. S. Robinson-Baker and M. Haseeb, Center for Biological Control, College of Agriculture and Food Sciences, Florida A&M University, Tallahassee, FL 32307.

Amrasca biguttula (Ishida) (Hemiptera: Cicadellidae), commonly known as the cotton jassid, is a major pest of tropical and subtropical crops. This invasive pest recently invaded Florida and the neighboring states. Due to its wide host range and substantial economic impact. This sap-feeding leafhopper causes chlorosis, curling, and marginal necrosis of leaves, resulting in reduced photosynthetic activity, stunted growth, and yield loss in crops such as okra (*Abelmoschus esculentus*), cotton (*Gossypium hirsutum*), and roselle (*Hibiscus sabdariffa*). Its feeding activity also predisposes plants to secondary infections and physiological stress. This study aimed to assess the occurrence of *A. biguttula* across different host plants and document associated predators with potential for biological control. Weekly field samplings were conducted in experimental plots cultivated with okra, cotton, and roselle. Insects were collected through direct leaf inspections and identified using standard taxonomic keys. *A. biguttula* populations were recorded on all host plants, with the highest abundance observed in okra, followed by roselle and cotton. Three principal predators were frequently observed: the minute pirate bug *Orius insidiosus* (Hemiptera: Anthocoridae), green lacewing (*Chrysoperla* sp.) (Neuroptera: Chrysopidae), and the Asian lady beetle *Harmonia axyridis* (Coleoptera: Coccinellidae). The presence of these natural enemies, particularly O. insidiosus and *H. axyridis*, indicates strong potential for natural regulation of jassid populations through predation. These findings highlight the ecological interactions between *A. biguttula* and its natural enemies across host plants and underscore the importance of conserving beneficial arthropod species.

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HTS-Based Detection of Divergent Grapevine Virus B in Florida Muscadine Grapes. H. Edwards*, A.G. Mohamed, and V. Tsolova, Center for Viticulture and Small Fruit Research, Florida A&M University, Tallahassee, FL 32308, and M. Al Rwahnih and K. Stevens, Foundation Plant Services, University of California, Davis, CA 95616.

During an annual survey of the G1 foundation block (“Clean Vineyard”) at the Center for Viticulture and Small Fruit Research in Tallahassee, Florida, young leaves and petioles were collected in spring to early summer from *Muscadinia rotundifolia*. Multiple legacy/published RT-PCR and RT-qPCR assays currently in use for grapevine diagnostics detected no signal for Grapevine virus B (GVB), suggesting primer–template mismatches in circulating strains. High-throughput sequencing (HTS) of total RNA nevertheless confirmed the presence of GVB. De novo–assembled viral contigs returned the closest BLASTn match to a Tennessee isolate (GenBank MN716773.1) from cultivated grapevines that was itself generated by RNA-Seq of rRNA-depleted total RNA (7,585-nt contig), underscoring that both detections relied on unbiased HTS. HTS served as an unbiased safety net in the clean-plant foundation nursery, revealing cryptic or novel variants that challenge conventional diagnostics. HTS-derived contigs were mined to identify conserved targets across the local population, guiding the design of candidate primers intended to restore detection sensitivity in endpoint and real-time assays while keeping costs compatible with certification workflows. Curated consensus sequences are being prepared for public repositories to expand community resources, enable inter-laboratory harmonization, and support future comparative analyses. By pairing discovery (HTS) with targeted assay

refinement, nurseries can mitigate false negatives, reduce reliance on HTS for every sample, and sustain high-confidence surveillance. Collectively, these actions strengthen certification testing and nursery biosecurity, limit the spread of latent infections through propagation material, and provide practical, sequence-informed markers to update primer designs as viral populations evolve.

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Building a Low-Cost Tabletop Aquaponics System for Research and Sustainable Home Food Production. A. Francis*, S. Syntils, E. Duke, Plant and Soil Science Program, V. Chhetri, Food Science Program, College of Agriculture and Food Sciences, Florida A&M University, Tallahassee, FL, 32310.

Aquaponics (AP) is a closed-loop integration of aquaculture and hydroponics, offering a sustainable approach to food production that significantly conserves water and reduces reliance on chemical fertilizer inputs. This project aims to design and construct tabletop aquaponics systems using readily available materials, suitable for food safety and production research, as well as small-scale household production. A total of 10 aquaponic systems, each featuring 10-gallon aquarium tanks and 12-gallon plant grow beds, were constructed. The biofilter consisted of three layers: clay pebbles, bio-balls, and filter mats, designed to facilitate the natural nitrification process, which converts ammonia from fish waste into nitrates through microbial activity. Goldfish (*Carassius auratus*) are selected in this study due to their ability to tolerate a wide range of water temperatures and low maintenance costs. Spinach will be planted in the system, and changes in water quality parameters, including pH, dissolved oxygen, ammonia, nitrite, and nitrate concentrations, will be regularly monitored to assess system stability and the efficiency of the biofilter. Additionally, food safety risks and plant growth performance will be assessed. This work will contribute to the development of a laboratory-scale aquaponics system for investigating sustainable food production and assessing food safety risks.

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Implementing Native Under-Vine Vegetation for Climate-Smart Weed Management in Florida Muscadine Vineyards. A. Anderson*, A. F. Humphries, C. Kruis, & V. Tsolova, Center for Viticulture & Small Fruit Research, College of Agriculture and Food Sciences, Florida A&M University, Tallahassee, FL 32308.

Florida's grape producers face intensifying climate pressures that exacerbate weed growth, soil erosion, and heat stress within the vine row. This study evaluates under-vine vegetation (UVV), the intentional establishment of low-growing native species, as a practical alternative to bare, chemically or mechanically maintained strips in muscadine vineyards. In mid-November, UVV treatments were installed by removing existing vegetation and planting seeds or plugs of native species: sunshine mimosa (*Mimosa strigillosa*), buffalo clover (*Trifolium reflexum*), lyreleaf sage (*Salvia lyrata*), and turkey tangle fogfruit (*Phyla nodiflora*), alongside a native wildflower seed mix. Treatments are compared to a bare control and the site's standard under-vine management. Early-spring assessments will quantify UVV establishment and weed suppression using fixed quadrats (seedling density), percent cover (point-intercept), and optional biomass sampling; growth and phenology (plant height, time to 50% cover, first flowering); and microenvironmental effects at the soil surface (photosynthetically active radiation, soil temperature, volumetric moisture). We hypothesize that dense, stoloniferous species (e.g., *M. strigillosa*, *P. nodiflora*) will reduce bare ground, moderate the soil microclimate, and lower weed density relative to controls, while direct-seeded treatments may show more variable establishment. Findings will inform best-practice recommendations for a "Climate-Smart Muscadine Management Guide," emphasizing effective, ecologically grounded, and economically viable under-vine strategies for Florida vineyards.

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The Effects of Compost on Soil Health. K. Nelson*, T. White, D. White. UAPB Discovery Farm Educational Center, University of Arkansas at Pine Bluff, Pine Bluff, AR 71601.

Soil health is a cornerstone of sustainable agriculture and food production. Healthy soil supports plant growth, regulates water, cycles nutrients, and sustains biodiversity. However, practices such as intensive farming, erosion, and poor land management degrade soil quality over time. Composting—recycling organic waste into nutrient-rich amendments—provides a practical, low-cost strategy to restore and maintain soil health. Compost enhances soil structure, boosts microbial activity, improves water retention, and supplies essential nutrients critical for plant growth.

This study investigates the impact of compost on three key indicators of soil health: pH**,** moisture retention**,** and organic matter content**.** A comparative experiment was designed with two groups: (1) a control group consisting of untreated garden soil and (2) an experimental group consisting of soil mixed with 25–30% compost by volume. Baseline measurements were taken for all variables, followed by repeated testing at regular intervals. Soil pH was measured using digital meters or test strips, organic matter content through soil testing methods, and moisture retention will be measured by saturating soil and recording water-holding capacity over 24–48 hours. By evaluating differences between compost-amended and control soils, this study aims to provide measurable evidence of compost's benefits in improving soil quality over time. The findings will not only reinforce the scientific value of composting but also highlight its role as a sustainable practice for schools, community gardens, and local agriculture. Demonstrating these benefits can encourage broader adoption of composting as both an educational and environmental strategy.

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Source Sink Manipulation in Soybean to Understand its Final Seed Size Determination Stage. P. Niyomugabo*, S. Poudel and A. Chiluwal, 1890 Land-Grant Program, Kentucky State University, Frankfort, KY 40601.

Photoassimilates production in source and its transport to the sink is a vital physiological process in the plant. Any source or sink limitations during crop growth can lower crop productivity. Potential seed size in many crops including major cereals is determined during early seed developmental stages. However, previous studies in soybean (*Glycine max* [L.] Merr.) indicate that final seed size is determined in later developmental stages and is more dependent on assimilate supply during the seed filling phase. However, the stage when final seed size is determined in soybean is not clearly understood especially under the field conditions. Hence, seed growth dynamics under the increased assimilate supply during different seed filling periods were studied in a field experiment at Frankfort, KY. Two soybean cultivars, representing Maturity Group 2 and 4, were evaluated for seed growth dynamics under control and increased assimilate supply during different seed filling stages. Treatments consisted of a control, and a depodding (pod removal) treatments at weekly intervals after R5 (beginning of seed filling stage) until maturity. Only 4 to 6 pods (one pod in a node) were maintained in a plant in depodding treatments to provide a higher assimilate supply to remaining seeds. Providing higher assimilates during the seed-filling stage increase soybean yield traits. Therefore, providing supplemental inputs during this stage or developing soybeans with greater source strength could help improve soybean productivity by minimizing the gap between actual and potential seed size.

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Biochemical Identification of Plant Growth-Promoting and Salt-Tolerant Bacterial Endophytes from *Sporobolus alterniflorus* I. Murphy*, K. Williams, H. Schwalbe, A. Todd, College of Agriculture, Science, and Technology, Delaware State University, Dover, DE; T. Turner, College of Arts and Sciences, Tuskegee University, Tuskegee, AL.

Abiotic stressors, including salinity, drought, and oxidative conditions, negatively impact the growth and production of crops. Plant growth-promoting bacteria (PGPB) have not been measured or identified with halotolerant capabilities in plants. This study aims to determine the mechanisms by which bacteria resist salt stress and promote plant growth. A total of 43 bacterial isolates were extracted from field-harvested *Sporobolus alterniflorus* root tissue and organized based on salinity levels of the collection site: high, medium, and low. The isolates were re-cultured from frozen glycerol stocks using Lysogeny Broth (LB) and subjected to various biochemical assays. The tests measured catalase activity, indole-3-acetic acid (IAA) production, detection of the 1-aminocyclopropane-1-carboxylate (ACC) deaminase gene (acdS) via polymerase chain reaction (PCR), halotolerance testing, and soluble phosphates. 33% of the isolated bacteria passed the catalase and phosphate production tests, as determined by the weighted average of the results. Only 9% of bacterial isolates express the ACC deaminase gene, indicating that the gene is selective in bacteria since numerous isolates do not obtain it. Production of catalase and IAA indicates the bacterial isolates could be plant-growth promoting, while the presence of the ACC gene is low. Considering the findings, the identified bacterial isolates may be capable of improving plant growth and surviving in environments with high salinity stress. To further understand the effects of microorganisms on plant health, future studies could incorporate the use of microbial biofertilizers to enhance plant stress tolerance and promote sustainable plant growth by improving soil health and crop productivity.

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Defining Safe Genomic Insertion Sites in Tomato. C. Thompson*, J. Larkin, S. Hind, M. Egnin, I. Ritte, M. Okoma, and G.C. Bernard Dept. of Ag. and Envi. Sciences-Plant Biotech & Genomics Research Lab, Tuskegee University, Tuskegee, AL 36088; Dep. of Crop Sciences, University of Illinois Urbana-Champaign, Urbana, IL 61801; School of Plant Sciences, College of Agriculture, Life and Environmental Sciences, University of Arizona, Tucson, AZ 85721.

Tomatoes are a globally significant crop and a key model for plant biotechnology, yet the absence of identified genomic safe harbors (GSHs) specific genome regions where DNA can be inserted safely limits the precision of genetic engineering in this species. Our study aims to identify potential GSHs in tomato by evaluating 16 predicted genomic targets to determine which sites support the most stable and efficient transgene integration. Establishing a dependable GSH will improve gene-editing safety and reliability in tomato breeding. To begin this work, we designed and synthesized 64 primers to amplify homology arms DNA segments that guide accurate gene insertion at specific genomic sites. PCR amplification results showed that 13 of 32 homology arms produced strong bands, 3 yielded partial amplification, and 16 did not amplify under current conditions, suggesting optimization is needed. As a proof of concept, we successfully cloned the left homology arm for Site 189 into a destination vector. Sequence alignment revealed that the Yellow Pear tomato homology arm was 100% identical to the corresponding region in the Heinz 1706 reference genome, demonstrating high conservation between the two varieties. Future experiments will introduce these constructs into tomato protoplasts (cell wall–less plant cells) to evaluate transgene insertion efficiency. This research establishes a foundation for predictable and precise genetic modification in tomatoes, enabling the development of improved varieties with enhanced disease resistance, nutritional quality, and shelf life. *Work supported by NSF-STC to Cornell-CROPPS #DBI-2019674, University of Illinois-CROPPS and Tuskegee University-CROPPS Sub-Award #92226-22979, Tuskegee University USDA-NIFA Evans-Allen.*

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Influence of Floral Pruning and Trellising on *Pachyrhizus erosus* Tuber Yield. I. Hodge*, D. A. Richards Jr., I. R. Charles, and T. W. Zimmerman, University of the Virgin Islands, Agricultural Experiment Station, St. Croix, U.S. Virgin Islands 00850.

Jicama (*Pachyrhizus erosus)* is a tropical climbing legume valued for its edible tuberous root and potential role in sustainable agricultural production systems. Being a climbing vine, trellising for support is used. The objective of this study was to investigate the effects of trellising and floral removal on jicama tuberous root development. Jicama was planted in a replicated trial involving trellising with flowers, trellising with floral pruning, no trellis with flowers, and no trellis or flowers. Six harvests, at 14-day intervals, started at 70 days. Floral buds were initiated at 70 days. By 98 days, significant difference in jicama tuberous roots for all floral pruned plants. Non-trellised floral pruned tuberous roots were slightly smaller than trellised nonflowering plants. Additional evaluation of root quality traits and above-ground growth patterns would further clarify how these management practices influence overall crop performance. Future studies could also incorporate economic analysis to determine whether the yield benefits of floral pruning justify the labor investment across production systems. In conclusion, across treatments, limiting reproductive development enhances jicama tuberous root development, while no trellis minimizes labor and supply costs as well as making harvest easier.

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Investigating the Role of *Moringa oleifera* on Nuclear Factor Kappa B (NF-κB) Inhibition in T cells. M. Hackett*, H. Scott, J. Hayes, T. Alamin, and R.C. Minor, Department of Animal Sciences, North Carolina Agricultural and Technical State University, Greensboro, NC 27411.

Nuclear Factor kappa B (NF-κB) is a transcription factor involved in numerous diseases and serves as a target for therapeutic interventions. Many anti-inflammatory drugs derived from plant sources. Moringa oleifera, commonly known as the "miracle tree," offers a variety of health benefits. Moringa extracts have been shown to suppress inflammatory responses in macrophages through a mechanism that involves the NF-κB pathway, but its impact on NF-κB activation in T cells, cells crucial for adaptive immune responses, remains unclear. This study aims to characterize whether extracts from Moringa oleifera inhibit NF-κB activation in T cells. Human derived Jurkat E16.1 T cells were cultured at a density of 5×10^6 cells/ml in complete RPMI media and pretreated with ethanolic Moringa extracts at concentrations of 0.5%, 1%, 2.5%, and 5% (v/v) for 1 hour. Pre-treated Jurkat T cells were stimulated with

anti-CD3/CD28 [1 mg/ml]. At 15-, 30-, and 60-minute time-points, cells were collected and extracts (cytoplasmic and nuclear) prepared. Western Blotting analysis of the extracts showed increased NF-κB translocation into the nucleus at 30 minutes. However, in these preliminary experiments, Moringa treatment did not alter NF-κB protein levels as compared to the untreated cells. Further experiments will be needed to increasing our understanding of the role of Moringa on T cells and its promise as alternative immunotherapeutic agent.

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Understanding the Roles of RDR and DCL Proteins in Virus Induced Gene Editing in Tomato Plants. S. Leggette*, Plant Biotechnology and Genomics Research Lab, College of Agriculture, Environment and Nutritional Sciences, Tuskegee University, AL 36088; F. Xia and J. Van Eck, The Boyce Thompson Institute, Ithaca, NY 14853 and Center for Research On Programmable Plant Systems (CROPPS) Cornell University, Ithaca, NY 14850; I. Ritte, M. Egnin, and G. Bernard, Plant Biotechnology and Genomics Research Lab, College of Agriculture, Environment and Nutritional Sciences, Tuskegee University, AL 36088.

Genome editing is an important tool for biological research and crop improvement while relying heavily on tissue culture. Tissue culture is the traditional method for genome editing but requires large investments, extensive procedures, and can have unintended effects on the genome. Virus induced gene editing (VIGE) creates heritable edits using engineered viruses to deliver single-guide RNA to the meristem via direct delivery. Tobacco Rattle Virus (TRV) is a desirable vector and has successfully created heritable edits in dicotyledonous plants. Many plants exclude viruses from their meristems as a defense mechanism. RNA-dependent RNA polymerase (RDR) and Dicer-like (DCL) genes encode key proteins involved in said viral protection. This project evaluates how they affect VIGE efficiency by creating loss of function mutant tomato plant lines and conducting TRV mediated VIGE on these plants using phytoene desaturase (PDS) as a reporter gene. Loss of function mutants were crossed with high Cas9 expressing, high editing efficiency wildtype plants, and VIGE was conducted on the crossed plants. Phytoene Desaturase photobleaching symptoms began showing 11 days post editing after which a western immunoblot analysis was performed to evaluate the Cas9 expression in the crossed plants. Positive DNA sequencing results indicated successful creation of loss of function in mutants. Additionally, western immunoblot results revealed high Cas9 expression in the crossed plants. This project lays the foundation for future work on developing protocols for more efficient VIGE work and acts as progress towards the overall goal of overcoming the barriers of tissue culture-based genome editing in agricultural crops. *Research supported by NSF STC Cornell Center for Research on Programmable Plant Systems (CROPPS) Grant No. DBI-2019674/Sub Award Number 92226-22979 to Tuskegee University, USDA-NIFA Grant #2014-38821-22448 (iBREED), USDA TU-CAENS-Evans-Allen-GWCAES Grant # ALX-FVC18, USDA Award # 022-67037-36622.*

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Unraveling Generalist Floral Visitations in the Perennial Crop *Silphium integrifolium.* J. Pierre*, Department of Agricultural and Life Sciences, Central State University, Wilberforce OH 45384; Y. Oladosu, Agricultural Research and Development Program, Central State University, Wilberforce OH 45384; and M. Nagle, Agricultural Research and Development Program, Central State University, Wilberforce, OH 45384

The global decline in pollinator populations, driven by agricultural expansion and habitat destruction, threatens ecosystem services and food security. Incorporating native perennial crops into agricultural landscapes offers potential benefits for ecosystem services and crop production. *Silphium integrifolium* (silflower), a native North American prairie species from the Asteraceae family is a promising candidate for a sustainable oilseed crop providing ecological advantages such as soil protection and boosting pollinator populations. This perennial crop flowers late season, from July to September, offering a substantial floral resource for pollinators during times of dearth. Within a multi-institutional and interdisciplinary project, floral visitation to *S. integrifolium* was systematically observed at six sites during the flowering season in and around Central State in Ohio. A total of 1,062 floral visitors were recorded from 47 species, spanning four orders and eighteen families. Bee (Hymenoptera) was the most common floral visitors making up 65.6% of visitors, including a mix of native and non-native species. Butterflies (Lepidoptera), beetles (Coleoptera), and flies (Diptera) also contributed to pollination. The high mix of floral visitors, especially native bees, suggests that *S. integrifolium* employs a broad, generalist pollination strategy, which could improve its reproductive success amid environmental fluctuations. This study shows that *S. integrifolium* supports a diverse pollinator community, highlighting its potential as a key component of sustainable farming systems that can provide both

ecosystem services and crop yields. Understanding the pollination ecology of this emerging crop is crucial for its effective domestication and integration into future agricultural practices.

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Priming with Hydrogen Peroxide (H_2O_2) Solution Enhances Seed Germination in Fababean (*Vicia faba*). M. L. Jermison*, T. Edens, College of Agriculture, H. L. Bhardwaj, C. Kim and R. Dhakal. Agricultural Research Station, Cooperative Extension, Virginia State University, Petersburg, VA 23806.

Seed germination in Fababean (*Vicia faba*) is major problem particularly in some specific germplasm and old seed lots. Faster seed germination is very important for earlier plant establishment and growth especially in winter planting. A study was conducted to identify suitable priming method for better germination using large (GL), medium (BH) and small (BL) seeded varieties. Twenty-five seeds of each varieties were treated with various priming methods (no priming, water and H_2O_2 priming) and the experiment was replicated three times. Seed were soaked for 24 hrs and kept in germination paper at room temperature. Sufficient water was applied on germination tray to keep seed moist throughout the experiment. Significant difference was observed in seed breaking, water absorption and sprouting time with priming methods. Seed coat breaking was observed within 24 hours in H_2O_2 treated varieties. Both priming methods (water and H_2O_2) were found superior in terms of germination than no priming. All varieties showed good response to H_2O_2 treatment and average germination ranged from 85 to 90 %. Interestingly, H_2O_2 priming enhanced germination in very old seed lot of large-seeded variety (GL) as compared to other priming methods. It shows the potential of H_2O_2 priming to enhance germination in very old seed lots and can be beneficial in other leguminous crops.

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Fiber Yield Potential of Selected Hemp (*Cannabis sativa*) Cultivars at Various Planting Date. T. Edens*, M. L. Jermison, College of Agriculture, C. Kim and R. Dhakal, Agricultural Research Station, Cooperative Extension, Virginia State University, Petersburg, VA 23806.

Industrial hemp (*Cannabis sativa*) is naturally a photosensitive and short day plant. The growth of plants stops once days become shorter irrespective of the planting date. So, optimal planting date is extremely important to ensure proper vegetative growth of this crop. This study aimed to find out the optimal planting date and variety for fiber production in Virginia. Six commercial varieties were sown at various dates at VSU Randolph farm. Four planting dates were evaluated in this experiment (May 1, May 15, May 30 and June 15). The plants were harvested at maturity and leaves and tops were removed for retting. Equal amount of stem mass (1 kg) was used for fiber extraction through wet retting. Retting was done for 2 weeks and fiber is extracted from the stem manually. Significant difference in fiber yield was observed among varieties and planting dates. Earlina8FC recorded the lowest fiber yield at every planting date and ranged from 12-17 % on dry wt. basis. Fibror79, Monoica and Futura83 grows very well and produced higher fibers. Futura83 consistently produced higher fiber in each planting dates and ranged from 21.5- 28.6 %. All varieties recorded higher fiber content on May 30 and sharply declined on June planting. Futura83 recorded the highest (28.6 %) followed by Fibror79 (24.8 %) during May 30 planting. These initial results showed the potential of Futura83 and Fibror79 as suitable varieties for fiber production.

873

Assessing the Merits of Flower Strips as Forage to Pollinators and Beneficial Arthropods: Experience from Virginia State University. N. Bugg*, Z. Mersha, Agricultural Research Station, Virginia State University, Petersburg, VA 23806.

About 75% of crops depend on pollinators, so year-round forage matters beyond the multifaceted benefits of honeybees. This project aims to 1) identify the most prevalent pollinators and evaluate their activity across flower strips grown at Randolph farm and 2) increase awareness on how integrated pest management (IPM) supports pollinator health. In 2024, strips of buckwheat BW) and black-oil sunflower (BOSF) were planted; in 2025, lemon-queen sunflower (LQSF), crimson clover (CC), and zinnia (ZN) were added. BW, CC, and BOSF were tested as randomized plots during the summer months and all five species were grown in 5×150-ft strips since August. Pollinator activity by major insect orders, flower preference, and time of day was recorded on-plant and in flight at three stations

per strip using 30-second gazes. High resolution pictures were taken and species were confirmed through the Virginia Tech Insect ID Lab. Pollinator activity peaked at midday when there is enough warmth and sunlight. Hymenopterans, primarily honeybees, bumble bees, and wasps were most abundant on sunflowers and buckwheat but not on zinnias which attracted most Lepidopterans (butterflies and moths). Most insects observed were pollinators, followed by beneficials (e.g., ladybird beetles); pests were fewer but included June beetles. Results underscore plant selection to support diverse pollinators across times of day and seasons. Outreach engaged hundreds of Randolph Farm visitors. IPM messaging emphasized pollinators' roles in crop production, avoiding broad-spectrum pesticides, and risk assessment to minimize exposure. Together, pollinator-targeted plantings and IPM practices protect pollinators, bolster beneficial arthropods and support sustainability.

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Assessing the Economic Viability of Specialty Crop Production in North Carolina. R. Jones*, and K. Jefferson-Moore, Department of Agribusiness, Applied Economics and Agriscience Education, North Carolina Agricultural and Technical State University, Greensboro, NC 27411.

This research examines the economic viability of specialty crop production in North Carolina, with emphasis on small-scale producers and the factors that influence profitability and sustainability. Specialty crops, which include fruits, vegetables, tree nuts, horticultural products, and nursery crops, represent an increasingly important segment of U.S. agriculture, generating $56.6 billion in cash receipts nationally in 2024. In North Carolina, specialty crops totaled approximately $1.7 million in cash receipts in 2023, with sweet potatoes, cucumbers, peppers, blueberries, watermelons, tomatoes, squash, cantaloupe, and cabbage representing major contributors to the sector. However, the economic potential of specialty crops is shaped by a series of interconnected variables, including market trends, climate suitability, labor availability and cost, regulatory pressures, and access to resources and capital for small-scale farms. Literature on small farm resilience highlights that farm economics is central to sustaining agricultural operations, while research on economies of scale and scope suggests that specialty crop producers often face structural disadvantages compared to commodity crop operations. This study evaluates the current market trends of specialty crops and their prospective viability for economic growth and resilience in North Carolina agriculture. The a priori expectations are that consumption of specialty crops is strong; however, long-term viability will depend on improved labor efficiency, strategic diversification, and policy or institutional support, which are expected to reduce barriers for smaller producers.

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Integrating Cover Crops to Enhance Yield and Sustainability in Organic Vegetable Farming. E. Bodude*, S.P. Naroju, S. Chowdhury, D. Nandwani, and J.C. Ricketts, Department of Agricultural Sciences and Engineering, College of Agriculture, Tennessee State University, Nashville, TN 37209.

Cover crops play a vital role in enhancing the sustainability and productivity of organic vegetable production systems by improving soil fertility, conserving moisture, and suppressing weeds. To evaluate their impact on crop-yield performance, a two-year field experiment (2024-2025) was conducted at Tennessee State University's certified organic farm. The study assessed three economically important vegetable crops (tomato, okra, and chilli pepper) grown under two management treatments: with cover crops and without cover crops. Barley, winter rye, and field pea were used as cover crops in a rotation preceding vegetable planting. Seedlings were raised under hoop-house conditions and transplanted at the four-leaf stage into replicated field plots. Crop yields were recorded at maturity and subjected to statistical analysis to assess treatment effects. Results demonstrated that integrating cover crops significantly enhanced vegetable yields across all species evaluated ($p < 0.05$), with an overall yield increase of 67.2% compared to non-cover crop plots. Specifically, yield improvements ranged from 134.7 to 222.2% in chili pepper, 37.9 to 44.6% in okra, and 59.3% in tomato. The observed yield gains were attributed to the improved soil nutrient availability, enhanced microbial activity, and better soil moisture retention that previous studies have cited following cover crop incorporation. Our findings confirm that cover crops provide substantial agronomic and ecological benefits in organic vegetable production. The results also support cover crop adoption as a key management strategy for maintaining long-term soil health and optimizing crop productivity in sustainable farming systems.

876

Symbiotic Biological Nitrogen Fixation Impact on Legume Adaptation to the Delmarva Peninsula Environmental Conditions. M. Kaba*, A. Ahmed, F. Hashem, Department of Agriculture, Food, and Resource Sciences, University of Maryland Eastern Shore, Princess Anne, MD 21853.

Symbiotic biological nitrogen fixation (BNF) by legumes is vital for sustainable agriculture, improving soil health, and reducing reliance on synthetic nitrogen fertilizers. Legumes form symbiotic associations with rhizobia and bradyrhizobia bacteria, converting atmospheric nitrogen into forms usable by plants within their root nodules. This study evaluated the adaptability and nitrogen fixation efficiency of soybeans (*Glycine max*), pigeon peas (*Cajanus cajan*), and mung beans (*Vigna radiata*) under the Delmarva environmental conditions. These legume genotypes with four cultivars/varieties each were cultivated in a randomized complete block design at the UMES Agriculture Experiment Station over 10 years of growing seasons. Environmental variables (soil type, ambient temperature, and rainfall) were assessed, and their effects on legume nodulation and performance and crop yield were evaluated. At the 50% flowering stage, plants were sampled to measure nodule number, mass, and effectiveness, and plant biomass was determined. At harvest, seed yield and plant biomass were recorded. Soybeans exhibited the highest nodulation (≈50 nodules/plant) and nitrogen fixation efficiency (≈85%), indicating a strong adaptation to the Delmarva region. Mung beans displayed moderate nodulation (≈11 nodules/plant), while pigeon pea showed limited nodulation (≈3 nodules/plant). Despite these differences, all legume species demonstrated satisfactory vegetative growth, suggesting moderate adaptability to Delmarva conditions. Results underscore soybean establishment efficiency and suitability for sustainable cropping systems; however, mung bean and pigeon pea showed promise. Overall, this study emphasizes the importance of selecting legume species and genotypes suited to local environments to maximize BNF, improve soil health, and promote environmentally friendly agricultural practices across the Delmarva region.

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Effects of Mycorrhizal Fungi and Drought Stress on Marshmallow (*Althaea Officinalis*) Shoot and Root Yield. N.A. Trinidad*, C.P. Cotton, A.B. Matthews, and S.K. Bonik, University of Maryland Eastern Shore, Princess Anne, MD 21853.

Marshmallow (*Althaea officinalis*), a medicinal plant valued for its high root mucilage content, has long been used to soothe digestive, respiratory, and skin ailments. The species naturally thrives in wetlands and marshy environments; however, changing climatic conditions and increasing drought frequency may negatively impact root biomass. Mycorrhizal fungi form symbiotic relationships with plant roots, enhancing water and nutrient uptake and thereby improving plant growth and resilience. A high tunnel study evaluated the effects of mycorrhizal fungi and drought on Marshmallow plant growth and development. Marshmallow seedlings were transplanted into Vego self-watering (wicking cell system) raised beds containing Promix substrate with and without mycorrhizae. Six raised garden beds were separated into two sections: self-watering and drought, with six plants in each section. For the drought treatment, a black plastic bag created a barrier between the Promix and the self-watering system. The Promix was watered as needed, and the plants were fertilized biweekly with Jack's Classic All-Purpose 20-20-20 fertilizer. Plant height, chlorophyll content, and moisture content were recorded weekly. There was no significant difference in shoot fresh and dry weight among treatments. The Promix without mycorrhizae self-watering treatment was significantly higher ($P \leq 0.05$) in root fresh and dry weight, average plant height, and average chlorophyll content. Results suggest that the mycorrhiza fungi had little effect on root development, which could be due to environmental factors or specific species involved. Further research is needed to identify mycorrhizal strains capable of forming effective symbiotic relationships with Marshmallow's thick, tough, yet pliable root system.

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Phenotypic evaluation of blueberry plants treated with different soil pH levels. I.A. Walker*, K.P. Kulkarni, Z.A. Khan, K. Melmaiee; Department of Agriculture and Natural Resources, Delaware State University, Dover, DE 19901.

Blueberry (*Vaccinium corymbosum*), belonging to the family Ericaceae, is a shrub native to eastern North America. In the United States, blueberries grow best in the Pacific Northwest and other temperate regions. Soil pH is a significant factor in blueberry growth, as they are acid-loving plants; highbush blueberry performs best in acidic soils (pH 4.5–5.5). However, large areas of the Midwest, Great Plains, and arid Western states have naturally neutral to alkaline soils that are unsuitable for blueberries without soil acidification management. In contrast, the Eastern coastal zones, the Southeast, and the Pacific Northwest possess acidic soils that are congenial for blueberries. Soil pH

influences the solubility and availability of nutrients, such as iron and manganese, which are essential for optimal plant growth. In this study, we aimed to evaluate the effects of different soil pH levels (5 as a control, and 6, 7, and 8 as treatments) on the popular blueberry cultivars and assess their performance. Blueberry plants (three replications) will be grown in pots with pH adjusted to selected levels and observed for about three months. The plant's performance will be compared with that of control plants grown at pH 5.0. Key physiological parameters, including whole-plant biomass and chlorophyll as measured by SPAD and NDVI, will be measured every 15 days. These indicators of photosynthetic capacity and vegetative index will allow us to evaluate cultivars across different pH conditions and understand how increased pH affects plant growth and performance.

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Sustainable Food Systems' Experiential Learning: The 1890 Research and Extension Experiences (REEU) for Undergraduates in Mississippi. A. Parker*, N. Jarrell, D. Howard, Departments of Natural Resources and Environmental Design, Agribusiness Applied Economics, and Agriscience Education, and Animal Science, North Carolina A&T State University, Greensboro, NC 2741**;** K. Faustin, Animal and Veterinary Science Program, Tuskegee University, Tuskegee, AL 36008; R. Hooper FLAIM Elementary School, Baton Rouge, LA 70808; M. Gaspard, Department of Entomology, Louisiana State University, Baton Rouge, LA 7080;. R. Butler Department of History, Southern University and A & M College, Baton Rouge,LA 70813; E. Coleman, D. Moody, J. Goins, A. Solorzano, P. Baldwin, D. Miller, J. Coleman, M. Mason- Montgomery, C. Shili, M. Burr, Department of Agriculture, and Alcorn Extension Program, Alcorn State University, Lorman, MS 39096; E. Ali, T. Kumudini, A. Abolude, T. Rashid and D. Collins, Department of Agriculture, and Alcorn Extension Program, Alcorn State University, Lorman, MS 39096.

Sustainable agriculture production is a vital component in developing sustainable food systems for both urban and rural communities. The USDA defines a food system as everything from the farm to the table. Alcorn State University hosted a cohort of twelve student interns from North Carolina, Alabama, Louisiana,and Mississippi in the 1890 REEU Small Farm summer internship program 2025. The objective of this project was to provide students with firsthand, real-world experience in research and extension learning opportunities in sustainable plant and animal production systems, processing, and distribution. This projectis an overview of student engagement with research and extension faculty, local and state community stakeholders in combating food deserts in the Mississippi Delta, Southwest, and Central Mississippi. Experiential learning activities included farm visits, touring research plots, visiting farmers' markets, and visiting Alcorn State University Research/Extension Farm Technology Transfer Center, Mound Bayou, MS; Alcorn State University Vegetable processing facility in Marks, MS. Students also engaged in hands-on learning with community gardens in Natchez, Fayette, and Jackson, MS. Animal production systems included poultry and goat production research and extension.

880

Student Experiential Learning in Sampling of Pollinator Bees in the Mississippi Delta. A. Solorzano*, Department of Agriculture, Alcorn StateUniversity, Lorman, MS 39096; D. Collins, Department of Agriculture, Alcorn State University, Lorman, MS 39096; and T. Rashid, Department of Agriculture, Alcorn StateUniversity, Lorman, MS 39096.

The 1890 Small Farm Research and Extension Program continues to encourage experiential learning and the development of skilled agricultural scientists through applied research and outreach. Apis spp. Pollinators play a vital role in maintaining ecological balance and agricultural productivity; however, their populations have declined due to habitat loss, pesticide use, and environmental stressors. This research, conducted through the 1890 Small Farm Research and Extension Program at Alcorn State University, focused on sampling and analyzing pollinator activity in sweet potato production systems across the Mississippi Delta. Bee samples, including, were collected from field sites in Mound Bayou, Mississippi, using sweep nets and pan traps to assess pollinator species composition and abundance. Collected data were evaluated to observe general patterns of species distribution and activity in relation to environmental conditions. The research provided valuable insight into pollinator health and conservation while supporting sustainable agricultural practices within regional crop systems. Findings highlight the importance of pollinator conservation and its connection to agricultural sustainability. The 1890 Small Farm Research and Extension Program continues to encourage experiential learning and the development of skilled agricultural scientists through applied research and outreach.

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Assessing the Effect of Trap Color on Bee Collection in a Sweet Potato (*Ipomoea batatas*) Field. M. Pulliam*, Department of Agriculture, Alcorn State University, Lorman, MS 39096; D. Collins, Department of Agriculture, Alcorn State University, Lorman, MS 39096; and T. Rashid, Department of Agriculture, Alcorn State University, Lorman, MS 39096.

Sweet potatoes (Ipomoea batatas) are an important root vegetable crop worldwide. The estimated value of sweet potatoes in the U. S. is over 680 million in 2021. Bees (Apidae) are important pollinators of sweet potatoes. The 1890 Small Farm Research and Extension program hosted student interns at the Alcorn Research and Demonstration Farm in Mound Bayou, MS., working on pollinator health in documenting the variety of bee species visiting sweet potato fields in the Mississippi Delta. Student experiential learning activities included monitoring bee visits and species composition in a sweet potato plot. The goal of the project was to see how different trap colors, white, blue, and yellow, affected the number and types of bees collected. We used bee traps filled with water and a small amount of soap to capture bees that were attracted to the colors. In addition to the traps, we also used net swatters to collect bees by hand. This combination of trapping and netting helped ensure we sampled a variety of bee species in the area. Through this experience, the interns learned valuable skills in field research, data collection, and pollinator identification, as well as the importance of studying bees in agricultural systems. This internship allowed me to gain hands-on experience in scientific research and deepen my understanding of pollinator ecology. Students learned how environmental factors and visual cues, like color, can influence bee behavior and capture rates. Students also developed teamwork and problem-solving skills while working in outdoor field conditions. Overall, this project strengthened the interns' appreciation for the role bees play in crop production and how studying them can contribute to sustainable agricultural practices.

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Sustainable Fruit and Vegetable Production Experiential Learning for Elementary K-3 Students. R. Hooper*, FLAIM Elementary School, Baton Rouge, LA 70808; M. Gaspard, Department of Entomology, Louisiana State University, Baton Rouge, LA 70803; R. Butler, Department of History, Southern University and A & M College, Baton Rouge, LA 70813; T. Rahid and D. Collins Departmentof Agriculture, Alcorn State University, Lorman, MS 39096.

Introducing youth to careers in sustainable agriculture is vitally important for our nation to maintain its global competitiveness in agricultural production. Alcorn State University has created a niche in working with small farmers in sustainable fruit and vegetable production. Leveraging this strength, Alcorn has collaborated over the years with over 25 high K12 schools in Mississippi and Louisiana by hosting an annual summer camp in Small Farm Integrated Pest Management (IPM) for undergraduate and K-12 students. The purpose of this program was to expose students to hands-on experiential learning insustainable fruit and vegetable production. Students were actively engaged in research and extension projects in fruit and vegetable production with crops such as watermelons, potatoes, peppers, and tomatoes.Students also obtained hands-on experience in small fruit production with muscadine grapes and blueberries. Students also had the opportunity to interact and network with farmers, scientists, and professionals from various Land Grant universities, USDA agencies, and non-government organizations working on the front lines of sustainable fruit and vegetable production. At the conclusion of this internship,all students presented their research and extension findings in a closing Research Symposium and a student-led sustainable agriculture field day.

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Evaluation of Vinca, Zinnia, and Okra as a Companion Plant for Watermelon Production. M. Gaspard*, Department of Agriculture, Alcorn State University, Lorman, MS 39096; R. Butler, Department of Agriculture, Alcorn State University, Lorman, MS 39096; R. Hooper, Department of Agriculture, Alcorn State University, Lorman, MS 39096; T. Rashid, Department of Agriculture, Alcorn State University, Lorman, MS 39096; and D. Collins Department of Agriculture, Alcorn State University,Lorman, MS 39096.

Pollinator variety plays an important role in the development of crops such as watermelon. Intercrop planting is a sustainable agricultural practice that can increase the presence of pollinators by introducing flowering plants into cropping systems. The objective of this study is to document the range of pollinators visiting flowering plants

intercropped with watermelon, such as Vinca (Catharanthus roseus Periwinkle), Zinnia (Zinnia), and Okra (Abelmoschus esculentus), to increase the efficiency of pollination of watermelon and increase fruit quality and yield. A wide range of pollinators was found visiting the flowering plants and watermelon flowers. The insect pollinators identified were carpenter bees, bumblebees, wasps, and butterflies. They were attracted to the flowering plants for consumption, and from there they pollinated watermelon plants. This pollination yielded a great amount of watermelons from a wide variety, including Sugar Babies, Tendersweet, Jubilee, and Crimson Yellow.

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Students' Research and Extension Experiential Learning in Integrated Pest Management Targeting Underresourced Small Farmers. R. Butler*, Department of History, Southern University and A & M College, Baton Rouge, LA 70813; M. Gaspard, Department of Entomology, Louisiana State University, Baton Rouge, LA 70803; T. Rashid, Department of Agriculture, Alcorn State University, Lorman, MS 39096; and D. Collins Department of Agriculture, Alcorn State University, Lorman, MS 39096.

Small farmers in the southern region of the U.S. face challenges in managing plant diseases, weeds, and insects in crops and forest ecosystems. Yield losses due to subtropical weather conditions, weather extremes (e.g., hurricanes, drought, tornadoes), and pest outbreaks have been substantial. As long term changes in weather patterns continue to intensify and create new pest threats, we must train the next generation of plant health management scientists and professionals in how to respond and develop new farm and forest ecosystem management practices to mitigate the impacts of changing weather conditions on crop production. Underresourced farmers and communities are especially vulnerable due to limited resources and a lack of integrated pest management training in weather-smart agriculture. To maintain our nation’s global competitiveness in sustainable agriculture, we need a diverse, well-trained workforce. The overall objective of this project is to provide students with research and extension experiential learning opportunities in weather-smart IPM practices. The small farm IPM interns engaged in firsthand research in the use of cover crops for carbon sequestration and soil health. Students planted and maintained research and extension demonstration field plots in the use of flowering plants for pollinator health and ecosystem functioning in crop production. Additionally, the small farm IPM interns conducted a plant pest survey of plant diseases and insect pests impacting small farms in Mississippi and Louisiana.

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Using the PCR technique to detect the sweet potato leaf curl virus. E. Coleman*, J. Goins, Y. Meng and D. Collins, Department of Agriculture, Alcorn State University, Lorman, MS 39096; A. Parker and D. Howard, Departments of Natural Resources and Environmental Design, Agribusiness Applied Economics, and Agriscience Education, North Carolina A&T State University, Greensboro, NC 27411.

Sweetpotato (*Ipomoea batatas* L.) is an important crop worldwide. Sweetpotato storage roots and vines can be consumed by both humans and livestock. Plant diseases are a major constraint to sweetpotato production. Diagnostic and identification of plant pathogens is an important disease management strategy in order to implement plant disease control strategies. Sweet potato leaf curl virus (SPLCV) is a growing threat to the popular crop; studies by the USDA have shown a 10%-80% drop in yield in numerous heirloom varieties. The purpose of this project was to determine whether or not the virus would be found in the crops grown in controlled environments. Not all plants showed signs of virus infection, but this may have been due to heat and other abiotic factors. Samples were collected, dunked, and stored in liquid nitrogen to become brittle. Using optimized methods for DNA extraction, our results varied for a number of reasons, mainly lab mishaps.

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Pollinators Associated with Marigolds (*Tagetes erecta*). D. Moody*, Department of Agriculture, Alcorn State University, Lorman, MS 39096; J. Goins, Department of Agriculture, Alcorn State University, Lorman, MS 39096; E. Coleman, Department of Agriculture, Alcorn State University, Lorman, MS 39096; D. Collins, Department of Agriculture, Alcorn State University, Lorman, MS 39096; and T. Rashid, Research and Demonstration Farm and Technology Transfer Center, Alcorn State University, Mound Bayou, MS 38762.

Insect pollinators provide important ecological services by pollinating crop plants and increasing yield and income for

farmers. Merrigolds (Tagetes erecta) provide habitat and important nectar resources for pollinators and other beneficial insects. The purpose of the study was to document the variety of pollinators visiting merigolds intercropped with watermelons (Citrullus lanatus). Preliminary results showed a range of pollinators were recorded visiting merigolds from the following orders: Lepidoptera, Diptera, Coleoptera, and Hymenoptera. Pollinators were observed visiting merigolds and then the watermelon flowers, which resulted in excellent fruit set and yield of watermelons.

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Sustainable Weed Management in Crop Production. J. Goins*, Department of Agriculture, Alcorn State University, Lorman, MS 39096; E. Coleman, Department of Agriculture, Alcorn State University, Lorman, MS 39096; D. Collins, Department of Agriculture, Alcorn State University, Lorman, MS 39096; and J. Coleman, Research and Demonstration Farm and Technology Transfer Center, Alcorn State University, Mound Bayou, MS 38762.

Weeds are a prevalent threat in agriculture, and not all methods suit every situation. To assist our small farmers, Alcorn's research and extension programs offer multiple IPM (Integrated Pest Management) solutions for an array of crops. Methods of IPM are successfully being used in an ongoing study regarding flowering plants on watermelon. Watermelon (*Citrullus lanatus*) is a widely popular, heavily consumed fruit of the Cucurbitaceae family in the South, especially in the hot summer months. Unfortunately, it can not compete with invasive weeds or native weeds at early growth stages. In our study, these weeds are primarily crabgrass (*Digitaria sanguinalis*), nutgrass (*Cyperus rotundus*), carpetweed *(Mollugo verticillata*), and pigweed (*Amaranthus retroflexus*), with several IPM-based strategies such as the use of cover crops, mechanical control, and mulch fabric.

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Unraveling Morphological Diversity in Industrial Hemp (*Cannabis sativa* L.): Insights for Breeding and Productivity Enhancement. J. J. Jones*, K. P. Thennakoon, K. C. Daundasekara and A. Weerasooriya**,** CAFNR Research, College of Agriculture, Food and Natural Resources, Prairie View A&M University, TX, 77446.

Industrial hemp (*Cannabis sativa* L.) is a multipurpose crop cultivated for fiber, seed, and secondary metabolites, yet breeding progress has been limited by insufficient phenotypic characterization of traits influencing plant architecture, productivity, and quality. This study systematically phenotypes a diverse panel of hemp genotypes to assess variation in key anatomical and developmental traits relevant to growth and reproduction. Traits measured include plant height, internode length, stem girth, leaf morphology (number of lobes and vein patterns), flowering time, secondary branching time, and inflorescence structure. Internode length and stem girth provide insight into plant architecture and biomass accumulation, while leaf morphology, flowering, and branching traits influence photosynthetic capacity and reproductive success. Preliminary analyses reveal that variation in plant morphology, particularly height and stem girth, reflects differences in growth architecture and biomass potential among genotypes. Principal Component Analysis (PCA) shows distinct clustering patterns, where genotypes such as Jin Ma Brown and KLR-Auto exhibit phenotypic consistency, while others like Mix John and Abacus display unique morphological profiles. These differences highlight valuable phenotypic diversity that can be leveraged for targeted breeding. Understanding these phenotypic variations is essential for identifying high-performing hemp genotypes with optimized architecture, enhanced yield, and desirable quality traits. The results will provide foundational data to guide cultivar selection and breeding programs aimed at improving performance across production systems. Future work will build on these findings to advance breeding efforts and develop resilient, high-yielding hemp cultivars for diverse agricultural and industrial applications.

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Decoding Seed Diversity: Morphological and Physiological Variation Among Hemp (*Cannabis sativa* L.) Genotypes. E. C. Greenup*, K. P. Thennakoon, K. C. Daundasekara and A. Weerasooriya**,** CAFNR Research, College of Agriculture, Food and Natural Resources, Prairie View A&M University, TX, 77446.

Seed quality is a fundamental determinant of crop establishment, uniformity, and yield, yet systematic evaluation of seed traits in hemp (*Cannabis sativa* L.) remains limited. This study comprehensively characterizes seed phenotypes across approximately 50 hemp genotypes to generate foundational data for breeding and cultivation strategies. Key traits measured include seed vigor, length, width, thickness, weight, hilum dimensions, and germination rates,

capturing both morphological and physiological variation among genotypes. These parameters are directly linked to germination potential and seedling performance, making them critical indicators of overall crop success. Preliminary analyses reveal that variation in seed size traits, such as weight, width, and thickness, accounts for most of the phenotypic diversity among genotypes, while hilum dimensions contribute additional differentiation. Tight clustering observed in genotypes such as Jin Ma, MS-77, and USO 30 suggests consistency in seed characteristics, whereas separated clusters like Chinese Hemp Fiber Plant Seed-04 and Colorado Ditch Weed indicate distinct phenotypic profiles. Variation in seed size reflects differences in energy reserves and growth potential, influencing germination vigor and cultivation outcomes. Understanding these phenotypic differences provides valuable insights for identifying superior seed sources and developing targeted breeding strategies. The results offer a foundation for integrating seed phenotyping into hemp improvement programs, supporting the selection of genotypes with enhanced establishment potential, uniform growth, and high yield. Ultimately, this study advances the understanding of hemp seed diversity and its role in optimizing productivity and quality across diverse agricultural applications.

890

Chemical Secrets of an Invader: GC–MS Profiling Reveals Phytotoxic Metabolites in *Tillandsia recurvata* (Ball Moss). J. C. Calvin *, K. P. Thennakoon, A. Weerasooriya and S. Woldesenbet. CAFNR Research, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446.

Tillandsia recurvata (L.) L., or ball moss, is an invasive epiphytic bromeliad native to the Americas and the Caribbean. It has rapidly expanded across the southern United States, where it negatively affects native and ornamental trees such as southern live oak, crape myrtle, and cedar. Its impact extends beyond shading. Evidence suggests that *T. recurvata* releases bioactive compounds that disrupt host physiology, leading to canopy thinning, branch dieback, and tree mortality. This study aimed to characterize the chemical composition of *T. recurvata* extracts and assess their phytotoxic potential. Plant material collected from Prairie View A&M University, Texas, was oven-dried, ground, and extracted with hexane, ethanol, and methanol using sonication. Microwave-assisted extraction followed by gas chromatography–mass spectrometry (GC–MS) identified a broad spectrum of secondary metabolites. GC–MS analysis revealed 111 compounds in hexane:acetone extracts, 39 in ethanol, and 48 in methanol extracts. The dominant constituents included phenolics (2-methoxy-4-vinylphenol, benzeneethanol,4-hydroxy-), triterpenoids (9,19-cyclolanost-25-en-3-ol,24-methyl-), and phytosterols (γ-sitosterol). These compounds are associated with membrane disruption, germination inhibition, and impaired cell division. The chemical evidence supports that *T. recurvata* produces potent phytotoxins contributing to its invasiveness and competitive success. This study provides the first comprehensive GC–MS-based chemical profile of *T. recurvata*, offering new insights into the biochemical mechanisms underlying its persistence and spread. Understanding these mechanisms can inform management strategies to mitigate its impact on forest and urban ecosystems. These findings highlight the need for continued monitoring and exploration of its metabolites as potential natural herbicide or defoliant candidates.

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Genotype–Environment Interactions Influence Yield and Fruit Chemistry of Hybrid Grapes Grown in Louisiana. S. Brown, Department of Agricultural Sciences and Technology, College of Agricultural, Human and Environmental Sciences, Southern University and A&M College, Baton Rouge, LA 70813; J. Reason, M. Walker, J. Snowden, D. Kambiranda, Southern University Agricultural Research and Extension Center, Baton Rouge, LA 70813.

Hybrid grape cultivars are developed through interspecific crosses between Vitis vinifera, the traditional European wine grape, and native American species such as Vitis labrusca and Vitis riparia. These hybrids are bred for enhanced resilience to environmental stressors, including pests, diseases, and variable climatic conditions, making them well-suited for sustainable viticulture with reduced chemical inputs. Their adaptability allows for cultivation in regions like the southern United States, where traditional grape varieties may struggle. The Southern University Agricultural Research and Extension Center (SUAREC) maintains a vineyard with a diverse collection of American and French hybrid grapevines. A comprehensive study was initiated to evaluate the performance of these cultivars under Louisiana's unique climate. Agronomic traits assessed include berry size, berry weight, cluster weight, number of berries per cluster, and total fruit yield per plant. Additionally, fruit chemistry was analyzed through measurements of pH, titratable acidity (TA), malic acid, tartaric acid, and yeast assimilable nitrogen (YAN)—key indicators of grape quality and fermentation potential. Preliminary findings revealed significant differences in harvest timing and fruit development among cultivars, influenced by seasonal weather patterns. Some hybrids demonstrated greater tolerance

to heat and humidity, while others showed variability in fruit composition. These results highlight the importance of genotype-environment interactions in determining grape quality and yield. The study provides valuable insights into the suitability of hybrid grapes for southern climates and supports future efforts in regional grape production.

892

Effects of Organic Vs Inorganic Soil Amendments on the Yield of Watermelon Varieties. E. Staley*, M. Anderson, T. Frederick, and L. C. Kibet, Sherman Lewis School of Agriculture and Applied Sciences, Langston University, Langston, OK 73050

This study examines the impact of various soil amendments on the growth and yield of two watermelon varieties using a randomized complete block design (RCBD). The experiment includes three soil amendment treatments—Composted Cattle Manure (CCM), Mushroom Compost (MC), and NPK fertilizer, applied to two watermelon types: Seedless Watermelon (SW) and Watermelon with Seeds (WS). The treatment application was applied at a rate of 100 lbs. N/ acre. Each treatment combination is replicated three times across a total of eighteen plots to account for field variability and enhance data reliability. The primary objective is to investigate the impact of organic and inorganic nutrient sources on watermelon growth, fruit yield, and soil health. Growth parameters, yield components, and soil fertility indicators were monitored throughout the growing season. Intensive soil sampling was conducted prior to treatment application and after harvest to assess changes in soil nitrogen, phosphorus, potassium, carbon, and related soil properties. Preliminary results indicate that organic amendments, particularly Composted Cattle Manure and Mushroom Compost, significantly improved watermelon yield and plant vigor compared to NPK fertilizer. The positive effects of organic amendments include enhanced soil structure, improved moisture retention, and increased nutrient availability, all of which contribute to improved crop performance. This research provides practical insights into sustainable watermelon production systems and supports farmer decision-making on soil fertility management. The findings highlight the potential of organic nutrient sources to promote higher yields and long-term soil health, as well as productive agricultural practices.

893

Melatonin Enhanced *In-vitro* Morphogenesis of the Rare *Scutellaria havanensis* Jacq. S. Viradia*[1], A. Basnet[2], B. Sapkota[2], P. Khatri[2], N. Joshee[2]. [1]Vanderbilt University, Undergraduate College of Arts and Sciences, [2]Agricultural Research Station, Fort Valley State University, Fort Valley, GA 31030.

Scutellaria havanensis Jacq. (Havana skullcap) is a rare species with limited distribution and the optimization of an efficient micropropagation protocol is essential for its conservation. This study investigated the effect of exogenous melatonin, applied individually and in combination with cytokinin (6-Benzyl-aminopurine), on shoot induction from nodal segments. Melatonin (N-acetyl-5-methoxytryptamine) is an indoleamine with recognized roles in plant growth regulation and stress mitigation but is less explored in *in vitro* morphogenesis. Highest shoot induction with 7.56 ± 0.83 shoots per explant was achieved on the Driver and Kuniyuki Walnut (DKW) medium supplemented with 2.5 µM BAP along with 2.5 µM Melatonin after eight weeks under 16 h photoperiod. Eight- to nine-week-old and two to three cm long shoots were inoculated on the basal DKW medium for shoot elongation and rooting. The current study indicates that the treatment with equimolar amount of cytokinin and melatonin enhanced shoot number, elongation, and improved rooting as compared with the individual treatments of cytokinin and melatonin. Histological analysis for shoot induction revealed that shoot primordia arose directly from nodal meristems, bypassing callus. These findings highlight melatonin as a promising bio-regulator for generating healthy plants, supporting large-scale production and germplasm conservation.

894

Investigating the Effects of Nutrient Quantity on Hydroponically Grown Mustard Greens. V. Mensah*, M. Mccullough, J. Mimbs, A. Roberson and B. Biswas, Fort Valley State University, Fort Valley, GA 31030.

Hydroponics relies on the precise delivery of nutrient solutions, but the optimal concentration for maximizing crop yield remains a critical unknown, particularly for community-based agriculture where resource efficiency is paramount. This study aimed to determine the ideal nutrient concentration for Mustard Greens (Brassica juncea) grown in a Deep-Water Culture (DWC) system over a 30–45-day period. The experiment utilized four independent DWC

systems. Forty Mustard Green plants were distributed across the systems to test four distinct treatments: a control (baseline nutrient concentration) and three varying, elevated nutrient concentrations. Romaine Lettuce was also included as a secondary crop. Throughout the trial, key environmental parameters, including pH, Total Dissolved Solids (TDS), and water consumption, were rigorously monitored. The primary measure of growth and treatment efficacy was biomass accumulation, determined by the final fresh weight of each plant. The central hypothesis posited that an intermediate nutrient concentration would produce significantly greater biomass compared to the control and the lowest or highest concentrations. Data analysis will employ a one-way Analysis of Variance (ANOVA) to identify statistically significant differences in biomass. If significance is detected, Tukey's Honestly Significant Difference (HSD) post-hoc test will determine which specific concentration maximizes growth. The evidence-based findings will provide practical, yield-maximizing recommendations for resource-constrained hydroponic growers.

895

Investigating the Effects of Nutrient Quantity on Romaine Lettuce Growth. M. Mccullough*, V. Mensah, J. Mimbs, A. Roberson and B. Biswas, Fort Valley State University, Fort Valley, GA 31030.

This study examines how varying nutrient concentrations affect the growth of Romaine lettuce (*Lactuca sativa* L. 'Romaine') in a Deep-Water Culture (DWC) hydroponic system. Optimizing nutrient levels is crucial for maximizing yield and efficiency in soil-less cultivation. The experiment will use three or more distinct treatment groups, differing only in the concentration of a complete hydroponic nutrient solution (e.g., standard, 50% reduced, and 150% elevated). Romaine seedlings will be grown under these conditions for a designated period. Growth will be monitored through several key metrics. Physicochemical parameters such as pH and Total Dissolved Solids (TDS) will be measured daily. TDS serves as a direct indicator of available nutrient concentration. Daily water consumption will also be tracked to assess plant health and transpiration. At the conclusion of the experiment, the final fresh weight (g) and dry weight (g) of the harvested lettuce will be measured to quantify yield. Statistical analysis, likely a One-way ANOVA, will compare the mean final weights across the treatment groups to determine if nutrient variations caused statistically significant differences in biomass accumulation. The results aim to identify the most effective nutrient concentration for maximizing Romaine lettuce yield in a DWC system, offering valuable data for commercial and research hydroponic applications.

896

How to Become Self-Sustainable for Food Production Using Hydroponics to Fight Future Population Growth C. Harris*, B. K. Biswas, College of Agriculture, Family Sciences and Technology, Fort Valley State University, Fort Valley, GA 31030

Hydroponics offers a modern solution for achieving food self-sufficiency in the face of climate uncertainty and rapid population growth. This study examined the feasibility of cultivating Romaine lettuce through hydroponic farming versus traditional soil-based farming. Soil-grown romaine lettuce has frequently been associated with *Escherichia. coli* outbreaks in recent years, often linked to contamination from animal feces. By contrast, hydroponic systems minimize this risk while supporting higher yields in controlled environments. In a 4-week study, the growth of Romaine lettuce was evaluated in both controlled environment agriculture (CEA) and traditional field conditions. Results showed that hydroponic-grown lettuce achieved an average of 48 g/g/ plant, while soil-grown lettuce averaged only 10 g/g/ plant. On a larger production scale, hydroponic farming has demonstrated the potential to yield between 10,000 and 100,000 lbs. of lettuce per acre annually, compared to only 350–1,000 lbs per acre in traditional soil farming. Ongoing analyses are assessing bacterial loads on harvested leaves, with results to be presented in the poster. These findings highlight hydroponics as a promising strategy for sustainable food production, offering higher productivity and reduced risks of contamination. This approach may play a vital role in feeding future global populations.

897

Development of an Efficient Plant Regeneration Tissue Culture Method for *Cannabis sativa.* K. Dennis*, A. Martinez, L. Morton, and S. K. Dhir, College of Agriculture, Center for Biotechnology, Fort Valley State University, Fort Valley, GA 31030.

Hemp (*Cannabis sativa* L.) is a dioecious plant widely grown as a source of fiber, food, oil, and medicinal applications. Micropropagation is an area of research focused on genetic storage and the large-scale production of sterile planting material. With an effective *in vitro* protocol, many genotypes can be maintained with little risk of pests or disease using less space. The present study describes an efficient *in vitro* propagation protocol for obtaining plants from shoot tips and nodal segments of two-week-old seedlings grown *in vitro*. The isolated explants were cultured on MS and DKW culture medium containing various combinations of cytokinin's, including BA, KN, MT, TDZ, ZT, and 2-iP, to investigate their response to shoot proliferation. The resulting shoot cultures were transferred to medium containing varying levels of IAA, IBA, or NAA and incubated under a 16-h/8-h light/dark period. The maximum number of auxiliary bud multiplication was observed on MS medium supplemented with MS+MT (0.5 mg/l; 25-32 shoots) compared to MS+BA (0.5 mg/L; 10-12 shoots) with 18-20 shoots. Among various rooting treatments studied, shoots grown in the dark for 10 days exhibited the highest frequency of rooting on medium containing 1.0mg/L NAA or 0.5 mg/L IBA + 0.5 mg/L NAA. Fully developed plants with a robust shoot and root system were transferred to soil, acclimatized under high-humidity conditions, and then transferred to ambient conditions after 4 weeks. The protocol developed here enables the rapid multiplication of disease-free plants, while also facilitating further physiological, biochemical, pharmacological, and genetic studies.

898

Development of a Cas3 System for Plant Genome Editing. L. Harris-Smith*, N. Butler, M Guo, and S.K. Dhir. College of Agriculture, Center for Biotechnology, 1005 State University Drive, Fort Valley State University, GA 31030.

The abiotic and biotic factors that cause stress have been a threat to crop production. The application of biotechnology, particularly genome editing, is crucial towards enhancing the traits of crops, such as resilience to adapt to changing environments and yield potential. There are several approaches to genome editing, such as Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR-Cas9), which uses a guide RNA (gRNA) and the Cas9 enzyme to make precise changes to DNA sequences. While Cas9 and Cas12, Type II CRISPR system enzymes, have been widely used in genome editing, they lead to small deletions or genome alterations. On the other hand, Type I system enzymes, like Cas3, have the potential to sequentially create large DNA deletions, as demonstrated in bacterial genome editing. The primary objective of this project is to develop an alternative strategy using Cas3 to generate large deletions in the plant genome, a novel approach that could revolutionize plant biotechnology. To achieve this, we have adopted the Golden Braid (GB), a standardized assembly system based on Type IIS restriction enzymes that allows the indefinite growth of reusable gene modules composed of standardized DNA pieces. This innovative system was implemented to create binary plasmids carrying Cas3, Cas5c, Cas7, and Cas5, the essential components of the Cas3 complex, as well as guide RNAs specific to the target genes. To test the Cas3 system, these constructions will be transformed into model plants Arabidopsis or the crop plant soybean using Agrobacterium-mediated transformation.

899

Non-Destructive Stress Physiology Assessment for Early Diagnosis of Drought and Nutrient Stress in Rhizoma Peanut. K. C. Coleman*, A. Siddique, S. Basak, S.D. Samuels, College of Agriculture, Family Sciences and Technology, Fort Valley State University, Fort Valley, GA 31030.

Rhizoma peanut (RP) is a persistent, warm-season legume valued for high-quality summer forage and premium hay production for dairy, goat, and equine industries. However, RP productivity is limited due to various abiotic stressors. Bioelectrical impedance analysis (BIA) is a non-destructive method that assesses plant tissue health and water status by measuring resistance (R), reactance (Xc), impedance magnitude (Z), and phase angle (φ). These parameters indicate the capacitive or resistive properties of tissues, such as roots and fruits, providing insight into stress physiology, including drought, waterlogging, cold, and nutrient deficiency. Our study aims to evaluate the preliminary physiological assessments of different RP cultivars subjected to drought and nutrient stress using bioelectrical impedance analysis (BIA), CI340 gas exchange data, and remote sensing and geospatial technological applications as an early diagnostic tool. In this study, 10 plants per treatment will be subjected to independent stressors (Control, Drought, P-def) under greenhouse conditions for 10 weeks. The BIA profiles (R, Xc, $|Z|$, φ) for healthy RP across growth stages will be measured twice a week to quantify physiological shifts under drought, and P-deficiency, and collated with CI340 and imaging parameters. These findings will determine the potential of BIA and imagining technologies as a non-destructive diagnostic tool for early diagnosis of stress within Rhizoma peanut.

900

Growth Beyond Soil: A Comparative Study Between Conventional Agriculture and Hydroponic Farming M. Ramirez*, A. Colvard, M. Towner, and B. Biswas, College of Agriculture Family Sciences and Technology, Fort Valley State University, Fort Valley, GA 31030.

The escalating global population, particularly within the US, is placing immense pressure on conventional agricultural resources, including a significant decrease in available farmland. Reports from the American Farmland Trust indicate a decline in agricultural acreage across 34 states, predominantly in the western regions. This study addresses these limitations by comparing the growth and yield of several vegetable crops cultivated using both traditional farming methods and various hydroponic systems. Our initial hypothesis was that the crops grown hydroponically would exhibit superior performance compared to those planted in the field. The methodology involved simultaneous planting and weekly growth monitoring of crops in both cultivation environments. To assess environmental impact, some hydroponic systems were situated inside a greenhouse, while others were placed outdoors under a shade net. Exponential growth differences were immediately apparent; hydroponic crops displayed a much greener, stronger, and more vigorous appearance. Conversely, the field crops experienced significant challenges, including observable wilting and a considerable accumulation of pests, notably Aphids. The experimental conclusion strongly supports the hypothesis: plants grown in the hydroponic systems significantly outperformed their conventionally planted counterparts. Furthermore, the hydroponic method proved more efficient, utilizing less space and yielding a greater product volume, whereas most conventionally planted crops were not viable for harvest. We conclude that the hydroponic method offers a far more reliable, space-efficient, and productive approach to crop production, making it an essential consideration amid shrinking farmland and burgeoning populations. The final yield from each system will be statistically analyzed after 6-8 weeks of growth.

901

AI-Driven Forage Plant Identification: Enhancing Decision-Making for Resource-Limited Farmers J. Francis, A. Siddique, T. H. Terrill Department of Agricultural Sciences, Fort Valley State University, Fort Valley, GA 31030; S. S. Panda, Institute for Environmental Spatial Analysis, University of North Georgia, Oakwood, GA 30566; E. R. Morgan, Institute for Global Food Security, Queen's University Belfast, UK; J. A. van Wyk, Department of Veterinary Tropical Diseases, Faculty of Veterinary Science, University of Pretoria, Onderstepoort, South Africa.

Accurate identification of beneficial forage plants is critical for sustainable livestock systems, particularly in resource-limited settings. Sericea lespedeza (SL; *Lespedeza cuneata*), a bioactive legume with anti-parasitic properties, offers both nutritional and health benefits for ruminants. Traditional plant identification methods, however, require specialized expertise and are often labor-intensive. This study explored the use of Convolutional Neural Networks (CNNs) to distinguish between SL, alfalfa (*Medicago sativa*), and weeds. A dataset of 1,000 images per class was compiled, split 70:30 for training and testing, and analyzed using three custom CNN architectures alongside a ResNet-50 benchmark. Results revealed wide variation in model performance. Custom CNN Variant 1 achieved low accuracy (0.13), frequently misclassifying SL and alfalfa. In contrast, Custom CNN Variants 2 and 3 reached 0.91 accuracy, demonstrating robust classification across species, particularly for weeds. ResNet-50 achieved 0.79 accuracy, excelling in alfalfa detection but performing less consistently for SL. These findings highlight the potential of deep learning to provide farmers with accessible, cost-effective plant identification tools. By integrating CNN models into mobile-based platforms, forage recognition could become faster and more reliable, supporting informed decisions on crop cultivation, grazing management, and sustainable land use.

902

The Effect of Growth Regulators on Shoot Tip Multiplication of the Kenaf (*Hibiscus Cannabinus*) B. Matthews* and S.K. Dhir, Center for Biotechnology, Department of Plant Sciences, Fort Valley State University, Fort Valley, GA 31030.

Kenaf (Hibiscus cannabinus L.) is an herbaceous annual crop mainly used for producing pulp, paper, and textile fibers, such as ropes, twine, bags, and rugs. It is propagated by seed; however, seed availability is limited, and seed production strategies depend on factors like the cultivar, location (especially latitude), and cultural practices. This study aimed to

develop an efficient protocol for micropropagation of Kenaf using multiple buds from both nodal and apical explants. The explants were cultured on Murashige and Skoog (MS) basal medium, supplemented with silver nitrate (0.1-1.0 μM/L) and various concentrations of cytokinins, including BAP, Thidiazuron (TDZ), Meta-Toplin (MT), Kinetin (KN), and 2IP (0.5-1.0 mg/L). The highest shoot tip multiplication rate was observed on MS medium with 2IP (100%), followed by BAP (88%), TDZ (77%), MT (44%), and KN (33%) with 0.25 μM/L silver nitrate. In vitro shoots rooted on 0.5 mg/L IBA-treated shoots, showing the highest root number (8.7) and length (3.4 cm) after 4 weeks. This study achieved a high frequency of multiple shoot induction and proliferation, enabling complete propagation of Kenaf through apical and nodal shoots on hormone-free MS medium. The method offers a practical in vitro propagation system that could be commercially viable for Kenaf, using a simple protocol to produce uniform plants quickly and with a high multiplication rate.

903

Insecticidal Potential of *Lespedeza cuneata* Seed and Leaf Powders Against *Sitophilus zeamais* and *Plodia interpunctella* Under Laboratory Conditions A. Mincey*, K. Howard, S. Warsi, G.N. Mbata, P. Batchu, A. Mbata, A. Siddique, T. H. Terrill, Department of Agricultural Sciences, Fort Valley State University, Fort Valley, GA 31030.

The maize weevil, *Sitophilus zeamais* (Coleoptera: Curculionidae), and the Indianmeal moth, *Plodia interpunctella* Hübner (Lepidoptera: Pyralidae), are major postharvest pests responsible for significant quantitative and qualitative losses of stored grains and food commodities. Increasing resistance to synthetic insecticides, coupled with escalating concerns over environmental safety, human health, and cost, underscores the urgent need for sustainable alternatives for insect pest control in stored grains. This study investigated the insecticidal potential of *Lespedeza cuneata* (Fabaceae) seed and leaf powders as botanical protectants against *S. zeamais* and *P. interpunctella*, with synthetic linalool, a monoterpene commonly reported for insecticidal properties isused as a reference standard. Adult insects were exposed under controlled laboratory conditions to three dosage levels (0.5, 1, and 2 g) of *L. cuneata* seed and leaf powders. Mortality was monitored daily for five consecutive days, and treatment efficacy was evaluated in a time- and dose-dependent framework. Both *L. cuneata* seed and leaf powders produced significant insecticidal effects, with mortality exceeding 70% from the third day post-treatment across all dosages for both species. The highest dosage (2 g) consistently yielded the strongest effect, resulting in near-complete control by day five, whereas lower dosages (0.5 and 1 g) exhibited moderate but significant impacts. These findings demonstrate that *L. cuneata* exhibits strong bioactive potential as a botanical insecticide against two key postharvest pests. Future research should focus on characterizing the active phytochemical constituents, exploring liquid extract formulations, and optimizing application methods to enhance efficacy and support the development of eco-friendly, plant-based grain protection strategies.

904

DNA Methylation Mediated Response to Abiotic Stress in Maize (*Zea mays*). Z. M. Vilsaint*, T. F. Madzima, S.K. Dhir and E. Goldberg. College of Agriculture, Center for Biotechnology, 1005 State University Drive, Fort Valley State University, GA 31030.

Plants face abiotic stresses which affect growth and productivity. One-way plants respond to stress is through epigenetic modifications like DNA (cytosine) methylation, to regulate gene expression without altering DNA sequence. This study explores how the plant-specific RNA-directed DNA methylation (RdDM) pathway influences stress-responsive gene expression in maize. The RdDM process involves small RNAs guiding methylated groups to specific DNA sequence. In maize, the *mediator of paramutation 1* (*mop1*) gene is required for the progression of the RdDM pathway. We compared wildtype (*Mop1*) and mutant (*mop1-1*) plants following abscisic acid (ADA) treatment, a hormone associated with abiotic stress. DNA was extracted to study methylation patterns in the promoters of stress-related genes. Our hypothesis is that transcriptional changes between genotypes under ABA, suggesting RdDM plays a role in regulating stress responses. However, DNA methylation didn't show clear differences between two types, implying that either these genes are not direct RdDM targets or methylation changes occurred outside the promoter region. This work highlights the complexity of RdDM-mediated regulation and suggests further genome-wide approaches to detect subtle methylation. Additional studies using varied ABA exposure times could help clarify whether RdDM responses occur rapidly or require prolonged stress.

905

Somatic Embryogenesis and Plant Regeneration in Alfalfa (*Medicago sativa* L.). A. Moreno*, and S. K. Dhir, College of Agriculture, Center for Biotechnology, Fort Valley State University, Fort Valley, GA 31030.

Alfalfa (*Medicago sativa* L.) is a perennial species known for its use as a forage legume, and it undergoes outcrossing. It has significant importance as a forage crop, cultivated extensively across numerous countries worldwide. This study aimed to investigate the effects of different media, including B5H, MS, and ½MS supplemented with 3% maltose, 4.5 µM 2,4-D, 0.9 µM KN, activated charcoal (AC), and IBA, on somatic embryogenesis and plant regeneration using leaf explants. High somatic embryo initiation rate (96.3%) after a three-week incubation period in the dark. Various concentrations of AC (0 to 4% w/v) were tested, with the highest percentage (85.2%) of globular structured somatic embryo induction and maturation observed on B5H medium containing 1.0% activated charcoal. Different concentrations of IBA (0 to 1.25 mg/L) were examined on MS basal medium, with the highest percentage of root formation (76.5%) achieved on MS medium containing 0.25 mg/L IBA in the light. Somatic embryos cultured on B5H medium supplemented with 1.0% AC and 0.25 mg/L IBA successfully regenerated into normal plantlets. Each healthy plantlet was transferred to an acclimatization medium containing MS basal medium with 3% sucrose and 0.03% GELRITE®. The in vitro regenerated plantlets were then carefully transplanted into soil cups, initially maintained in a growth chamber for one week, and later hardened and grown to maturity in the field.

906

Nuclear Factor Y Subunit C4 Enhances Protein Content in Sweetpotato without Affecting Yield. E. Terrett*, Y. Meng, Z. Yue, F. Banks, J. Williams, Department of Agriculture, Alcorn State University, Lorman, MS 39096; R. Vamenani, L. Wang, and L. Li, Department of Biological Sciences, Starkville, MS 48824.

The *Arabidopsis* gene *Qua-quine Starch* (QQS) and its primary interactor, a nuclear factor Y subunit C4 (NF-YC4), play key roles in regulating carbon and nitrogen partitioning for starch and protein accumulation in Arabidopsis, as well as in soybean and other crops. Sweetpotato (*Ipomoea batatas* (L.) Lam.) is widely cultivated in tropical and subtropical regions and ranks among the top ten most important food crops globally. However, sweetpotato has a relatively low protein content compared to staple foods such as maize, rice, wheat, and soybean. In this study, overexpression of the sweetpotato *NF-YC4* gene via *Agrobacterium*-mediated transformation was successfully achieved. Quantification of protein and starch levels in transgenic sweetpotato leaves and roots revealed a significant increase in protein content and a reduction in starch accumulation compared to wild-type controls, indicating the potential for improved nutritional value in transgenic sweetpotato lines. The impact of the transgene on storage root development and yield was also analyzed. Comprehensive data were collected for each transgenic line and control, including node number, leaf number, and the individual weights of leaves, petioles, stems, and roots, providing a detailed quantitative comparison of their growth and productivity. This research demonstrates that overexpression of the sweetpotato *NF-YC4* gene enhanced protein levels in sweetpotato without negatively impacting yield.

907

Test, Don't Guess: Boosting Crop Productivity with Accessible Soil Kits. T. Brown*and A. Emran, Department of Agriculture, S. Waliullah, Department of Biology, Alcorn State University, Lorman, MS 39096.

Soil health is a critical determinant of crop productivity, yet many minority and resource-limited farmers in Mississippi face significant challenges in accessing affordable and timely soil testing services. Traditional laboratory methods are often costly and time-intensive, limiting their practicality for small-scale farmers. To address this gap, this research evaluates a portable, cost-effective soil testing kit as an alternative. We used the Rapitest Soil Test Kit to conduct on-site analysis of key soil health parameters: pH, Nitrogen (N), Phosphorus (P), and Potassium (K). Soil samples were collected from multiple spots to create composite samples and analyzed following the kit's protocols. Results from the collected samples showed soil pH values ranging from 6.0-6.5, with average N, P, and K levels identified as adequate or sufficient. These findings demonstrate the kit's effectiveness in detecting soil pH and nutrient variations, empowering farmers to apply precise, site-specific amendments. This accessible and cost-effective method promotes sustainable agriculture and long-term soil health, offering a viable pathway to enhance productivity for resource-limited farmers.

908

***In Vitro* Propagation of African Violet (*Saintpaulia ionantha* H. Wendl.).** F. Banks*, J. Williams, A. Jones, and Y. Meng, Department of Agriculture, Alcorn State University, Lorman, MS 39096.

The global houseplant industry is a booming market and was valued at over $5.6 billion in 2021, in whichthe United States houseplant industry was worth $1.7 billion. The global ornamental plants market, whichincludes houseplants, is expected to reach $27.1 billion by 2025, with a Compound Annual Growth Rate (CAGR) of 6.9%. African violet (*Saintpaulia ionantha* H. Wendl.) is a popular ornamental pot plant sincethe1960s, recent breeding has introduced lots of new cultivars with more flower and leaf colors and forms. African Violet is usually propagated vegetatively from leaf cuttings by many home gardeners; however, constrictions are imposed by the multiplicity of plantlets in a limited growing space, resulting inunsymmetrical plants with elongated sideways-displaced petioles. Propagation by tissue culture overcomes this problem and results in many well-formed, single-stemmed plants from a given amount of leaf tissue. In this study, we use leaf and petiole as explants, develop an efficient regeneration protocol forthe direct induction of shoots, involves the use of a cytokinin like BA or KT in combination with an auxinlike IAA or NAA, on a Murashige and Skoog basal medium. Rooting is induced from shoots directly, even in the absence of an auxin, yet a low concentration (0.5 mg/L) of NAA is significantly stimulate theroots growth. African violets acclimatize easily, performed with over 98% of survival rate after transferring to soil. The regeneration protocol developed in this study may also benefit the in vitro cultureand conservation of wild species of *Saintpaulia*.

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Baby Ginger: A High-Value Niche Crop for Oklahoma. B. H. Colbert*, D. R. Kandel, R. Solomon, R. Boateng, K. De Silva, and D. Jones. Sherman Lewis School of Agriculture and Applied Sciences, Langston University, Langston, OK 73050

Ginger (*Zingiber officinale*) is a high-value spice crop of significant importance. The ginger rhizome contains bioactive compounds, including gingerols and shogaols, which provide various health benefits. Due to these nutraceutical properties, ginger has been studied for its potential role in managing obesity, gout, cancer, oxidative stress, and other conditions. Ginger requires a long, warm growing season of approximately 10 to 12 months. Oklahoma's cold winter weather does not favor the production of mature ginger; however, "baby ginger," which can be harvested within 5–8 months, could serve as a potential alternative crop if the growing environment is modified. To evaluate the feasibility of baby ginger production in Oklahoma, we tested three ginger varieties in a high tunnel condition during the 2025 summer–fall season at the Horticulture Education Research and Extension Center (HERC) at Langston University (LU), Oklahoma. Greenhouse-sprouted rhizomes were transplanted into the high tunnel during the fourth week of May. The high tunnel, covered with 45% shade cloth, provided favorable growing conditions through late October. Three ginger cultivars—Peruvian Yellow, Vietnamese Buffalo, and Vietnamese Bird—performed well under these conditions. Field days and educational training were organized to disseminate best practices for baby ginger production. This study shows baby ginger cultivation has promising potential as a high-value niche crop in Oklahoma.

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Evaluating Molecular Markers for *Fusarium* Wilt Resistance and Plant Architecture to Develop Improved Vintage Tomato Varieties. A. J. Miller*, K. M. Rorrer, L. J. Fultz, B. Maharjan and B. E. Liedl, Department of Biology, West Virginia State University, Institute, WV 25112.

Tomatoes rank among one of the most economically important food crops worldwide. However, vintage varieties do not possess the general resistances or a shorter architecture found in current varieties, making growing them problematic. This research was to determine if markers for these genes could be used to improve vintage tomato varieties. Three markers for the *I* gene controlling *Fusarium* wilt resistance, a soil borne fungal disease, were trialed. The brachytic (*br*) gene, which promotes shortened internodes to reduce the plant architecture, tested two markers from the literature. DNA was extracted using a modified CTAB extraction protocol from several vintage varieties and the donor. Marker specific primers along with Taq DNA Polymerase and DNA were used to create the amplicons. PCR conditions were poorly documented, thus amplicons were generated using a range of annealing temperatures based on the primers melting temperatures. Gel electrophoresis confirmed expected amplicon sizes, and optimal annealing temperatures were selected. All amplicons were digested with marker-specific restriction enzymes, and the fragment sizes were analyzed by electrophoresis to verify banding profiles based on the literature. Only one *br* marker

showed variation between the donor and vintage varieties but more work is needed to verify its use in the breeding program. One marker for *I* had the expected band sizes for the donor and most of the vintage varieties. This marker was used on BC2 breeding lines for one vintage variety and the resistant marker genotype correlated with the SNP marker for *I* developed by the University of Florida.

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Plant Germination and Growth Under Two pH Regimes at Prairie View A&M University. B.G. Oglesby*, R.W. Griffin, CAFNR Research, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446.

Plant germination can be affected by several factors present in the soil at the time of planting. In addition, environmental factors may play a significant role in the plant's ability to germinate from seeds in the laboratory and greenhouse settings. Crop plants thrive when grown under pH conditions that best match the range in which they can extract sufficient nutrients for growth and ultimately production of seeds. The objectives of the project were: 1) to measure germination and growth characteristics for 4 plants grown in the laboratory at PVAMU, 2) to compare the plant germination and growth using descriptive statistics to determine spatial variability within the replicated pots; and 3) to use inferential statistics to analyze the germination and growth within and across the 4 plant types. Four types of plant seeds were planted in potting soil mix in the laboratory. Followed by addition of water to moisten the soil to promote germination. Germination was observed beginning on Day 1 after planting to evaluate which seeds germinated the earliest and whether the plants encountered any difficulty germinating based on the differences in pH. The control soil had no addition of either the soil acidifier product which contained sulfur and gypsum (calcium sulfate) or the soil alkalinizer which contained baking soda. The soil pH was measured to determine the base level for the potting soil control and the amended samples. The data results were entered into a Microsoft Excel spreadsheet for graphical, descriptive, and inferential statistical analyses.

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Optimizing Soil Amendment Strategies Using Biochar-Manure Composites. K. Thompson*, A. Shembo, A. Geremew, R. Ray, and L. Carson. CAFNR Research, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446.

Carbon depletion poses a critical challenge to sustainable agriculture, undermining soil health and contributing to release of heat-trapping gases. Biochar (BC), a carbon-rich material derived from biomass, has emerged as a promising soil amendment for enhancing soil quality and offset impacts of heat-trapping gases. However, its effectiveness is highly dependent on its formulation and interaction with other organic inputs. This study investigates the impact of tailored biochar–manure blends on soil carbon storage and discharge reduction. A field experiment was conducted using a completely randomized block design (CRBD) at the Bill & Vara Daniel Ranch and Farm, Prairie View A&M University (PVAMU). Seventeen treatments were applied, including biochar, chicken manure, cow manure, chitosan, and their blends in varying proportions, each replicated three times. Baseline soil samples were collected and analyzed prior to treatment, followed by post-treatment assessments at 30 and 60 days. Soil carbon content was measured using CHNS and TOC analyzers at the PVAMU Core Laboratory. Preliminary results indicate that biochar–manure blends significantly increased ($p < 0.05$) soil organic carbon (SOC) compared to manure-only treatments. The most effective formulation—a blend of biochar and cow manure—achieved a 30% increase in SOC (0.58 ± 0.25). These findings underscore the synergistic potential of biochar–manure combinations in improving soil carbon dynamics. Future research should explore the profiles of heat-trapping gases from these blends across different cropping systems to validate their environmental benefits and scalability.

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Performance of Goji berry Varieties Under Open Field Conditions in Southeast Texas. K. D. Singleton*, P.A.Y. Ampim, A.A. B. Kotochi, E. A. Faluyi, M. M. Imoro, M. A. Salisu, and A. Weerasooriya, College of Agriculture, Food and Natural Resources Research, Prairie View A&M University, Prairie View, TX 77446.

Goji berry (*Lycium barbarum* L.) is a dense nutrient supper fruit valued for its antioxidant and medicinal properties. Despite its increasing global popularity, limited information exists on its performance under field conditions in North

America. Hence this study evaluated the agronomic performance of three goji berry varieties (Phoenix Tears, Big Life and Big Boy) under subtropical conditions in southeast Texas. The varieties were established using transplants planted on landscape fabric covered beds supplied with drip irrigation in September 2024. Planting was done in a completely randomized design with three replications per variety. Each plot consists of five plants spaced 1.5 m apart with plots separated by 7.6 m. Watering was done sparingly on as needed basis. Weeds around the plants were removed manually while those in between rows were mowed down. Harvesting was done every two to three weeks between May and September 2025. During each harvest, the fruits were sorted into marketable and cull categories and weighed. The yield data was analyzed using the JMP software and conclusions were drawn at $\alpha = 0.05$. All the yield parameters evaluated including marketable fruit weight, cull fruit weight, marketable fruit weight/plant, cull fruit weight/plant, total fruit weight/plot and total fruit weight/plant showed significant differences. The trend observed for all the parameters examined was Big Boy > Phoenix Tears > Big Life. The results indicate that Big Boy is performing better than the other varieties and appears to be adapting better to the soil and climatic conditions in southeast Texas.

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Optimizing an Assay to Evaluate the Pathogenicity of Sweet Potato Fungal Isolates on Sweet Potato Storage Root Slices. P. Mubiru*, U. Kamboj and W. Kaluwasha; College of Agriculture, Environmental and Human Sciences (CAEHS), Lincoln University of Missouri, Jefferson City, MO 65101.

Sweet potato (*Ipomoea batatas*) is prone to infection by various fungal pathogens. Many of these pathogens coexist thus isolation from symptomatic tissue yields several fungal isolates. The objective of this study was to determine whether fungal isolates retrieved from diseased sweet potato slips and storage roots can cause disease symptoms on sweet potato storage root slices. Sweet potato storage roots with various forms of postharvest decay and sweet potato slips with signs of necrosis were collected. Storage root or slip tissue was surface sterilized in 10% sodium hypochlorite and 70% ethanol prior to plating on Potato Dextrose Agar (PDA) amended with antibiotic and incubated at 25ºC. Subculturing was performed on emerging colonies to obtain pure cultures. Eleven fungal isolates from diseased sweet potato slips and fifty-four isolates from diseased storage roots representing diverse fungal general including *Fusarium* sp., *Penicillium*, *Macrophomina* sp., and *Trichoderma* sp. were recovered for the pathogenicity assessment. Storage root slices from the cultivar Covington were placed on a moistened paper towel in a plastic container, and then agar plugs of each isolate were placed in the center of the root slices. The containers were sealed and incubated at room temperature for 14 days to observe symptom development and lesion diameter was measured on the final day. Differences were observed among isolates with some isolates causing more pronounced disease symptoms than others. This study provides insights on potential storage root pathogens, allowing for further research evaluating cultivar responses and management strategies.

Student Poster Presentation – Graduate Competition

Plant Health and Production and Plant Products

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Nitrogen Fixation and Carbon Sequestration Efficiency in Leguminous and Non-leguminous Plants. I.M. Harry*, F. Quarcoo, G. Bernard, A. Kumi, Department of Agriculture, Environment, and Nutrition Sciences, Tuskegee University, Tuskegee, AL, 36088.

There is an increased need for sustainable methods of recycling nitrogen and sequestering carbon. Leguminous cover crops are a viable biological carbon sequestration strategy and can increase available soil nitrogen by forming symbiotic relationships with bacteria that convert atmospheric nitrogen into a form that is usable by the legume. A greenhouse study was conducted to determine the effects of nitrogen fixation ability on plant growth characteristics and to compare the carbon sequestration potential of selected leguminous and non-leguminous cover crops. Four cover crop species−two leguminous, and two non-leguminous− were arranged in a randomized complete block design. Pots of sterilized sandy soil were prepared for each plant. Groups were treated with or without inoculant containing Bradyrhizobium vigna , and with or without fertilizer. Plant growth characteristics were recorded on a weekly basis. The carbon and nitrogen contents of plant tissue and soil samples were assessed at the end of a 60-day period. Statistical analysis was completed in SPSS. At harvest, significant differences were observed for height, stem diameter, leaf width, leaf length, leaf count and chlorophyll content between the blocks. Soil nitrate content decreased in all

varieties. Soil total nitrogen generally increased in all varieties. Analysis for carbon content of plant tissue is ongoing. It is expected that the use of inoculant will result in significant increases in the carbon content of leguminous species. This information can be used to make projections on the relative potential of the selected plants as biological agents of sequestration.

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AI-Assisted Phenotyping And Computer-Based Learning For Screening Root-Knot Nematode Resistance In Sweetpotato (Ipomoea Batatas (L.) Lam.) V. Abera*[1], G. C. Bernard1, J. Jaynes[1], D. Bedi[1], Y. Sun[2], H. Bramantyo[2], C. Jones[1], K. Jones[1], N. A. Bakari[1], V. York[1], A. Brown[1], D. Wilson[1], I. Ritte[1], M. Okoma[1], G. Aguti[1], S. Critchlow[1], T. Nobles[1], C. Thompson[1], O. Idehen[1], and M. Egnin[1]. [1]Department of Agricultural and Environmental Sciences, Plant Biotechnology and Genomics Research and Robotics Integrated High Tunnels (RobInHighTs) Laboratory, Tuskegee University, Tuskegee, AL 36088; [2]Department of Electrical and Computer Engineering, Auburn University, Auburn, AL 36849.

Sweetpotato (Ipomoea batatas (L.) Lam.) is a nutrient-dense crop vital to global food and nutrition need, yet productivity is hampered by root-knot nematodes (Meloidogyne incognita), which cause severe yield and quality losses. Traditional resistance screening is destructive, labor-intensive, and slow, hindering breeding progress. This research integrates autonomous imaging, computer vision, and machine learning to develop an AI-assisted phenotyping framework for identifying nematode-resistant sweetpotato genotypes under controlled greenhouse conditions. Five sweetpotato cultivars (Zapallo, Georgia Jet, Carver, TU Purple, and NZ196) demonstrate specific host responses to infection, serving as resistant, susceptible, intermediate-resistant, or unknown controls, respectively. We utilized the autonomous FarmBot system, equipped with an RGB camera to capture canopy images three times daily over a 42-day inoculation period following M. incognita infection. The continuous imaging provided non-destructive, temporal data on plant growth and stress dynamics. Physiological and agronomic parameters, including chlorophyll content, stem diameter, biomass, galling index, and nematode egg and soil counts, served as ground-truth metrics. These multimodal datasets will help train a convolutional neural network (CNN) to classify genotypes based on host reactions. Statistical analyses, including ANOVA, Tukey's HSD, and correlation matrices to evaluate trait relationships. This approach enables faster, more objective, and data-driven detection of subtle resistance responses that traditional screening methods may overlook. The integration of robotics, imaging, and artificial intelligence enhances precision phenotyping and accelerates the discovery and development of nematode-resistant, high-yielding, and nutritionally improved sweetpotato cultivars.

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Integrating AI-Powered Robotic Systems For Precision Agriculture And Environmental Monitoring C. Jones*, G. C. Bernard, K. Jones, N. A. Bakari, V. York, A. Brown, V. Abera, D. Wilson, R. Menon, M. Egnin, I. Ritte, M. Okoma, G. Aguti, S. Critchlow, T. Nobles, C. Thompson, and O. Idehen. Department of Agricultural and Environmental Sciences, Plant Biotechnology, Genomics and Autonomous Tools, Research Laboratory, Tuskegee University, Tuskegee, AL 36088.

This research seeks to improve agricultural efficiency, precision, and sustainability through automation and intelligent data analysis. Integration of autonomous crop phenotyping systems with AI analytics addresses challenges in crop health monitoring, inconsistent data collection, and limited real-time insights into crop and soil health. The combination of robotics and artificial intelligence can automate data collection, enhance the accuracy of crop phenotyping, and strengthen yield prediction. LiDAR sensors, high-resolution cameras, and multispectral imaging from drones and rovers were used to collect detailed data on canopy structure, plant growth dynamics, and spectral indicators of soil moisture, temperature, biomass, and nutrient status. Computer vision frameworks and analytical platforms, such as Roboflow, Pix4D Fields, Google Colab, and convolutional neural network (CNN) architectures. YOLO facilitated advanced image recognition and object detection, enabled early identification of plant stress indicators and pest infestations through image-derived phenotypic features. CropWizard, a conversational AI platform, complemented these systems in interpreting image-derived data and generating accessible, farmer-friendly summaries and management recommendations. Preliminary results from our model, trained using the Region-Focused Detection Transformer for Segmentation (RF-DETR-Seg) architecture, show a mean Average Precision (mAP@50) of 39.2%, precision of 41.5%, and recall of 50%. The model shows moderate accuracy in detecting plant instances, with ongoing improvements aimed at increasing precision through expanded datasets, refined annotations, and multispectral

integration. This research highlights the potential of AI-driven robotics to transform agricultural systems, optimize resource management, and support global sustainability goals through smarter, data-driven decision-making in precision agriculture.

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Optimizing Thidiazuron-Induced Somatic Embryogenesis In Arabidopsis Rosette Leaves As A Framework For Plant Regeneration. G. Aguti*[1], M. Okoma[1], M. Egnin[1], S. Day[1], C. Thompson[1], B. Rusnak[2], A. Roeder[2], I. Ritte[1], G. C. Bernard[1], L. Hu[2], and A. Sharma[1]. [1]College of Agriculture, Environment, and Nutrition Sciences, Tuskegee University, Tuskegee, AL 36088, USA. [2]Weill Institute for Cell and Molecular Biology and Plant Biology Section, School of Integrative Plant Science, Cornell University, Ithaca, NY 14853, USA.

Somatic embryogenesis demonstrates plant developmental plasticity by reprogramming cell fate to enable efficient plantlet regeneration vital to agricultural biotechnology. True plant plasticity occurs in non-reproductive tissues like leaves which often arrest development at the globular stage. This study examined how hormonal, genetic, and environmental factors influence embryo induction to plantlet conversion from Arabidopsis rosette leaves across two genotypes. We cultured ten-twenty-day-old seedling leaf explants on Gamborg's B5 medium containing varying concentrations of 2,4-D and BAP to induce callus formation under continuous light or darkness. Globular embryogenic calli were further subjected to Thidiazuron or ABA treament, under photoperiod conditions, to test the efficiency of somatic embryo development to maturity. Dark-initiated explants produced pale-yellow calli exhibiting visible embryogenic structures. Continuous light-cultured explants yielded green, compact, non-embryogenic calli. Genotypic variation was observed, with WS dark-induced calli exhibiting the highest embryogenic potential (75%) by 14 days, while Col-0 showed the least embryogenic potential (35%) by 21 days. An 85% efficiency of globular-to-heart-to-torpedo formation was obtained with dark-initiated calli on Thidiazuron, resulting in a 68% successful somatic embryo-to-plantlet conversion. Only 2% of embryos matured, and none germinated into plantlets under ABA treatments. Histological analyses revealed that embryogenic regions contained compact, uniformly-sized cells with an organized orientation, whereas non-embryogenic calli exhibited disorganized, irregular-cells with larger spaces. These results confirmed that Thidiazuron enhances somatic embryogenesis by improving both efficiency and structural organization via the developmental progression from the globular to mature cotyledons through hormone-mediated cell reprogramming thereby strengthening crop plant regeneration systems that support sustainable agricultural biotechnology.

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Molecular Assessment of Anthocyanin Biosynthesis Pathway in Synchronized In Vitro Red Cell Cultures of American Native Grapes. A. Leggett*, V A. Ananga, Food Science Program, College of Agriculture and Food Sciences, V. Tsolova, Center for Viticulture and Small Fruit Research, College of Agriculture and Food Science, Florida A&M University, Tallahassee, FL 32317 and V. Georgiev, Laboratory of Cell Biosystems, Institute of Microbiology, Bulgarian Academy of Sciences, Plovdiv, Bulgaria.

Anthocyanins are flavonoid compounds that are responsible for the red color of grapes and wines. Because anthocyanins are the most important colorants in grapes, they have been widely studied for their numerous beneficial effects on human health. The study of the flavonoid biosynthetic pathway genes is critical for anthocyanin biosynthesis in *Vitis* species. Little has been done to study the influence of these genes on muscadine grapes. Muscadines are extensively cultivated in Florida and the southeastern United States. Using in vitro synchronized cell cultures obtained from super-epidermal cells of red berries of 'Cynthiana' and 'Noble' varieties, we examined the expression of 13 genes involved in the flavonoid biosynthetic pathway. By using gene-specific primers in combination with a reliable normalization gene (*Actin*), we compared relative expression of the flavonoid biosynthetic genes between 'Noble' and 'Cynthiana'. Our study revealed no significant difference in the expression levels of these genes in the in vitro red cell cultures of both varieties. Among them, CHS2, ANS, DFR, PAL, GST4, CHI4, LDOX, GST5, CHS3, and UFGT showed more expression in 'Noble' than 'Cynthiana'. This study demonstrates that the genes involved in the flavonoid biosynthetic pathway are expressed in in vitro red blood cells as the cells multiply. This makes the study of red cells useful and validates their future use as nutraceuticals. It is important to note that this is the first attempt to elucidate the expression pattern of flavonoid biosynthetic pathway genes in synchronized in vitro red cell cultures of muscadine grapes.

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Impacts of Under-Vine Herbicide Management on Muscadine Vine Performance and Juice Quality. C. Kruis*, A.F. Humphries, V. Tsolova, Center for Viticulture and Small Fruit Research, College of Agriculture and Food Sciences, Florida A&M University, Tallahassee, FL 32308; A. Gaffke, ARS/USDA, Center for Medical, Veterinary and Agricultural Entomology, Tallahassee, FL 32308.

Herbicides are widely used for under-vine vegetation management, but their benefits may be offset by potential risks to human health, the environment, and crop performance. This study evaluates how herbicide-based conventional under-vine management versus no management influences vine physiology and fruit quality of *Vitis rotundifolia* 'Noble' and 'Carlos' at Florida A&M University's Center for Viticulture and Small Fruit Research. Experimental plots were established for each cultivar under conventional and no-management regimes, with conventionally managed vines receiving scheduled herbicide applications and no-management vines surrounded by naturally occurring vegetation. Whole-vine volatile organic compounds (VOCs) were collected from vegetative tissues, concentrated using solid-phase microextraction, and analyzed by gas chromatography–mass spectrometry. Fruit was harvested and processed into juice and small-lot wines for compositional analysis. Preliminary results indicate cultivar- and management-dependent responses. In 'Carlos', no-management vines produced must that was generally riper and less acidic than juice from conventionally managed vines, whereas basic juice composition of 'Noble' was largely unaffected by management. Whole-vine VOC measurements showed higher total VOC emissions from conventionally managed 'Carlos' vines despite their less advanced ripening, while 'Noble' again exhibited minimal treatment differences. These findings suggest a cultivar-specific decoupling of fruit ripening and vine VOC signaling under contrasting under-vine vegetation management and will guide subsequent compound-level VOC profiling and wine chemistry evaluations.

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Cloning of a cDNA Encoding the Muscadine dDihydroflavonol-4-Reductase (DFR) and its Expression in Transgenic Cell Lines Increases Flavonoid Flux. S. Dacosta*, A. Ananga, Food Science Program, V. Tsolova, Center for Viticulture and Small Fruit Research, College of Agriculture and Food Science, Florida A&M University, FL 32317 and V. Georgiev, Laboratory of Cell Biosystems, Institute of Microbiology, Bulgarian Academy of Sciences, Plovdiv, Bulgaria.

Flavonoids are a diverse group of phenolic secondary metabolites that occur naturally in plants and therefore form an integral component of the human diet. Many compounds in this group are potent antioxidants in vitro, and epidemiological studies suggest a direct correlation between high flavonoid intake and a decreased risk of cardiovascular disease, cancer, and other age-related diseases. Modifying flavonoid biosynthesis in selected crops may provide new raw materials with the potential to be used in foods designed to offer specific benefits to human health. Muscadine grapes are known for their high antioxidant capacity, and there is a need to enhance the production of nutraceutical compounds in many cultivars. A clone representing a full-length of the dihydroflavonol-4-reductase (*DFR*) gene from muscadine grapes was isolated from the berry skin total RNA using the *Vitis vinifera DFR* gene as a probe. Sequence analysis of the clone confirmed homology to published *DFR* gene sequences. Nucleotide sequence homology of the full-length clones was highest to the published DFR sequence from V. vinifera (about 80% identity), followed by V. Amurensis, Prunus avium, Malus domestica, and *Pyrus communis*. When expressed using the CaMV 35S promoter, the *in vitro* transgenic muscadine grape cell lines were much darker red than the controls. Some heterogeneous lines that are not normally highly pigmented were also dark red. These data confirm the identity and function of the muscadine clones and further suggest that overexpression of the muscadine *DFR* could be used to increase anthocyanin production in transgenic plants.

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Integrative Biochemical and Phytochemical Analysis of Wild and Cultivated *Vaccinium Corymbosum* from Arkansas: Exploring Variations in Antioxidant Activity, Phytochemical Composition, Total Soluble Solids, Ph, And Protein Content. N. Ibnat*, S. S. Chowdhury, M. Azad, S. Islam, Department of Agriculture, University of Arkansas at Pine Bluff, Pine Bluff, AR 71601.

Vaccinium corymbosum (blueberry) is renowned for its abundance of bioactive compounds, particularly flavonoids and phenolic acids, which contribute to its strong antioxidant properties. This study evaluated and compared the antioxidant capacity, phytochemical profiles, pH, and total soluble solids (TSS) content of four blueberry varieties from the Arkansas region. Three cultivars—'Brightwell', 'Powder Blue', and 'Premier'—were rabbiteye types, while the fourth was a wild-type southern highbush variety. Physical parameters, including fruit weight and pH, were assessed to identify structural and chemical differences among the varieties. Organic extracts were analyzed for total phenolic content (TPC), total flavonoid content (TFC), and antioxidant activity using standardized methods, while TSS was measured with a refractometer. All analyses were performed in triplicate, and mean values with standard deviations were reported. Among the cultivars, 'Powder Blue' and 'Premier' exhibited the highest average fruit weights, whereas the wild type and 'Brightwell' had the lowest. The wild-type variety recorded the lowest pH (3.43), indicating higher acidity. 'Powder Blue' showed the strongest antioxidant activity (98% scavenging; lowest IC_{50}) and the highest phenolic content, followed by 'Brightwell'. In contrast, the wild type showed the lowest phenolic concentration (1.81 mg TAE/g). Ongoing analyses aim to quantify total protein content and assess varietal differences in protein accumulation. Overall, these findings highlight the nutritional and functional value of Arkansas-grown blueberries, with cultivated varieties—particularly 'Powder Blue'—emerging as rich sources of health-promoting bioactive compounds.

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Assessing the Impact of Biochar and Late-Season Nitrogen Fertilization on Soybeans' Biological Nitrogen Fixation. D. Gray*, A. Chiluwal, 1890 Land-Grant Program, Kentucky State University, Frankfort, KY, 40601

Late-season nitrogen (N) fertilization is used to improve soybean seed protein content, but its potential to suppress biological nitrogen fixation (BNF) remains a concern. Biochar amendments may enhance soil fertility and microbial activity, potentially affecting legume–rhizobia symbiosis. A field experiment was conducted in 2023 at Kentucky State University using a split–split plot randomized complete block design with four replications. Treatments included biochar (0 vs. 12 t ha^{-1}), two soybean cultivars (MG2 and MG4), and four late-season N rates (0, 40, 80, and 120 kg N ha^{-1}) applied at R5, one week after R5, and two weeks after R5. Aboveground biomass (R6) and seed samples (R8) were analyzed for total N and ^{15}N natural abundance to estimate the proportion of N derived from the atmosphere (%pNDFA) and BNF. Biochar had no significant effect on seed yield, biomass, total N concentration, %pNDFA, or BNF. In contrast, late-season N significantly reduced atmospheric N reliance. The highest N rate (120 kg ha^{-1}) lowered %pNDFA by 23% in R6 biomass and 31% in mature seed, accompanied by BNF reductions of 103 and 94 kg N ha^{-1} at R6 and R8, respectively. Moderate N (80 kg ha^{-1}) also reduced BNF, while low-rate N (40 kg ha^{-1}) showed less impact. Overall, high late-season N rates strongly suppressed soybean BNF, whereas biochar showed no measurable effect. Low-rate N application (40 kg ha^{-1}) may support seed filling without compromising BNF.

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Economic and Environmental Implications of Biochar Application in Pea (Pisum sativum) Production Systems in Jefferson County, Arkansas. C. Rochford*, T. White, Ph.D., T. Dunbar, Ph.D., R. Nedd, Ph.D. Department of Agriculture, University of Arkansas at Pine Bluff, Pine Bluff, AR 71601.

The Mississippi River, known as "America's River," supports millions of people through its watershed, which provides water, food, and recreation. However, nutrient runoff from agricultural activities has contributed to a dead zone in the Gulf of America, leading to ecosystem degradation. This study examines the economic and environmental impacts of biochar application compared to non-biochar soil management in pea (Pisum sativum) production systems, including rotation with corn, in Jefferson County, Arkansas. Biochar, a carbon-rich byproduct of biomass pyrolysis, has been linked to improved soil health, reduced nutrient losses, and enhanced crop productivity. Despite these potential benefits, adoption remains limited due to uncertain profitability and variable performance across regions. This research integrates agronomic field data with economic modeling to assess yield performance, nutrient runoff reduction, and economic viability, including net present value and benefit-cost ratio. Water samples collected with the ISCO 6712 automatic sampler will be analyzed for nutrient and sediment content. Findings are expected to guide farmers in assessing the feasibility of biochar adoption while providing insight into its broader policy implications for sustainable agriculture and water quality improvement in the Mississippi River Basin.

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Evaluation of Performance for 12 West Indian Avocado (*Persea americana)* Cultivars I. R. Charles*, S. S. Joseph, and T. W. Zimmerman, University of the Virgin Islands, Agricultural Experiment Station, U.S. Virgin Islands 00850.

Avocado (*Persea americana*) cultivar performance was evaluated at the University of the Virgin Islands Agricultural Experiment Station to characterize yield, fruit quality, and ripening behavior under calcareous hillside conditions. Twelve West Indian cultivars produced harvestable fruit and were assessed at both the mature-green and ripened stages. Measurements included fruit dimensions, total and seedless flesh weight, days to ripe, and soluble solids. Cultivars displayed substantial variation in productivity, fruit size, edible flesh proportion, sweetness, and ripening rate. Fruit size varied across the collection, with several West Indian–type cultivars producing particularly large fruit, with length ranges of 16–23 cm and weight ranges of 0.7–1.3 kg, highlighting the strong size potential of this genetic group. Some cultivars exhibited strong yield performance, while others showed favorable market traits such as high flesh-to-seed ratios or elevated °Brix. Across all cultivars, fruit width showed a stronger association with total and seedless weight than length, indicating that lateral fruit development contributes more to overall mass under these growing conditions. Ripening time and sweetness levels also helped differentiate cultivars with more reliable postharvest performance. Harvest timing analysis revealed clear early-, midseason-, and late-producing groups, supporting opportunities for extended market availability. This evaluation provides the first integrated assessment of avocado cultivar performance under Caribbean calcareous soils and identifies promising selections for regional production, market diversification, and future germplasm development.

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Evaluating the Antimicrobial Efficacy and Associated Properties of Selected Essential Oils: Hemp, Basil, and Lemongrass in Polymers. S. Willis*, D. G. Mortley, College of Agriculture, Environment and Nutritional Sciences, V. Rangari, College of Engineering and R. Faraj, College of Veterinary Medicine, Tuskegee University, Tuskegee, AL 36088.

Essential oils (EOs) have emerged as promising natural antimicrobials with applications in food packaging, pharmaceuticals, and agriculture. With growing concerns over antibiotic resistance and the environmental impact of synthetic preservatives, incorporating EOs into biodegradable polymers presents a sustainable alternative. This study aimed to evaluate the antimicrobial efficacy of industrial hemp (Cannabis sativa), lemongrass (Cymbopogon citratus), and basil (Ocimum basilicum) essential oils against Escherichia coli in poly(3-hydroxybutyrate-co-3-hydroxyvalerate) (PHBV) polymer systems. The experiment followed a completely randomized design with three EOs tested at five concentrations (0.25, 0.5, 1.0, 2.0, and 4.0% v/v) and five replications. Oils were extracted by steam distillation and ethanol extraction, with yields ranging from <2% for steam-distilled hemp to ≥2% for ethanol extracts. Preliminary results indicated that lemongrass EO exhibited the strongest inhibition zones, followed by basil and hemp, likely due to the higher citral content in lemongrass. Ongoing gas chromatography (GC) and high-performance liquid chromatography–mass spectrometry (HPLC–MS) analyses are characterizing active compounds such as cannabinoids and terpenes that may enhance antimicrobial efficacy. The findings suggest that EO–PHBV composites can serve as effective, eco-friendly antimicrobial agents with potential applications in sustainable food packaging and biomedical materials.

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Evaluating the Effects of Moringa Tea on Lymphocyte Proliferation. J. Hayes*, Department of Biology; D. S. Pettiford, and R. C. Minor, Department of Animal Sciences, North Carolina Agricultural and Technical State University, Greensboro, NC 27411.

Moringa oleifera Lam (MOL) is a tree originating from tropical and subtropical regions in Asia and Africa that has been utilized in traditional medicine, that is increasingly being investigated for its medicinal attributes. Moringa has been shown to have an immunomodulatory role in influencing innate immune cells such as macrophages, however, Moringa's role in modulating the adaptive immune response, particularly those of lymphocytes is emerging. The objective of this study was to investigate whether and how consumption of Moringa tea (MT) impacts T- and B-lymphocyte proliferation. For this study, mice were given fresh water or fresh Moringa Tea (MT) to drink for 14 days. On day 14, the spleens and lymph nodes were collected to compare the percentages of lymphocytes (T- and B-

lymphocytes) between the two groups. Flow cytometric analysis showed any changes in the populations of CD3+, CD19+ cells, or CD4+ and CD8+ cells within the spleen or lymph nodes of mice that consumed MT compared to mice that consumed water. The effect of MT on lymphocyte proliferation in response to either Lipopolysaccharide (LPS), Concanavalin A (CON A), or anti-CD3 and anti-CD28 was then evaluated ex vivo. MTT assays showed that lymphocytes within the spleen of mice that consumed MT for 14 days had a trend toward decreased proliferation in response to activation with anti-CD3+ and anti-CD28+, but not to CON A or LPS. This study suggests that Moringa tea consumption for 14 days may impact T cell proliferative responses through a mechanism that will be further evaluated.

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Impact of Differential Nitrogen Fertilization on the Growth and Performance of Fiber Hemp (*Cannabis sativa* L.*)* N. Gorgin*, D. Rai, B. Ghimire, and A. Bhowmik, Department of Natural Resources and Environmental Design, North Carolina Agricultural and Technical State University, Greensboro, NC 27411.

There is growing need for fiber hemp in textile industry, however, fertilization regimes to optimize production of hemp (*Cannabis sativa* L.) remain limited. In this study, a randomized complete block design with split plot arrangement was employed to evaluate the effects of three nitrogen (N) fertilization treatments equivalent to 180 kg N ha^{-1}; integrated (nature safe + urea), urea and unfertilized soil (control) on two fiber hemp varieties; Yuma and Shama. Growth parameters including plant height, stem diameter, chlorophyll content and retted stem yield were recorded. Results showed that in Yuma, stem diameter under integrated fertilizer application significantly increased (11.3±0.79 mm) compared to urea (8.92 ±0.66 mm) and control (7.03±0.40 mm). Similarly, integrated fertilization significantly increased plant height (162 ±11.5 cm) and chlorophyll content (39.5 ±0.49 SPAD value) compared to the control (89.0±7.55 cm and 31.5±1.47 SPAD value, respectively) in Yuma. Additionally, in Shama, integrated fertilizer significantly increased plant height, stem diameter, and chlorophyll content compared to the control, while showing a slight increase in these parameters compared to urea. Furthermore, at harvest, the retted stem yield under integrated fertilizer (6310 ±753 kg ha^{-1}) was significantly higher than that under urea (2799±373 kg ha^{-1}) and the control (1136 ±82.0 kg ha^{-1}) in Yuma. However, in Shama, no significant difference was observed between treatments. Overall, integrated fertilization proved most effective for promoting growth performance in fiber hemp, particularly for Yuma. These findings highlight the potential of integrated nutrient management to enhance fiber hemp productivity while supporting sustainable agricultural practices.

929

Review of Methods for Assessing Organic Carbon Measurements. M. Toussaint*, A. Kumi, and J. Quansah, Department of Agricultural and Environmental Sciences, Tuskegee University, AL 36088.

Soil organic carbon plays a vital role in maintaining soil health, agricultural productivity, and climate regulation through carbon sequestration. As global efforts intensify to reduce atmospheric CO2, the accurate assessment of soil organic carbon (SOC) is crucial for supporting sustainable land management and carbon farming initiatives. This review explored a wide range of traditional and emerging methods for quantifying SOC at different spatial and temporal scales. These include conventional laboratory techniques like wet digestion and dry combustion, advanced spectroscopic tools such as LIBS and INS, CO2 flux measurement via Eddy covariance, and innovative approaches like machine learning, remote sensing, and isotopes analysis. Each method is evaluated based on its principles, accuracy, and scalability for integration into climate action and carbon credit frameworks. This review highlights the growing importance of combining modeling and sensing approaches to overcome cost, labor, and accuracy challenges. These integrated systems represent a promising direction for creating robust, scalable, and economically viable SOC monitoring solutions for both researchers and land managers.

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Indoor and Outdoor Cultivation Studies on Improved Strains of *Ganoderma mbrekobenum.* J. O. Enemudo*, O. W. Oderinwale, F. N. Anike, O. S. Isikhuemhen, Department of Natural Resources and Environmental Design, North Carolina Agricultural and Technical State University, Greensboro, NC 27411.

Ganoderma mbrekobenum is an emerging yet underexplored medicinal mushroom known for its bioactive compounds and therapeutic potential. Despite its promise, commercial cultivation remains limited due to low yield, poor biological efficiency (BE%), and the scarcity of high-performing strains. This study aimed to improve the productivity of *G. mbrekobenum* by identifying superior progenies through breeding and cultivation trials. Twenty progenies derived from a parent strain were evaluated under both indoor and outdoor cultivation systems to identify isolates capable of outperforming the parent. Substrates composed of hardwood pellets and soybean hulls (1:1) were sterilized, inoculated, and incubated under controlled conditions. Growth parameters, including mycelial colonization rate, time to pinning, fruit body formation, fresh weight, and BE were recorded. Under outdoor cultivation, isolates 10 and 18 produced the highest yields of 142.28 ± 18.52 g (BE = 10.82%) and 142.50 ± 11.35 g (BE = 10.84%), respectively, exceeding the parent yield of 133.50 ± 10.35 g (BE = 10.15%). In indoor cultivation, isolate 6 achieved the highest yield of 225.75 ± 6.10 g (BE = 17.21%), followed by isolate 15 with 216.67 ± 14.78 g (BE = 16.51%), outperforming the parent (166.42 ± 8.47 g; BE = 12.68%). These results surpass previous reports on *G. mbrekobenum* productivity and are comparable to yields of other *Ganoderma* species. This highlights its potential for commercial cultivation, particularly in tropical regions with favorable environmental conditions. Ultimately, this work advances the potential of *G. mbrekobenum,* and its progenies as a valuable resource for sustainable mushroom production.

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Effects of Floral Development Stage and Cultivar on Cannabinoid Profile, Phenolic Contents, and Antioxidant Capacity in Industrial Hemp (*Cannabis sativa* L.). E. Noh*, S. Bhetwal, S. Dhekney, and B. R. Min, Department of Agriculture, Food and Resource Sciences, University of Maryland Eastern Shore, Princess Anne, MD 21853.

Industrial hemp is legally defined as *Cannabis sativa* cultivars containing less than 0.3% Δ9-tetrahydrocannabinol (THC) on a dry weight basis. It has gained interest due to its health-promoting phytochemicals, especially cannabinoids. Cultivar selection and floral maturity affect phytochemical compositions, making them critical for maximizing cannabinoid yield while maintaining regulatory compliance. The objective of the study was to determine the effects of cultivar and harvesting period on phenolic contents, antioxidant capacities, and cannabinoid profiles in ten hemp cultivars grown in 2021: Abacus (AB), NC/VA (NC), AC/DC Otto II, Cucumber Diesel, Mountain Ras, Valley Kush D, Mountain Diesel (MD), West Slope Orange, Suzy Kush, and White X Bliss (WXB). Flowers were collected at three stages: S1 (onset of flowering), S2 (2–3 weeks after S1), and S3 (full maturity). Freeze-dried samples were extracted using 80% methanol. Phenolic contents and antioxidant capacities of the samples were analyzed spectrophotometrically and fluorometrically, and cannabinoids were quantified using HPLC-DAD. In most cultivars, phenolic and cannabinoid contents and antioxidant capacity significantly increased from S1 to S2 but did not change from S2 to S3. MD uniquely showed continuous increases during floral development. Cannabidiolic acid (CBDA) was the predominant cannabinoid in nine cultivars, followed by cannabidiol (CBD), tetrahydrocannabinolic acid (THCA), cannabigerolic acid (CBGA), and THC. WXB showed a distinct cannabinoid profile, accumulating only cannabigerol (CBG) with high CBGA but no CBD or CBDA. Cultivars, such as MD, AB, and NC, exhibited the highest cannabinoid and antioxidant capacities at S3, suggesting strong potential for cannabinoid production in this region.

932

Impact of Precipitation Variability on Switchgrass Growth and Productivity. J. Christian*, Department of Environmental Sciences, and C. Kieffer and D. Hui, Department of Biological Sciences, Tennessee State University, Nashville, TN 37209.

Switchgrass (*Panicum virgatum* L.) is a warm-season C_4 bioenergy grass valued for its resilience and carbon-sequestration potential. To quantify how hydroclimatic variability influences its physiology and productivity, a field experiment was conducted at the Tennessee State University Agricultural Research and Education Center (Nashville, TN) using a randomized complete block design with five precipitation manipulations (-50%, -33%, 0%, +33%, +50% of ambient) from 2015 to 2022. Throughout the years, we measured photosynthesis, transpiration, chlorophyll, and biomass yield. Results showed that no measured variables differed significantly among the precipitation treatments. Blocking significantly affected photosynthesis in 2015-2017, indicating micro-environmental heterogeneity. Year effects emerged thereafter: transpiration differed among years in 2015-2020, while both photosynthesis and transpiration varied by year in 2015-2022. As for productivity, biomass yield and chlorophyll differed significantly by year in 2020-2022, with 2021 generally exhibiting the highest values. The major impacts of precipitation treatments

were not consistently significant, suggesting that inter-annual hydroclimatic context (e.g., ambient rainfall and temperature patterns) was more important in driving physiological responses than imposed plot-level modifications. The results provide meaningful field information to enhance management and modeling efforts targeted at stabilizing switchgrass productivity under changing precipitation.

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Hemp Growth and Soil Responses to Biochar in Controlled Greenhouse Conditions. M. Qambar Baysa*, D. Rai, B. Ghimire, and A. Bhowmik**,** Department of Natural Resources and Environmental Design, North Carolina Agricultural and Technical State University, Greensboro, NC 27411.

Biochar is used as a soil amendment to improve nutrient availability and microbial activity in agricultural systems. However, its short-term effects on plant growth, particularly in hemp (*Cannabis sativa* L.), grown for seed are not well understood. This greenhouse study evaluated the effects of biochar (5% w/w) on plant growth and soil characteristics of the Canda variety of hemp. Plants were grown with and without biochar in pots containing sandy clay loam soil. Measurements included plant traits (height, stem diameter, canopy, central leaflet length (CLL), chlorophyll, biomass) and soil properties (NH_4^+, NO_3^-, pH, enzymes, moisture). Results showed that the biomass of leaves, stems, and roots did not differ significantly between treatments. However, taproot length, at harvest, was significantly lower in biochar-treated plants (11.84 ± 0.19 cm) compared to controls (12.28 ± 0.19 cm). Plant height (31.56 ± 0.93 cm), canopy diameter (11.22 ± 0.29 cm), and CLL (4.01 ± 0.09 cm) were significantly greater in the control compared to the biochar treatment, and chlorophyll content (39.76 ± 0.86 SPAD value) was also significantly higher in the control. Stem diameter and petiole length showed no significant variation, along with gravimetric water content. These results may reflect short-term nutrient immobilization or limited nitrogen availability in biochar-amended soil. Ongoing analyses will assess nitrogen allocation and microbial responses via enzyme assays and PLFA profiling. Overall, the study suggests that biochar can temporarily limit specific above- and belowground growth traits in hemp, offering insights into short-term plant–soil interactions.

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Antioxidant Capacity Assessment of Ginger Grown under Different Shade Colors and Intensities. D. Tetteh*, R. Minor, and G. Yang, College of Agriculture and Environmental Sciences, North Carolina Agricultural and Technical State University, Greensboro, NC 27411.

Ginger is a commonly used medicinal spice valued for its rich antioxidant capacity, contributing to its health-promoting properties. However, the antioxidant capacity of ginger can be influenced by environmental factors, particularly light quality and intensity. Colored shade nets not only reduce overall light but also selectively filter wavelengths, potentially altering production of antioxidant compounds. This research evaluated how shade color and shading intensity affect the antioxidant potential of ginger rhizomes. Ginger plants were cultivated in containers and subjected to multiple shading treatments, including red (30%), yellow (60%), black (50% and 70%), white (50% and 70%), brown (70%), blue (60%), green (70%), aluminum (50% and 70%), and an unshaded control (0%). After harvest, rhizomes were analyzed for antioxidant activity using three standard assays; Ferric Reducing Antioxidant Power (FRAP), 2, 2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging capacity, and ABTS radical cation decolorization. Results showed significant variation among treatments. Ginger grown under 70% green shade exhibited the lowest FRAP, ABTS, and DPPH values, indicating a substantial reduction in antioxidant activity under this condition. Similarly, 70% black and 70% brown shades produced relatively low FRAP readings, suggesting that high shading intensity generally suppresses antioxidant accumulation. Conversely, moderate shading with yellow (60%), white (50%) and blue (60%) shade nets resulted in comparatively higher DPPH, FRAP and ABTS values. The study demonstrates that shade net color and intensity significantly influence ginger's antioxidant properties. High intensity shading negatively affects antioxidant accumulation in ginger, whereas moderate shading with specific net colors can enhance antioxidant potential.

935

Chlorophyll Fluorescence and Yield of Lettuce (*Lactuca sativa* L.) under Controlled Conditions of Light and Temperature. C. Uche*,* H. Sidhu, E. Kwekutsu, and H. Sharma, Department of Natural Resources and Environmental Design, North Carolina Agricultural and Technical State University, Greensboro, NC 27411.

Lettuce (*Lactuca sativa* L.) growth and photosynthetic performance are highly sensitive to light intensity and temperature. This study evaluated the effects of two light intensities (500 and 750 μmol m^{-2} s^{-1} PPFD) at 25/18 ºC (day/night) on chlorophyll fluorescence dynamics, chlorophyll content, and yield of three looseleaf varieties—Slo Bolt, Bronze Arrow, and Thai Oakleaf. The varieties were grown for 45 days in a Conviron GEN1000 growth chamber. Fluorescence parameters, including initial fluorescence (Fo), maximum fluorescence (Fm), maximum quantum yield (Fv/Fm), non-photochemical quenching (NPQ), photochemical quenching (qP), and the effective quantum yield of PSII (ΦPSII) were measured weekly using a LI-COR 6800 portable photosynthesis system. At 500 PPFD, Fv/Fm values (0.80–0.84) and qP (0.6–0.8) indicated optimal PSII efficiency and balanced energy partitioning across varieties. At 750 PPFD, Fo and Fm rose markedly, while Fv/Fm declined slightly after 31 DAT, suggesting elevated excitation pressure and onset of photoinhibition in Bronze Arrow and Thai Oakleaf. NPQ and ΦPSII showed inverse patterns, with higher NPQ (>2.0) reflecting greater heat-dissipation capacity under high light. Slo Bolt maintained higher qP and ΦPSII, indicating stronger photochemical resilience. SPAD-based chlorophyll content increased steadily with growth stage under both treatments, remaining slightly higher under 750 PPFD. Despite mild photo-stress at 750 PPFD, all varieties achieved higher biomass accumulation, particularly Slo Bolt, reflecting enhanced photosynthetic utilization of higher irradiance. These findings highlight varietal differences in light-use strategies and reveal that moderate high-light exposure promotes yield while inducing adaptive photoprotection in lettuce grown under controlled environments.

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Differential Gene Expression in Salt-Tolerant Cotton Species in Response to Salt-Stress. S. G. Kommireddypally*, S. K. Sanathanam, S. Mentreddy, L. Nyochembeng, E. Moss, V. R. Sripathi, Department of Natural Resources and Environmental Sciences, Alabama A&M University, Normal, AL 35762.

Salt stress is a significant issue in agriculture, especially for Gossypium hirsutum (Upland cotton), which is essential for global fiber production. As soil salinity rises due to climate change and agricultural practices, studying molecular responses to salt stress is vital for breeding resilient cotton cultivars. Identifying key genes for salt tolerance is essential for developing stress-tolerant varieties, which is a priority for food security. This study aims to identify key salt-tolerant and differentially expressed genes (DEGs) using RNA-Seq by analyzing the transcriptomes of salt-tolerant cotton species under stressed and unstressed conditions. This study will examine the responses of salt-tolerant cotton species exposed to NaCl concentrations of 0 mM (control) and 300 mM, with leaf samples collected at 0, 24, 48, 72, 96 and 120 hours after treatment with three replicates (1 species x 2 treatments x 6 collection time points x 3 replicates = 36). DNA/RNA was extracted from the leaves of treated and untreated 30-day-old seedlings. RNA-seq analysis will include quality control, trimming, alignment, counting, normalization, differential gene expression (DGE) analysis, and functional enrichment analyses using GO, COG, and KEGG pathways. This study will identify important genes that regulate osmotic pressure, ion balance, and protection against oxidative damage. It will also identify key gene families linked to plant stress resistance, such as protein kinases, glutathione S-transferases, the CAZy family, and expansion proteins. The findings from this study on salt-tolerant materials will provide a crucial basis for identifying potential breeding parents for salt tolerance in cotton.

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The Effects of Foliar-Applied Seaweed Biostimulant on Biomass and Antioxidant Potential of Aeroponically Grown Lettuce Cultivars. P. A. Nkrumah*, Khadka, N., B. Min, and E. Noh, Department of Agriculture, Food and Resource Sciences; M. Mitra, Department of Natural Sciences; A. Nagchaudhuri, B. Butler, and P. Wilson, Department of Engineering; University of Maryland Eastern Shore, Princess Anne, MD 21853.

Controlled sustainable agriculture presents innovative solutions to address global food demand. Aeroponics represents a leading example of resource-efficient crop production. The application of biostimulants in controlled-environment agriculture is gaining increasing attention for their ability to enhance crop growth and nutritional quality. However, the influence of seaweed-based biostimulants on the growth and antioxidant potential of aeroponically grown crops remains underexplored. This study evaluated the effects of foliar applications of a seaweed biostimulant on the biomass and antioxidant potential of aeroponically grown lettuce (*Lactuca sativa*) using a Tower Garden system. Two cultivars, Bibb and Gourmet, were grown for 45 days under identical conditions, with 12 plants treated and 6 serving as controls for each cultivar. The biostimulant (Raw Kelp Marine, USA) was applied three times weekly starting nine

days after sowing at concentrations of 0.62 g L^{-1} and 0.31 g L^{-1}. After 45 days, Bibb lettuce exhibited a 48–50% increase in fresh weight, while Gourmet lettuce showed an 8–11% increase relative to controls. Antioxidant activity, assessed through total phenolic content (TPC), total flavonoid content (TFC), DPPH radical scavenging capacity, and oxygen radical absorbance capacity (ORAC), was higher in treated Bibb lettuce but not significantly different in treated Gourmet lettuce. These results suggest that foliar application of seaweed biostimulant can enhance both biomass and antioxidant activity in aeroponically grown lettuce in a cultivar-dependent manner, highlighting its potential for improving nutritional quality in sustainable soilless vertical farming systems.

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Impact of Regenerative Agriculture Farming Practices on the Delmarva Peninsula Sandy Loam Soil Health Under Organic Vegetable Cropping Systems. K. Bucca*, A. Allen, E. Casey, D. Gurung, F. Hashem, Department of Agriculture, Food and Resource Sciences, University of Maryland Eastern Shore, Princess Anne, MD 21853; P. Millner, Sustainable Agricultural Systems Laboratory, USDA, ARS, NEA, BARC, EMFSL Beltsville, MD 20705.

The benefits of coupling regenerative agriculture practices (conservation tillage, cover cropping, poultry litter, and compost amendment) to improve sandy loam soil health are unclear. The Delmarva sandy loam soil has low organic matter and nutrient levels, creating production challenges for vegetable growers. This study examined the benefits of a combined practices approach, including cover cropping, tarping with landscape fabric, compost, and pelletized organic fertilizer amendment to satisfy the plants' (Swiss chard) need for nitrogen (N). Thus, a completely randomized experiment was conducted in fall 2023 and 2025 at the UMES Ag Experiment Station on a certified National Organic Program (NOP) field. Four treatments with four replications each were included: A control (T1: no organic amendments or cover crops); T2: winter rye and hairy vetch cover crop mixture (CCM), no amendments; T3: CCM, and organically-compliant compost; and T4: CCM and organically-produced poultry litter pellets, were used to quantify the effects on organic vegetable production. Soil health was assessed by determining pH, electrical conductivity, organic matter, soil texture, respiration, active carbon, bulk density, wet aggregate stability, total carbon, total nitrogen, soil organic carbon, soil enzymes, macronutrients, and micronutrients. Cover crop (hairy vetch) impacts on nitrogen use efficiency, calculated for different management practices, were compared to determine which practices improved soil health and N-levels in this field experiment cultivated with Swiss chard. Our findings provide farmers with options to enhance NOP cropping systems on Delmarva sandy loam soil by combining regenerative agricultural practices, which results in enhanced soil health and improved crop productivity.

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Evaluating the Growth of Specialty Crops in a Hydroponic System Using Recycled Nutrient Solution. A.B. Matthews*, C.P. Cotton, N.A. Trinidad, and S.K. Bonik, Department of Agriculture, Food, and Resource Sciences, University of Maryland Eastern Shore, Princess Anne, MD 21853.

Hydroponic cultivation can sustainably produce higher yields within shorter growing cycles compared to traditional agriculture. A disadvantage of hydroponic cultivation is the amount of nutrients discharged into the environment after each water change. This study evaluated the efficiency of a recycled nutrient solution for cultivating holy basil (*Ocimum tenuiflorum*), cutting celery (*Apium graveolens* var. *secalinum*), and tatsoi (*Brassica rapa* var. *narinosa*) in Nutraponics Pro-Tower Gardens. The crops were grown under 30% shade cloth in a high tunnel during summer 2025. Treatments included Veg+Bloom (control) and a recycled nutrient solution collected biweekly from a controlled-environment vertical hydroponic system, with three replications each. Treatments were replenished as needed, and plants were harvested periodically. The pH was maintained between 5.5 and 6.5. Chlorophyll content, yield, and nutrient solution parameters were measured and analyzed. Electrical conductivity, total dissolved solids, and salinity were significantly higher ($P \leq 0.05$) in the recycled nutrient solution. Yields for all crops harvested throughout the growing season were significantly lower ($P \leq 0.05$) in the recycled treatment. At the final harvest, there were no significant differences in fresh or dry weights among the crops and treatments, except for tatsoi, whose fresh weight was significantly higher ($P \leq 0.05$) in the control. Chlorophyll content was significantly higher ($P \leq 0.05$) in the recycled treatment in the final two harvests and in the first two harvests of cutting celery and holy basil, respectively. Further research is needed to explore ways to optimize recycled nutrient solution to produce optimum crop yields, while reducing environmental pollution.

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Genome-wide Identification and Characterization of HSP and HSF Gene Families in Blueberry. Z. A. Khan*, K. P. Kulkarni, K. Melmaiee; Department of Agriculture and Natural Resources, Delaware State University, Dover, DE 19901

Highbush blueberry (*Vaccinium corymbosum* section Cyanococcus) is among the five healthiest fruits recommended by the Food and Agriculture Organization of the United Nations. Blueberry plants are sensitive to changes in pH and temperature, especially during flowering. Heat shock proteins (HSPs) and heat shock factors (HSFs) play pivotal roles in stress tolerance. However, the role of HSP/HSF gene families in blueberries is not well understood. In this study, we aimed to analyze the regulatory and evolutionary roles of HSP and HSF genes in response to heat stress in blueberries. We retrieved protein sequences of HSP/HSF genes from three model crops *Arabidopsis thaliana*, rice (*Oryza sativa* L.), and grape (*Vitis vinifera* L.) from NCBI. These sequences were used as 'queries' to perform a BLAST search against the V. corymbosum Draper genome. Through this method, we identified 57 HSP and 61 HSF genes in the tetraploid blueberry. Phylogenetic and principal component analyses grouped these genes into known major families. So far, we have identified several subgroups within the HSP gene family, including sHSP, HSP70, HSP20, HSP60, and HSP100. We also analyzed gene structures using both gene and cDNA sequences as 'queries.' Currently, we are characterizing these genes for their expression profiles in selected blueberry cultivars under heat-stress conditions. This study provides a comprehensive characterization of the VcHSP and VcHSF gene families, offering insights into their roles in heat-stress tolerance. Furthermore, the findings will serve as a valuable resource for functional validation and the genetic improvement of heat-tolerant blueberry plants.

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Optimization of an Efficient Plant Regeneration Protocol in Strawberry for Developing Disease-Resistant Lines. M. E. Abrams*, A. R. Vennapusa, K. Melmaiee, S. Elavarthi, Department of Agriculture and Natural Resources, Delaware State University, Dover, DE 19901

The strawberry (*Fragaria x annanasa*) is one of the top small fruit crops grown worldwide, holding significant economic and cultural value. Several factors can hinder or negatively impact strawberry production. One such problem is fruit rot, caused by fungal pathogens *Botrytis cinerea* and *Colletotrichum acutatum*. Fruit rot can damage fruits both in the field and after harvest, creating challenges for transportation and storage. Currently, managing fruit rot mainly relies on the use of harmful fungicides. An alternative approach involves developing strawberry lines resistant to fruit rot using advanced biotechnology techniques such as tissue culture and gene editing. Our study focused on optimizing a plant regeneration protocol for strawberries, experimenting with different sterilization steps, explant types, media, and hormonal combinations. Our protocol successfully standardized plant regeneration, elongation, and the establishment of plantlets for the Tribute cultivar, using petioles as explants along with various auxin and cytokinin combinations and sterilization procedures. The genes responsible for fruit rot resistance were validated using qRT-PCR. Gene transformation protocols and the development of gene constructs for genome editing are currently underway. These results offer an effective tissue culture method for strawberry functional genomics research. The plant regeneration protocols and candidate genes developed here will help in creating fruit rot-resistant cultivars and in expanding technological applications for crop improvement in strawberries.

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Identifying Pathways Implicated by Drought Stress in Sugar Maple Saplings Using Weighted Gene Correlation Network Analysis. L. Waller*, O. E. Jacobs, A. R. Vennapusa, S. Elavarthi, A. B. Mirto, M. E. Abrams, and K. Melmaiee, Department of Agriculture and Natural Resources, Delaware State University, Dover, DE 19901.

Acer saccharum, commonly known as sugar maple, is an economically significant hardwood forest species native to Canada and the eastern United States. Many forest species face critical population threats due to the accelerating effects of climate change, demanding a deeper understanding of plant-stress relationships at the genomic level. Therefore, our research focused on the physiological, biochemical, and transcriptomic analysis of *A. saccharum* in response to drought stress, integrated through Weighted Gene Correlation Network Analysis (WGCNA) to identify co-expression modules and related pathways. Drought stress was imposed on the leaves of *A. saccharum* saplings at 7, 14, and 21 days, with leaves collected for RNA sequencing. The data was further analyzed to identify differentially expressed genes (DEGs) and build correlation networks. Gene Ontology (GO) and functional enrichment analyses of

these networks revealed four gene modules significantly enriched in biological processes involved in stress signaling, protein kinases, and transcriptional regulation in response to drought stress. The positive and negative hub genes identified within these modules may serve as key regulators of drought tolerance. These findings offer valuable insights into the molecular networks underlying *A. saccharum*'s adaptive response to drought stress and establish a foundation for future hardwood tree genomic-assisted breeding and conservation efforts.

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Seedling and Whole Plant Evaluation of Industrial Hemp Lines for High Temperature Stress Tolerance A. B. Mirto*, A. R. Vennapusa, S. Elavarthi, M. E. Abrams, L. A. Waller, and K. Melmaiee, Department of Agriculture and Natural Resources, Delaware State University, Dover, DE 19901.

Industrial hemp (*Cannabis sativa)* is a versatile crop with numerous uses in the seed and fiber industries. As industrial hemp has recently been approved for cultivation in the USA, the availability of cultivars and germplasm is necessary to meet the growing demand for various applications. The changing climate and unseasonal heatwaves are negatively affecting hemp crop production. Limited studies have been conducted to understand the impact of high-temperature stress on hemp. To address this, we carried out a systematic study to evaluate the effects of high-temperature stress on seedling germination and whole-plant physiology. Seedling screening was performed at 25℃ (control) and 35℃ (heat stress) for seven days to assess germination and growth across 59 genotypes. Whole-plant screening was carried out on selected genotypes at 25°C (control) and 40°C (heat stress), with physiological traits measured. Hemp lines exhibited different responses to high-temperature stress at both seedling and whole-plant levels. High-temperature stress significantly affected seed germination, root, and shoot length at the seedling stage. Reductions in NDVI, SPAD, and biomass were observed during whole-plant assessments. This research helps identify potential high-temperature stress-tolerant lines during germination and development stages and enhances understanding of how heat stress impacts plant physiological functions. Further exploration of molecular mechanisms and integration with our physiological data offer valuable resources for hemp breeding programs, promoting sustainable crop production.

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Uncovering the Genetic Architecture of Pungency, Carotenoids, and Flavor in *Capsicum chinense* via TWAS-mGWAS Integration and Spatial Transcriptomics. R. Duhan*, U. K. Reddy, K. S. Karnatam, A. Talavera-Caro, C. Lopez-Ortiz[1], S. R. Chinreddy, S. Ramireddy, Gus R. Douglass Institute and Department of Biology, West Virginia State University, Institute, WV, USA; P. Natarajan, Department of Agriculture, Food and Resource Sciences, University of Maryland Eastern Shore, Princess Anne, MD, USA; V. Kumar, S. S. Kadiyala, Gus R. Douglass Institute and Department of Biology, West Virginia State University, Institute, WV, USA; N. Balagurusamy, Laboratorio de Biorremediación, Facultad de Ciencias Biológicas, Universidad Autónoma de Coahuila, Torreón, Coahuila, México; M. Chakrabarti, School of Integrative Biological and Chemical Sciences, University of Texas Rio Grande Valley, Edinburg, TX, USA; V. A. Benedito, Department of Agriculture, Food and Resource Sciences, University of Maryland Eastern Shore, Princess Anne, MD, USA; D. A. Adjeroh, Lane Department of Computer Science and Electrical Engineering, West Virginia University, Morgantown, WV, USA; and P. Nimmakayala, Gus R. Douglass Institute and Department of Biology, West Virginia State University, Institute, WV, USA.

Capsicum chinense (habanero pepper) displays remarkable natural diversity in fruit pungency, color, and aroma arising from its specialized metabolites—capsaicinoids, carotenoids, and volatile organic compounds (VOCs). To unravel the genetic basis of these complex traits, we conducted an integrative study combining metabolomics, metabolite–genome-wide association (mGWAS), and transcriptome-wide association (TWAS) analyses across 244 diverse accessions. The mGWAS identified over 2,000 significant SNPs associated with capsaicinoid, carotenoid, and VOC profiles, while TWAS linked gene expression with metabolite accumulation, revealing regulatory modules within phenylpropanoid, fatty acid, and terpenoid pathways. Spatial transcriptomics of contrasting fruit tissues uncovered 7,034 differentially expressed genes, including AP2 transcription factors and Pentatricopeptide Repeat (PPR) proteins as key co-expression hubs with pigment and volatile biosynthetic genes. Integration of TWAS and spatial data pinpointed 74 candidate genes with tissue-specific expression overlapping genomic loci. Functional validation in CRISPR/Cas9 knockout tomato lines demonstrated that AP2 mutants accumulated elevated β-carotene and lycopene, whereas PPR mutants altered xanthophyll ester and apocarotenoid levels. This is the first comprehensive TWAS–mGWAS–spatial transcriptomic integration in *C. chinense*, providing novel insights into fruit quality

regulation and offering molecular targets for precision breeding and metabolic engineering of superior pepper varieties.

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Integration of Metabolomics and Transcriptomics Reveals Grafting-Mediated Regulation of the Ionone Biosynthesis Pathway in Whitefly Resistance Traits in Watermelon. R. Madabathula*, K. Chinnannan, L.M. Nallagari and P. Nimmakayala. Department of Biology, Gus R. Douglass Institute, West Virginia State University, Institute, WV 25112, USA.

The sweet potato whitefly (*Bemisia tabaci*) is a globally significant pest responsible for severe yield losses in watermelon. Current management strategies rely heavily on insecticide use, which is both economically taxing and environmentally unsustainable. As an alternative, grafting offers a promising and eco-friendly approach to enhance plant tolerance. In this study, five grafting combinations were evaluated under whitefly infestation to assess grafting-mediated resistance in watermelon. Grafted plants demonstrated enhanced adaptability and stress tolerance compared to ungrafted (UG) plants. Among the combinations, the LG30 rootstock exhibited the highest membrane stability index (82%), followed by MM30 (80%), CSB (68%), S/S (67%), and UG (54%). This trend showed an inverse relationship with electrolyte leakage, indicating improved membrane integrity in grafted plants. Analysis of stress markers and histological features revealed higher reactive oxygen species (ROS) accumulation and cell death in UG plants, both of which were significantly reduced in grafted combinations. The highest whitefly nymph density was observed in S/S plants (536 nymphs/plant), followed by UG (378), MM30 (355), CSB (281), and LG30 (131). Integrated transcriptomic and metabolomic analyses identified the ionone biosynthesis pathway as a key secondary metabolic route. Notably, LG30-grafted plants infested with whiteflies produced higher levels of ionone and flavonoids, driven by the upregulation of pathway-associated genes, which potentially contributed to their enhanced resistance. These findings highlight LG30 as a valuable rootstock for whitefly resistance, provide novel insights into the role of ionone in whitefly resistance, and offer a theoretical foundation for anti-insect breeding and metabolic trait improvement in grafted watermelon.

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Deciphering Arsenic (As) Stress Tolerance in Cucurbitaceae: Insights from Physiological and Transcriptomic Analyses. L.M. Nallagari*, K. Chinnannan, R. Madhabathula and P. Nimmakayala Department of Biology, Gus R. Douglass Institute, West Virginia State University, Institute, WV, 25112.

Arsenic (As) contamination represents a major abiotic stress that undermines crop performance and food safety. To elucidate the molecular and physiological mechanisms underlying As tolerance, six cucurbit species, *Lagenaria siceraria* (Lagenaria), *Cucurbita pepo* (Pepo), *C. maxima* (Maxima), *C. moschata* (Moschata), *Citrullus lanatus* (Watermelon), and *Cucumis sativus* (Cucumber), were evaluated through integrated analyses of IC_{50} screening, physiological responses, As accumulation, and orthogroup (OG)-level transcriptomics. IC_{50} values ranged from 8.94–17.28 mg kg^{-1}, reflecting broad variation in As sensitivity between species. However, physiological performance distinguished true tolerance, where Lagenaria maintained superior membrane integrity with minimal electrolyte leakage (2.2%) and stable photosynthetic performance (ΦPSII + 1.76%, ETR + 14.22%), whereas *Moschata* and *Maxima* showed marked declines. ICP–MS profiling revealed the highest As accumulation in Maxima roots (1789 µg/g DW), followed by Lagenaria (1253.46 µg/g DW) and Pepo (926.13 µg/g DW), while Cucumber exhibited the greatest shoot (11.28 µg/g DW) and fruit (2.19 µg/g DW) accumulation, indicating inefficient translocation control. OG-based PCA separated species according to molecular strategy: those with enhanced peroxidase activity, thiol-peptide transport, and ROS detoxification maintained physiological stability, whereas others relied mainly on stress signaling and proteostasis. Candidate gene analysis further highlighted RING E3 ligases (*Lsi11G008250*), aquaporins (*Cp4.1LG00g00200*), and TFs (WRKY, bZIP, MYB) as key detox regulators in tolerant species, contrasting with stress-inducible genes (*MAPKKK18*, *HIPP7*, *HSP70*) in susceptible species. This integrative framework delineates physiological and molecular coupling in As tolerance and identifies genetic targets for breeding As-resilient cucurbits and minimizing As accumulation.

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The Benefits of Hydroponics. S. Sarkar*, M. Towner, M., Ramirez; A. Colvard, and B. Biswas, Fort Valley State University, Fort Valley, GA 31030.

This research was conducted to determine the benefits of hydroponics compared to traditional soil-based growing methods, with the aim of helping to combat food deserts and address global food security challenges. With the world population projected to reach 9.8 billion by 2050 and the US seeing over 20,500 malnutrition-related deaths in 2022, innovative growing solutions are critical. In this experiment, two sets of plants were established: one in controlled hydroponic systems inside a greenhouse and a comparative set planted outdoors using plastic culture. On day one, all plants were measured and documented. Micronutrients were administered to both groups, with the hydroponic system plants receiving nutrients automatically and the outdoor plants receiving them by hand. To manage pests, the outdoor plants were treated weekly with a homemade, all-natural neem pesticide (a solution of boiled neem leaves, water, and detergent). Data, including photographic evidence taken every other week for seven weeks, revealed a significant difference in growth. By the end of week three, the hydroponically grown plants were already twice the size of the conventionally grown plants. Upon harvest, the plants from the hydroponic systems were fully mature and healthy, while the traditional-method plants were considerably smaller. This research successfully demonstrates the superior growth rate and yield of hydroponics, proving its potential as a viable, efficient method to help eradicate food deserts and save thousands of lives annually.

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Sampling of Pollinator Bees in the Mississippi Delta. E. Clark*, Department of Agriculture, Alcorn State University, Lorman, MS 39096; M. Pullman, Department of Agriculture, Alcorn State University, Lorman, MS 39096; A. Mack, Department of Agriculture, Alcorn State University, Lorman, MS 39096; B. Stewart, Department of Agriculture, Alcorn State University, Lorman MS 39096; A. Solorzano, Department of Agriculture, Alcorn State University, Lorman, MS 39096; T. Clifton, Department of Agriculture, Alcorn State University, Lorman, MS 39096; T. Rashid, Department of Agriculture, Alcorn State University, Lorman, MS 39096; and D. Collins, Department of Agriculture, Alcorn State University, Lorman, MS 39096.

An estimated production of over 150 food crops in the United States depends on animal pollinators. Pollination from a diverse set of pollinators can lead to higher-quality yields. More pollinator visits to a flower can result in larger, more flavorful, and more uniformly shaped fruits. This study investigates wild bee communities on different crops to establish a baseline dataset for comparison with other small farms. Wild bees were collected by using sweep net, and bee bowl traps at two different locations including ASU Extension/Research Farm & Technology Transfer Center in Mound Bayou, MS and ASU Experiment Station at ASU, Lorman, MS. Preliminary data from these collections suggest that approximately 25 species of wild bees were captured in sweep net samples and bowl traps. The dominant bees consisted of two-spotted longhorn Bee (*Melissodes bimaculate*),Tepanec long-horned bee (*M. tepaneca*), common long-horned bee (*M. communis*) and bicolored striped sweat bee (*Agapostemon virescens*). Collecting bee data over multiple years can be a critical tool for augmenting declining species through both direct and indirect conservation strategies.

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Sensitivity of *Phytophthora Capsici* From Mississippi to Dimethomorph, Ethaboxam, Mandipropamid And Oxathiapiprolin Fungicides. A.O. Popoola*, E. Ali. Department of Agriculture, Alcorn State University, Lorman, MS 39096 and Md. Aktaruzzaman, Department of Plant Pathology, University of Georgia, GA, 30602.

Phytophthora capsici is a devastating oomycete plant pathogen that causes diseases in a wide range of crops around the world and the selective use of fungicides remains an important component of disease management regimens. In this study, the sensitivity of 36 *P. capsici* isolates collected from vegetable crops in Mississippi to dimethomorph, mandipropamid, ethaboxam, and oxathiapiprolin were assessed based on different asexual life stages such as mycelial growth, sporangium formation, zoospore germination. The average EC_{50} values of dimethomorph (0.39, 0.44, and 0.15 µg/ml), mandipropamid (0.028, 0.050 and 6.74 µg/ml), ethaboxam (0.43, 0.92, and 1.68 µg/ml), and oxathiapiprolin (0.0014, 0.0005, and 0.78 µg/ml) in inhibiting mycelial growth, sporangium production and zoospore germination were determined respectively. We found only three & six isolates were moderately sensitive to dimethomorph based on inhibiting mycelial growth, and sporangium production respectively. But all isolates were sensitive to mandipropamid, ethaboxam, and oxathiapiprolin based on mycelial growth, sporangium formation, zoospore

germination. The findings showed that populations of *P. capsici* in Mississippi have not evolved a resistance to the aforementioned fungicides. Alternatively, the efficacy of essential oil as a biocontrol approach in management of P. capsici was tested. The preliminary results shows that oregano, thyme, palmarosa, and black seed essential oil showed a varying degree of inhibition against *P. capsici isolates*. Work supported by USDA_NIFA #20243882142125.

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Optimization of Hydroponic Systems for Leaf Vegetable Production for Small-scale Growers. Y. Yun*, Department of Agriculture, S. Waliullah, Department of Biology, Alcorn State University, Lorman, MS 39096; Q. Zhang, Truck Crops Branch Experiment Station, Mississippi State University, Crystal Springs, MS 39059; and E. Ali, Department of Agriculture, Alcorn State University, Lorman, MS 39096.

Hydroponics, a soilless plant cultivation method utilizing nutrient-rich water, offers a sustainable alternative to traditional farming by allowing precise nutrient and water management to enhance crop growth and quality. As demand for fresh vegetables rises and arable land decreases, vertical hydroponic systems are emerging as efficient solutions for urban agriculture. This study evaluated two systems for leafy vegetable production: the Nutrient Film Technique (NFT) and a Tower (Aeroponic) system. Both methods were tested under controlled environmental conditions without growth stimulants to compare yield, water-use efficiency, and seasonal adaptability. The investigation also examined the effects of different nutrient flow rates on plant growth. Preliminary results showed that the Aeroponic (Tower) system demonstrated significantly higher productivity, achieving yields three times greater per cultivation area than the NFT system. This advantage was attributed to enhanced spatial utilization and the precise delivery of nutrients through mist. Furthermore, the Aeroponic system produced greater fresh and dry mass in both shoots and roots across the different flow rates tested. In contrast, the NFT system resulted in more uniform plants and consistent root development. The results indicated that the interaction between flow rate and plant age was an important factor, as root lengths varied between systems at different flow rates.

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Integration of a Cost-Effective Homemade Spore Trap with Molecular DiagnosticsfFor Cucurbit Downy Mildew. M.T. Anwar*, Department of Agriculture, S. Waliullah, Department of Biology and E. Ali, Department of Agriculture, Alcorn State University, Lorman, MS 39096.

Cucurbit downy mildew, caused by *Pseudoperonospora cubensis*, is a devastating disease affecting cucurbit crops worldwide, leading to significant yield losses. Early detection and effective disease management strategies are crucial for mitigating its impact. This pathogen, classified as a biotrophic oomycete, disperses through wind currents during warm, humid summers, making its timely detection essential. Over the past two decades, shifts in pathogen populations and reduced fungicide efficacy have highlighted the importance of molecular characterization and epidemiological studies. In this study, we evaluate the efficacy of a cost-effective homemade spore trap for monitoring airborne *P. cubensis* spores and its integration with molecular detection techniques such as polymerase chain reaction (PCR). Airborne sporangia were collected from two southwestern counties in Mississippi and amplified using *P. cubensis*-specific molecular markers. Our preliminary results indicate that the homemade spore trap functions as a cost-effective tool for monitoring, successfully capturing spores in high-risk periods. Furthermore, molecular diagnostic techniques confirmed the pathogen's presence with high specificity and sensitivity. To build upon these findings and facilitate rapid on-site diagnostics, we have also developed primers for Loop-mediated isothermal amplification (LAMP), which are now ready for field implementation. Our study contributes to the development of an accessible bio-surveillance system for *P. cubensis*, aiding in the timely application of fungicides and improving management strategies for airborne phytopathogens in vegetable crops.

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Comparative Evaluation of Moths and Beetles on Stored Peanut Deterioration and Aflatoxin Contamination in Georgia, USA. R.A. Addai*, J.K. Danso, G.N. Mbata, Entomology Research Laboratory, Agricultural Research Station, Fort Valley State University, Fort Valley, GA, 31030; and R.L. Holton, Premium Peanut, Douglas, GA, 31535.

Georgia produces nearly 50% of the annual peanut (*Arachis hypogaea* L.) yield in the United States, yet comprehensive data on postharvest losses caused by insects and molds under local storage conditions remain scarce. Stored peanuts are highly vulnerable to insect infestation and fungal contamination, both of which compromise quality and food safety, making such information essential for developing reliable insect–aflatoxin risk assessment models that can guide management decisions. Moths and beetles, such as *Tribolium castaneum* (Herbst), *Cryptolestes ferrugineus* (Stephens), *Oryzaephilus surinamensis* (L.), *Plodia interpunctella* (Hübner), *Cadra cautella* (Walker), and *Ephestia elutella* (Hübner), are economically important insect pests of stored peanuts, and this study aims to comparatively assess the risks they pose with emphasis on their population dynamics, damage potential, and associated aflatoxin contamination during storage. Storage facilities (silos) filled with in-shelled peanuts and infested with moths or beetles will be monitored for insect population growth and peanut quality loss parameters (percentage insect-damaged kernels, discolored kernels, loose-shelled kernels, and kernel weight loss), over extended storage durations, while parallel evaluations will determine aflatoxin accumulation and the incidence of aflatoxigenic fungi across insect-infested and control samples. This research will provide a comprehensive understanding of how these major stored-product insect pests contribute to peanut deterioration and, critically, their roles in disseminating and promoting aflatoxin contamination in stored peanuts. Furthermore, these findings would be essential for developing more targeted and effective pest management strategies to ensure the safety, quality, and sustainable storage of peanuts.

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In Vitro* Plant Regeneration and Genetic Transformation in Hemp Using *Agrobacterium tumefaciens. L. Morton*, and S. K. Dhir, College of Agriculture, Center for Biotechnology, Fort Valley State University, Fort Valley, GA 31030.

Hemp (*Cannabis sativa* L.) is an annual crop cultivated for its fiber, oil, and seeds. This study outlines an efficient *in vitro* propagation and genetic transformation protocol from three-week-old *in vitro*-grown Hemp seedlings. Isolated shoot tips were cultured on MS medium alone/in combination with cytokinins (BA, KN, MT, TDZ, ZT, and 2-iP). The highest number of auxiliary buds was achieved on MS medium supplemented with MS+MT (0.5 mg/L; 28-35 shoots) compared to MS+BA (0.5 mg/L;10-12 shoots). The DKW medium proved superior in producing the highest number of shoots with fully developed true leaves. Root induction was observed on half-strength MS medium containing GA3 (0.25 mg/L) and IAA (1.0 mg/L). Transformation was also studied using three screening markers (*RUBY*, GFP, and GUS) in various explants. Successful transient and stable gene expression of all three marker genes was observed in all tissue types: leaves, cotyledons, hypocotyls, roots, nodal parts, and 2 to 3-week-old callus cultures. The best transformation efficiency was achieved with three-week-old seedlings cultured on LB medium supplemented with 100 µM acetosyringone, a bacterial density of 0.4 OD at 600 nm, and a 30-minute incubation. Transformed tissues showed red pigments, green fluorescence, and blue spots to easily distinguish from non-transgenic tissues and were confirmed by PCR of a 349 bp gene fragment. The improved parameters from this study can improve both transient and stable expression of genes, enable the implementation of CRISPR/Cas9 genome editing for Hemp breeding, and promote the development of varieties with enhanced properties with industrial and pharmacological utility.

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Investigating Rhizobiome Dynamics in Intercropping Systems of Sorghum with Peanut. S. Ghimire*, S. Punnuri, Agricultural Research Station, Fort Valley State University, Fort Valley, GA 31030.

Soil acts as a habitat for numerous microbial taxa and plays an important role in ecosystem functioning. The rhizosphere constitutes the core microbiome affecting plant growth, development, and immunity. Plant health and productivity are closely linked to the diversity and abundance of rhizosphere microorganisms. However, the microbial composition in the rhizosphere is highly variable due to factors such as environmental conditions, soil type, host plant growth stage, and species. This study investigates intercropping as a potential method to modulate the rhizobiome dynamics within the sorghum and peanut intercropping system—a combination of cereal and legume crops. The experiment, conducted in a greenhouse in a randomized complete block design involved three treatments: sorghum (*Sorghum bicolor* L. Moench) monocrop, peanut (*Arachis hypogea* L.) monocrop, and intercrop of sorghum and peanut. Soil samples were collected at the flowering stage of both crops, and extracted DNA was sequenced using Illumina Miseq at the University of Minnesota Genomics Center. Analysis of the 16S rRNA amplicon sequencing data revealed distinct microbial families in the intercropping system compared to monocropping of the same crop. Notably, Bradyrhizobiaceae and Streptomycetaceae were identified as the most abundant families across all

treatments, indicating a significant impact of intercropping on rhizobiome dynamics. These findings suggest that intercropping is a sustainable strategy for shaping the rhizobiome while enhancing soil fertility and crop productivity. Future research should prioritize genotype selection guided by beneficial microbial associations to further advance sustainable agriculture.

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Characterizing the Genetic Architecture of Panicle Morphology in Sorghum, *Sorghum bicolor* Through Genome Wide Association Studies. J. Adhikari* and S. Punnuri, Agricultural Research Station, Fort Valley State University, Fort Valley, 31030

Panicle morphology is a key trait in sorghum (*Sorghum bicolor*) that directly influences grain yield, plant architecture, and adaptability across diverse agroecological zones. Characterized by extensive branching and variation in panicle length, width, and compactness, sorghum panicles play a huge role in seed distribution, yield, and reproductive efficiency. In this study, we evaluated a diverse panel of 347 SAP (Sorghum Association Panel) and around 345 BAP (Biofuel Association Panel) sorghum accessions in replicated field trials conducted over multiple years (2019, 2023 and 2025) at two locations (Tifton, GA and Fort Valley, GA). Phenotypic data for panicle length, peduncle length, and panicle compactness were collected manually. The correlation results showed a moderate negative relationship between these traits: panicle length and compactness ($r = –0.37$), panicle length and peduncle length ($r = –0.20$), and compactness and peduncle length ($r = –0.15$), indicating potential trade-offs in trait selection. The GBS and WGS genotype was used in Genome-wide association studies (GWAS) analysis. The GWAS analysis identified key genetic loci linked to panicle traits, revealing complex interactions between structural genes and regulatory pathways, including candidate genes homologous to inflorescence regulators in rice and maize. Beyond applications for marker-assisted breeding, these findings provide insights into how selection on panicle traits can balance yield potential, disease resistance, and environmental adaptation. The ecological and evolutionary implications highlight how panicle architecture contributes to sorghum's diversification, domestication, and resilience across various agroecological zones, ultimately informing the development of next-generation cultivars for sustainable agriculture.

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Compatibility of Parasitoid and Entomopathogens for the Management of Sweet Potato Whitefly (*Bemisia tabaci*). A. Shrestha*, S. Warsi, and G. N. Mbata, Fort Valley State University, Fort Valley, GA, 31030; D. I. Shapiro-Ilan, USDA/ARS, Byron, GA, 31008.

The sweetpotato whitefly, *Bemisia tabaci* Gennadius (Hemiptera: Aleyrodidae), is a major pest in the southeastern United States, causing significant economic losses on field crops through direct feeding and transmission of plant viruses. Effective management of this pest is important for improved crop yield, but the commonly used method, which is application of chemical insecticides, has often led to increased pests' resistance and environmental contamination. Such outcomes create economic and agronomic pressures that highlight the urgent need for integrated, sustainable, and resistance-mitigating pest management strategies. The proposed study aims to evaluate the compatibility of the parasitoid, *Eretmocerus eremicus* Rose and Zolnerowich (Hymenoptera: Aphelinidae) with entomopathogenic fungi (*Beauveria bassiana* GHA strain and *Cordyceps javanica* wfGA17 strain) and entomopathogenic nematodes (*Heterorhabditis bacteriophora* HOM1 and *Steinernema carpocapsae* All), against *B. tabaci*. Each has proven effective to some extent individually, but little is known about their interactions when applied together. Treatments will include single-agent and combined applications. *Bemisia tabaci* nymph parasitism rates and emerged adult parasitoids will be recorded over time. We hypothesized that these biocontrol agents do not exhibit negative interactions when targeting shared *B. tabaci* hosts. This study will explore efficacy of combination of biocontrol agents to reduce the reliance on chemical pesticide for sustainable *B. tabaci* management and ultimately contribute towards improved crop productivity and reduced environmental contamination.

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Differential Effects of Polyvinyl Chloride Microplastics and Lead on Hydroponically Grown Lettuce: Dose-Dependent Responses and Risk Implications. J. D. Mimbs*, and B. Biswas, College of Agriculture Family Sciences and Technology, Fort Valley State University, Fort Valley, GA 31030.

This study investigated the emerging risk of plastic and heavy-metal co-contamination on soilless crop production, specifically evaluating the 30-day hydroponic growth of lettuce (*Lactuca sativa* L.) exposed to polyvinyl chloride (PVC) microplastics or lead (Pb). Plants were exposed to three nominal concentrations (5, 10, and 15 mg L^{-1}) or an uncontaminated control. Shoot fresh weight was recorded on days 10, 20, and 30. The PVC exposure showed a transient hormetic response. The 10 mg L^{-1} dose initially increased biomass by 34% at day 10 (15.8 g $plant^{-1}$ vs. 11.8 g control) but returned to control levels by day 30 (38.5 g vs. 44.0 g). The highest PVC dose (15 mg L^{-1}) sustained control-level growth (43.3 g) throughout the trial. In contrast, Pb effects were strongly dose-dependent. Moderate Pb (10 mg L^{-1}) had minimal effect on final biomass (42.7 g). However, the lowest dose (5 mg L^{-1}) surprisingly reduced yield by 29%, and the highest dose (15 mg L^{-1}) severely suppressed growth by 68% (14.0 g). Two-way ANOVA confirmed significant effects of contaminant type, dose, and their interaction on biomass at all time points ($p<0.001$). These results indicate a narrow "beneficial" window for PVC microplastics but a sharp toxicity threshold for Pb above 10 mg L^{-1}, suggesting a need for more stringent management of heavy-metal inputs than plastic particulates in controlled-environment agriculture. This data provides benchmarks for modeling yield loss and informs risk assessments for hydroponically produced leafy greens.

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A Comparative Analysis of Liquid Algae Fertilizers to Commercial and Organic Fertilizers. V. Wright*, M. Guo, O. Adewumi, G. Ozbay, One Health Lab, College of Agriculture, Science & Technology, Delaware State University, Dover, DE 19901.

This study explores the advantages and disadvantages of chemical and organic fertilizers in comparison to liquid algae fertilizers to determine sustainable alternatives in agriculture. Chemical fertilizers have historically enhanced crop yields, but prolonged use can cause soil degradation, nutrient leaching, and water contamination. Organic fertilizers improve soil structure and microbial diversity but may introduce ecological risks, such as inconsistent nutrient release and potential contamination. Liquid algae fertilizers derived from *Chlorella vulgaris* present a promising alternative due to their rich nutrient composition, bioactive compounds, and ability to enhance soil structure and plant growth while minimizing environmental harm. This study will evaluate soil pH, electrical conductivity, soil moisture content, and cation exchange capacity using standard methodologies, including pH meter protocol, EC meter protocol, gravimetric moisture method, and molybdate blue method. By synthesizing prior research and employing these established techniques, the study aims to assess the overall effectiveness of liquid algae fertilizers and their potential as a sustainable replacement for conventional fertilizers. The goal is to promote environmentally responsible agricultural practices that maintain productivity, improve soil health, and support long-term ecosystem stability.

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A Novel UV-Shielding Strategy: Enhancing the Efficacy of Entomopathogenic Nematodes for Sustainable Small Hive Beetle (*Aethina tumida*) Management. B. Paudel*, S. Warsi, and G. N. Mbata, Fort Valley State University, Fort Valley, GA, 31030; D. I. Shapiro-Ilan, USDA/ARS, Byron, GA, 31008.

The small hive beetle (SHB), *Aethina tumida* Murray (Coleoptera: Nitidulidae) is a major pest of beehives in the United States. While chemical insecticides are typically used to control SHB, there are concerns about beetles becoming resistant to the pesticides, while at same time the pesticides contaminate the environment. Entomopathogenic nematodes (EPNs) may be a more sustainable alternative, but their effectiveness is limited by their vulnerability to ultraviolet (UV) radiation and desiccation. The current study examined the effects of UV radiation on the efficacy of the infective juvenile (IJs) of two EPN species: *Steinernema carpocapsae* All and *Heterorhabditis floridensis* K22 against SHB larvae when protected with six UV- filtering materials: 2% barricade, 5 cm organic mulch, 0.15 mm fabric, 5% white kaolin clay, 50% liquid starch, and 1% watergel. Soil treated solely with entomopathogenic nematodes was designated as the positive control, while fresh soil at 14% moisture was the negative control. This experiment was replicated three times in field conditions, with SHB larval mortality quantified at 7- and 14- days post inoculation (dpi). Results showed that EPNs applied without protective materials resulted in lower SHB mortality than protected formulations. The highest SHB mortality was obtained when *S. carpocapsae* was protected with starch- or gel-based carriers. These combinations resulted in ~66% SHB larval mortality at 14 dpi. These results indicate that the efficacy of *S. carpocapsae* can be enhanced by protecting the IJs from direct UV rays, particularly water gel or starch However, further evaluations are in progress to validate these findings across broader field conditions.

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Nutrient-use Efficiency in Selected Elite Sorghum Cultivars with BNI Traits. M. M. Imoro*, P. A.Y. Ampim and M. A. Salisu, CAFNR Research, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446.

Sorghum (*Sorghum bicolor*) is a resilient cereal crop with agricultural and economic value, especially in resource-poor environments. However, nutrient losses, especially nitrogen through denitrification, leaching and as gas, often deprive the crop of the nutrients needed. Nitrogen loss contributes to the deterioration of aquatic systems by causing eutrophication and problems associated with it. The overall goal of this research will be to examine if Biological Nitrification Inhibition (BNI) traits in elite sorghum cultivars can improve nutrient use efficiency (NUE). The specific objectives are to (1) evaluate the growth and biomass production and NUE of elite sorghum cultivars under varying nitrogen fertilizer rates; and (2) examine the influence of different fertilizer types on the biomass production and NUE of a selected sorghum cultivar. The study will be conducted in a greenhouse using field soil and will involve real-time measurement of nitrogen loss in gaseous forms. The working hypothesis is that sorghum cultivars with high BNI will significantly minimize nitrogen loss, boost soil nitrogen retention and improve plant uptake. Results of the study could suggest suitable cultivars that can efficiently enhance yield at the field scale while reducing the environmental footprint of production. The findings of this research could provide an alternative to the use of costly synthetic nitrification inhibitors. Incorporation high BNI sorghum cultivars in cropping systems could improve resilience and the sustainability of sorghum cultivation especially for resource poor small holder farmers.

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Pangenome-wide Identification and Characterization of Circadian Rhythm, Flowering, and Maturity Genes in Industrial Hemp (*Cannabis sativa* L.). S. Padyana*, C. B. Carson, S.H. Mahdi, and B. Valliyodan, College of Agriculture, Environmental and Human Sciences, Lincoln University of Missouri, Jefferson City, MO 65101.

Industrial Hemp (*Cannabis sativa* L.) is an emerging multipurpose crop valued for its fiber, seed, and bioactive compounds. Its successful cultivation across diverse environments depends strongly on flowering time and maturity traits tightly regulated by the circadian and photoperiodic networks. Understanding the genetic variation underlying these traits is critical for optimizing regional adaptation and yield potential. *C. sativa* shows wide variations in flowering time, maturity, and photoperiod response. This study aims to identify circadian rhythm, flowering, and maturity-related genes across *C. sativa* pangenome and to assess how structural and sequence variation of the associated genes contribute to these key developmental processes. Only limited studies are there to uncover the genetic basis of these traits. We utilized the available genome and pangenome information of *C. sativa* including the recently published hemp pangenome. Preliminary results show significant variations in selected genomic regions associated with the above traits. These genes are validated through qRT-PCR for gene expression. Also, selected candidate genes will be functionally characterized using the Arabidopsis model system.

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Yield and Nutrient Contents of Greenhouse Grown Lettuce Mix Microgreens and Baby Greens. A. A. B. Kotochi*, P. A.Y. Ampim, S. Woldesenbet and K. Addo, College of Agriculture, Food and Natural Resources Research, Prairie View A&M University, Prairie View, TX 77446.

Microgreens and baby greens are increasingly gaining popularity because of their high nutritional content, health benefits, short cultivation cycles and potential year-round cultivation in controlled environment settings. This study evaluated yield and mineral levels in Allstar Gourmet lettuce mix (*Lactuca sativa*) grown as microgreens (21 days) and baby greens (48 days) under standard greenhouse conditions. The study was designed as a completely randomized design with three replications per greens type. Each replication comprised six 10.2 cm^2 pots filled with Pro-mix Bx Mycorrhizae. The microgreens were planted at 1g/pot while the baby greens were planted at 0.5g/pot. The pots were placed in 1020 heavy duty trays and sub irrigated. Both the microgreens and the baby greens received a one-time application of 7 L of 2857 mg/L nitrogen solution made from Jack's Professional 20-20-20 fertilizer 10 days after planting. The yield and nutrient data collected were subjected to a pooled t-test using the JMP software and conclusions drawn at $\alpha = 0.05$. Besides Mn and Na, the baby greens had significantly higher levels of Ca, Cu, Fe, K, Mg, P and

Zn compared to the microgreens. B levels were statistically the same, but yield was also higher for the baby greens. These findings indicate that lettuce mix baby greens were generally more nutrient-packed than microgreens. This is contrary to the general notion that microgreens are often more nutrient-dense than older plants. These findings also highlight the need for more research on both microgreens and baby greens covering more vegetables and their blends.

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Effect of Location and Crop Type on Spotted Wing Drosophila (*Drosophila suzukii*) Populations in Missouri Fruit Farms. B. Pandey*, S. Turner, Y. Cheng and W. Kaluwasha, College of Agriculture, Environmental and Human Sciences, Lincoln University of Missouri, Jefferson City, MO 65101; J. Zhou and T. Yao, Division of Plant Science and Technology, University of Missouri, Columbia, MO 65201; M. Pszczolkowski, Missouri State University and State Fruit Experiment Station, Mountain Grove, MO 65711; C. A. Mensah, Alabama A & M University, Huntsville, AL 35811.

Spotted Wing Drosophila (*Drosophila suzukii*), an invasive fruit pest, poses significant challenges to small fruit production in Missouri due to its ability to infest ripening fruit and cause rapid yield losses. Effective monitoring is critical for integrated pest management, yet conventional methods remain labor-intensive and inefficient. This study aims to investigate the spatial and temporal dynamics of SWD populations across multiple fruit farms and crop types in Missouri. Monitoring for spotted wing drosophila (SWD) was performed using Trece bucket traps from May 2024 to October 2025 at elderberry, blackberry, strawberry, blueberry, and grape farms across central and southern Missouri locations. The numbers of SWD males and females were determined biweekly during the first year and weekly during the second year. The results showed variations in population numbers and peaks depending on the location and crop type, with elderberry farms being associated with greater numbers of SWD. Highest populations were observed between August to September in both years. These findings provide insights into the timing and intensity of SWD infestation in different fruit production systems and locations. Findings from this research will improve monitoring efficiency, support more precise pest forecasting, and guide growers in optimizing SWD management with reduced chemical inputs.

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Efficacy of Sanitizers in Preventing Mechanical Transmission of *Botryosphaeria dothidea* in Redbud. P. Subedi*, T. Simmons, and F. Baysal-Gurel, Department of Agricultural Sciences and Engineering, Tennessee State University, Otis L. Floyd Nursery Research Center, McMinnville, TN 37110.

Eastern redbuds (*Cercis canadensis*) are among the most popular deciduous flowering trees in the U.S. Canker disease caused by *Botryosphaeria dothidea* poses a significant economic threat to redbud production. *B. dothidea* can be transmitted between plants through contaminated pruning or cutting tools. However, effective management strategies to prevent its spread are still lacking. This study evaluated the efficacy of different classes of sanitizers in preventing the transfer of *B. dothidea* between plants via cutting tools. Both *in vitro* and greenhouse trials were conducted to assess 14 treatments (12 experimental products and two control treatments). The *in vitro* study was conducted to identify the products that completely or near-completely inhibited conidial germination of *B. dothidea*. In the greenhouse, Felco 19 shears equipped with a mounted sprayer were used to test single and multiple-cut transmission, followed by assessment of lesion length and pathogen recovery. Under *in vitro* conditions, didecyl dimethyl ammonium chloride (DDAC) + alkyl dimethyl benzyl ammonium chloride (DBAC), sodium hypochlorite, and hydrogen peroxide + peroxyacetic acid completely inhibited conidial germination. In the greenhouse, DDAC + DBAC, DBAC + didecyl ethyl benzyl ammonium chloride (DEBAC), and hydrogen peroxide + peroxyacetic acid effectively reduced pathogen transmission during pruning, resulting in significantly shorter canker lesion lengths and lower pathogen recovery. These findings suggest that sanitizers can effectively prevent the mechanical transmission of *B. dothidea*, providing nursery producers with practical management options to reduce canker disease spread in redbud production.

Student Poster Presentation – Undergraduate Competition

Bioenergy, Natural Resources and Environment

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Plant-Rhizome-Soil Microbial-Organic Matter and MnOx Interactions in East Central Texas. T.L. Pickens*, R.W. Griffin, CAFNR Research, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446.

Plants and soils interact in the rhizome, the area surrounding the roots. Soil water, organic matter, microbes, and minerals participate in biogeochemical processes that promote plant respiration and soil development. The sandy surface soils of East Central Texas tend to maintain low organic matter levels, range from 0.1 to 0.8 percent, since microbes are active during the entire year based on temperate weather conditions. In the wetland buffer and wetland areas, the organic matter levels are enhanced by the slow decomposition associated with anaerobic redox chemistry reactions. The objectives of the project include: 1) measuring plant-rhizome-mineral concentrations in the upper 12 inches of the soils in the upland-wetland buffer-wetland zones at 4 sites; 2) measuring soil manganese oxide (MnO_X) reactivity levels in the plant-rhizome-soil ecosystems; 3) comparing the plant-rhizome-soil MnOx levels using descriptive and inferential statistics to determine spatial variability; and 4) determining microbial communities characteristics within and across the plant-rhizome-soil ecosystems. The MnO_X reactivity level was determined by reaction with 3% hydrogen peroxide (H_2O_2). Microbial communities were characterized using 16S RNA sequencing for a range of microbial types. The soil samples were collected in the field at 4 locations with 6 depths and 3 replicates, from plant-rhizome-soil ecosystems. Preliminary results indicate that the fluctuating environmental conditions, between wet and dry seasons, drive the microbial/mineral redox chemistry processes that produced elevated numbers of concentrated zones of single or combined Fe and Mn oxides in the riparian buffer and wetland zones.

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Trapping of Formosan Subterranean Termite, *Coptotermes formosanus* (Blattodea: Rhinotermitidae) an Effort by The North Florida North American Termite Survey (NATS) R. Germany*, A. Sharma, Entomology, College of Agriculture and Food Sciences, Florida Agricultural and Mechanical University, Tallahassee, FL, 32307; J. Welch, Florida Department of Agriculture and Consumer Services, Pensacola, FL 32524; S. Portugal, Department of Biochemistry, Molecular Biology, Entomology & Plant Pathology, Mississippi State University, Starkville, MS, USA; A. Ashbrook, Department of Entomology, Louisiana State University, Baton Rouge, LA, USA

The North American Termite Survey (NATS), established in 2024 and supported by the USDA Southern IPM Center, is a collaborative network of urban and structural entomologists, researchers, and pest management professionals across 12 U.S. states. The group aims to promote preventative termite management by developing educational resources and updating the distribution map of the invasive Formosan subterranean termite (*Coptotermes formosanus*). To improve understanding of the current distribution of this destructive species, we conducted alate trapping in North Florida during March–July 2025. Traps were deployed and maintained by collaborators, including extension agents and Master Gardeners, and were replaced every two weeks. Collected samples were identified to confirm species presence and distribution. Trapping alates serves as an essential monitoring tool within Integrated Pest Management (IPM), providing data on termite activity, population trends, and early detection before structural damage occurs. By integrating trapping data with submissions from pest management professionals and public participants, NATS contributes to mapping the spread of *C. formosanus* and other termite species. This poster highlights the progress of NATS efforts to date, the outcomes of the 2025 North Florida trapping survey, and available digital resources to support termite identification, education, and sustainable management practices.

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Integrating the Plasma Exposome and T-Cell Phenome: An FT-ICR and Spectral Flow Cytometry Approach to Environmental Immunotoxicity. A. Griffis and B. Quinn. School of Arts and Sciences, Langston University, Langston, OK 73050

Human health is a product of the complex interplay between the environmental exposome and the immune phenome. This project aims to integrate these two data-rich worlds. We will leverage two high-resolution platforms to investigate the impact of agricultural contaminants. First, the plasma "exposome" will be characterized using untargeted FT-ICR mass spectrometry to build a library of environmental chemical features, including mycotoxins. Second, the "immunophenome" will be profiled using 20-color spectral flow cytometry on matched PBMCs from the buffy coat, providing a deep snapshot of T-cell, B-cell, and monocyte populations. By computationally integrating these massive

datasets, we seek to identify specific plasma metabolomic features (mycotoxins) that are predictive of a dysfunctional immune state, such as a skewed Th1/Th2 balance or impaired T-cell activation potential. This project creates a powerful, data-driven framework for assessing health risks from the food supply chain.

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Spatial Variability of the Silt Cap Soil Area in East Central Texas. G.T. Hester*, R.W. Griffin, CAFNR Research, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446.

The Silt Cap Soil Area (SCA) of East Central Texas is in Harris County, north of Houston. Surface soil textures are mainly very fine sand and loamy fine sand, which feel siltier compared to coarser sandy soils. Soil colors are pale which is associated with higher values and lower chromas of lighter colored sand particles. Delineation of hydric soils is much more difficult due to light-colored soil horizons that can be confused with redox depletions. Incorrect characterization of hydric soil can lead to incorrect determination of wetland statuses which have hydric soils, hydrology, and hydrophytic plants. Hydric soils that are difficult to describe have been designated on the Katy Prairie (west of Houston) and problematic hydric soils exist in the Columbia Bottomlands (west/south of Houston). The objectives of the project include: 1) to determine surface and subsurface soil colors for all soil series in the unofficial SCA, 2) to determine surface and subsurface soil textures for all soil series in the SCA, 3) to compare and contrast soil color and texture data by soil layer depth using descriptive statistics to determine spatial variability; and 4) to determine a much better well-defined boundary for the SCA. Soil Colors ranged from 10YR 4/2 to 10YR 6/3 in surface and subsoil samples. Soil Textures ranged from very fine sand to silt loam in the surface horizons and sandy clay loam to silty clay loam in the subsoils. Soil colors and textures allowed a clear boundary between the SCA and Katy Prairie Soils.

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Stochastic Dominance and Crop Risk Management in Flood-Prone Counties of North Carolina. A. Verrios *,G. Ejimakor, and K. Ribeiro, Department of Agribusiness, Applied Economics, and Agriscience Education, North Carolina Agricultural and Technical State University, Greensboro, NC 27411.

Farmers in flood-prone areas face growing challenges due to unpredictable yields and income caused by increasingly frequent and severe flooding. This study explores how different crop choices impact income stability in North Carolina's most flood-vulnerable counties. By analyzing historical USDA data through 2023, the research focuses on three key specialty crops, *Zea mays* (corn), *Glycine max* (soybeans), and *Ipomoea batatas* (sweet potatoes). These three crops were selected for their distinct relevance within the three counties with the highest flood risks; *G. max* and *Z. mays* are frequently at the center of national agricultural policy debates, while *I. batatas* were included due to North Carolina's status as the top producer in the United States. The financial performance of these crops will be compared through an analysis that will evaluate risk using measures such as yield and price variability, standard deviation, and cumulative distribution functions. It employs stochastic dominance tests to determine which crops consistently offer better returns with lower or more manageable risks. Additionally, the study investigates how diversifying crop productioncan boost average farm income and cushion the financial impact of extreme weather events. The findings provide valuable insights for small-scale and resource-limited farmers operating in high-risk areas. By identifying the specialty crops thatperform well under uncertain conditions, the study contributes to more informed decision-making. It also supports broader goals of enhancing climate resilience, improving agricultural risk management, and promoting sustainable farming practices in North Carolina.

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Immobilized Composite Photocatalyst Development for Cyanotoxin Decomposition under Sunlight. G. Falconer*, Department of Engineering and Technology, Central State University, Wilberforce, OH 45384; N. Zhang, Department of Engineering and Technology, Central State University, Wilberforce, OH 45384; and K.V. Nedunuri, Department of Engineering and Technology, Central State University, Wilberforce, OH 45384

Recently, widely present harmful algae species (i.e., cyanobacteria) along with their metabolite cyanotoxins in surface waterbodies have threatened the public, domestic animals and wildlife species. This research aims to develop immobilized, self-floating photocatalysts with increased visible light absorption and utilization to effectively

decompose toxins (e.g., Microcystin LR, MC-LR) that are released by cyanobacteria during algal blooms. Bismuth (Bi) with its smaller band gap and superior visible-light responsiveness, exhibits greater potential for field applications compared to conventional semiconductors, such as titanium dioxide (TiO_2). Bi based photocatalysts were also reported with distinctive layered structure, remarkable chemical stability, and exceptional photocatalytic activity, finding widespread utility in the degradation of persistent pollutants. In this study, a hydrothermal synthesis method was employed to deposit Bi/Zn compounds onto expended perlite, forming a BismuthZinc/Perlite (BiZn-P) composite photocatalyst. The synthesized material was characterized by Scanning Electron Microscopy with Energy Dispersive X ray spectroscopy (SEM-EDX) and Surface Analyzer to investigate its morphology, chemical compositions, and surface properties to explore the optimal synthesis conditions. SEM images show a uniform tube-like porous structure formed on the perlite surface when temperatures are greater than 160 °C. EDX results also indicate that both Bi and Zn were successfully deposited onto the surface of perlites. Additionally, photocatalytic experiments were conducted to evaluate BiZn-P effectiveness in degrading MC-LR under simulated solar illumination with the initial MC-LR concentration of 20 µg/L. The bench top photocatalytic experiment showed 85% decomposition of MC-LR after 2-hour full spectra light irradiation with 2 g/L BiZn-P loading rate. The synthesized BiZn-P composite photocatalyst is effective for MC-LR decomposition with short-term natural visible light irradiation. This suggests that the BiZn-P composite catalysts may be an effective solution to manage MC-LR pollution in natural surface water.

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Effect of particle surface characteristics on the adsorption of perfluoroalkyl substances (PFAS) in municipal water by granular activated carbons and biochar. D. Davis, International Center for Water Resources Management, Central State University, Wilberforce, OH 45384; N. Zhang, K.V. Nedunuri, International Center for Water Resources Management, Central State University, Wilberforce, OH 45384; S. Kumaran, S. Rangu Agriculture Research and Development Program, Central State University, Wilberforce, OH 45384.

Perfluoroalkyl substances (PFAS) are synthetic chemicals widely used in the industry since the 1940s and detected in soil, water, and air. One common approach to removing PFAS from drinking water is by adsorption using activated carbon (both granular AC and powdered AC). Several studies have reported adsorption characteristics using batch isotherm studies involving single solute systems. In this study, we investigated the adsorption characteristics of a multi-solute system involving five solutes (both short-chain hydrophilic and medium-chain hydrophobic PFAS) in municipally sourced waters. We tested five commercially available granular activated carbons (two granular AC and three powdered AC) for their potential to simultaneously adsorb multiple solutes. The feasibility of using biochar from corn stover, prepared by oven drying at 105°C, hydrothermal carbonization at 220°C and high temperature activation at 800°C to adsorb PFAS was assessed and compared for its PFAS removal efficiency against the commercial ACs. The adsorption efficiency was tested at different loading rates of the adsorbents (g GAC or PAC/L solution), ionic strengths, and pH of water samples using 24-hour and 48-hour equilibrium experiments. The experimental isotherms were fitted using Frieundlich, Langmuir, and Brunauer–Emmett–Teller adsorption models. Residual PFAS in treated water samples were analyzed using the High Peformance Liquid Chromatography Mass Spectrometry (HPLC-MS/MS). Adsorption efficiencies of ACs were analyzed using a Micromeritics 3Flex Multiport Surface Characterization Analyzer. The results showed the varied effects of bed porosity, pore size, and surface areas of ACs and the biochar on PFAS adsorption and its usefulness in designing effective mitigation strategies.

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Quantifying the Impact of Rainfall Dependent Infiltration and Inflow (RDII) on nutrient pollution at a rural-urban interface in southwestern Ohio. A. Adu*, International Center for Water Resources Management, Central State University, Wilberforce, OH 45384; K.V. Nedunuri, International Center for Water Resources Management, Central State University, Wilberforce, OH 45384; S. Kumaran, Agriculture Research and Development Program, Central State University, Wilberforce, OH 45384; R. Mawasha Montgomery County Environmental Services (MCES), Dayton, OH 45432; R. Miller Montgomery County Environmental Services (MCES), Dayton, OH 45432; and T. Petry, Montgomery County Environmental Services (MCES), Dayton, OH 45432

Rainfall-Dependent Infiltration and Inflow (RDII) can significantly affect the efficiency of wastewater collection systems often necessitating expensive rehabilitation efforts to minimize the risk of sanitary sewer overflows (SSOs) into nearby water bodies and prevent non-point source nutrient pollution. Traditional methods such as CCTV footage and smoke testing can be labor-intensive and disruptive. The objectives are to analyze and mitigate nutrient loading

into the Great Miami River watershed and recycle nutrient-rich water for application on urban and rural farmlands. We used 12 ADS Triton+ combo flow and depth ultrasonic sensors along with three tipping bucket RainAlert rain gauges in the Stillwater sub-basin of the Great Miami River Watershed in Ohio. The sensors were strategically positioned near maintenance holes in the main interceptor sewer to collect data every 5 minutes, covering both residential and non-residential areas. By analyzing depth, velocity, and flow data during dry and wet weather, we identified RDII and calculated its volume in relation to rainfall. Scatter graphs indicated that 9 of the 12 pipe sections experienced surcharges. We created maps of the affected maintenance holes and compared them with visual images of the area. Potential causes of RDII included cracks in the pipes and sewer lines located near large streams. We will discuss the volume of SSOs and the potential discharge into nearby water bodies. Furthermore, the county's efforts to mitigate these SSOs through proactive sensor monitoring, upgrading of a lift station, and plans to construct a relief sewer will be discussed. RDII estimation using sensors assists in the early detection of surcharges leading to pipe damage and concomitant nutrient discharges into the Great Miami River, Ohio, impacting its water quality.

973

An Exploratory Study: Comparing Fecal Indicator Bacteria Levels at Three Locations along Muddy Creek. C. Gerald-Hasan*, A. Kanu, and P. L. Spence, Department of Natural Resources and Environmental Design, North Carolina Agricultural and Technical State University, Greensboro, NC 27411.

Muddy Creek, an under-monitored urban stream, flows parallel to the campus of North Carolina Agricultural & Technical State University and passes through communities with 1890 Stakeholder residents in Greensboro, North Carolina. This exploratory study aims to analyze and compare the fecal indicator bacteria levels and physiochemical water quality parameters (dissolved oxygen, pH, temperature, and conductivity) at three sampling sites along Muddy Creek. A Kruskal-Wallis, nonparametric test, was performed to compare the fecal indicator bacteria (fecal coliform and *Escherichia coli*) and water quality parameters at three sites once a week for two months. The Kruskal-Wallis analysis indicated significant differences in the mean ranks for *Escherichia coli* ($p = 0.020$), stream pH ($p= 0.004$), and conductivity ($p= 0.007$) between the three sampling locations. The geometric mean for fecal coliform (C.H. Moore = 733.7 MPN/100mL, Yanceyville = 1008.3 MPN/100mL, Sullivan = 931.2 MPN/100mL) and *Escherichia coli* (C.H. Moore = 1410.2 MPN/100mL, Yanceyville = 919.3 MPN/100mL, Sullivan = 767.1 MPN/100mL) exceeded a geometric mean of 200 MPN/100mL (fecal coliform) and 126 MPN/100mL (*Escherichia coli*) for at least five samples collected over a 30-day period at each site. The geometric mean for fecal indicator bacteria measurements indicated that Muddy Creek did not meet its intended uses at these three sites during the sampling period. These results indicate that additional research is needed to evaluate the water quality condition of Muddy Creek over a longer sampling period to establish a baseline for fecal indicator bacteria.

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A Comparative Water Quality Index Assessment for Muddy Creek and South Buffalo Creek Watersheds in Greensboro, North Carolina. G. Ibrahim-Balogun*, and P. L. Spence, Department of Natural Resources and Environmental Design, North Carolina Agricultural and Technical State University, Greensboro, NC 27411.

Changes in land use threaten the water quality and ecological health of urban watersheds. Water Quality Index (WQI) scores are useful for evaluating stream health. The city of Greensboro Stormwater Management Program publishes WQI scores, ranging from 0 (poor) to 100 (good), that include a combination of nine measures: temperature, dissolved oxygen, fecal coliform, biochemical oxygen demand, total phosphorus, turbidity, total suspended solids, total dissolved solids, and nitrate-nitrogen. One monitoring location within two watersheds, Muddy Creek (MC) at White Street (drains NCA&T campus) and South Buffalo Creek (SBC) at McConnell Road (near NCA&T farm), was selected to compare the WQI scores over a 24-year period. A t-test was performed to compare the differences between decade one (2000-2012) and decade two (2013-2024), whereas seasonal differences, spring (March-May), summer (June-August), fall (September-November) and winter (December-February) were tested with one-way ANOVA with Tukey post-hoc comparison. The t-test results indicated the statistical significant decline in the mean WQI scores within MC watershed between decade one =77.04 and decade two =74.20 and SBC watershed between decade one =77.71 and decade two =73.44. The ANOVA results revealed statistical significance differences between the seasons ($p< 0.001$) with the lowest WQI occurring during the summer in both MC (71.53) and SBC (72.05) and the highest during the winter (MC =77.29) and fall (SBC =76.42). This work emphasizes the importance of utilizing long-term WQI scores to evaluate decadal and seasonal trends in urban streams.

975

Remote Sensing Nitrate Leaching Hotspots in Agricultural Watersheds and Mapping Them Using AI. B. Willis*, Agricultural Research and Development Program, Central State University Wilberforce, OH 45384; E. A. Salas, Agricultural Research and Development Program, Central State University Wilberforce, OH 45384 and S. Kumaran, Agricultural Research and Development Program, Central State University Wilberforce, OH 45384

Nitrate leaching is a major environmental concern that affects water quality and agricultural sustainability in Ohio watersheds. In this study, we developed a framework that assessed the nitrate leaching risk in four HUC12 watersheds without using in-situ nitrate datasets. We processed the last five years (2019 to 2024) of SAR and optical data from Sentinel 1 and 2 images using Google Earth Engine (GEE). We derived multi-temporal predictors such as vegetation, soil, and water indices, radar backscatter ratios, and topographic derivatives from a digital elevation model. These predictors represented the key indicators of nitrate dynamics from vegetation health to surface moisture, soil exposure, and hydrologic flow patterns. We ran a Random Forest regression model by training it using proxy nitrate data derived from modeled SWAT+ data. We evaluated the performance of our model using cross-validation and feature importance ranking. The important outputs of our model were temporal nitrate leaching risk maps and a watershed-level nitrate susceptibility index map. Our results revealed spatial patterns that link vegetation cover dynamics and topographic wetness to the potential losses of nitrate. Our results emphasized the importance of remote sensing indicators for nutrient management. This study demonstrated a framework for nitrate risk assessment that is transferable to any agricultural watersheds, especially when field measurements are unavailable.

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Proximal sensing of soil organic matter fractions for building time and cost effective pedotransfer functions. R. Hightower*, Agricultural Research and Development Program, Central State University Wilberforce, OH 45384; E.A. Salas Agricultural Research and Development Program, Central State University Wilberforce, OH 45384; R. Bennett, Agricultural Research and Development Program, Central State University Wilberforce, OH 45384; N. Saji, Agricultural Research and Development Program, Central State University Wilberforce, OH 45384; and S. Kumaran, Agricultural Research and Development Program, Central State University Wilberforce, OH 45384

Soil organic matter (SOM) formation, transformation, translocation, and sequestration into conceptually defined pools is highly variable across landscape conditions and is heavily influenced by management. Pedotransfer functions (PTF) defining the relationships between the key drivers of SOM dynamics and SOM pools rely on time and cost consuming size and density fractionation methods. For rapid quantification of initial SOM in various pools necessary to model and map current and future SOM storage under varied management and changing weather patterns, it is crucial that the PTFs developed leverage readily or easily available information at spatially explicit scales. In this work, we utilized rapid proximal soil sensing tools including visible, near infrared, are highly variable across landscape conditions and are all techniques to build pedotransfer functions for SOM in various conceptually defined pools. Soil samples were collected from on-farm sites distributed across Ohio. Fractionated SOM pools included mineral associated organic matter and particulate organic matter. Both density and size separation methods were employed in the PTF development process. The results demonstrated the usefulness of various spectral reflectance regions and clay mineralogy in predicting SOM pools. Because the proposed approach is rapid and uses surrogates that reflect secondary information often captured through earth observations, the results highlight the potential for scaling up these PTFs using AI techniques for earth systems modeling.

977

From Grape Waste to Wearable Innovation: Developing Sustainable Biomaterials and Natural Dyes from Vitis Vinifera By-Products. J. Batts* and L. Davis, Department of Human Sciences, College of Agriculture, Tennessee State University, Nashville, TN 37209.

This study examines an innovative approach to sustainable textile development by transforming agricultural waste, specifically *Vitis vinifera* (grape) by-products, into leather-like fabrics and natural dyes. As part of the expanding biomaterials movement, this research demonstrates how organic residues can be repurposed into high-value materials that support circular economy principles. The work is significant due to its potential to reduce environmental waste,

promote resource efficiency, and offer safer alternatives for individuals sensitive to traditional fabrics or chemically derived dyes. Grape waste generated during the winemaking process, including skins, seeds, and stems, was collected and dried as the initial preparation step. After drying, the biomass underwent mechanical processing and was combined with biodegradable polymer binders to create flexible composite sheets. These sheets were further refined through tanning and finishing treatments designed to mimic the performance characteristics of conventional leather. Parallel to this process, grape residues were also used to extract natural dyes, providing a fully integrated approach to material and color production. The resulting biomaterial demonstrated functional properties suitable for use in fashion, accessories, and interior design. Its durability, flexibility, and aesthetic quality highlight its potential as a competitive alternative to animal leather and petroleum-based synthetic textiles. Overall, this research underscores the viability of grape biomass as a renewable raw material for next-generation sustainable textiles. By converting organic waste into functional, eco-friendly products, the study contributes to advancing sustainable manufacturing practices and supports broader efforts to reduce environmental impact within the textile and fashion industries.

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Mapping Algal Blooms in Coastal Waters of the Gulf of America (Formerly Known as Gulf of Mexico) using Remote Sensing. M. Dunford*, R. Kulawardhana, J. Cummings, S. Chatterjee, Department of Natural Resources and Environmental Sciences, Alabama A&M University, Normal, AL, 35762.

Algal blooms are naturally occurring events of large growth of phytoplankton, often resulting from excessive nutrient intake, temperature increase, or other anthropogenic factors. Algal blooms are considered harmful when they negatively affect human health or ecosystems by producing toxins or creating anoxic environments. Improved understanding of the spatial patterns and temporal trends of algal bloom occurrence can help predict future events as well as connect driving factors. In this study we evaluated the applicability of remotely sensed chlorophyll-a concentration data from Moderate Resolution Imaging Spectroradiometer (MODIS) data to map and evaluate algal bloom incidences in the coastal waters of the Gulf of America (formally known as Gulf of Mexico). As the algal blooms largely reported during the summer seasons, we focused our analyses on data acquired during summer months (June-August) of the past 3 years (2023-2025). Our findings will help understand spatial patterns and timing of peak occurrences of algal bloom events.

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Evaluation of Seasonal Dynamics and Concentrations of Poly- and Perfluoroalkyl Substances in Influent and Effluent Water at the Huntsville Spring Branch WWTP. K. Johnson*, J. Whisenhunt, E. Moss, Department of Natural Resources and Environmental Sciences, Alabama A&M University, Normal, AL, 35762.

Poly- and perfluoroalkyl substances (PFAS) are a class of more than 4,700 fully synthetic compounds that have been widely used in industrial applications and consumer products. Their chemical stability and resistance to degradation have made them persistent environmental contaminants of growing concern due to their potential impacts on human health and ecosystems. Previous studies indicated that PFAS, often termed “forever chemicals,” could occur in municipal wastewater systems even in the absence of direct industrial discharges. Likely non-industrial sources included household wastewater, local commercial activities, and residual PFAS in community drinking water. This study investigated seasonal variations and average concentrations of PFAS in influent and effluent water from the Huntsville Spring Branch Wastewater Treatment Plant (WWTP). Samples were analyzed monthly following U.S. Environmental Protection Agency (EPA) Method 537.1 to quantify PFAS levels. The research sought to identify seasonal trends, evaluate treatment process efficiency, and explore opportunities to enhance sustainability and regulatory compliance. Results revealed measurable concentrations of perfluorooctanesulfonic acid (PFOS) and perfluorooctanoic acid (PFOA)—the two most widely studied PFAS—along with several short-chain and polyfluorinated compounds. These findings improved understanding of PFAS dynamics in non-industrial municipal systems and provided essential data to inform local and regional water quality management. The outcomes supported future mitigation strategies and contributed to the development of sustainable wastewater treatment practices designed to protect public health and the environment in Huntsville, Alabama, and similar communities.

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Urban Feature Extraction Using Deep Learning Models and Geo-AI Tools. B. Howard*, R. Kulawardhana, S. Chatterjee, Department of Natural Resources and Environmental Sciences, Alabama A&M University, Normal, AL 35762.

Recent advancements in remote sensing and automated computer techniques along with increasing availability of public data archives have significantly enhanced automated approaches for extraction of earth's geographic features from remote sensing imagery. Deep learning (DL) is a specialized subset of Artificial Intelligence (AI) that uses multi-layered neural networks to detect complex patterns that exist in large data sets. In this study, we applied a geospatial approach to evaluate the applicability of Deep Learning Models to extract linear features from remotely sensed data. Our approach deviated from most studies that employed DL in similar applications, as we incorporated DL models that are embedded in Geo-AI tools within GIS environment. Geo-AI tools in GIS environment (in ArcGIS Pro software) provide set of tools to extract linear features from remotely sensed data using pretrained DL models. The goal of this study was to develop a Geo-AI based approach using deep learning models in Geographic Information Systems (GIS) environment to extract linear features from satellite remote sensing data and products. Moderate resolution satellite remote sensing data from Landsat satellites were used as the primary source of remote sensing data along with already existing GIS datasets on linear features (i.e. roads). Findings of this study will help to understand the applicability of novel AI tools (Geo-AI tools) for feature extraction using freely available remotely sensed data.

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Saltwater Intrusion: Comparing the Ecological Stress on *Pinus taeda* (Loblolly Pine) Across Forest Elevation Gradients on the Delmarva Peninsula. L. Jones*, S. Stotts, Department of Agriculture, Food and Resource Sciences, University of Maryland Eastern Shore, Princess Anne, MD 21853.

Ghost forests are stands of dead trees created by saltwater intrusion, visually marked by their salt marsh grass surroundings, and serving as striking indicators of substantial ecosystem change. *Pinus taeda* (loblolly pine), an economically and ecologically important, moderately salt-tolerant species in the mid-Atlantic region, is a frequent research subject. Basal Area Increment (BAI), the yearly increase in cross-sectional area, was used to quantify tree growth. We hypothesized that saltwater intrusion would negatively affect *P. ta*eda growth, producing a smaller average BAI in low areas exposed to salt (LF) than in high areas of the same coastal forest (HF). Samples were collected via increment coring at breast height (1.4m) from paired HF/LF plots at Milford Neck, DE, Monie Bay, MD, and Brownsville, VA. Basal area chronologies were generated and compared at each site with Student's T-tests. Growth trends in the high and low forests at VA and MD began to significantly diverge in the 1950s and 1960s, indicating a long legacy of saltwater impacts. In DE, growth trends between the HF and LF diverged early but synchronized in recent decades, reflecting a land use history of orchard production. All sites showed statistically significant differences in average BAI between HF and LF (DE p-value = 5.08×10^{-8}, MD p-value = 2.98×10^{-4}, VA p-value = 6.64×10^{-15}). Virginia experienced the most negative effects, followed by Maryland, then Delaware. These results provide a critical, long-term perspective on loblolly pine resilience to the stress of saltwater intrusion.

982

Influence of Environmental Shifts on Soil Microbial Communities in Agricultural Systems. A. Britton*, D.V. Ruiz- Ramos, W. Weaver, J. Cumming, and E.B. May**,** Department of Natural Sciences, University of Maryland Eastern Shore, Princess Anne, MD 21853.

Alterations in environmental conditions pose a critical emerging factor influencing the sustainability and productivity of the future of crop production. Increased drought and intense rain events, combined with the continued use of fertilizers, may intensify nutrient impacts on ecosystems surrounding agricultural lands. Since nitrogen flow within agricultural systems is regulated by microbial communities inhabiting soils, changes in environmental factors are likely to influence these populations. Agricultural drainage systems warrant particular attention, as nutrient inputs in these systems often exceed those found in natural environments such as forests, grasslands, or wetlands. This project is a collaborative effort between private farms and UMES scientists to evaluate microbial community composition and changes in nitrogen cycling and minimize nutrient pollution of the Chesapeake Bay. To examine how shifts in environmental conditions affect community composition and function of soil microbiomes, we constructed a controlled environment drainage system. Using DNA metabarcoding, we will assess changes in the soil microbial community under various temperatures, precipitation, and nitrogen treatments. First, baseline information is needed

about the seasonal and depth changes in the microbial community. We collected soil samples from the three ditch sites over the course of a year before the experimental treatments. For each ditch, six soil cores of 15 cm were collected at distances of 1 meter during Summer and Fall (n=24). The top 5 cm soil layer was homogenized, and DNA was extracted using the Invitrogen Soil Extraction Kit and quantified. DNA was amplified for the bacterial (16S) and fungal (ITS) barcode genes.

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Investigation and Characterization of Two Novel *Gordonia* Bacteriophages from North Alabama. J. Williams*, S. Posey, J. Ray, K. Miles, M. Hayes, D. F. Indihar, Department of Biological Sciences, Alabama A&M University, Normal, AL 35762.

Bacteriophages (phages), viruses that infect and replicate within bacteria, play critical roles in microbial ecology and are increasingly being explored as alternatives or adjuncts to antibiotics through phage therapy in response to the rise of multi-drug-resistant bacteria. Characterizing novel phages is essential for understanding their biology, infection dynamics, and potential therapeutic utility. As part of the Howard Hughes Medical Institute (HHMI) SEA-PHAGES program, two previously uncharacterized bacteriophages were isolated from soil samples collected in Huntsville, Alabama, using *Gordonia rubripertincta* as the host bacterium. Following isolation, plaque morphology was documented to assess lytic activity and infectivity. Transmission electron microscopy revealed capsid and tail structures, allowing classification of structural morphology. Plaque characteristics and genomic analysis were used to infer whether the phages exhibit temperate or lytic replication strategies. The genomes of the novel phages were annotated and compared to those of previously discovered phages, revealing evolutionary insights into genetic diversity, conserved functional domains, and potential mechanisms underlying host specificity and infection strategies. The discovery and characterization of novel *Gordonia*-infecting phages expand the catalog of phages associated with Actinobacteria and enhances our understanding of phage diversity and evolution. Because *Gordonia* species occur in diverse environments and can act as opportunistic pathogens, phages infecting these bacteria may have applications in biotechnology and targeted antimicrobial approaches. This work underscores the importance of systematic phage discovery in advancing both fundamental phage biology and applied phage therapy research.

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Mapping the Urban Forest: A Data-Driven Inventory of Southern University's Campus Trees. B. Campbell*, C. Chappell, Department of Urban Forestry, Environment, and Natural Resources, Southern University and A&M College, Baton Rouge, LA 70813.

Urban forests are essential components of sustainable campus environments, offering a wide range of ecological, social, and economic benefits. This study presents a data-driven inventory of the urban forest at Southern University, utilizing i-Tree tools to assess the structure, distribution, and ecosystem services of campus trees. By systematically mapping and analyzing tree data, the project aims to quantify the environmental contributions of the university's green infrastructure and identify opportunities for enhanced urban forest management. Field data were collected on tree species, diameter at breast height (DBH), canopy spread, and health condition across the campus. These data were processed using i-Tree Eco and i-Tree Canopy to estimate the total tree population's contribution to environmental sustainability. GIS mapping techniques were employed to visualize tree distribution and identify areas with low canopy coverage, informing future planting and management strategies. Preliminary findings reveal that Southern University's urban forest provides substantial environmental services, with notable potential for expansion in underutilized green spaces. This project not only establishes a baseline for long-term urban forestry planning but also supports the university's sustainability goals. By integrating ecological data with spatial analysis, the study demonstrates the value of data-driven decision-making in managing green infrastructure on academic campuses.

985

Quantifying Green Assets: Assessing Tree Canopy and Ecosystem Services at Southern University and A &M College. A. Shaffer, C. Chappell, Department of Urban Forestry, Environment, and Natural Resources, Southern University and A&M College, Baton Rouge, LA 70813.

Urban forests play a critical role in enhancing environmental quality, public health, and climate resilience in city landscapes. This research project presents a comprehensive urban forestry inventory of Southern University's campus using i-Tree, a suite of tools developed by the U.S. Forest Service to quantify ecosystem services provided by trees. The study aims to assess the structure, composition, and ecological value of the campus tree canopy, including carbon sequestration, air pollution removal, stormwater mitigation, and energy savings. Field data were collected across various zones of the campus to identify tree species, measure diameter at breast height (DBH), and evaluate canopy coverage. These data were analyzed using i-Tree Eco and i-Tree Canopy to estimate the environmental and economic benefits of the urban forest. Preliminary results indicate that Southern University's trees contribute significantly to carbon storage and air quality improvement, while also offering shade and aesthetic value that enhance the campus experience. This inventory provides a baseline for future urban forestry planning, maintenance, and expansion. It also supports sustainability initiatives by highlighting the measurable benefits of green infrastructure. The findings underscore the importance of data-driven urban forest management in promoting environmental stewardship and resilience in historically Black college and university (HBCU) settings.

986

Machine Learning-Based Prediction of Field Corn Yield Using Key Cob Traits under Different Soil Amendment Types and Rates. A. Woods*, B. Thapa, R. Awal, A. Fares, A. Veettil, A. El Hassan, A. Adem, and A. Rahman, CAFNR Research, College of Agriculture, Food, and Natural Resources, Prairie View, TX 77446.

Field corn (*Zea mays* L.) plays a vital role in global food and feed systems, and improving its productivity under climate-smart soil management is critical for sustainability. This study evaluated the effects of organic amendments and biochar on corn growth and yield at Prairie View A&M University, Texas. A factorial experiment was conducted using two biochar rates (2,268 and 4,536 kg ha^{-1}), two manure types (chicken and dairy) applied at three nitrogen levels (0, 224, and 448 kg N ha^{-1}), and replicated three times. Machine learning models: Multiple Linear Regression (MLR), Random Forest (RF), and XGBoost were trained using key cob traits (length, diameter, and kernel row number) to predict yield performance. Among the models, the MLR model is expected to achieve the highest accuracy, followed by the RF model. Cob length and kernel row number are anticipated to be the strongest yield predictors. Results will demonstrate that predictive modeling can effectively estimate yield and inform management decision-making. The study highlights the potential of machine learning as a decision-support tool for advancing climate-smart and sustainable corn production systems.

987

Physical Water Quality Dynamics of Silver Lake, Delaware Under Extreme Temperature and Rainfall Events. C. Wetherill*, N. Boukari, X. Rosado, C. Krejczman, L. Roberts, J. Ramos, K. Jahan, G. Ozbay, One Health Lab, College of Agriculture, Science, and Technology, Delaware State University, Dover, DE 19901, USA

Extreme heat enhances evaporation, leading to the concentration of dissolved solids and a decrease in oxygen solubility, whereas rainfall can either dilute or introduce particles that impact turbidity and conductivity. These alterations are crucial for understanding environmental stress and maintaining the stability of water quality in lakes. The purpose of this project is to assess variations in the physical water quality parameters of Silver Lake on the hottest day, prior to rainfall, and following rainfall, focusing on the effects of evaporation and the dynamics of oxygen influenced by temperature and precipitation events. The project seeks to identify trends in solute concentration and fluctuations in oxygen levels. Data was collected at six different sites: Silver Lake Dam and Dock, Richardson Park, Lakeside Cemetery, McGlynn's Gazebo, and Fork Branch. Samples were taken from three subpoints at each site. A YSI Multiprobe measured temperature, conductivity, salinity, dissolved oxygen percentage, dissolved oxygen in milligrams per liter, pH, and turbidity, while another YSI probe measured chlorophyll-a. All water samples were collected in 500 mL bottles and stored in a cooler with ice. The data was analyzed using RStudio to generate precise graphs. Results showed that dissolved oxygen and turbidity had the widest range of values, largely due to concentration differences between sites. Dissolved oxygen ranged from 23.8% to 135.5%, while turbidity varied between 5.09 and 27.85. Salinity remained stable at 0.08 across weather events. Overall, the findings demonstrate how extreme heat and rainfall significantly influence lake water quality, providing valuable insights for improved lake management.

988

Integration of Ecologically Resilient Agricultural Practices to Enhance Soil Health and Crop Production. D. Nash*, L. C. Kibet, D. Kendal, and K. Matand, Sherman Lewis School of Agriculture and Applied Sciences, Langston University, Langston, OK 73050

Ecologically resilient agriculture integrates sustainable practices and technologies to enhance soil health, crop productivity, and climate resilience. By combining ecological principles with precision agriculture, farms can achieve synergies that support food security, environmental protection, and long-term agricultural sustainability. This study examines the impact of various soil management systems—NPK fertilizer, composted cattle manure, and an unamended control—on crop performance and soil health in vegetable production. The treatment application was based on 100 pounds of nitrogen per acre. Each treatment is replicated five times to ensure statistical accuracy. Winter cover crops are planted across all research plots each October and terminated in the spring before the main crops are established, contributing to soil structure and nutrient cycling. To support precision management, novel soil sensor probe technology is utilized to monitor soil nutrients, moisture, carbon, and other key health parameters in real-time throughout the growing season. Intensive soil sampling is conducted before treatment applications to establish baseline data and after each season to assess changes in soil nitrogen, phosphorus, potassium, carbon, and related properties. This integrated approach aims to compare the efficacy of inorganic versus organic nutrient sources while demonstrating how precision technologies can optimize input use and improve ecological outcomes.

989

Analysis of Ecological Structure and Functions of the Southern University Campus in Baton Rouge, LA. N. Williams*, J. Johnson, Y. Qi. Department of Urban Forestry, Environment, and Natural Resources, Southern University and A&M College, Baton Rouge, LA 70813.

A university campus functions as a physical hub for learning, social interaction, and community building. Green space is essential infrastructure providing ecological, environmental, and social-economic benefits for the campus population. Southern University is an 1890 land-grant university system with its main campus located in Baton Rouge, LA. This study investigated the ecological structure and function of the SUBR campus using a GIS based i-Tree Canopy program. This program facilitates land and tree cover assessment using random sampling of aerial imagery and quantifies the ecological and environmental benefits. The campus geographic boundaries were drawn onto Google maps based on an ESRI shapefile. The i-Tree Canopy randomly generates sample points for land use assessment based on predefined categories. Five hundred random survey points were used in the land-use assessment based on predefined categories. The results show that SUBR campus has 36% tree/shrub canopy cover, 32.4% grass/herbaceous cover, 24.4% of impervious areas (building, road, and other), 4.2% soil/bare ground, and 3% water body. Total carbon stored in trees/shrubs is 5,816 metric tons with annual carbon sequestration of 231 metric tons. The tree/shrub benefits on air pollution removal were quantified including annual removals of CO, NO_2, O_3, SO_2, $PM_{2.5}$, and PM_{10}. The hydrological benefits by the trees/shrubs were estimated, including avoided runoff, evaporation, transpiration, interception, and potential evapotranspiration. The results will have implications in strategic planning and greenspace management to maximize the ecological and environmental benefits for the well-being of the campus community.

990

People-Powered Conservation: Spatial Analysis of Volunteer Participation in Rock Creek Park. C. Portegies*, C. Chappell, Department of Urban Forestry, Environment, and Natural Resources, Southern University and A&M College, Baton Rouge, LA 70813.

This research project investigates the geographic distribution of volunteer participation in Rock Creek Conservancy's (RCC) forest restoration efforts, with a focus on understanding spatial patterns and informing equitable outreach strategies. Leveraging volunteer address data from RCC's records, the study analyzes participation trends by zip code, hypothesizing that neighborhoods in closer proximity to Rock Creek Park—particularly zip codes 20012, 20011, 20015, 20010, 20009, and 20008—will show higher engagement. The project integrates spatial analysis tools, including ArcGIS StoryMaps and Atlist, to visualize volunteer density and correlate it with restoration sites such as Mini-Oases and Pilot Restoration Sites. The research also explores the relationship between volunteer hours and ecological outcomes, specifically the reduction of invasive plant cover from 2021 to 2025. By filtering out corporate and non-local volunteers, the analysis centers on community-driven stewardship. Demographic overlays are used to assess whether current outreach aligns with the city's racial and socioeconomic distribution, identifying gaps in

engagement and opportunities for inclusive growth. This project contributes to Rock Creek Conservancy's broader mission of fostering climate resilience and ecological restoration through people-powered conservation. It highlights how data-driven insights can guide strategic outreach, enhance community involvement, and support the long-term sustainability of urban forest ecosystems. The findings will be presented through interactive maps, charts, and a concise research presentation, offering a replicable model for other urban conservation initiatives seeking to align environmental impact with social equity.

991

The Determination of Organic Content in Marsh Samples in the Mississippi River Delta. E. Murphy*, Department of Agriculture, Alcorn State University, Lorman, MS39096; C. Wilson, Department of Geology and Geophysics, Louisiana State University Baton Rouge, LA 70803; M. Burr, Department of Agriculture, Alcorn State University, Lorman, MS 39096; I. Atoloye, Department of Agriculture, Alcorn State University, Lorman, MS 39096; and C. Kemick, Department of River-Coastal Science and Engineering, Tulane University, New Orleans, LA 70118.

The Balize (Bird's Foot) delta of the Mississippi River is the river's active depositional lobe where fluvial sedimentation, subsidence, and coastal processes interact to form prodelta, natural levee, and interdistributary environments. Supported by the National Academy of Science, Engineering and Medicine Gulf Research Program, the Mississippi River Delta Initiative (MissDelta) is investigating thefuture of the Delta under the conditions of relative sea level rise and reduced sediment availability. Thisinvestigation is part of the effort to understand seasonal sediment deposition in the Delta, by deploying tiles into the marsh during the 2025 flood season of the Mississippi River. Periodic high-discharge eventsare pivotal for delivering and depositing new material, but subsequent wave and tidal reworking often redistribute or remove these deposits. We will focus on results from the Loss on Ignition data which isan estimate of the organic content in the sediments. This was collected from over 50 locations in the Bird's Foot delta and represent a range of ecological conditions. This is a critical measurement, as it allows us to begin to understand the contribution of mineral sediments from the Mississippi River and compare those to the amount of organic material likely derived from local senescent plant material in themarsh sediments. These results will be compared to the site distance from the bank line, their elevation, and plant composition.

992

Characterizing Extreme Storm Surges for the Long-record Tide Gauges Along the U.S. Gulf of Mexico and East Coasts using Surge Hydrographs. T. Buck*, Department of Agriculture, Alcorn State University, Lorman, MS 39096; C. Williams, Department of Agriculture, Alcorn State University, Lorman, MS 39096; and M. Rashid, Gulf Coast Research Laboratory, University of Southern Mississippi, Ocean Springs, MS 39564.

Collecting sea level data is crucial for comprehending the dynamic changes in our environment and for tackling environment-related challenges. This data facilitates the analysis of long-term trends, allowing for effective monitoring and prediction of coastal impacts. The application of coding languages such as Python and mLAB enhances the interpretation of hydrographs, enabling researchers to manipulate and analyze complex datasets efficiently. By employing these technologies, scientists gain deeper insights into ocean circulation and its significant influence on global environmental patterns. Storm surge, defined as an abnormal rise in sea level resulting from the combined effects of high winds and low atmospheric pressure, can lead to water levels surpassing predicted astronomical tides. In contrast, storm tide refers to the observed seawater level during such storm events. Tides themselves are predictable phenomena, characterized by the periodic rise and fall of sea level driven by the gravitational interactions of the Earth, Moon, and Sun. A hydrograph shows the rate of flow (discharge) versus time past a specific point in a river or conduit carrying flow. Hydrographic analysis plays a critical role in this context by providing detailed hydrographs that illustrate temporal changes in river levels at specific locations. This analysis is vital for predicting flooding and for mapping seafloor topography, coastlines, and potential obstructions, thereby ensuring safe navigation and transportation. When understanding hydrographs there can be proper decisions about where and how to specifically use water resources.

993

The Impact of Living Shorelines on Vegetation Productivity in Coastal Wetlands. L. Esquivel*, Department of Agriculture, Alcorn State University, Lorman, MS 39096; Z. Robinson, Department of Biology, Alcorn State

University, Lorman, MS 39096; M. Mason-Montgomery, Department of Agriculture, Alcorn State University, Lorman, MS 39096; and W. Wu, Division of Coastal Sciences, University of Southern Mississippi, Ocean Springs, MS 39564.

Living shorelines are manufactured construction techniques used to stabilize erosion that may occur for several reasons. They are typically made by installing submerged aquatic vegetation and organic materials such as bio-logs and fiber mats in addition to oyster reefs to act as breakwater to dissipate wave energy lessening the impact of erosion. Although they are important to the environment, these resources are unfortunately in threat of decline due to human impact in nature. The overall goal of this research was to evaluate coastal wetland vegetation productivity as impacted by living shorelines to support their effectiveness and preventative techniques. It was hypothesized that the green aboveground biomass in coastal wetland areas with living shorelines would be in more abundance when compared to the reference sites lacking such protection. To carry out this research, field work was conducted to collect above and below ground biomass that was later processed in the lab. In the end, the results were gathered using statistical analysis of variance to test the difference of green biomass protected by living shorelines in comparison sites. The results found there to be no significant difference between the different living shoreline structures or living shorelines in comparison to the reference sites; however, there was an exception in the Camp Wilkes data with a p-value of 0.09. Although the results differ from the hypothesis, the more prominent difference is believed to lie in the below ground biomass. The next steps to further this study and new hypothesis is to test the below ground biomass to offer further insight into the protective capabilities of living shorelines.

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Optimizing Oyster Restoration Techniques through Larval Storage Duration. E. Adams*, Department of Agriculture, Alcorn State University, Lorman, MS 39096; M. Mason-Montgomery, Department of Agriculture, Alcorn State University, Lorman, MS 39096; and B. Thames, Gulf Coast Research Laboratory, University of Southern Mississippi, Ocean Springs, MS 39564.

Oyster populations are critical to marine ecosystems but have suffered dramatic declines due to overharvesting, pollution, and habitat loss. This study focuses on optimizing oyster restoration by examining how different larval refrigeration durations affect settlement success. Oyster larvae were divided into groups and stored for up to 72 hours under refrigeration. Settlement and survival rates were monitored daily for three days. Results indicated that larvae stored for 72 hours exhibited the highest settlement and survival rates. These findings provide valuable insights into improving restoration protocols, particularly for techniques involving refrigerated larval transport. Future research should explore long-term effects and larger sample sizes to further refine restoration practices.

995

Evaluating Chlorophyll Content in Microalgae for Sustainable Aquaculture Feed: Outdoor Pond vs. Bioreactor Cultivation. C. Krejczman*, K. Jahan, K. McKinley, G. Ozbay, One Health Lab, College of Agriculture, Science, and Technology, Delaware State University, Dover, DE 19901 USA

Microalgae are photosynthetic microorganisms with high nutritional potential, making them a promising sustainable alternative to conventional fishmeal feed in aquaculture by sequestering excess nutrients from fish waste products such as ammonia, phosphorus, and calcium. Chlorophyll concentration can be used as one determining factor of microalgae nutritional value. Higher chlorophyll retention can be high in pigments such as carotenoids and have applications as an antioxidant source and a dye for fish flesh. This study compares chlorophyll a and b concentrations in microalgae grown in controlled indoor bioreactors versus outdoor turf systems and aquaculture ponds at Delaware State University. Outdoor cultivation exposes algae to natural environmental factors, including temperature fluctuations, rainfall, and microbial interactions, while indoor bioreactors maintain stable light, nutrient, and temperature conditions. Samples were processed for pigment extraction and analyzed using a microplate reader. Outdoor-cultivated algae exhibited higher biomass and higher total chlorophyll retention than bioreactor-grown algae, highlighting greater nutritional potential. These findings suggest that outdoor cultivation is not only resource-efficient but also produces microalgal biomass suitable for enhancing fish growth and supporting sustainable aquaculture practices.

996

Soil Compaction and Crust Formation in Sandy Soils of the Upper Gulf Coast Prairie of Texas. D.D. Taylor*, R.W. Griffin, CAFNR Research, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446.

Soil structure is defined as the arrangement of soil particles into organized units that influence the bulk density, porosity, air and water flow in soils. Soil compaction results in an increase in bulk density with a corresponding decrease in soil porosity which can negatively impact plant growth, nutrient uptake, and overall health. Sandy and silty particles present in soils on the Upper Gulf Coast Prairie of Texas are highly susceptible to soil compaction due to the denser packing configurations that occur during vibration by machinery traffic over the soil surfaces. Objectives of the project include: 1) measure soil compaction for 126 soil depths from 6 soil sites with3 replicates (triplicates) at each soil site; 2) compare the soil compaction data by soil layer depth using descriptive statistics to determine spatial variability; and 3) use inferential statistics to analyze soil compaction within and across 6 soil sites. Null hypothesis was that each of soil site should have the same soil compaction values since the soil texture is the same in upper 12 inches of Wockley soil. Soil compaction was measured using a Static Cone Penetrometer with an analog dial. Results from previous studies indicated the root limiting layer, defined by soil compaction values $\geq$ 300 psi, indicated that the shallowest root limiting layers occurred at Sites 4 and 5 with the deepest root limiting layer at Site 6. Data results from this study indicated that surface soils with thicknesses that ranged from 3.5 to 8 inches to the root limiting layer.

997

Soil Microbial-Organic Carbon Redox Reactions from the Willow Waterhole Sites: Soil Sausage Model. J.S. Freeman*, R.W. Griffin, CAFNR Research, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446.

Soils were collected from the Willow Waterhole Detention Basin complex which has a 15-acre Coastal Prairie Management Area in Houston, Texas. The dominant land use in the Management Area is Coastal Prairie with a range of grasses, sedges, shrubs, and intermittent tree species that correspond closely to the undulating elevation differences representing wetland basins, vegetated flats, and forested uplands. Within the Management Area, the federally listed endangered plant species, Texas prairie dawn (*Hymenoxys texana*), and several remnants of native coastal prairie habitat were discovered during preliminary site investigations. The objectives of the project include: 1) measuring soil-organic carbon redox (Eh) conditions in upland, flat, and basin landscapes; 2) measuring soil pH, Electrical Conductivity (EC), and salinity conditions; 3) measuring soil manganese oxide (MnO_X) reactivity levels; and 4) comparing soil chemical levels using descriptive and inferential statistics to determine spatial variability. Soil redox potential was measured using a portable probe. Soil pH, EC, and salinity were measured using a portable multiparameter probe, while MnO_X reactivity level was determined by reaction with 3% hydrogen peroxide (H_2O_2). Soil samples, collected from 3 locations at 2 depths with 3 replicates, were placed in semi-permeable dialysis tubing (soil sausage), inserted into a 700 mL plastic bottle, then flooded with tap water. Results indicated that mean pH values ranging from 5.98 (medium acid) to 6.33 (slightly acid), and mean EC values ranged from 1.88 to 2.11 mmhos/cm indicating low salinity levels.

998

Soil Color, Texture, and MnOx Spatial Variability in Kenney Soils at Prairie View A&M University. A.L. Gilliam*, R.W. Griffin, CAFNR Research, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446.

Soil color is the most visible characteristic of the surface layer of the land. Soil texture is defined as the percentage sand, silt, and clay in the mineral soil with the USDA Soil Texture Triangle used to categorize the soil after performing the ribbon test. Manganese oxide (MnOx) spatial variability in soil can be used to correlate the water movement processes in landscapes that contain the mineral. The following objectives of the project include: 1) to measure soil color, texture, and MnOx reactivity levels for 3 soil profiles of the Kenney soil located on the PVAMU Farm, 2) to compare and contrast the soil physical and chemical data by soil layer depth and profile using descriptive statistics to determine spatial variability; and 3) to use inferential statistics to analyze the soil chemical parameters within and across the 3 soil profiles. Soil Color was characterized using the Munsell Soil Color Book and Soil texture was

determined by the ribbon method. The MnOx reactivity levels was determined by reacting 1 gram of soil with 1 mL of 3% Hydrogen Peroxide with a corresponding increase in the solution level. The data results were entered into a Microsoft Excel spreadsheet for graphical, descriptive, and inferential statistical analyses. Also, data were summarized and compiled to develop a depth and land use function model. Results for surface soil colors (dry) ranged from 10YR 3/3 (brown) and 10YR 2/2 (very dark brown (moist). Soil exhibited hydrophobic properties due to organic matter releasing oils that repel water.

999

Spatial Variability of Manganese Oxide and Microbial Communities in Two Soilscapes: Upland-Lowland, and Riparian Buffer-Wetland Boundary-Wetland. C.L. Collins*, R.W. Griffin, CAFNR Research, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446.

When soils are waterlogged for an extended period, microbial respiration can lead to anaerobic conditions in which iron and manganese (Mn) oxides are reduced to their soluble forms that diffuse from the soil matrix to zones of oxidation. Two previous research studies focused on manganese reactivity by landscape position (Soilscapes 1 and 2) have been completed at PVAMU with the results provided in the literature. The research hypothesis for Soilscape 1 was that the level of MnO_X reactivity should be greatest at the Lowland sites as compared with the Upland sites, and, for Soilscape 2, the level of MnO_X reactivity should be greatest at the Wetland Boundary sites as compared with the Wetland sites. The objectives of the project include: 1) to measure soil manganese oxide (MnO_X) reactivity in two soil ecosystems, 2) to compare the soil MnOx using descriptive and inferential statistics to determine spatial variability; and 3) to determine microbial communities characteristics within and across the 2 soil ecosystems. The MnO_X reactivity level was determined by reaction with 3% hydrogen peroxide (H_2O_2). The MnOx levels were highest in the Lowland position in Soilscape 1 which corresponded with diffusion and precipitation of ions in this landscape position. The Wetland Boundary had higher MnOx reactivity levels followed by Riparian Buffer and the lowest levels were in the Wetland landscape position. Microbes and plants that tolerate higher MnOx levels are expected to occupy the landscape positions with elevated MnOx levels.

1000

Enhancing Soil Nutrient Dynamics Through Environmentally Adaptive Agricultural Practices. L. Simpson*, B. Thapa, A. Veettil, A. Fares, R. Awal, A. Elhassan, A. Rahman, CAFNR Research, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX, 77446.

Enhancing crop productivity and soil sustainability under environmentally adaptive agriculture involves strategically using soil amendments to improve soil health and resilience. A field experiment conducted at Prairie View A&M University in Texas studied the impact of environmentally adaptive agricultural practices, utilizing soil amendments (chicken manure, dairy manure, and biochar), on soil health indicators. The experiment used two biochar (made from coconut husk) rates (2.5 and 5 t ha^{-1}) and two types of manure (chicken and dairy) at three rates (0, 180, and 360 kg N ha^{-1}) for sorghum in a factorial design with three replications. Soil samples were collected from the top 0 - 15 cm depth after the harvest of sorghum, and soil nutrients, including carbon (C), nitrogen (N), phosphorus (P), and potassium (K) were analyzed. The results showed that soil treated with dairy manure had 83.2% higher K content than chicken manure-treated soil, while chicken manure-treated soil had 40.0% higher P content than dairy manure-treated soil. The P and K contents were significantly higher in 180 and 360 kg N ha^{-1} compared to control treatments. However, no significant effects were observed with the biochar rate for either of the soil nutrients. The findings emphasize balancing manure type and application rates to optimize soil fertility and minimize environmental risks, supporting sustainable soil management strategies.

1001

Evaluating the Atmospheric Emission Potential from Fresh Chicken Manure as Affected by Soil Moisture and Temperature in a Pot Study. M. Clark*, A. Rahman, A. Fares, A. Adem, and AV. Veettil, CAFNR Research, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446.

The application of poultry manure as an organic fertilizer contributes valuable nutrients to soils but can also increase atmospheric emissions during decomposition. This study aimed to assess the emission potential of carbon dioxide (CO_2), nitrous oxide (NO_2), and methane (CH_4) from fresh chicken manure under varying soil moisture and temperature conditions. A controlled pot experiment was conducted using fine sand packed in the pot. Chicken manure was incorporated into the upper six inches of each pot based on nitrogen (N) recommendations for field corn. The pot was irrigated twice a week based on calculated evapotranspiration. Pots were kept free of weeds and debris throughout the experimental period. Biweekly measurements of CO_2, NO_x, and CH_4 fluxes were taken using a closed-chamber sampling technique and gas chromatography analysis. Results revealed that both soil moisture and temperature significantly influenced atmospheric emissions. Elevated temperatures and higher moisture levels promoted greater CO_2 and NO_x emissions, whereas CH_4 fluxes remained relatively low but variable under anaerobic conditions. Overall, the study demonstrated that environmental factors such as soil temperature and water content strongly regulate atmospheric emissions from poultry manure-amended soils. These findings suggest that optimizing moisture and temperature management during manure applications could mitigate carbon and nitrogen losses while maintaining the nutrient benefits of organic fertilizers in crop production systems.

1002

Atmospheric Emissions from Goat Manure and Compost: Influence of Soil Moisture and Temperature in a Controlled Pot Study. S. Akhtar*, A. Fares, A. Rahman, and A. Veettil, CAFNR Research, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446.

Livestock manure management plays a critical role in agricultural atmospheric emissions. Composting manure before soil applications can mitigate these emissions by stabilizing organic carbon and nitrogen fractions. This study evaluated the effects of goat manure and goat manure compost on carbon and nitrogen emissions under controlled pot conditions. Fine sand was used as the soil medium, and each manure type was incorporated into the upper six inches of the pots based on nitrogen (N) recommendations for field corn. Irrigation was applied twice weekly according to evapotranspiration rates to maintain optimal soil moisture. Pots were kept free of weeds and debris for the entire experimental period. Biweekly measurements of carbon dioxide (CO_2), nitrous oxide (NO_x), and methane (CH_4) were conducted to quantify gas fluxes and examine their relationship with soil temperature and moisture. Results revealed that both environmental factors significantly influenced emission rates, with higher CO_2 and NO_x fluxes observed under warm and moist conditions. There were no remarkable differences in CH_4 emission from both goat fresh manure and compost. Thus, goat manure compost produced markedly lower CO_2 and NO_x emissions than fresh manure, demonstrating the potential of composting as an effective mitigation strategy. The findings underscore the importance of manure stabilization prior to field application to reduce the carbon footprint of livestock-based cropping systems.

1003

Dynamic Soil Properties and Natural Disasters: Establishing Baseline Correlations between Soil Bulk Density and Dynamic Soil Properties. A. Dyson Jr.*, Department of Agricultural Sciences and Technology, College of Agricultural, Human and Environmental Sciences, Southern University and A&M College, Baton Rouge, LA 70813; L.A. Hodges, Southern University Agricultural Research and Extension Center, Baton Rouge, LA 70813; T. L. Carter, Virginia State University, Research Agriculture Research Station, Virginia State University, VA 23806.

Dynamic Soil Properties (DSPs) are traditionally measured at 10-year intervals. The increased frequency of natural disasters, such as hurricanes and flooding, has accelerated the rate at which Dynamic Soil Properties change over time. Therefore, new baseline DSP databases need to be established to monitor accelerated changes in soil properties resulting from natural disasters. The overall goal of this study is to establish a soil health DSP database to enhance the USDA-NRCS National Soil Laboratory's ability to monitor soils in the Lower Mississippi River Valley. Southern University Ag Center Research Farm served as the soil sampling site due to its history of being impacted by natural disasters, such as hurricanes and river flooding. Project objectives are 1) to establish a current Bulk Density, Organic Matter, Carbon, and Nitrogen baseline databases for future natural disaster response, and 2) to evaluate the impact of soil depth (0-10cm,10-20cm,20-30cm) on Bulk Density, Organic Matter, and Carbon Dynamic Soil Properties. Results indicate that soil depth affects Bulk Density, Organic Matter, Carbon, and Nitrogen Dynamic Soil Properties. Thus, this data will serve as the baseline database to assess Dynamic Soil Property changes for future natural disaster response and remediation of the sampled soils.

1004

Soil hydrological and thermal characteristics under varying agroecosystems and amendment techniques. K. Barnes*, G.W. Tefera, R. L. Ray, CAFNR Research, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446.

Precision agricultural systems provide a more sustainable option by combining cutting-edge techniques to optimize input use and continuously monitor the condition of agroecosystems. This study utilized precision agriculture tools and remote sensing to examine soil hydrological and thermal characteristics across agroecosystems and amendment techniques. Soil moisture sensors and ground-penetrating radar (GPR) were used to monitor subsurface water dynamics, temperature profiles, and crop root structure. The LAI-2200C Plant Canopy Analyzer was also used to assess the Leaf Area Index (LAI). While soil organic carbon stocks and carbon fluxes were evaluated using innovative gas analyzers, automated chambers, and eddy covariance flux towers. Vegetation indices such as Normalized Difference Vegetation Index (NDVI) and LAI were derived from high-resolution satellite datasets (Sentinel-2 and MODIS). Results indicated significant seasonal and ecosystem-type differences in soil moisture, soil temperature, NDVI, and LAI among soil amendment techniques and agroecosystems.

1005

Assessing the Effects of Organic Amendment Type and Application Rate on Soil Saturated Hydraulic Conductivity. J. Houston*, A. El Hassan, A. Veettil, R. Awal, A. Rahman, A. Fares, and B. Thapa, CAFNR Research, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446.

According to the Food and Agriculture Organization (FAO), global population growth is projected to substantially increase food demand by 2050, requiring a 70% rise in global food production. However, environmental variability continues to threaten agricultural productivity, soil health, and overall food security. To mitigate these impacts, different agricultural practices, such as applying biochar and organic amendments, are increasingly being adopted to enhance soil quality and resilience. These practices can significantly influence the physical and chemical properties of soils. This study evaluated the effects of various soil management practices, particularly biochar and organic manure, on soil hydraulic conductivity. The experiment followed a factorial randomized block design with twelve treatment combinations, including two biochar rates (2,268 and 4,536 kg ha^{-1}) and two manure types (chicken and dairy), each applied at three nitrogen-equivalent rates (0, 224, and 448 kg N ha^{-1}). Results indicated that hydraulic conductivity differed significantly among manure types ($p < 0.05$). Although biochar application rates showed a slight positive effect, no statistically significant difference was observed between the two levels, despite a 40% variation in mean values. Other factors, including manure rate and interactions among variables, had no significant impact on soil saturated hydraulic conductivity.

1006

Predicting Sorghum Yield Using Multispectral Imagery under Different Organic Amendment Treatments. K.D. Hall*, R. Awal, A. Veettil, A. Fares, B. Thapa, A. Elhassan, A. Adem, and A. Rahman, CAFNR Research, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446.

Multispectral imagery in crop monitoring offers powerful opportunities for precision agriculture by enabling early detection of plant stress, optimizing resource utilization, and supporting data-driven management decisions. This study evaluated the potential of multispectral imagery to predict sorghum yield under varying organic amendment types and application rates. A factorial field experiment was conducted at the Prairie View A&M University Research Farm, incorporating two biochar rates (2,268 and 4,536 kg ha^{-1}) and three nitrogen-equivalent rates of dairy and chicken manure (0, 180, and 360 kg total N ha^{-1}). Multispectral images were collected throughout the growing season using a Sentera 6X Thermal Sensor mounted on an overhead truss platform supported by C-stands. Spectral data were processed to derive multiple vegetation indices related to plant vigor, nutrient status, and stress response. The analysis demonstrated that these indices effectively captured differences in crop growth and provided reliable predictors of sorghum biomass and grain yield. The multilinear regression analysis showed a Pearson correlation coefficient of 0.6 between the predicted and measured biomass, and 0.61 between the predicted and measured sorghum yield. The findings highlight the potential of multispectral sensing as a non-destructive and efficient approach for yield estimation and sustainable crop management in organic amendment systems.

1007

Comparing Soil Moisture and *Juniperus virginiana* Density in Oak-Hickory Dominated Forest in North America. A. Townsend* and A. Sparer, College of Agriculture, Environmental and Human Sciences (CAEHS), Lincoln University of Missouri, Jefferson City, MO 65101.

Understanding how specific tree species effect the microclimate of North American Temperature Forest is important for managing forests sustainably. 3 m tripods with HOBO weather stations were deployed in the Baskett Forest in central Missouri to monitor photosynthetically active radiation, rainfall/through fall, wind speed and direction, air temperature, relative humidity, soil moisture, and soil temperature. The tripods were stationed at 6 sites. Five of the sites were chosen because they were located at the terminus of each transect associated with the Missouri Ozarks Ameriflux (MOFLUX) tower. The 6th site was cleared, open, mowed, area of the forest that would serve as an additional comparison to the forested sites. At the 5 forested, cedar trees (Juniperus virginiana) were counted in 4.2 x 4.2 square, based off the 3m transects radiating outward for the microclimate station. The results showed that there was a significant difference between sites in soil moisture content (p-value <0.001). The highest average soil moisture (0.340 m^3/m^3) was found at the West transect. The lowest soil moisture content was found at the South site (0.236 m^3/m^3) which also contained the most cedar trees.

1008

Stages and Buccal Morphology of the Ohio River Prawn Larviculture. C. dos Santos*, C.A. King, D.L. Flickinger, College of Agriculture, Environmental and Human Sciences (CAEHS), Lincoln University of Missouri, Jefferson City, MO 65101

The production of Macrobrachium prawn species in artificial rearing systems has shown little development due to difficulties related to their management during the larval phase. Similar to other palaemonids, the larviculture of freshwater prawns is the bottleneck to producing prawn post-larvae since it depends on strict control of the water quality, adequate feeding and other specialized management. The Ohio River prawn (*Macrobrachium ohione*) shows prolonged and irregular larval development. No commercial scale larvicultures have been performed for the *M. ohione* and interest has grown for more domestic production of animal protein. Nevertheless, the larvicultures of the *M. ohione* may be improved when considering advances in feeding regimes and maintenance of water quality. Thus, the present research aims to establish the different larval stages of the *M. ohione* and measure the buccal morphology as a strategy to determine preferred diet of these larvae. Adults and broodstock will be obtained from various Texas river systems in the early spring.

1009

Preliminary Results for Abundance and Population Structures based on mtDNA Control Regions for Freshwater Prawns in Texas Rivers. J.P. Ridder*, A. Walker, D.L. Flickinger, College of Agriculture, Environmental and Human Sciences (CAEHS), Lincoln University of Missouri, Jefferson City, MO 65101

Freshwater prawns of the genus *Macrobrachium* are ecologically important components of tropical and subtropical river systems, where they function as detritivores, omnivores, and bioturbators. Prawns migrate for larval development and juvenile recruitment. However, anthropogenic stressors such as dam construction, altered flow regimes, and water quality degradation have contributed to population declines and range contractions across much of their historical distribution. Despite their ecological importance, these species remain poorly studied in Texas, where historical records suggest their presence in multiple Gulf-draining river systems. This study will survey river systems in southern Texas for presence and abundance of various freshwater prawn species. Tissue samples will be collected to analyze single nucleotide polymorphisms in mitochondrial DNA, specifically the mitochondrial control region. The single nucleotide polymorphisms may be used to assess the population structure of the main lineages of the *M. ohione*, *M. carcinus*, and the *M. acanthurus*. The *M. carcinus* and *M. acanthurus* mtDNA markers will then be compared to individuals of the same species of Brazil to verify if divergence exists among separate populations and if a single population shows a high quantity of polymorphisms. Tissue samples will be digested to extract mtDNA at Lincoln University of Missouri. Sequences will be sent to the Federal University of Pará for detection of polymorphisms.

1010

Trapping Methods and Population Structures based on mtDNA COI and 16s Regions for Freshwater Prawns in Texas Rivers. A. Walker*, J.P. Ridder, D.L. Flickinger, College of Agriculture, Environmental and Human Sciences (CAEHS), Lincoln University of Missouri, Jefferson City, MO 65101

Freshwater prawns of the genus *Macrobrachium* are ecologically important components of tropical and subtropical river systems, where they function as detritivores, omnivores, and bioturbators. Despite their ecological importance, these species remain poorly studied in Texas, where historical records suggest their presence in multiple Gulf-draining river systems. This study will analyze trapping methods for capturing specimens of freshwater prawns. Hole size of modified crab traps and different baits will be tested, specifically coconut pieces and fish meat. In addition, tissue samples will be collected to analyze single nucleotide polymorphisms in mitochondrial DNA, specifically the mtDNA cytochrome c oxidase subunit and the 16 S rDNA regions. The single nucleotide polymorphisms may be used to assess the population structure of the main lineages of the *M. ohione*, *M. carcinus*, and the *M. acanthurus*. The *M. carcinus* and *M. acanthurus* mtDNA markers will then be compared to individuals of the same species of Brazil to verify if divergence exists among separate populations and if a single population shows a high quantity of polymorphisms. Tissue samples will be digested to extract mtDNA at Lincoln University of Missouri. Sequences will be sent to the Federal University of Pará for detection of polymorphisms.

Student Poster Presentation – Graduate Competition

Bioenergy, Natural Resources and Environment

1011

Modeling the Potential Distribution of *Glycaspis brimblecombei* under the Current climate conditions using MaxEnt. F. A. Coelho[1*]and M. Haseeb, Center for Biological Control, College of Agriculture and Food Sciences, Florida A&M University, Tallahassee, FL 32307-4100, U.S.A.; R. S. Silva, Departamento de Agronomia, Universidade Federal dos Vales do Jequitinhonha e Mucuri, Diamantina, Minas Gerais 39100000, MG, Brazil

Glycaspis brimblecombei Moore, 1964 (Hemiptera: Aphalaridae), commonly known as the red gum lerp psyllid, is native to Australia but has rapidly expanded its range following its first detection outside its native habitat in California, USA. This sap-sucking pest feeds exclusively on *Eucalyptus* spp., extracting phloem from young leaves and causing leaf discoloration, reduced photosynthetic area, stunted growth, shoot dieback, and the proliferation of sooty mold. Severe infestations can significantly reduce tree vigor and productivity, threatening both commercial plantations and natural stands. The population dynamics of *G. brimblecombei* are strongly influenced by abiotic factors such as temperature, humidity, and precipitation, highlighting the importance of understanding environmental determinants of its occurrence and potential expansion. In this study, ecological niche modeling was conducted using MaxEnt software to predict the species' potential geographic distribution under current climatic conditions. The model achieved high predictive accuracy (AUC = 0.888; TSS = 0.678), demonstrating strong reliability in distinguishing suitable from unsuitable areas. Results indicate that the highest habitat suitability occurs in tropical and subtropical regions, with particularly favorable areas in South America (Brazil, Argentina, Paraguay), Central America, southern North America, coastal Africa, southern Asia, and Oceania. These regions represent high-risk zones for invasion and establishment. Overall, the findings provide valuable insights for early detection, surveillance, and preventive management of *G. brimblecombei*, supporting biosecurity preparedness and guiding decision-making for mitigating potential impacts on *Eucalyptus* forestry worldwide.

1012

Post-Hurricane Management Impacts on Long-Term Soil Nutrient Dynamics and Carbon Stability in the Chipola Experimental Forest. T. Sarker*, L. Ngatia, K. Oduor, G. O. Nwoke, W. Marechal, G. C. Bugna, Florida A&M University, College of Agriculture and Food Science, Center for Water Resources, Tallahassee, FL 32307; J. M. Grace III, USDA-Forest Service, Southern Research Station, Center for Forest Assessment and Synthesis, Tallahassee, FL 32303

In 2018, Hurricane Michael roared through the Florida Panhandle, depositing large amounts of downed wood debris (DWD) on the forest floor. Wood debris management practices were employed: drum chopping and prescribed fire. However, it remains unclear how the management practices affected the carbon (C) stability and nutrient dynamics. Therefore, this study determined the effect of management practices on C stability and nutrients after drum chopping, fire, and post-fire. Samples were collected before drum chopping (baseline), after drum chopping, after fire, and post-fire. Multi-Element Scanning Thermal Analysis (MESTA) was employed to determine C thermal stability, while total and available nutrients were determined using the ashing method and Mehlich 1 method. The results indicated a significant difference ($P < 0.05$) in total nutrients at the 0–2 cm depth. Notably, Total C ($P = 0.001$), N ($P = 0.0011$), K ($P < 0.0001$), and P ($P = 0.0001$) were significantly higher after fire and sharply declined post-fire, indicating nutrient losses, while available nutrients showed no significant change apart from nitrate, which significantly declined. Low thermal stable C (LTSC< 400 °C) was in the order of Fire>Baseline>post-fire>Drum-chopping, while higher thermal stable C (HTSC> 400 °C) followed the order of Fire>Baseline>Drum-chopping>post-fire. The R400 index ranged from 0.60 to 0.74 across treatments, showing little change with depth but slightly lower values after fire and post-fire, suggesting more stable carbon formation. This study offers valuable insights into the impact of post-hurricane debris management on C thermal stability and nutrient dynamics, supporting data-driven forest restoration strategies.

1013

Development and Implementation of a Digital Identification Tool for Ambrosia and Bark Beetles of Agricultural and Forestry Importance in Florida. S. O. Laird. M. Haseeb, and A. M. S. Robinson-Baker, Center for Biological Control, College of Agriculture and Food Sciences, Florida A&M University, Tallahassee, FL 32307-4100; D. A. Solis, Agribusiness Program, College of Agriculture and Food Sciences Florida A&M University, Tallahassee, FL 32307-4100; P. A. Skelley, Florida State Collection of Arthropods, Florida Department Agriculture and Consumer Services, Division of Plant Industry, Gainesville, FL 32608-1201

Ambrosia and bark beetles (Coleoptera: Curculionidae: Scolytinae and Platypodinae) are major pests of forest and agricultural ecosystems in Florida and throughout the United States. These insects primarily infest coniferous hosts, particularly *Pinus* spp., and cause substantial economic losses to the timber, paper, and resin industries. Several invasive species have been introduced through international trade and have established stable populations, exhibiting ecological plasticity that allows them to move between natural forests and cultivated orchards, inflicting recurrent damage each year. Accurate identification remains challenging due to their minute size, high diversity, and cryptic morphology. To enhance diagnostic accuracy and support effective detection and monitoring, this study focused on developing a digital identification tool for economically important ambrosia and bark beetles in Florida. Between 2023 and 2025, 25 species representing 18 genera were collected from Leon and Gadsden Counties in the Florida Panhandle. Adult beetles were photographed using a Leica S9i stereomicroscope to obtain high-resolution dorsal and lateral habitus images. Morphological identification relied on diagnostic characters such as body shape, color, antennal structure, pronotal configuration, elytral punctation, and surface ornamentation, including setae, scales, spines, and tubercles. These features were compiled into an interactive matrix using Lucid Builder software to create a user-friendly, web-based identification key. The tool is currently being expanded with additional species and metadata. Upon completion, it will assist pest screeners, taxonomists, researchers, students, extension agents, pest managers, and foresters by improving identification capacity, management practices, and biosecurity preparedness in Florida's forest and agricultural production systems.

1014

Temperature-Associated Declines in Scaled Body Mass Across Passerine Species. D. A. Baker*, C. Heckscher, Department of Agriculture and Natural Resources, Delaware State University, 1200 N Dupont Hwy, Dover, DE 19901

Environmental conditions are a pervasive driver of ecological transformation, influencing the physiology, distribution, and morphology of wildlife across taxa. Among avians, passerines are particularly responsive indicators of environmental variation. Morphological traits such as scaled body mass (SBM), a size-independent metric integrating body mass and wing chord, are closely tied to survival, thermoregulation, and reproductive success. Using long-term temperature and precipitation data alongside historical morphometric records, we test whether variation in these environmental factors predicts changes in SBM among five songbird species breeding at research sites located in White Clay Creek State Park, Delaware and Pennsylvania, USA, and French Creek State Park, Pennsylvania, USA.

The focal species included a non-migratory resident, *Cardinalis cardinalis*; two short- to medium-distance migrants, *Seiurus aurocapilla* and *Dumetella carolinensis*; and two long-distance migrants, *Catharus fuscescens* and *Hylocichla mustelina*. Over a multi-decadal period, temperature and precipitation were significant predictors of interannual variation in scaled body mass across species, with warmer years generally associated with reduced SBM, consistent with Bergmann's rule. The strength and direction of these relationships varied by migratory strategy and species, suggesting differential sensitivity to shifting environmental conditions. In general, long-distance migrants exhibited stronger environment–morphology associations than resident or short-distance species. Our results indicate that long-term shifts in temperature and precipitation regimes are driving morphological variation in eastern North American songbirds and support the premise that rising temperatures and altered hydrological patterns are reshaping avian body form. These findings add to growing evidence that contemporary environmental trends represent a significant and measurable selective force acting on passerine populations and ultimately on our own.

1015

LiDAR-Based Forest Structure Mapping and Individual Tree Species Characterization in the Chipola Experimental Forest, Florida. G. K. S. Ananth*, S. Dev, College of Agriculture and Food Sciences, Florida A&M University, Tallahassee, FL 32307; J.M. Grace, III, U.S. Department of Agriculture, Forest Service, Southern Research Station, Chipola Experimental Forest, FL

Longleaf pine (*Pinus palustris*) ecosystems represent one of the most biologically diverse habitats in the southeastern United States but have experienced extensive decline due to land-use change and fire suppression. Characterizing their structure and composition is critical for restoration and adaptive management. This study integrates unmanned aerial vehicle (UAV) LiDAR and high-resolution RGB imagery to map forest structure and classify dominant tree species in the Chipola Experimental Forest, Florida. LiDAR point clouds were processed to derive canopy height models and structural metrics (height percentiles, crown volume, canopy density), while DeepForest was applied to RGB orthomosaics for tree-crown delineation. Spectral indices such as ExG, VARI, and LAB color features complemented LiDAR-derived attributes. A Random Forest classifier distinguished longleaf pine, sand pine, and hardwood species with an overall accuracy exceeding 85%. The integrated LiDAR–RGB workflow enhances species separability, supports data-driven ecological monitoring, and provides a scalable approach for longleaf pine restoration and sustainable forest management across the southeastern United States.

1016

Using SWAT to Simulate Residue Management as a Best Management Practice to Improve Watershed Management. O. E. Anigboro-Napoleon*, Soil and Water Sciences, College of Agriculture and Food Sciences, Florida A&M University, Tallahassee, FL, 32307; Y. Liu, Department of Environmental and Sustainable Engineering, University at Albany, State University of New York, Albany, NY, 12222; J. Chen, Biological Systems Engineering, College of Agriculture and Food Sciences, Florida A&M University, Tallahassee, FL, 32307;

Soil & Water Assessment Tool (SWAT), a widely used hydrological modelling tool, simulates various hydrological processes. The standard SWAT model currently lacks support for simulating residue management, a key agricultural best management practice. This study extends the SWAT model's capacity to represent residue management practices. The SWAT model's source code, which is written in Fortran, was modified to develop and implement a new function capable of effectively simulating residue management. This newly created function allows explicit control over residue management, enabling simulations to explore various conservation scenarios. Another major challenge was that the modified model functioned efficiently only for a single Hydrologic Response Unit (HRU), whereas real watersheds typically comprise hundreds of HRUs. To address this, we developed a MATLAB-based automation that identifies HRUs by land use type and replaces default management operations with customized schedules. SWAT operation codes and parameters were further modified, assigning code 7 to residue management (variable HARV+RES). These improvements enable SWAT to simulate residue cover effects on runoff and soil erosion at the HRU level, thereby supporting more realistic watershed-scale assessments of residue management and enhancing conservation planning and water quality evaluations.

1017

Optimizing Zinc and Copper Recovery from Swine Wastewater. J.A. Gibson*, A. Mansaray, G. Uzochukwu, and N. Aryal, Department of Natural Resources and Environmental Design, North Carolina Agricultural and Technical State University, Greensboro, NC 27411.

Commercial swine operations commonly supplement weanling piglets with high levels of copper (Cu) and zinc (Zn) to promote growth and alleviate post-weaning digestive complications. However, up to 90% of these trace metals are excreted through fecal waste, ultimately entering soil and aquatic ecosystems through runoff or wastewater discharge. Their accumulation poses toxicity risks to plants, microorganisms, and aquatic life, as well as contributing to the emergence of antimicrobial resistance. Constructed wetlands have shown potential to sequester these heavy metals, but their long-term stability is uncertain, as changing redox conditions may remobilize bound metals. Phytoremediation has been proposed as a sustainable recovery approach, but two key questions remain: (1) Which plant species are most effective in selectively accumulating Cu and Zn, and are these species broadly applicable across different environments? (2) How can the harvested, metal-enriched biomass be disposed of without reintroducing contaminants? This review synthesizes current literature on the uptake, accumulation, and recovery of Cu and Zn by wetland plants from swine wastewater. It highlights candidate plant species capable of selectively absorbing these metals while retaining potential nutritional value. The synthesis examines key advances, knowledge gaps, and design considerations in using constructed wetlands for metal recovery. Results from this review will guide subsequent mesocosm and field experiments to optimize Cu and Zn recovery for reuse as feed supplements to livestock.

1018

Using Photovoice to Assess Impacts of Hurricane Beryl on Agricultural Producers in Jamaica. [1]M. Malachi*, [1]G. Sorola, [1]A. Igwenagu, [1]Dr. N. Estwick, [1]Dr. P. Ampim, [2]Dr. S. Glover, [1]Dr. M. Robinson and [3]Dr. D. Deslandes.[1] CAFNR Research, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446, [2] University of South Carolina, South Carolina and [3]College of Agriculture Science and Education, Jamaica.

On July 3, 2024, Hurricane Beryl, a Category 4 storm, devastated Jamaica's agricultural sector, destroying banana *(Musa acuminate)* and plantain *(Musa paradisiaca)* fields, soil nutrients and greenhouses. The storm also damaged infrastructure in the northern parishes, including hospitals and health facilities. Beyond economic losses, smallholder farmers lacked resources to recover, further threatening Jamaica's food security. Using photovoice and the Community-Based Participatory Research (CBPR) approach, the research team engaged banana and plantain farmers to document post-disaster experiences. The CBPR collaboration between researchers and the community emphasized local knowledge and shared decision-making. Findings from the photovoice interviews with farmers in Portland Parish revealed the absence of formal disaster plans to prepare for disasters, widespread wind damage, and severe soil erosion. However, participants identified existing mitigation strategies, such as windbreaks, drainage improvements, and greenhouse reinforcements to reduce impacts from storms. The research aims to promote community-led disaster prevention while integrating producer-driven resilience strategies. Ultimately, this study contributes to strengthening disaster policy in Jamaica and its agricultural sector through the development of locally driven disaster mitigation and response strategies and practices.

1019

Water Quality Assessment of Two North Carolina Urban Watersheds and a Reference Site Using Non-Parametric Analysis. A. Kanu*, and P. L. Spence, Department of Natural Resources and Environmental Design, North Carolina Agricultural and Technical State University, Greensboro, NC 27411.

Urbanization threatens water quality and the availability of ecosystem services. This study assessed the water quality of two urbanized watersheds, Third Fork Creek (TFC) and Northeast Creek (NEC), and a reference site, Little River (LR) located in Durham, NC. Monthly data collected by the City of Durham between 2008 and 2022 were used to determine the Water Quality Index (WQI), fecal coliform, turbidity, dissolved oxygen (DO), pH, total nitrogen (TN), total phosphorus (TP) and TN:TP ratios. A Spearman rho Correlation Coefficient analysis was conducted to measure the association of the water quality parameters for each watershed. A Kruskal-Wallis, nonparametric test, compared the differences in annual and seasonal water quality within the two urban watersheds and across all monitoring locations including the reference site. Kruskal-Wallis results indicated statistically significant differences ($p < 0.05$) between the mean ranks of the urban watersheds and the reference site in all water parameters, except temperature. Correlation analysis revealed strong associations between WQI and fecal coliform ($p = -0.713$ (TFC), $p = -0.690$

(NEC), p = 0.841 (LR); p < 0.000) as well as WQI and DO (p = 0.518 (TFC), p = 0.518 (NEC), p = 0.895 (LR); p < 0.000). Mean TN:TP ratios indicated both urban watersheds co-nutrient limiting (10:1 to 20:1), although the TN:TP ratios varied annually and seasonally across the monitoring locations. These findings emphasize the importance of long-term annual and seasonal water quality assessments of urban watersheds to support water resource management decisions.

1020

Efficacy of Biochar, Compost, and Crops in Remediating PFAS and Enhancing Plant Productivity. S. Gautam*, and N. Aryal, Department of Natural Resources and Environmental Design, North Carolina Agricultural & Technical State University, Greensboro, NC, 27411.

Per- and polyfluoroalkyl substances (PFAS) can persistently accumulate in agroecosystems through biosolids application, atmospheric deposition, and contaminated irrigation water, posing risks to soil health and food safety. This greenhouse study investigated the effects of biochar and compost amendments on PFAS distribution and on plant growth in three vegetable crops: Tomato, Beetroot, and Swiss chard. Twelve treatment combinations, including unplanted controls, were arranged in a Randomized Complete Block Design with four replicates (n = 48). Soils were spiked with 200 ppb of two long-chain PFAS [perfluorooctanoic acid (PFOA), perfluorodecanoic acid (PFDA)], and two short-chain PFAS [perfluoropentanoic acid (PFPeA), and perfluorohexanoic acid (PFHxA)]. PFAS were extracted using Dionex AutoTrace 280 Solid Phase Extraction and quantified using Orbitrap Exploris 120 Liquid Chromatography Mass Spectrometry. Additionally, soil pH and plant growth parameters were measured and analyzed using SAS. Preliminary observations indicate that soils amended with biochar or compost generally had lower extractable PFAS concentrations than unamended controls, particularly for long-chain compounds, suggesting that amendments affected PFAS distribution and retention. Concentrations of PFAS in vegetated soils were lower than those in control soils, implying possible rhizosphere effects. Plant tissues are being analyzed to confirm uptake. Regression analyses showed that amendments and crop type were key determinants of early growth response, accounting for over 90% of the variation. These results highlight that organic amendments can influence PFAS mobility while supporting crop growth. Further plant analyses will help better understand uptake and inform mitigation strategies.

1021

Regenerative Potential of Diverse Cover Crop Mixtures, Seed Rate, and Termination Methods for Improving Soil Health in Southeastern U.S. Vegetable Production. S.Y. Relangi*, College of Agriculture and Environmental Sciences, North Carolina Agricultural and Technical State University Greensboro, NC 27411; U. Ahmad, Texas A&M AgriLife Research, Uvalde, TX 78801; H. Berger, J. H. Wall, College of Agriculture and Environmental Sciences, North Carolina Agricultural and Technical State University Greensboro, NC 27411; M. Bell, Center for Environmental Farming Systems, North Carolina State University, Raleigh, NC 27695; N. Aryal, and B. Dari, College of Agriculture and Environmental Sciences, North Carolina Agricultural and Technical State University Greensboro, NC 27411.

Soil health degradation poses a growing challenge to sustainable food production, particularly in the southeastern United States, where intensive cultivation and climatic variability accelerate nutrient depletion and erosion. Integrating cover crops into production systems can be a promising regenerative approach to restore soil function. Our field study aimed to evaluate how diverse cover crop mixtures, seeding rates, and termination methods influence soil health in organic vegetable systems at the Center for Environmental Farming Systems, Goldsboro, North Carolina. Treatments included five cover crop species mixtures of clover, rye, vetch, oat, and mustard under high and low seeding rates and terminated using a roller crimper and flail mower. Our findings indicate significant treatment effects were observed for nutrient cycling, microbial activity, and soil aggregation. Among mixtures, the clover–rye–vetch combination exhibited the highest nitrate activity, while clover–mustard recorded maximum soil respiration. The strongest correlation (r = 0.84) occurred between soil respiration and microbially active carbon, highlighting strong biological linkages that drive nutrient turnover. Principal component analysis further identified clover–oat and clover–rye–vetch mixtures as key drivers of improved organic matter, aggregate stability, and overall soil health. These preliminary short-term effect of treatments suggest that integrating legume–grass–brassica cover crop mixtures under proper management strategies can enhance soil biological activity and functional resilience. Continued monitoring will determine the cumulative long-term impacts of these regenerative management practices on soil health and system sustainability.

1022

Mechanism of Perfluorooctanesulfonic Acid (PFOS) Adsorption on Loring Silt Loam Soil. D. Blankenship and S. Rakshit, Department of Environmental Sciences, College of Agriculture, Tennessee State University, Nashville, TN 37209.

Perfluorooctanesulfonic acid (PFOS), a persistent perfluoroalkyl substance (PFAS), poses a major environmental concern due to its extreme stability, bioaccumulation potential, and strong affinity for soil minerals. This study examined PFOS sorption mechanism on the Loring silt loam (Oxyaquic Fragiudalfs) soil series, common to agricultural landscapes of Tennessee and the southeastern U.S., using in situ Attenuated total reflectance-Fourier transform infrared (ATR-FTIR) spectroscopy under varying solution properties. Results indicated that PFOS adsorbed on Loring soil, most likely through electrostatic attraction between the negatively charged sulfonate group and positively charged pH-dependent sites such as on oxide mineral surfaces. Infrared (IR) bands indicated greater absorbance values for adsorption at lower pH (4.5-5.5), consistent with increased surface protonation and existence of anionic species of PFOS. Results suggested that PFOS persistence and transport are strongly influenced by soil mineralogy and pH-dependent surface chemistry. In fertilizer-managed soils, phosphate anions may compete with PFOS for adsorption sites, decreasing retention and increasing potential mobility. Future research will isolate interactions among clay minerals, iron oxides, and aluminum oxides/hydroxides to develop mineral-specific sorption parameters that refine predictive fate models and inform soil remediation strategies.

1023

Nonlinear Modeling of Total Suspended Solids in Rehoboth Bay Through Turbidity and Water Quality Indicators. O. Williams*, F. Boukari, and G. Ozbay. One Health Lab, College of Agriculture, Science, and Technology, Delaware State University, Dover, DE 19901

Turbidity is widely used as a field indicator of total suspended solids (TSS), an important determinant of water quality and habitat suitability for species such as oysters and blue crabs. However, the strength of the turbidity–TSS relationship can vary with local hydrodynamics and environmental conditions. This study evaluated that relationship in Delaware's Rehoboth Bay using field measurements collected by the Ozbay ONE Health Lab Student Team. Turbidity, salinity, dissolved oxygen, chlorophyll, and pH were measured in situ using YSI multiprobes and an Aquafluor fluorometer, while laboratory analyses quantified TSS, alkalinity, hardness, and nutrients. A machine learning framework was developed to assess how well TSS can be predicted from turbidity and related parameters. Data preprocessing included median imputation, winsorization, and feature scaling. Three regression models; ElasticNet, HistGradientBoosting, and RandomForest—were compared. RandomForest yielded the highest predictive performance ($R^2 \approx 0.51$) using turbidity, salinity, and temperature, reflecting its ability to capture nonlinear interactions and threshold responses in the system. While turbidity emerged as the strongest single predictor, results highlight the influence of additional drivers such as runoff, mixing patterns, and particle composition. Overall, the study supports turbidity as a useful but incomplete proxy for TSS in Rehoboth Bay. The machine learning framework provides a practical approach for sensor-based TSS estimation and rapid water quality assessment. Integrating hydrological and meteorological datasets in future models may further enhance predictive accuracy and benefit Delaware's expanding oyster aquaculture industry.

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Interannual Variation in Biomarker and Essential Fatty Acids of Forage Fish Under Ocean Thermal Variations. T. Ahmed*, P. Chigbu, A. Ishaque, and C. Richardson, Department of Natural Sciences, University of Maryland Eastern Shore, Princess Anne, MD 21853, L. Hamilton, Salisbury University, Salisbury, MD 21801.

The Northwest Atlantic Ocean has experienced pronounced environmental variability between 2022 and 2024, including marine heatwaves in the Gulf of Maine and Georges Bank and temperature anomalies linked to Labrador Current influx. This study investigates how these hydroclimatic shifts influence food-web dynamics by assessing fatty-acid composition in five key forage fish species: butterfish (*Peprilus triacanthus*), silver hake (*Merluccius bilinearis*), Atlantic herring (*Clupea harengus*), Atlantic mackerel (*Scomber scombrus*), and alewife (*Alosa pseudoharengus*). Fatty-acid methyl ester (FAME) analysis was conducted on freeze-dried trawl samples to quantify essential omega-3

fatty acids (EPA, DHA) and biomarker fatty acids tracing trophic and primary-producer inputs. Statistical tests (ANOSIM, SIMPER) showed significant interspecific and interannual differences, with EPA and DHA percentage composition declining during warmer years and most notably in Atlantic herring, butterfish, and silver hake. Reduced EPA/DHA ratios corresponded to suppressed diatom-dominated spring blooms under heatwave conditions, with partial recovery during cooler periods in 2023–2024. Pelagic filter feeders showed higher EPA/DHA ratios during productive bloom years, reflecting improved dietary quality, whereas predatory and omnivorous species displayed mixed fatty-acid profiles. These results suggest that thermal variation and altered bloom phenology reduce forage-fish nutritional quality by diminishing polyunsaturated fatty-acid availability, potentially affecting zooplankton, higher predators, and fisheries productivity. This research emphasizes the importance of integrating biochemical and oceanographic monitoring to understand and manage temperature-driven changes in marine food-web function and ecosystem resilience in the Northwest Atlantic.

1025

Soil Enzyme Activity Response to Xanthan Gum Biopolymer Amendment. N. Rutayisire*, J. Metuge, E. Havugimana, Z. Senwo, Department of Natural Resources and Environmental Sciences, Alabama A&M University, Normal, AL 35762.

Such biodegradable biopolymers as xanthan gum have gained increased attention for their potential to improve soil health and fertility, as well as their roles in soil biochemical and microbial processes. This study investigates its likely impact on the activities of key soil extracellular enzymes involved in the transformation or mineralization of carbon, nitrogen, sulfur, and phosphorus in soils. Greenhouse and laboratory experiments will be reported using soils amended with xanthan gum at 0%, 0.05%, and 0.1% concentrations to observe responses of β-glucosidase, phosphatase, sulfatase, and N-acetylglucosaminidase. Effects on microbial activity, and nutrient availability by promoting organic matter decomposition and improving soil structure will be shared. The results of this research will provide valuable insights into the potential use of xanthan gum or other biopolymers as sustainable soil amendments to boost nutrient cycling, soil fertility, and ecosystem productivity.

1026

Evaluating Microbial Extracellular Polymeric Substances on Soil Enzyme Activities of Carbon, Nitrogen, Phosphorus, and Sulfur Mineralization. E. Havugimana*, J. Metuge, N. Rutayisire, Z. Senwo, Department of Natural Resources and Environmental Sciences, Alabama A&M University, Normal, AL 35762.

Microbial extracellular polymeric substances (EPS) may play a vital role in regulating soil biochemical processes by affecting various soil properties. This study examines EPS produced by *Rhizobium tropici* on the activities of key soil enzymes involved in the mineralization of carbon, nitrogen, phosphorus, and sulfur (CNPS). Field and laboratory experiments were carried out on agricultural soils to compare soils amended or not amended with EPS. Enzyme assays targeting β-glucosidase, N-acetyl-β-glucosaminidase, urease, phosphatase, and arylsulfatase will be used to evaluate the effects of EPS on nutrient transformation processes. Results are expected to show that EPS enhances microbial activity, stabilizes enzymes, and increases nutrient availability by aiding organic matter decomposition and mineralization. These findings will provide valuable insights into the potential use of microbial EPS as a sustainable bioresource or biostimulant to boost soil fertility, nutrient cycling, and ecosystem productivity. This research supports the development of microbiome-based soil management practices for agricultural and environmental health and sustainability.

1027

Urban Expansion and their Impacts on Surface Urban Heat Island Effect: A Case Study from Alabama, USA. R. Rathnayaka*, R. Kulawardhana, S. Chatterjee, Department of Natural Resources and Environmental Sciences, Alabama A&M University, Normal, AL 35762.

Urban growth changes natural land surfaces and greatly impacts local thermal environments. Converting vegetated or agricultural lands into built-up areas increases surface heat storage and declines natural cooling, intensifying the Surface Urban Heat Island (SUHI) effect. This study explored the relationship between urban expansion and surface temperature changes across Alabama from 2000 to 2024 using remote sensing data. The main objectives were to (1)

map spatial patterns and temporal dynamics of urban expansion, and (2) evaluate how these changes affect SUHI. Land Surface Temperature (LST) and Land Use/Land Cover (LULC) data were available from the Moderate Resolution Imaging Spectroradiometer (MODIS) MOD21A2 product, and the National Land Cover Database (NLCD) LULC product archives, respectively. NLCD derived annual LULC products were used to spatially map and quantify the trends in spatial expansion of developed areas within major cities of Alabama over the last two decades (from 2000 – 2025). MODIS derived LST data were analyzed to spatially map UHIs and to quantify UHI intensities by comparing temperature differences between urban and non-urban areas. Initial findings reveal consistent growth in urban coverage alongside rising LSTs over urban areas indicating UHI effects with intensified UHI intensities during summer day times. These findings demonstrate applicability of remotely sensed data to spatially map and quantify thermal effects of urban growth. The results offer valuable insights for sustainable urban planning and emphasize the need to manage land development to lessen heat-related risks in rapidly growing cities.

1028

Intra-Annual Growth Dynamics of Sugar Maple (*Acer saccharum)* in Relation to Climatic Influence in Paint Rock, Alabama. K. Ghimire*, D. Lemke, Department of Natural Resources and Environmental Sciences, Alabama A & M University, Normal, AL, 35762.

Tree stems expand and contract in response to the replacement and depletion of stem water. Determining how weather influences tree growth during the growing season is useful for evaluating forest resistance to change in weather patterns. Continuous stem monitoring provides crucial information on a daily pattern of expansion and contraction, capturing both growth and water stress. The research examines the intra-annual growth patterns of *Acer saccharum* (sugar maple) in the Paint Rock Forest Dynamics Plot in Jackson County, Alabama. Electronic band dendrometers were installed on five mature trees at breast height (1.3 m) and have been measuring hourly stem circumference change since April 2023. The data were used to estimate irreversible stem expansion (GRO) and reversible contraction (TWD), representing true growth and tree water deficit, respectively. GRO and TWD were regressed daily against climatic variables and soil moisture at a depth of 51 cm from a nearby weather station. Spearman and Pearson correlation analyses were used to validate growth responses and climatic relations during the growing season. A 14-day moving correlation was applied to capture short-term climate–growth interactions. Early results suggest sugar maple has stem growth in cooler, more humid environments and lower growth in warmer, drier conditions. Findings confirm that sugar maple growth responds sensitively to short-term weather variability. Integration of dendrometer measurements with climatic data provides a sound foundation for the prediction of future climatic change responses of tree growth.

1029

Effects (Short- And Long-Term) of Biopolymers, Cork and *Rhizobium Tropici*-Derived Extracellular Polymeric Substances (EPS) on Soil Microbial Communities. O. Soyinka*, S. Karapareddy, S. K. Sanathanam, Z. Senwo, L. Nyochembeng, E. Moss, V. R. Sripathi, Department of Natural Resources and Environmental Sciences, Alabama A&M University, Normal, AL 35762.

Soil microbes play a crucial role in plant growth and development. Biopolymer amendments, such as cork and extracellular polymeric substances (EPS), may improve soil health but can affect sequencing and subsequent analysis. This study evaluated 48 soil samples from Decatur, Alabama, subjected to four treatments: unamended soil (soil.control), soil with cork (soil.cork), soil with EPS (soil.EPS), and soil with both cork and EPS (soil.cork.EPS). Samples were collected at four time points (0, 24, 48, and 72 hours-after-treatment) with three biological replicates per treatment. We first measured various physicochemical properties of soils, including pH, salinity, electrical conductivity, organic matter content, and available nutrients. Then, we used FastDNA Spin kit for DNA extraction. Microbial biodiversity was assessed by amplicon sequencing (Illumina/NextSeq) targeting the ITS region for fungi and the 16S rRNA for bacteria and archaea. The raw reads obtained were filtered and analyzed using Qiime2/PhyloSeq programs to identify 62,996 amplicon sequence variants (ASVs), with 513 and 467 ASVs commonly present across time points and treatments, respectively. The microbial community was primarily composed of Actinobacteria, Proteobacteria, and Acidobacteria, with Actinobacteria being the most abundant phylum. Core microbiome analysis identified Bacillus and Gaiella as dominant genera, playing key roles in soil ecosystem stability and nutrient cycling. These microbes contribute to carbon sequestration, nitrogen fixation, phosphorus solubilization, improving soil fertility, and plant-microbe interactions. These findings show how organic amendments affect microbial biodiversity

and composition, impacting soil fertility and microbial ecosystem stability. These findings contribute valuable information for enhancing soil quality and agricultural productivity.

1030

Assessing Irrigation Water Microbial Quality and Predicting *E. coli* Using Environmental Parameters at the Winfred Thomas Agricultural Research Station. A. Brooks*, E. M. Moss Department of Natural Resources and Environmental Sciences, Alabama A&M University, Normal, AL 35762.

Wildlife activity and human inputs can affect the microbial quality of irrigation water through runoff from manure and pasture lands, fecal deposition by wildlife, and discharge from sewer infrastructure. As a result, irrigation ponds may serve as potential sources of microbial contamination. The five-acre pond at the Winfred Thomas Agricultural Research Station (WTARS) supports fish and local wildlife and is considered a potential supplemental irrigation source for crops and livestock. Over a twelve-month period, ten interior and ten perimeter samples were collected five times per month using GPS for consistent spacing. Physicochemical parameters—including dissolved oxygen (DO), total dissolved solids (TDS), pH, specific conductivity, turbidity, and temperature—were measured with a YSI ProDSS. The study objectives were to (1) enumerate and assess seasonal variability of *E. coli* as a fecal indicator bacterium, (2) evaluate environmental drivers influencing *E. coli* presence, and (3) develop a machine-learning model to predict *E. coli* concentrations. Results showed that geometric mean *E. coli* counts remained below the U.S. EPA threshold of 126 CFU per 100 mL, indicating no immediate microbial concern. Strong positive correlations were observed between *E. coli* and pH, turbidity, and temperature, while negative correlations occurred with DO, TDS, and conductivity. The machine-learning model accurately predicted *E. coli* concentrations based on these parameters and seasonal trends. This study demonstrates the potential of predictive modeling to evaluate irrigation water quality and supports data-driven onfarm level management strategies.

1031

Assessing Microbial Community Responses to Cold Atmospheric Plasma Treatment in Agricultural Soils. G. Porter*, S. Mentreddy, E. Moss, Department of Natural Resources and Environmental Sciences, Alabama A&M University, Normal, AL 35762; and G. Xu, Department of Materials Science, University of Alabama in Huntsville, Huntsville, AL 35899.

As global population growth intensifies agricultural demands, maintaining fertile and uncontaminated soils has become increasingly critical. Conventional soil decontamination methods often disrupt microbial communities, reducing soil health and crop productivity. Cold atmospheric plasma (CAP), a novel and sustainable technology, has demonstrated potential for decontaminating soils and eliminating harmful bacteria with minimal environmental impact. However, its effects on soil microbial communities remain poorly understood. In this study, soil samples from an organic plot at the Winfred Thomas Agricultural Research Station were treated with CAP using argon as the carrier gas for 30, 60, 90, and 120 seconds. Untreated control and treated samples were analyzed using next-generation sequencing (NGS) by Zymo Research Laboratory to assess absolute abundance, community composition, and microbial diversity. Results showed a post-treatment shift toward Firmicutes dominance, along with decreased abundance and diversity compared to controls. These findings indicate that CAP can significantly alter soil microbial structure and highlight its potential as a tool for plasma-based soil remediation and sustainable agricultural management.

1032

Mapping Hypoxia in the Northern Gulf of America (Formerly Known as Northern Gulf of Mexico) Coastal Waters using a Geospatial Approach. J. Cummings*, R. Kulawardhana, M. Dunford, Department of Natural Resources and Environmental Science, Alabama A&M University, Normal, AL 35762.

Hypoxia, defined as dissolved oxygen concentrations below 2 mg/L, is a recurring environmental challenge in the northern Gulf of America, where nutrient-rich runoff and water column stratification contribute to one of the world's largest coastal "dead zones." This study hypothesizes that dissolved oxygen, chlorophyll-a (as a proxy for algal biomass), and water depth interact to influence the temporal severity and spatial extent of hypoxia, with implications for ecosystem health and fisheries sustainability. Multi-year dissolved oxygen measurements from NOAA's Southeast

Area Monitoring and Assessment Program (SEAMAP) were combined with satellite-derived chlorophyll-a concentration data from Moderate Resolution Imaging Spectroradiometer (MODIS) in geospatial analyses to evaluate their spatial patterns and changes over time. Our preliminary findings suggest that hypoxia is severe in deeper, stratified waters during the summer months, with strong associations to elevated chlorophyll-a concentrations. These findings can indicate nutrient-driven productivity and depth-related stratification as key environmental drivers of low-oxygen conditions in the region. This work contributes to improved understanding of hypoxia dynamics in the Northern Gulf of America and highlights the importance of integrating in-situ and satellite observations for coastal water quality monitoring.

1033

Preliminary Assessment of Carbon Dioxide Efflux and Methane Emissions across Three Urban Ecosystems in Baton Rouge, Louisiana. C. Jackson*, C. Chappell, Department of Urban Forestry, Environment, and Natural Resources, Southern University and A&M College, Baton Rouge, LA 70813.

Urban forest ecosystems play a critical role in regulating greenhouse gas dynamics, yet their contributions to atmospheric carbon dioxide (CO_2) and methane (CH_4) fluxes remain understudied, particularly in southern U.S. cities. This preliminary investigation aims to quantify CO_2 efflux and CH_4 emissions across three distinct urban ecosystems in Baton Rouge, Louisiana: a managed parkland, a semi-natural riparian corridor, and an urban farmland. Using portable gas analyzers and static chamber methods, we measured soil respiration and trace gas emissions during the fall season to capture baseline fluxes under relatively stable climatic conditions. Site-specific variables such as soil moisture, temperature, vegetation cover, and anthropogenic disturbance were recorded to assess their influence on gas exchange rates. Initial findings suggest notable variability in CO_2 and CH_4 fluxes among the sites, with the riparian corridor exhibiting elevated CH_4 emissions likely due to anaerobic soil conditions, while the parkland showed higher CO_2 efflux associated with active root respiration and microbial activity. These results underscore the heterogeneity of urban forest contributions to greenhouse gas budgets and highlight the need for spatially resolved monitoring to inform urban climate mitigation strategies. Future work will expand temporal sampling and incorporate remote sensing data to refine emission estimates and explore seasonal dynamics. This study provides foundational data for understanding biogeochemical processes in Baton Rouge's urban green spaces and supports the development of localized environmental policies aimed at enhancing urban sustainability.

1034

Automation for a Resilient Future for Agriculture: Technology, Tools, and Trends- Redefining Agriculture with Cutting-Edge Automation for a Sustainable and Productive Tomorrow. I. Innis*, C. Chappell, Department of Urban Forestry, Environment, and Natural Resources, Southern University and A&M College, Baton Rouge, LA 70813.

Global agriculture is at a critical juncture, facing escalating challenges from weather change, resource depletion, land degradation, and population growth. With the global population projected to exceed 9.7 billion by 2050, the sector must significantly increase productivity while reducing its environmental footprint. This body of work explores how automation is driven by artificial intelligence (AI), robotics, and the Internet of Things (IoT) is reshaping agricultural systems to meet these demands. We examine the deployment of advanced technologies such as autonomous tractors, aerial drones, intelligent irrigation systems, and real-time sensor networks that enable precision agriculture. These tools facilitate data-driven decision-making, optimize resource use, and enhance resilience to climatic variability. Additionally, we analyze emerging trends including vertical farming, precision livestock monitoring, and supply chain automation, highlighting their potential to address labor shortages, improve food security, and support sustainable intensification. This research underscores the transformative potential of automation in fostering a sustainable, productive, and climate-resilient agricultural future. It calls for collaborative efforts among researchers, policymakers, and practitioners to harness these innovations responsibly and inclusively.

1035

Assessing the Impact of Forest Cover Loss on Carbon Sequestration and Biodiversity in Kisatchie National Forest, Louisiana: A Remote Sensing and GIS Approach. K. K. Annan*, Z.H. Ning, R. Armah, D. Aniewu, Y.A. Twumasi, D. T. Gyan, E. Dadzie, J.D. Osei. Southern University and A&M College, Baton Rouge, LA 70813, USA.

The study aimed to assess how forest cover loss affected carbon sequestration and biodiversity in the Kisatchie National Forest, Louisiana, between 2001 and 2024. Using remote sensing and GIS techniques, we analyzed multi-temporal Landsat imagery and data from the Hansen Global Forest Change and NASA GEDI datasets to measure forest change and carbon dynamics. The results showed that approximately 11.6% of the total forest cover in the study area was lost during the 23-year period, mainly due to logging, wildfire disturbances, and land-use expansion. This decline in vegetation cover led to an estimated carbon sequestration reduction of about 2.8 million metric tons of carbon (equivalent to 10.3 million metric tons of CO_2). Biodiversity data obtained from the USGS BISON and GBIF databases indicated that areas experiencing higher rates of deforestation overlapped with known habitats of several forest-dependent species, including migratory birds and small mammals. Spatial correlation analysis revealed a negative relationship between forest cover loss and species richness. The findings demonstrated that the combined use of remote sensing and open-source biodiversity datasets provided an effective and low-cost approach to monitor environmental changes. This study offered valuable insight into how deforestation continues to threaten carbon storage and biodiversity within Louisiana's only national forest.

1036

Implementing Urban Planning and Planting in East Baton Rouge Parish Communities. Z. Harris,* Z. Ning, Department of Urban Forestry, Environment, and Natural Resources, Southern University and A&M College, Baton Rouge, LA 70813.

Urban planning that incorporates community-driven tree planting can improve neighborhood environments and support long-term sustainability. This research focuses on East Baton Rouge Parish, examining how local planning strategies and resident-led planting efforts can strengthen green infrastructure and environmental equity. The study identifies areas with limited tree canopy and evaluates opportunities for site-specific planting within neighborhoods, local schools, and public spaces. Collaboration with local organizations and schools guide site selection, species choice, and long-term maintenance planning. The project emphasizes community education, participation, and shared responsibility in caring for newly planted trees to ensure lasting success. Expected outcomes include a framework for sustainable community planting programs and a clearer understanding of how localized urban forestry contributes to social benefits, smart growth, and ecological health. By aligning urban planning with community engagement, this research seeks to create practical strategies that promote a greener, more inclusive Baton Rouge.

1037

Effects of Heat Stress on Meiotic Recombination in Maize. B. Wosti* and G. Lee, Department of Biology, West Virginia State University, Institute, WV 25112

Meiotic crossover (CO) is the exchange of genetic material during meiotic cell division, which ensures accurate chromosome segregation and generates genetic variability in sexually reproducing organisms. Temperature dynamics can influence the meiotic recombination landscape, thereby affecting genetic diversity and adaptation. In maize (*Zea mays*), tropical and temperate cultivars have distinct evolutionary origins and thermal adaptations that may contribute to differences in CO patterns. Our previous work found that during male meiosis, temperate lines showed higher and more variable CO numbers than tropical lines, suggesting possible temperature sensitivity of recombination mechanisms. Building on this observation, we investigate the molecular basis of heat stress-induced differences in meiotic recombination patterns between tropical and temperate maize lines. Additionally, through integrative genomic and transcriptomic approaches, we examine how elevated temperature induces dynamics of CO frequency and arrangement by modulating the expression of key CO genes, including *ZYP1* and *HEI10*, involved in synapsis formation, CO interference, and distribution. Analyses of coding and promoter regions of populations from different climatic regions aim to identify structural and polymorphic variations associated with the temperature sensitivity of respective regulatory genes. By bridging molecular regulation of CO-associated genes to environmentally induced variation in CO patterns, this study provides insight into the mechanisms underlying recombination plasticity. Our findings are expected to enhance the understanding of heat sensitivity and adaptation in meiosis and contribute to the breeding strategies for climate-resilient maize varieties.

1038

Horticulture-Based Organic Agroforestry to Prevent Soil Erosion and Forest Fire, and to Keep the Humans and Mother Earth Healthy. T. Dailey*, Department of Agriculture, Alcorn State University, Lorman, MS 39096; G. K. Panicker, Department of Agriculture, Alcorn State University, Lorman, MS 39096; and W. Mims, Department of Agriculture, Alcorn State University, Lorman, MS 39096.

Soil erosion and weather change are major global conservation issues. Agroforestry, an innovative land management system integrating crops, trees, and sometimes livestock, enhances ecosystem health, prevents erosion, improves soil health, and boosts productivity. Horticulture-based agroforestry, which excludes livestock, involves cultivating herbs, shrubs, and trees for food on the same land unit. This scientifically designed mixed cropping system combines annuals, biennials, and perennials for financial, environmental, and health benefits. Five acres of Memphis Silt Loam were divided into five blocks for pecans, vegetables, muscadines, blueberries, spices, and condiments. This pioneering U.S. research focuses solely on horticultural crops, with pecans as the tree component. Tree rows are spaced 45 feet apart within rows and 90 feet between rows, effectively preventing forest fires. Similar systems in Asia and Africa promote economic sustainability and nutrition for small farmers. In this system, annuals, biennials, muscadines, blueberries, corn, legumes, cover crops, chilies, ginger, cocoyam, and turmeric are cultivated. Intercropping, interplanting, and cover cropping are practiced with organic manure for nutrient management and erosion prevention. Randomized Complete Block Design (RCBD) and Completely Randomized Design (CRD) were used with organic treatments such as cow and poultry manure, plant waste, and worm castings. The C-factor research technology developed by ASU and USDA scientists is being applied for growth and biomass evaluation. AccuPAR and Ceptometers measured leaf area index and canopy cover. Soil health was assessed following Cornell University's National Soil Health Lab protocol. This system supports healthy, economically sound farming and serves as a training center for foresters, farmers, and conservationists.

1039

Evaluating Soil and Water Quality Effects on Pollinator Nutritional Exposure in *Cannabis sativa* Cultivation Systems. J. Davis*, Department of Agriculture & Natural Resources, Delaware State University, Dover, DE 19901; K. Milligan, Department of Chemistry, Delaware State University, Dover, DE 19901; and G. Ozbay, Department of Agriculture & Natural Resources, Delaware State University, Dover, DE 19901.

Pollinator health is increasingly threatened by environmental contaminants and nutrient imbalances that alter the chemical composition of floral resources essential for survival and reproduction. *Cannabis sativa* (hemp) cultivation offers a novel, agriculturally relevant platform to investigate how soil and irrigation water quality drive the transfer of trace elements and nutrients into floral tissues—critical pathways for pollinator exposure. This interdisciplinary study combines environmental chemistry and pollinator ecology to quantify these relationships under controlled conditions. Hemp plants will be grown in soils and irrigated with waters varying in mineral composition, pH, and heavy metal content to simulate Mid-Atlantic field variability. Pollen and nectar analogs will be analyzed using ICP-MS for essential minerals (Fe, Zn, K) and trace contaminants (Pb, Cd), and LC for organic nutrient profiling. Outcomes will establish baseline nutrient and contaminant signatures and reveal mechanistic links between soil–water quality and floral chemistry. By identifying potential exposure risks, this research advances sustainable cultivation strategies that protect pollinator health, strengthen agricultural productivity, and enhance ecosystem resilience—providing actionable insights for growers, policymakers, and conservationists.

1040

Assessing Microplastics and PFAS Co-contamination Within the Delaware Inland Bays: A Field and Laboratory-based Analysis Linking Land-use Characteristics to Pollutant Stratification. J. Stennett*, K. Jahan, G. Ozbay, One Health Lab, College of Agriculture, Science & Technology, Delaware State University, Dover, DE 19901

Anthropogenic marine debris predominates in the form of plastic while per- and polyfluoroalkyl substances (PFAS) operate as highly resilient chemical compounds, both leaching from multiple applications into aquatic habitats. Baseline levels of these contaminants and respective biological and ecological interactions in coastal environments are not well understood. With a focus on determining the effect of land use characteristics on the horizontal stratification of MPs and PFAS, this study aims to investigate the deposition, concentration, characterization, and ecological implications in the urbanized estuary system of Delaware Inland Bays. Various sample sites within

Rehoboth Bay were selected for their diverse proximities to key land use characteristics representing a spectrum of human impact. Land-use categories included freshwater inputs, minimally disturbed natural areas, and human-influenced and developed coastal zones. The site selection confers scientific rigor ensuring adequate coverage of key hydrologic and anthropogenic gradients.This methodology integrates water quality monitoring, debris capture, and sediment and water sampling across vegetated and non-vegetated areas to be analyzed with Raman Spectroscopy and Liquid Chromatography. This approach allows for spatiotemporal comparisons with an emphasis on the potential of aquatic vegetation to act as a natural buffer capable of sequestering PFAS and MP particles. Combining environmental monitoring with ecological chemistry and land-use analysis, this research highlights the localized effects of anthropic activity on pollutant behavior considering the role of natural elements in pollutant transport mitigation. Expected results aim to inform coastal management organizations by providing data-driven recommendations on fishery conditions, habitat protection, and a baseline for chemical contamination.

1041

Balancing Digital Growth and Water Sustainability: A Review from the Memphis Case. C. Spivey*, A. Fares, and A. Veettil. CAFNR Research, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446.

In 1968, Dr. Martin Luther King Jr. joined Memphis sanitation workers to protest unsafe working conditions. Decades later, similar concerns have resurfaced as data centers require large volumes of water for cooling, often drawing from shared community aquifers. The Memphis Sand (Claiborne) Aquifer supports municipal water supplies, agriculture, and local ecosystems, yet concentrated industrial withdrawals could increase pressure on this resource and raise equity concerns for nearby low-income and predominantly Black neighborhoods. This review examines what is currently known about data-center water use and its potential impacts on groundwater resources and community well-being. It synthesizes findings from peer-reviewed studies, public reports, utility documents, and policy analyses related to water use and aquifer sustainability. The review compares cooling technologies and water-use metrics such as Water Use Effectiveness (WUE), identifies documented cases of community impacts, and summarizes how other U.S. cities manage similar challenges. Overall, the literature indicates that water demand varies widely by cooling design, with closed-loop and reclaimed-water systems generally reducing freshwater withdrawals compared with evaporative cooling. However, public reporting of water use remains limited, and few studies directly address equity outcomes. The review highlights the need for more transparent water-use data, improved coordination between utilities and local governments.

1042

Water-Energy-Food Nexus in Texas: Exploring Impacts of the Energy Transition on Water Usage and CO_2 Emissions from 2000-2024. K. Akhtar*, R. Awal, A. Fares, A. Veettil, and A. Rahman, Cooperative Agricultural Research Center, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX, 77446

Texas has undergone a significant energy transition over the past 24 years, shifting from conventional fossil fuels to renewable energy sources such as wind and solar. Understanding the implications of this transition is crucial, particularly in relation to water usage and CO2 emissions. This study examines the Water-Energy-Food (WEF) Nexus within Texas's energy transition from 2000 to 2024, focusing on its impacts on water usage and CO2 emissions. This research explores how the shift from coal to renewable energy sources has influenced environmental factors. The analysis incorporates data from sources such as ERCOT, the U.S. Census, and climate records, evaluating trends in electricity generation, fuel mix, and environmental impacts. The study assesses changes in renewable and non-renewable energy sources and their relationship to water footprint reductions and CO2 emissions. Preliminary findings indicate that the rapid growth of wind and solar energy has significantly lowered the environmental footprint and reduced the water dependency of the state's energy sector. Texas' energy history has evolved over the last 24 years from non-renewable to renewable. The study also highlights how studying the energy transition allows for a deeper understanding of the interconnected impacts of energy production on water resources, agricultural systems, and the broader environment. This research underscores the importance of continued innovation in water-efficient energy technologies and resource management to ensure a balanced approach to energy production, water conservation, and environmental protection.

1043

Green Nanotechnology for Drought Stress Mitigation in Soybean (*Glycine max*). B. Bastakoti* and H. P. Singh, Fort Valley State University, Fort Valley, GA 31030.

Drought frequency and severity have escalated due to shifts in atmospheric conditions, affecting global food security and agricultural yields. Soybean (*Glycine max* L.), a globally important crop, is particularly vulnerable to drought stress, causing yield losses. Different strategies to mitigate the negative effects of drought are being considered. At the same time, nanotechnology offers promising solutions for enhancing drought tolerance, with silica nanoparticles (SiO_2NPs) gaining attention due to their nanoscale sizes, high surface area, and efficient uptake by plants, resulting in improved stress resilience. This study explores the green synthesis of SiO_2NPs from energycane leaves and their application to mitigate drought stress in soybeans. The synthesized SiO_2NPs were characterized and confirmed using scanning electron microscopy (SEM) and Transmission Electron Microscopy (TEM). The NPs size ranged from 10-50 nm. A greenhouse experiment will be conducted, and NPs will be applied at concentrations (0.15g/L, 0.25g/L and 0.35g/L) through foliar application during vegetative and pod filling stage. Significant physiological and yield contributing characteristics, including plant growth, relative water content, chlorophyll content, photosynthesis rate, number of pods per plant and 100 seed weight will be recorded to evaluate the effectiveness of SiO_2NPs treatment. It has been reported that SiO_2 nanoparticles will increase drought tolerance by maintaining metabolic processes under stress. The results of this study will aid in addressing agricultural issues brought on by environmental stress through the development of environmentally friendly, nanotechnology-driven solutions to increase crop resilience.

1044

From Peanut Shells to Hydrogels: Transforming Agricultural Waste into Sustainable Solutions. N. Gandham*, V. N. Degala and H. P. Singh, Nanotechnology Laboratory, Department of Agricultural Research, College of Agriculture, Family Sciences and Technology, Fort Valley State University, Fort Valley, GA 31030.

Peanut (*Arachis hypogaea*) processing generates substantial volumes of lignocellulosic biomass, primarily in the form of shells, which are frequently underutilized and relegated to low-value applications. Given their high cellulose, hemicellulose, and lignin content, peanut shells constitute a promising renewable feedstock for functional biomaterials. This study aims to evaluate the potential of using cellulose from waste peanut shells into superabsorbent hydrogel for application in agriculture. The peanut shells were milled into fine powder, and cellulose microfibers were extracted through sequential acid digestion, periodate oxidation, and sodium chlorite delignification. The resulting reactive cellulose, enriched in dialdehyde functionalities, was subsequently crosslinked with carboxymethylated chitosan via free-radical polymerization to generate a biodegradable superabsorbent hydrogel network. The hydrogel will undergo comprehensive physicochemical and functional characterization, including quantification of aldehyde and carboxyl groups, Fourier-transform infrared spectroscopy (FTIR) for bond confirmation, reswelling kinetics in aqueous environments, water content, and biodegradability under soil conditions. Functional evaluation will focus on water retention efficiency and reduction of evaporative water loss in soil systems. Peanut shell–derived hydrogels not only add value to an underutilized biomass stream but also provide a climate-smart solution for precision agriculture. Their dual role in conserving water and reducing environmental waste underscores their relevance for building resilient agricultural systems in the face of climate variability.

1045

Multiple Revenue Streams Using Short - Rotation Planting of *Paulownia elongata* and *P. fortunei* trees. R. Lamsal*, A. Basnet, and N. Joshee, Agricultural Research Station, Fort Valley State University, Fort Valley, GA 31030.

Paulownia elongata and *Paulownia fortunei* are fast-growing, short-rotation tree species that can be integrated with various agricultural practices to strengthen the bioeconomy through multiple value-added applications. Their lightweight, moisture tolerance timber matures within 10-12 years and is suitable for high-value wood products. Biochar produced using pyrolysis demonstrates high carbon content and structural stability, even without post-treatment with oxidants. Paulownia wood and biomass are also being studied as lignocellulosic feedstocks for biofuel production. Furthermore, Paulownia-based bio-composites are sustainable alternatives to the petroleum-based materials in construction and packaging industries. The leaves of Paulownia are rich in crude protein (14 - 23%) and other nutrients, supporting their use as livestock fodder and green manure. Feed pellets containing up to 95%

Paulownia leaves have been successfully developed, offering a sustainable alternative feed source. Additionally, large, nectar-rich flowers support quality honey production; a 5-acre demonstration farm at FVSU yielded 191 kg of pesticide-free honey over one blooming season. Further, the ability of Paulownia species to regenerate through coppicing, potential to survive on the marginal land, and a positive role in intercropping systems enhances its application in sustainable land use and income generation. These combined applications position *P. elongata* and *P. fortunei* as a strategic crop for integrating forestry, agriculture, and renewable energy operations to assist bioeconomy in the middle Georgia climate. There is scope for future studies to expand on the expression of a cellulose synthase genes, key to biomass formation, for selecting and developing superior lines supporting genetic improvement efforts.

1046

Comparison of Eddy Covariance Reference Evapotranspiration (Eto) Data with Open Access Satellite-Based Data in Central Texas. S.A. Marquez*, N. Kumar, and R.L. Ray CAFNR Research, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446.

Evapotranspiration data are crucial for planning and achieving efficient water utilization for agricultural purposes. Additionally, it is essential for sustainable use, as it is a limited resource with high demand, not only for irrigation purposes, but also for industrial and commercial uses. Additionally, innovative solutions can be devised by using them. Comparing Eddy Covariance (EC) data with open-access satellite-based data helps ascertain the strengths and limitations of each method. Therefore, the goal of this study is to evaluate the accuracy of satellite-based evapotranspiration estimates by comparing them with *in-situ* EC measurements to support efficient water management in agriculture. In this study, reference evapotranspiration (ETo) data from 2024 were obtained from the EC flux tower located at the experimental farm of Prairie View A&M, analyzed, and compared with ETo data obtained from Open-net and GridMET for the same year. The results of this study indicate that Open-net data showed an underestimation of Eto, with an average value of 65.54 mm. In contrast, GridMET showed an overestimation, with a value of 131.28 mm, compared to EC data, which was 104.65 mm. In conclusion, *in-situ* EC measurements provided the most reliable estimates for Eto, highlighting their value in precision irrigation planning. However, satellite-based data remain practical alternatives when ground-based instruments are unavailable.

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Influence of Crop Types on Soil Environmental Responses under Controlled Agricultural Practices. C.A. Igwenagu*, T.G. Tarkegn, and **R.L. Ray, CAFNR Research,** College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446**.**

Agricultural systems both influence and are affected by shifts in environmental conditions, making the adoption of sustainable farming practices essential for long-term food production. Resilient and resource-efficient agricultural practices play a key role in reducing emissions from agroecosystems and enhancing their adaptability. This study, conducted at the research farm of Prairie View A&M University, explores the dynamics of soil emissions of nitrous oxide, carbon dioxide, and methane across three major crop systems: corn, soybeans, and sorghum. These crops were cultivated under identical environmental conditions and management practices, including similar irrigation, tillage, and no-till treatments, as well as consistent soil amendments. Measurements of soil's nitrous oxide, carbon dioxide, and methane emissions were periodically collected across the three agroecosystems using chamber-based field methods, with concurrent measurements of soil moisture and soil temperature to assess potential variations in soil gas fluxes attributable to crop type. By comparing soil gas fluxes across these agroecosystems, the research aims to identify potential differences in the magnitude and patterns of soil gas fluxes attributable solely to crop-specific factors. Although data analysis is ongoing, the anticipated outcomes include identifying which crop systems are more efficient in minimizing soil gas emissions under controlled conditions. These insights will be crucial in informing future agricultural practices aimed at reducing the carbon footprint of crop production. Ultimately, the research contributes to the broader goal of enhancing resilience in agricultural landscapes through data-driven decision-making.

1048

Impact of Biochar Application Rates on Soil Health and Hydrological Parameters S. Chaudhary*, B.G. Tikuye, and **R.L. Ray**, CAFNR Research, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446.

Biochar, a carbon-rich material produced through the pyrolysis of organic biomass under limited oxygen conditions, is increasingly utilized as a soil amendment to improve soil health, enhance water retention, and carbon sequestration. However, its effectiveness strongly depends on the application rate, pyrolysis process, and site-specific conditions. This study assesses the effects of varying biochar rates on soil health and hydrological dynamics by integrating measurements from both soil and agroecosystems. The study was conducted at the Prairie View A&M University research farm. There were 6 treatment sites, which are 1) Biochar rate 1(2.5 tons/acre) with recommended fertilizer full rate, 2) Biochar rate 1 (2.5 tons/acre) with recommended fertilizer 0.25 rate, 3) Biochar rate 2 (5 tons/acre) with recommended fertilizer full rate, 4) Biochar rate 2 (5 tons/acre) with recommended fertilizer 0.25, 5) Biochar rate 1 (2.5 tons/acre), 6) Biochar rate 2 (5 tons/acre) including a control, to assess the optimal biochar application rate for improving soil health, enhancing water storage capacity and carbon sequestration. A two-way ANOVA was performed to assess the effects of biochar rate and NPK application, as well as their interaction, on soil health, water dynamics, and carbon sequestration. Results showed that biochar amendment improved soil moisture retention, reduced short-term temperature fluctuations, and stabilized soil microclimate conditions. The results demonstrate that optimized biochar application rates enhance soil health, mitigate climate extremes, and support sustainable agricultural management. This integrated approach highlights biochar's potential as a nature-based solution for enhancing soil-water-climate interactions.

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Assessing the Effect of Organic Amendment Type and Rates on Vegetation Indices with PSR+ Spectroradiometer. N. Ausaji*, R. Awal, B. Thapa, A. Fares, A. Elhassan, A. Adem, and A. Rahman, CAFNR Research, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446.

Organic soil amendments play a crucial role in improving soil health, nutrient availability, and vegetation growth; however, their effects on plant spectral responses remain less explored. This study aimed to assess the impact of different organic amendment types and application rates on vegetation performance using spectral measurements obtained with a PSR+ spectroradiometer. A factorial field experiment was conducted at the Prairie View A&M University Research Farm, incorporating two biochar application rates (2,268 and 4,536 kg ha^{-1}) and three nitrogen-equivalent rates of dairy and chicken manure (0, 224, and 448 kg N ha^{-1}). Reflectance data collected across the visible to near-infrared spectrum were used to derive key vegetation indices. Results indicated that the rate of organic amendment significantly influenced canopy reflectance and vegetation index values, with manure treatments generally enhancing spectral indicators of plant vigor compared to control plots. Higher application rates led to stronger vegetation index responses, indicating improved canopy development and increased chlorophyll content. These findings demonstrate that spectroradiometric analysis is a practical and non-destructive approach for quantifying vegetation responses to soil management practices, thereby supporting precision agriculture strategies for optimizing the use of organic amendments.

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Preliminary Results for Nitrogen Budgets in the Grow-Out of Phase II Sunshine Bass and Giant River Prawns farmed in Monoculture and Integrated Multi-Trophic Aquaculture Systems in Earthen Ponds. M. Haruna*, A. Nassiwa, A.R. Coursey and D.L. Flickinger, College of Agriculture, Environmental and Human Sciences (CAEHS), Lincoln University of Missouri, Jefferson City, MO 65101; K.M. Barbosa Lacerda, Institute of Coastal Studies, Federal University of Pará, Bragança 68600-000, Brazil; A.D. Ingram, S.A. McDuffee, M.C. Ward, S.M. Kemp and O.J. Silva, Center for Fisheries, Aquaculture, and Aquatic Sciences, School of Biological Sciences, Southern Illinois University, Carbondale, IL 62901.

This study aimed to quantify inputs, outputs and accumulation of nitrogen in integrated multi-trophic aquaculture (IMTA) and monoculture systems of phase II sunshine bass (*Morone saxatilis* ♂ x *Morone chrysops* ♀) and giant river prawns (*Macrobranchium rosebergii*) farmed in stagnant earthen ponds. The experimental design was completely randomized with three replications of four treatments. The factor tested was the type of production system with four levels: Fish monoculture (FM) with 2 ind/m^2, Prawn monoculture (PM) with 1 ind/m^2, Fish-prawn IMTA (IMTA-FREE) with the fish and prawns free-swimming at 2 ind/m^2 and 1 ind/m^2, respectively, and fish-prawn polyculture (POLY-CAGE) with the bass reared in cages at 390 ind/cage and the prawns free-swimming at 1 ind/m^2. Samples of

inputs of stocked animals, inlet water, rain, feed, and atmospheric gas and the outputs of harvested animals, total suspended solids, accumulated sludge, settleable solids, harvest water, and gas emissions were collected and analyzed to calculate the nitrogen budget. The duration of the experiment was 82 days from June 24, 2025, to September 17, 2025, and nitrogen samples are still being analyzed. The stocking and harvest periods were atypical of the recommended dates for these two species because of unseasonably cold weather in the late spring and late-mid summer. No significant differences were observed between treatments for dissolved nitrite, nitrate, total nitrogen, and total Kjeldahl nitrogen. The nitrite was at an acceptable level, which indicates that the dissolved oxygen was sufficient to convert ammonia from animal waste into harmless nitrate.

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Preliminary Results for Phosphorus Budgets in the Grow-Out of Phase II Sunshine Bass and Giant River Prawns farmed in Monoculture and Integrated Multi-Trophic Aquaculture Systems in Earthen Ponds. A. Nassiwa*, M. Haruna, C.A. King, A.R. Coursey and D.L. Flickinger, College of Agriculture, Environmental and Human Sciences (CAEHS), Lincoln University of Missouri, Jefferson City, MO 65101; K.M. Barbosa Lacerda, Institute of Coastal Studies, Federal University of Pará, Bragança 68600-000, Brazil; A.D. Ingram, S.A. McDuffee, M.C. Ward, S.M. Kemp and O.J. Silva, Center for Fisheries, Aquaculture, and Aquatic Sciences, School of Biological Sciences, Southern Illinois University, Carbondale, IL 62901.

This study evaluated the phosphorus inputs, outputs, and accumulation for the phase II production sunshine bass (*Morone saxatilis* x *Morone chrysops*) and the giant river prawn (*Macrobrachium rosenbergii*) grow-outs in monoculture and integrated multi-trophic aquaculture (IMTA) systems. The experiment was completely randomized with four treatments in triplicate: fish monoculture with 2 fish/m^2, prawn monoculture with 1 prawn/m^2, IMTA with both animals free-swimming at 2 fish/m^2 and 1 prawn/m^2, and polyculture of the fish reared in cages at 390 fish/cage and prawns free-swimming at 1 prawn/m^2. The phosphorus budget was determined by measuring the phosphorus contents of the inputs of the feed, stocked animals, inlet water, and rain, and the outputs of harvested animals, accumulated sludge, total suspended solids, settleable solids, and outlet water collected throughout the experiment. The duration of the experiment was 82 days from June 24, 2025, to September 17, 2025, and phosphorus of the different samples is still being analyzed. The stocking and harvest periods were atypical of the recommended dates for these two species because of unseasonably cold weather in the late spring and late-mid summer. Productive performance data of the different treatments were obtained. Two of the three prawn monoculture ponds had no survival. This may be due to predation from insect larvae, turtles, and/or otters, or perhaps due to temperature fluctuations. The most interesting result thus far is that the freshwater prawns showed some survival when reared with the sunshine bass. Bass are carnivorous and were expected to consume the prawns.

1052

Effects of Prescribed Burning and Thinning on Oak Regeneration in Central Missouri. E. Rolfes*, I. Hayford and X. Zhang, College of Agriculture, Environmental and Human Sciences (CAEHS), Lincoln University of Missouri, Jefferson City, MO 65101; B. O. Knapp, School of Natural Resources, University of Missouri, Columbia, MO 65201.

The upland forests of central Missouri have shown recent patterns of successional change from oak dominance to species associated with more mesic conditions, like maples, due to factors including fire suppression. While oak species dominate the overstory, challenges exist in developing competitive oak reproduction for successful recruitment. While prescribed burning can reduce competitor densities and improve light availability, the competitive capacity of oak reproduction may not be improved, as the increased light benefits tends to be short-lived. To improve oak regeneration in mixed hardwood forests, prescribed burning in combination with precise thinning prescription is necessary. This study uses a completely randomized design, with one of four treatments randomly assigned to 12 forest stands at the University of Missouri's Baskett Wildlife Research and Education Center in Boone County, Missouri. The four treatments included midstory removal, prescribed burning, midstory removal combined with prescribed burning, and untreated control. We collected pre-treatment data on the density of natural reproduction in June 2024. Midstory removal was conducted in December 2024, followed by prescribed burning in March 2025. In April 2025, 1200 white oak (*Quercus alba* L.) seedlings were planted in each plot, with basal diameter and height measured at planting and set for remeasurement in January 2026. This study will evaluate the impact of the treatments on the density of naturally regenerated oaks, and the survival and growth of planted oak seedlings. Our findings will inform the development of management guidelines for successful oak regeneration in Missouri upland forests.

1053

Nutrient and Contaminant Dynamics in Recirculating Aquaculture Systems Under Soy-Based Diets: Phase I – Nitrogen Evaluation. V.A. Kazibwe*, S.O. Onileowo and J.K. Maiyo College of Agriculture, Environmental and Human Sciences (CAEHS), Lincoln University of Missouri, Jefferson City, MO 65101.

The replacement of fishmeal with plant-based proteins is an essential means of diversifying aquaculture feeds and promoting sustainability in fish production systems. However, the implications of this diversification for fish growth, health, and water quality in recirculating aquaculture systems (RAS) are still underexplored. This study evaluated nitrogen dynamics associated with soy-based diets during the culture of rainbow trout (*Oncorhynchus mykiss*) in RAS. Fish were fed to satiation using three experimental diets containing up to 50% soy-based protein replacement. Water samples were collected three times weekly from the fish tanks, the sump, and after the biofilter to assess water quality responses to dietary treatments. Results showed that replacing fishmeal with soy did not result in significant differences in ammonia-nitrogen (NH_3–N), nitrite-nitrogen (NO_2–N), or nitrate-nitrogen (NO_3–N) concentrations among individual tanks. This lack of variation was attributed to the short hydraulic residence time (~3 hours) within the fish tanks and the shared recirculation loop, which homogenized water quality across treatments. Biofilter NH_3–N conversion efficiency ranged from 60.82% to 21.38% over the production cycle. Environmental conditions, including temperature (58.9 ± 0.61 °F) and dissolved oxygen (7.22 ± 0.25 mg/L), were maintained within optimal ranges for trout growth and nitrification. Future research will employ independent biofilters for each diet treatment to isolate nutrient loading effects and evaluate the direct water quality implications of soy-based aquafeeds. Additional analyses will incorporate per- and polyfluoroalkyl substances (PFAS) and antibiotic residues better to understand contaminant dynamics in RAS with plant-based diets.

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Evaluation of Goat Production Performance by grazing on silvopasture compared to open pasture system. J. Noi, S. Bardhan, M. Acharya, K. Adams and T. Wuliji, College of Agriculture, Environmental and Human Sciences (CAEHS), Lincoln University of Missouri, Jefferson City, MO 65101.

The objective of this study was to evaluate silvopasture compared with open pasture grazing for goat production performance. Forty mixed breed does (Spanish, Kiko, and Boer crosses) with 77 suckling kids were randomly allocated between silvopasture (n=20 does, 39 kids) and open pasture (n=20 does, 38 kids) grazing treatments using rotational paddock design over 6 weeks. Assessments included forage biomass and quality analysis, and monitoring animal performance traits, including body condition scoring, ultrasound measurements, FAMACHA assessment, fecal egg count analysis, and kid growth performance across three recording intervals. Open pasture demonstrated substantial production advantages: 137.5% higher fresh weight, 106.7% higher dry matter production, 12.3% higher crude protein (16.39% vs 14.60%), and 9.2% lower acid detergent fiber (better digestibility). Despite lower biomass, silvopasture forage met NRC nutritional quality standards. Plant communities differed markedly—silvopasture showed high diversity (18+ species) versus open pasture dominance by tall fescue-white clover associations. Both systems imposed severe physiological stress, with greater deterioration in silvopasture. Longitudinal blood monitoring of the same animals revealed progressive anemia: hemoglobin declined from baseline (~10 g/dL) to clinically severe levels (5.28 g/dL silvopasture; 6.58 g/dL open pasture). Silvopasture animals experienced reduced muscle development (loin eye area: 4.95 vs 5.90 cm^2, p=0.039). External parasite pressure was notably higher in silvopasture, with increased tick infestations compounding internal parasitic stress. FAMACHA scores showed temporary mid-trial silvopasture advantage (p=0.021). The study demonstrates that silvopasture grazing can support goat production with a light to moderate stocking intensity will sustain regular rotational grazing schedules.

1055

Analytical Survey of Elemental Distribution in Topsoil of Lincoln University Research Farms by Energy Dispersive X-Ray Spectroscopy. N. Ishola*, D. Thomas, K. C Dipsanaa, X.Y. Guana, K. Adams, and T. Wuliji, College of Agriculture, Environmental and Human Sciences (CAEHS), Lincoln University of Missouri, Jefferson City, MO 65101; C. Keb, University of Missouri, Columbia, MO 65201.

Energy-dispersive X-ray spectroscopy (EDS) is a rapid analytical technique complementary to the scanning electron microscope (SEM) imagery. This study is to evaluate the applicability of EDS for analytical survey of elemental distribution in farmland topsoil. Soil samples were collected from 12 sampling sites on each of three Lincoln University farms in two consecutive years. Analytical soil specimens were subsampled and prepared according to the standard EDS procedures. COXEM EM-30AX Scanning Electron Microscope (SEM) fitted with an EDS Spectrometer (Oxford) was used for elemental identification, qualitative and quantitative analysis. Duplicate SEM observation and EDS specimens were prepared for each soil sampling site and elemental measurement. Five repeated elemental counting (AZtec Software) were recorded for each specimen. Twenty elements commonly occurring in farm soil were pre-selected for qualitative and quantitative analysis, including Al, As, C, Ca, Cl, Co, Cu, Fe, K, Mg, Mn, Mo, N, Na, O, P, Se, S, Si and Zn. The results show there is no difference in elemental variety or quantity among sampling sites, topographic (hill-site and plain-site) sites, between farms and sampling years. There was a nonsignificant but higher content for AL, C, Fe and Mg on hill-site than plain-site soil. Whereas a higher content for Ca, Mo, Na, and Si was recorded in plain soil rather than hill soil. Mean elemental mass were, respectively. Results indicated EDS measurement has high repeatability, consistency, and valid real-time qualitative and quantitative estimates for elemental distributions in farmland soil.

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Preliminary Results for Carbon Budgets in the Grow-Out of Phase II Sunshine Bass and Giant River Prawns farmed in Monoculture and Integrated Multi-Trophic Aquaculture Systems in Earthen Ponds. C.A. King*, M. Haruna, A. Nassiwa, A.R. Coursey and D.L. Flickinger, College of Agriculture, Environmental and Human Sciences (CAEHS), Lincoln University of Missouri, Jefferson City, MO 65101; K.M. Barbosa Lacerda, Institute of Coastal Studies, Federal University of Pará, Bragança 68600-000, Brazil; A.D. Ingram, S.A. McDuffee, M.C. Ward, S.M. Kemp and O.J. Silva, Center for Fisheries, Aquaculture, and Aquatic Sciences, School of Biological Sciences, Southern Illinois University, Carbondale, IL 62901.

This study aimed to quantify inputs, outputs and accumulation of carbon in integrated multi-trophic aquaculture (IMTA) and monoculture systems of phase II sunshine bass (*Morone saxatilis* ♂ x *Morone chrysops* ♀) and giant river prawns (*Macrobranchium rosebergii*) farmed in stagnant earthen ponds. The experimental design was randomized with three replications of four treatments. The factor tested was the type of production system with four levels: Fish monoculture (FM) with 2 ind/m², Prawn monoculture (PM) with 1 ind/m², Fish-prawn IMTA (IMTA-FREE) with the fish and prawns free-swimming at 2 ind/m² and 1 ind/m², respectively, and fish-prawn polyculture (POLY-CAGE) with the bass reared in cages at 390 ind/cage and the prawns free-swimming at 1 ind/m². Samples of inputs of stocked animals, inlet water, rain, feed, and atmospheric gas and the outputs of harvested animals, total suspended solids, accumulated sludge, settleable solids, harvest water, and gas emissions were collected and analyzed to calculate the carbon budget. The experiment lasted 82 days from June 24, 2025, to September 17, 2025, with carbon from some samples still being analyzed. Among the more interesting results are that several samples of gas ebullition showed no capture of gas bubbles. Fiberglass funnels floated at the pond surface for 24 hours every two weeks to capture gas bubbles. Presence of gas bubbles indicates that organic carbon is being metabolized anaerobically with nitrate as the principal terminal electron acceptor. The absence of bubbles and the adequate dissolved oxygen indicate that most of the organic carbon was metabolized aerobically.

1057

UAS LiDAR for Forest Inventory in Missouri's Ozark Forests. J. Desha* and X. Zhang, Cooperative Research, College of Agriculture, Environmental and Human Sciences (CAEHS), Lincoln University, Jefferson City, MO 65101

Forest inventory provides essential information for sustainable forest management, carbon accounting, and ecosystem monitoring. Traditional ground-based methods remain accurate but are costly, time-consuming, and restricted in spatial scale. Unmanned aircraft system (UAS) LiDAR offers a cost-effective and scalable solution for forest inventory, bridging the gap between traditional ground surveys and satellite observations. This study employs UAS LiDAR for forest inventory in the Missouri Ozark Forest Ecosystem Project (MOFEP) Conservation Area, a long-term experimental forest with permanent plots distributed across even-aged, uneven-aged, and control management treatments.UAS LiDAR data was collected under leaf-on conditions in fall 2025, and the complementary leaf-off flight is scheduled in spring 2026 to capture seasonal and structural variability. The LiDAR point clouds will be processed to generate canopy height models, voxel- and percentile-based indicators, and terrain models. These metrics

will be paired with MOFEP ground-plot data to train and validate machine learning models for estimating diameter at breast height (DBH), basal area, biomass, and species composition, including dominant oaks such as *Quercus alba* (white oak). Finally, UAS-LiDAR derived predictions will be compared across MOFEP's treatments to evaluate differences in forest structure and composition under varying management regimes. This work will provide a scalable and cost-effective framework for forest inventory in Missouri's Ozark forests, while also contributing insights into the long-term effects of forest management strategies.

Student Poster Presentation – Undergraduate Competition

Agricultural Systems and Technology

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AI-Powered Smart Textiles: Redefining Profitability and Wellness in the Hospitality Industry. Smith, S.* Opiri, J. Department of Human Sciences, University of Arkansas Pine Bluff., AR 71601.

This research investigates the potential of AI-powered smart textiles as an emerging innovation that enhances both guest well-being and profitability in the hospitality industry. By embedding sensors into hotel fabrics such as bedding and curtains, artificial intelligence can analyze non-identifiable guest data to automatically adjust environmental conditions, thereby improving comfort and sleep quality. The purpose of this study is to examine how such technology reshapes the hospitality experience and to assess guest perceptions and attitudes toward its adoption. A mixed-method approach is employed. Participants are presented with a hotel room scenario featuring AI-powered smart textiles and asked to evaluate their perceptions, attitudes, and willingness to pay for the enhanced experience. Qualitative insights are combined with secondary data from industry reports and academic literature to analyze the commercial feasibility and strategic value of this innovation. The implications highlight a paradigm shift from offering simple accommodation to delivering restorative, AI-enabled wellness experiences. Integrating smart textiles positions hotels to meet the rising demand for wellness tourism while achieving sustainable profitability and differentiation in a competitive global market.

1059

3D Printing for Next-Generation Aquaculture. R. Gillespie and B. Quinn. School of Arts and Sciences, Langston University, Langston, OK 73050

The global fisheries sector encompasses a broad economic spectrum, ranging from a multi-billion-dollar recreational angling industry to a vast commercial aquaculture operation that is vital to global food production. This project leverages the Form 4 3D printer's high-speed and high-resolution capabilities to create new, immediate products that address challenges in both industries. For recreational fishing, this project presents an approach for "Eco-specific tackle" design. Structural profiles of foraging fish from specific regions are converted into precision 3D models using Computer-Aided Design (CAD) software. These models allow support for the creation of hydraulically tailored hard baits and high-resolution master molds for custom soft-plastic lures, which improves performance and species-specific targeting. Commercial aquaculture focuses on minimizing operational downtime and enhancing research efficiency. Functional replacement components, such as aerator nozzles, pump fittings, and feeder parts, are quickly manufactured from engineering-grade resins. Tailored labware and experimental tools, which include specialized sorting trays and feeding systems, are also designed to improve research and operational procedures. The dual-sector strategy highlights the actual benefits associated with using additive manufacturing in fisheries. It enables a new generation of high-performance, personalized tackle for recreational fishermen, while aquaculture producers profit from cost-effective, quick solutions for maintenance, problem fixing, and research advancement. Together, these findings emphasize 3D printing as a transformative tool for improving economic efficiency, operational agility, and creativity in the fisheries industry.

1060

Sustainable Crop Management Through the Integration of Artificial Intelligence for Weed Detection and Food Safety. O. Ogunbade*, K. Harris, S. Chambo, Department of Human Sciences, University of Arkansas at Pine Bluff, Pine Bluff, AR 71601.

Weeds remain one of the most persistent challenges in global food production, threatening crop yield, quality, and ultimately food security (Sow et al., 2024). Recent advances in artificial intelligence (AI) have transformed agricultural weed management, offering data-driven solutions that enhance accuracy, reduce costs, and strengthen food safety practices (Monteiro et al., 2021; Wang et al., 2019). Intelligent tools, such as machine learning models and autonomous sprayers, enable site-specific detection and targeted treatment, thereby promoting food safety, which is crucial for human health, advancing environmental sustainability, and ensuring safe food systems. This study examines how AI innovations enhance efficient and environmentally responsible weed management, with a focus on their role in ensuring food safety. It aims to bridge the gap between conventional weed control methods and emerging AI-based agricultural systems. This information, when combined with AI technologies, may help improve the precision of weed control and promote agricultural sustainability.

1061

I**mpact of Drone Imaging on Stress Parameters in Meat Goats.** C. Mrani-Alaoui*, S. Harmer, and K. Matthews, Department of Agriculture and Natural Resources, Delaware State University, Dover, DE 19901. Virginia State University; E. Otchere, Department of Poultry Science, 101 Kleberg, College Station TX 77843; D. O'Brien, Virginia Cooperative Extension, Virginia State University, 1 Hayden Drive, Petersburg, VA 23806

Monitoring animal health in large herds is labor-intensive and often requires frequent handling and a large workforce. With advances in technology, especially the use of drones, more efficient and non-invasive methods for health surveillance methods. However, flying drones over animals can cause stress or nervousness. This study aims to assess the impact of drone use on the stress levels of meat goats. Forty-five meat goats (n = 45) were divided into nine paddocks with five goats each (n = 5) and monitored over 98 days using a DJI Matrice M350 RTK drone with an H20T thermal camera at 50 ft to capture images. Blood samples were taken every 14 days to measure cortisol levels. Briefly, blood was collected via jugular venipuncture, placed in EDTA tubes, and centrifuged at 2000 rpm for 20 minutes. The plasma was then collected for analysis. Cortisol was measured with a commercial ELISA kit (LSBio, Seattle, WA, USA) following the manufacturer's protocol on days 0, 56, and 98. Absorbance was read at 450 nm, and cortisol concentrations were calculated using a standard curve. Results showed a significant day effect ($P < 0.001$) on plasma cortisol levels, which decreased from Day 0 (28.2 ± 0.4 ng/mL) to Day 56 (14.6 ± 0.4 ng/mL) and Day 98 (14.2 ± 0.4 ng/mL). Under the conditions of this study, it can be concluded that using drones for data collection is a non-invasive and effective method, as the goats habituated to their environment and became accustomed to the drone's repeated noise.

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Applications and Challenges of UAV Assisted Soil Health Monitoring: Insights from the Literature. J. Labady*1, F.L. Tucker1, L. Anderson-Hodges2, and T.L. Carter1, 1Agricultural Research Station, Virginia State University, Virginia, 23806; 2Southern University Agricultural Research and Extension Center, Baton Rouge, Louisiana 70813.

Healthy soils are a fundamental component of sustainable agriculture, influencing crop productivity, nutrient cycling, biodiversity, and environmental regulation. Unmanned aerial vehicles (UAVs), also known as drones, have emerged as valuable tools for assessing, monitoring, and managing soil conditions with high spatial precision. Combined with in-situ soil sensors, drone-based remote sensing offers a comprehensive view of soil dynamics, linking topographic surface patterns with subsurface soil property measurements. This work examines the applications of drone technology in soil health management and the challenges of integrating aerial and ground-based data. Differences in the spatial and temporal resolutions of drone imagery versus in-situ soil sensor data may complicate calibration and reduce measurement accuracy. By integrating multispectral, thermal, and high-resolution imaging, drones can provide detailed spatial data that informs soil management strategies and supports conservation practices. However, several challenges limit the use and adoption of drone-based technology, including sensor calibration errors, limited soil penetration depth, high operational costs, the need for ground-truth data validation, and short flight endurance due to battery life. Looking ahead, addressing these challenges through advances in sensor technology, AI-based data analytics, and standardized soil assessment protocols will be essential to realize the potential of drones in soil health monitoring. Overall, drone-based soil monitoring represents a transformative advancement in precision agriculture, enabling stakeholders to better understand, maintain, and restore soil health across various agricultural landscapes.

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Calibration of Home-based Soil Test Kits for Use by Urban Farmers and Gardeners. J. Vega* and L. Githinji. College of Agriculture, Virginia State University, Petersburg, VA 23806

Maintaining healthy and productive soil is essential for growing healthy plants and soil tests provide more helpful information on soils than any other resource. It is an inexpensive way to maintain good plant health in urban forests, landscapes, and lawns, and to maximize the productivity of nurseries, vegetable gardens, and fruit crops. Recommendations based on soil test results save time, money, and help protect our environment by discouraging the overapplication of fertilizers. They can also be used to guide plant selection and serve as an additional tool in the plant diagnostics toolbox. Existing soil testing procedure takes time; from samples collection to mailing them to the laboratory. Home-based soil testing kits can simplify this process and save considerable amount of time. However, not all soil test kits are created equal. Hence, the goal of the study was to evaluate the accuracy of selected soil testing kits, with a focus on soil pH and the three primary nutrients—potassium, phosphorus, and nitrogen—that are needed by plants in larger quantities for growth and productivity. Triplicate soil samples were collected from various urban garden and farm sites and tested; one set using the "Rapidtest"; one set using the "Hold All" test kit and another set in a conventional soil testing lab. The results showed a high correlation in the magnitude between 0.70 and 0.90 for all the parameters and among the three methods. These results indicate usefulness of the test kits for affordable soil fertility assessments.

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Evaluation of Selected Potting Mixes and Their Effect on Growth and Yield of Vegetable Crops. K. Larue*, L. Rutto, D. Andrews-Brown, and L. Githinji. College of Agriculture, Virginia State University, Petersburg, VA 23806

This study was conducted to determine the suitability of multiple potting mixes for production of selected leafy vegetables. The experiment was conducted in a greenhouse located at Virginia State University Research and Demonstration Farm. Selected chemical, physical, and hydraulic properties of the mixes were determined, including organic matter (OM), essential nutrients, pH, bulk density (BD), volumetric water contents (VWC), hydraulic conductivity, infiltration, and matric potential (MP). The experiment was set up as a CRD with 6 treatments replicated 3 times. Curly kale (Brassica oleracea var. sabellica) and arugula (Eruca versicaria) growth characteristics including visual quality rating, plant height, leaf length and width were recorded weekly for the corresponding treatments. At the end of the experiment, the plant biomass was determined. All the data collected was subjected to analysis of variance (ANOVA) and further analysis using Tukey HSD test. The results revealed that PM1 had significantly higher BD, Ca, and pH, but significantly lower OM, Mg, MP, and GWC, compared to the other potting mixes. The visual quality rating of PM1 was significantly lower than that of the other potting mixes. However, PM2, PM3, and PM4 were not significantly different from each other. We concluded that not all the potting mixes are ideal for plant growth. PM1 revealed suboptimal characteristics and we recommend adding organic and inorganic amendments and nutrients to improve its properties.

1065

Chemical, Physical, and Hydraulic Properties of Biochar-Vermiculite Blends and Their Potential to Enhance a Loamy Sand Soil for Crop Production. M. Blakey* and L. Githinji. College of Agriculture, Virginia State University, Petersburg, VA 23806

In this study, various biochar-vermiculite mixes were evaluated for their properties and their potential to improve a loamy sand soil (Fine, kaolinitic, thermic Typic Hapludults) at Virginia State University's Randolph Farm. The various biochar-vermiculite mixes, viz., 0% Biochar/100% Vermiculite (0B/5V); 20% Biochar/80% Vermiculite (1B/4V); 40% Biochar/60% Vermiculite (2B/3V); 60% Biochar/40% Vermiculite (3B/2V); 80% Biochar/20% Vermiculite (4B/1V); and 100% Biochar/0% Vermiculite (5B/0V) were evaluated for their chemical, physical, and hydraulic properties. Hence, selected biochar-vermiculite mixes with the most promising properties were applied in potted loamy sand soil at five rates, viz, 0%, 25%, 50%, and 75%, followed by incubation for 15 days. Simultaneously, vegetable seeds were started in seedling trays. The experiment was set up as a completely randomized design (CRD), with 6 treatments of biochar-vermiculite mixes replicated 3 times. The results showed that the plant growth parameters improved with increased vermiculite rate. Although the application of a higher biochar rate improved the chemical

and hydraulic properties compared to vermiculite, this was not sufficient to increase the plant growth parameters. We therefore recommend mixes that have higher rates of vermiculite relative to biochar for optimal growth characteristics of plants. This study provides insights into the development of effective soil management strategies to foster sustainable agriculture.

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Effect of Accelerometer Location on Machine-Learning-Predictive Models of Animal Behavior. I. Bradhams, Department of Agriculture, Virginia State University, Petersburg, VA 23803; R. Puchala, School of Agriculture and Applied Sciences, Langston University, Langston, OK 73050; T. Gipson, (retired) School of Agriculture and Applied Sciences, Langston University, Langston, OK 73050; S. Wildeus, Agricultural Research Station, Virginia State University, Petersburg, VA 23803; D. O'Brien, Cooperative Extension and Agricultural Research Station, Petersburg, VA 23803; N. Brown, Department of Agriculture, Virginia State University, Petersburg, VA 23806.

Behavior is a key indicator of animal welfare and well-being. Increasingly artificial intelligence, specifically machine learning, has been used in conjunction with accelerometers to assess animal behavior. However, the location of the accelerometer can affect the accuracy of the predictive model. Therefore, the objective of this research is to explore accelerometer placement (rear leg vs. foreleg) on model accuracy in predicting lying/standing/walking behavior in sheep. Six wethers were randomly selected from the VSU research flock and fitted with accelerometers attached to the inside of the left metacarpus (fore) and left metatarsus (rear) of each sheep. Sheep were housed on pasture for five days and had access to shelter, water, feed, and grazing. Sheep were observed and behavior recorded, resulting in 42 animal-hours of observations. Accelerometer data were merged with the behavior data and analyzed using random forests from the scikit-learn, which is an open-source Python library of machine learning tools. Random forests were generated for fore and rear leg predictive models. The accuracy of the random forests was 89.7% and 89.7% for fore and rear, respectively. Accuracy did not improve using a 10-fold cross-validation approach (89.6% and 90.1% for fore and rear, respectively). Location of accelerometers did not have a significant effect on the accuracy of the predictive ability of random forest models.

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Virtual Soils: Advancing Experiential Learning and Public Engagement through Virtual Reality Technologies. C.J. Hines*, T.L. Carter, A. Hilliard, and R.M. Howell, Jr., Agricultural Research Station, Virginia State University, Virginia, 23806.

Soil is a critical component of agricultural production, with experiential learning and outdoor observation serving as fundamental components of soil science education. However, traditional field activities are often constrained by university resources, scheduling conflicts, adverse weather, physical constraints, and other environmental challenges. The growing emphasis on online and hybrid learning has accelerated the need for innovative teaching tools that maintain the rigor and engagement of in-person experiences. This study integrates virtual reality (VR) as a pedagogically grounded tool for enhancing soil science learning through immersive, inquiry-based environments. By combining experiential and constructivist learning frameworks, VR lessons simulate authentic field experiences that enable students and stakeholders to visualize, explore, and interact with soil environments in engaging and immersive ways. The incorporation of immersive soil observation methods into classrooms, outreach, and public engagement efforts can reduce logistical barriers while enhancing understanding and interest in soil science concepts. VR addresses educational constraints by providing safe, repeatable, and cost-effective simulated field settings. VR also offers the potential to improve accessibility as virtual field trips and labs reduce physical environmental constraints on learners. This study aims to evaluate the use of VR and its impact on comprehension and engagement across diverse audiences. Findings will inform the development of a scalable framework for evidence-based integration of virtual technologies into soil conservation education and outreach, bridging the gap between digital innovation and field-based pedagogy.

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Variation in Starch-Iodine Spectra of Maize Inbreds Within and Between ae and ae Waxy Genotypes Across Two Years. *Ernsley Eliodor, Agricultural Research and Development Program, Central State University, Wilberforce, OH 45384; Mark Campbell, Agricultural Research and Development Program, Central State University,

Wilberforce, OH 45384; and Luke Farno, Agricultural Research and Development Program, Central State University, Wilberforce, OH 45384

Starches from single-mutant amylose-extender (ae) and double-mutant amylose-extender waxy (ae wx) maize genotypes show distinct starch–iodine spectra compared to normal maize starch. These spectral differences are important for breeding specialty starch types and serve as diagnostic tools for genotype confirmation. In ae genotypes, starch–iodine complexes form mainly between amylose and iodine, allowing estimation of amylose or apparent amylose content using single or multiple wavelengths. In contrast, ae wx genotypes lack amylose and contain only amylopectin with longer internal branches. This study characterizes genotype variation within ae and ae wx types by analyzing lambda maximum absorbance spectra from 500 to 620 nm. Apparent amylose content was estimated using absorbance at 620 nm, the 620–510 nm difference, and the 640/550 nm ratio. Samples were collected from inbred lines grown for at least two years. Starch was isolated using a laboratory wet-milling procedure, and samples were analyzed in duplicate using colorimetric absorbance scanning from 500 to 620 nm at 10 nm intervals. ANOVA evaluated genotype (G), inbred (I), inbred nested within genotype [I(G)], year (Y), and the I(G) × Y interaction. Repeatability estimates were calculated to assess genetic versus environmental contributions. Ae genotypes exhibited lambda maxima between 580–600 nm and apparent amylose values of 55–80%, significantly higher than normal maize. ae wx genotypes showed lambda maxima between 540–560 nm. Genotype, inbred line, and year effects were significant, with genetic variation contributing more to spectral differences than environmental factors. The study demonstrates substantial genotypic variation for amylose content and amylopectin branching structure.

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The Role of Nitrogen Management in Supporting Farm Productivity and Economic Sustainability. D. Mitchell*, A. Mukunzi, K. Jefferson-Moore, Department of Agribusiness, Applied Economics and Agriscience Education, North Carolina Agricultural and Technical State University, Greensboro, NC 27411.

Nitrogen is a vital nutrient for plant growth and a cornerstone of profitable farming. This study explores literature on nitrogen management and its influence on crop yield and quality. Adequate nitrogen levels enable crops to grow vigorously, store energy efficiently, and achieve their genetic potential, resulting in higher market value and increased farm revenue. Conversely, poor nitrogen management or losses through volatilization and leaching can lead to diminished yields, crop stress, and financial losses due to wasted inputs. Effective nitrogen management—supported by soil microbial activity, mineralization, and diagnostic tools like soil testing—enhances nitrogen use efficiency and reduces costs. This study also highlights the economic benefits of organic nitrogen sources and cover crops, promoting microbial health to recycle nitrogen within the soil system. Such practices decrease reliance on synthetic fertilizers and contribute to long-term soil fertility. By optimizing nitrogen use, farmers can bolster financial stability, minimize environmental impact, and promote sustainable agricultural practices. Ultimately, nitrogen management is not only essential for plant physiology but also for ensuring resilient and economically viable farming systems.

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Enhancing AI-Based Crop Disease Diagnostics through Field Data Collection Using PlantVillage AI. A. Christopher*, C. Williams, N. Sharp, P. Natarajan, S. Tubene, Department of Agriculture, Food and Resource Sciences, University of Maryland Eastern Shore, Princess Anne, MD 21853; R. S. Ouedraogo, Department of Entomology, The Pennsylvania State University, University Park, PA 16802.

This collective study evaluates the performance of the PlantVillage AI application in diagnosing crop diseases and pest damage using authentic field imagery collected from the University of Maryland Eastern Shore (UMES) and surrounding farms. A total of 1,011 images were gathered from diverse crops, including apples, corn, grapes, pears, soybeans, aronia berries, peaches, and quinoa. Each image was analyzed using the PlantVillage AI system, and the resulting diagnoses were evaluated for accuracy, clarity, and contextual reliability through expert validation. The analysis revealed that AI performance was strongly influenced by image quality and environmental factors such as lighting and background interference. Frequently identified plant health issues included apple scab, fire blight, powdery mildew, black rot, and brown rot, along with pest damage from armyworms, mites, and Japanese beetles. Across all datasets, PlantVillage AI demonstrated promising diagnostic capabilities, with more than half of the images receiving high accuracy ratings. However, limitations were noted in distinguishing similar symptoms and identifying less common diseases due to restricted training data. Despite these challenges, the research highlights the value of

high-quality field-based datasets in improving AI-driven agricultural diagnostics. These student-led efforts contributed valuable real-world data to the ongoing refinement of the PlantVillage AI platform and provided hands-on experiential learning opportunities in digital agriculture and precision crop management.

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Engineering the Sky Wrangler: Operational Evaluation of UAVs for Pasture and Livestock Management. J. Watson*[1], J. Throckmorton-Hague[1], M. Throckmorton[1], A. Fuentes[1], M. Johnson[1], M. White[1], D. Lechner[1], T. Gipson[2], and S. Kunwar[2]. [1]Department of Engineering Technology, School of Arts and Sciences, Langston University, Langston, OK 73050. [2]Sherman Lewis School of Agriculture and Applied Sciences, Langston University, Langston, OK 73050.

Livestock producers often face challenges in monitoring large grazing areas where pasture conditions and animal health can change rapidly. Traditional visual inspections are time-consuming, labor-intensive, and provide limited spatial coverage. The Sky Wrangler project aims to address this by developing a smart, low-cost UAV system that provides actionable and concise feedback for livestock producers to effectively manage their pastures and animals. However, little is known about UAV operational parameters that minimize stress on animals. This study focuses on the engineering and operational design to determine the effect of the presence (in terms of distance and duration) of UAVs on animal stress and behavior. This research implemented mission planning and fleet management to ensure precise flight operations, consistent data collection, and safety during animal acclimation trials. A total of 36 acclimation treatments were tested, combining three speeds, three altitude angles, and four distances to identify the most effective parameters for animal comfort and data quality. Results from this study inform Best Management Practices (BMPs) for stress-free UAV operation, supporting improved animal welfare and enhanced data acquisition in precision livestock management.

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Monitoring Pasture Health with UAV-Derived Vegetation Indices: Insights from the Sky Wrangler Project. M. Throckmorton*[1], J. Throckmorton-Hague[1], J. Watson[1], A. Fuentes[1], M. Johnson[1], M. White[1], D. Lechner[1], T. Gipson[2], and S. Kunwar[2]. [1]Department of Engineering Technology, School of Arts and Sciences, Langston University, Langston, OK 73050. [2]Sherman Lewis School of Agriculture and Applied Sciences, Langston University, Langston, OK 73050.

Maintaining healthy and productive pastures is a critical challenge for livestock producers, as pasture degradation and uneven forage quality can directly affect animal nutrition, growth, and overall farm productivity. Traditionally, this task has relied on farmers and ranchers, who must visually assess forage availability and animal condition across large and often remote grazing areas. This study presents an unmanned aerial vehicle (UAV) based approach for monitoring pasture health as part of the Sky Wrangler project, an initiative by students at Langston University aimed at developing cost-effective, intelligent tools for livestock management. Specifically, this study focuses on using UAV-derived vegetation indices to monitor plant health in the pastures. Weekly aerial images were collected using the DJI Mavic 3E quadcopter UAV, equipped with a multispectral camera, and processed with Field Agent software to generate normalized difference vegetation index (NDVI) maps, with NDVI values ranging from -1 to +1. This enables the rapid assessment of plant health in pastures by providing insights into the level of chlorophyll (a measure of greenness). By identifying areas of low productivity or stress, UAV-derived vegetation indices can inform management decisions related to grazing intensity, fertilization, and forage allocation. This approach demonstrates the potential of integrating UAV-based tools into pasture management, providing livestock producers with precise information on pasture health, chlorophyll content, and spatial variability, thereby optimizing forage quality and productivity.

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Evaluating Goat Behavioral Responses to UAV Acclimation Treatments for Smart Livestock Monitoring. M. Johnson*[1], J. Throckmorton-Hague[1], M. Throckmorton[1], J. Watson [1], A. Fuentes [1], , M. White[1], D. Lechner[1], T. Gipson[2], and S. Kunwar[2]. [1]Department of Engineering Technology, School of Arts and Sciences, Langston University, Langston, OK 73050. [2]Sherman Lewis School of Agriculture and Applied Sciences, Langston University, Langston, OK 73050.

Unmanned aerial vehicles (UAVs) have the potential to help livestock producers efficiently monitor animal behavior and pasture conditions. However, limited information exists on how the proximity and flight characteristics of UAVs affect livestock behavior and stress. The purpose of this study is to evaluate the effects of the UAV flight distance, speed, and angle on animal behavior and stress. In total, thirty-six acclimation treatments were applied, combining three UAV speeds, three flight angles, and four flight distances. During each trial, goats were fitted with accelerometers to monitor movement and heart rate, and they were kept within a 5 × 5 m enclosure, where UAV flights were conducted. UAV flights were programmed and executed autonomously using QGroundControl flight planning software. The data collected from accelerometers were analyzed to identify behavioral changes and potential stress indicators in goats associated with different UAV flight conditions. The results helped identify optimal UAV operating parameters that minimize animal stress and ensure reliable aerial monitoring. This will ultimately help in developing a smart, yet inexpensive, UAV that provides usable and concise feedback for livestock producers to manage their pastures and animals effectively.

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Engineering the Sky Wrangler: Design, Development, and Maintenance of Affordable UAVs for Precision Livestock Management. A. Fuentes*[1], J. Throckmorton-Hague[1], M. Throckmorton[1], J. Watson[1], M. Johnson[1], M. White[1], D. Lechner[1], T. Gipson[2], and S. Kunwar[2]. [1]Department of Engineering Technology, School of Arts and Sciences, Langston University, Langston, OK 73050. [2]Sherman Lewis School of Agriculture and Applied Sciences, Langston University, Langston, OK 73050.

The overall goal of the Sky Wrangler project is to develop a smart, yet affordable, UAV that provides usable and concise feedback to livestock producers, enabling them to effectively manage their pastures and animals. This study highlights the engineering and design aspects of the project, focusing on the development of a cost-effective UAV system for precision agriculture and livestock management. The Langston University team assembled and deployed a fleet of seven Ironman 650s and two S500 quadcopters, along with DJI Mavic 3E and T30 drones, supporting RGB imaging, NDVI mapping, and site-specific pasture monitoring. This research particularly concentrated on the conceptual and preliminary design, 3D modeling, and build of the UAV systems, presenting a fleet of 17 drones with detailed documentation of their frame configurations, operational status, and custom-built components. Each UAV underwent a comprehensive evaluation for flight stability, payload integration, and mission readiness under field conditions, providing critical feedback to improve system calibration, safety protocols, and operational efficiency. The UAV system integrates QGroundControl software for flight mission planning, drone calibration, telemetry monitoring, autonomous navigation, and in-flight data acquisition, enabling precise control and real-time decision-making. Together, these efforts demonstrate a complete design-to-deployment workflow, illustrating how accessible, well-engineered UAV platforms can enhance pasture monitoring, livestock management, and data-driven agricultural decision-making.

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Evaluation of Organic Amendments and Fertilization Systems for Sustainable Production of Brassica Crops. T. Jones*, B. Wilkinson, and L. C. Kibet, Sherman Lewis School of Agriculture and Applied Sciences, Langston University, Langston, OK 73050

Sustainable agricultural systems are crucial for enhancing food security, improving soil health, and promoting long-term farm productivity. This research trial evaluates the productivity, soil health benefits, and sustainability of different organic amendment and fertilization systems for culturally significant Brassica crops—collards, mustard greens, kale, cabbage, and turnips—at Langston University. The experiment follows a randomized complete block design with three soil treatments: cow manure, mushroom compost, and a non-amended control. Organic fertility inputs include Alaska Fish Fertilizer (5-1-1), applied every three weeks, and recycled fish water from Langston University's aquaponics program, applied biweekly. The study investigates the impact of compost type and organic fertilizer combinations on plant vigor, yield, and soil quality in both plasticulture and traditional growing systems. Comprehensive data collection includes plant growth parameters, pest and disease incidence, and soil nutrient dynamics. Intensive soil sampling is conducted before treatment application and after each growing season to assess changes in soil nitrogen, phosphorus, potassium, carbon, and other indicators of soil health. This project advances Langston University's mission to promote sustainable, relevant green production through research-based practices. Findings will inform Extension outreach, on-

farm demonstrations, and producer recommendations, enhancing the productivity and resilience of vegetable production systems across local communities.

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AI-Driven Biosensor and Mobile Applications for Early Parasite Detection and Precision Health Management in Goats A. Allen*, A. Siddique, T. H. Terrill, Fort Valley State University, Fort Valley, GA 31030Fort Valley State University, Fort Valley, GA 31030; S. S. Panda, University of North Georgia, Oakwood, GA 30566; E. R. Morgan, Queen's University Belfast, UK; J. A. van Wyk, University of Pretoria, Onderstepoort, South Africa;

This study evaluated the effectiveness of digital applications for detecting parasite infections in goats and improving farm productivity. Conventional diagnostic techniques are invasive, labor-intensive, and often delay intervention, leading to compromised animal health and reduced farmer profitability. To address these limitations, we developed and tested two complementary tools: the Anihealth blood biosensor interface and an AI-powered Famacha application trained on more than 4,700 goat images. Both tools were integrated with Amazon Web Services (AWS) cloud infrastructure, enabling secure, scalable data storage and real-time monitoring accessible across diverse farm settings. The Anihealth biosensor provided rapid, non-invasive detection of blood parameters linked to parasitic infections, while the AI Famacha app offered image-based scoring to support early decision-making. Results demonstrated that these digital applications improved diagnostic accuracy and response speed, reduced dependence on chemical dewormers, and enhanced herd health management. Importantly, they proved effective in both resource-rich and resource-limited environments, making them adaptable to varying production contexts. Findings indicate that combining artificial intelligence, biosensor technology, and cloud computing offers a sustainable pathway for advancing small ruminant health. By promoting timely, evidence-based interventions, these tools contribute to higher productivity, reduced chemical input, and improved food security. The integration of digital platforms into livestock management highlights the potential of precision agriculture to transform smallholder and commercial goat farming systems alike. Such innovations create opportunities for scalable, affordable solutions to address pressing challenges in animal health while supporting global goals for sustainable agriculture.

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Bioelectrical Impedance Analysis for Mastitis Detection in Dairy Goats. L. Esprit*, A. Siddique, F. Knecht, N. Whitley, T. H. Terrill Department of Agricultural Sciences, Fort Valley State University, 1005 State University Drive, Fort Valley, GA 31030. E. R. Morgan, Institute for Global Food Security, Queen's University Belfast, UK; J. A. van Wyk, Department of Veterinary Tropical Diseases, Faculty of Veterinary Science, University of Pretoria, Onderstepoort, South Africa.

Mastitis is a major health issue in dairy goats, affecting productivity, welfare, and farm economics. Early and accurate detection is critical for management, and bioelectrical impedance analysis (BIA) offers a promising non-invasive tool by measuring resistance (R) and reactance (Xc) of tissue. This study evaluated differences in R and Xc between clinically healthy goats (DH) and mastitis-affected goats (DM) across multiple frequencies. A total of 15,728 observations were analyzed using SAS GLIMMIX with fixed effects for condition, frequency, and tag. Results demonstrated significant differences between health groups for both R and Xc. Mean R was higher in healthy goats ($774.6 \pm 66.6\ \Omega$) compared to mastitis goats ($479.7 \pm 80.3\ \Omega$), with an adjusted mean difference of $294.8\ \Omega$ ($p = 0.0011$). Similarly, Xc was markedly greater in healthy goats ($954.6 \pm 94.1\ \Omega$) than in mastitis goats ($424.8 \pm 113.4\ \Omega$), with a difference of $529.7\ \Omega$ ($p < 0.0001$). Frequency also influenced impedance values, with lower frequencies (10 kHz) yielding significantly higher R and Xc compared to higher frequencies (100–180 kHz). These findings indicate that mastitis substantially reduces both R and Xc, reflecting compromised tissue integrity and altered cellular properties. The clear separation between healthy and diseased goats suggests BIA has strong potential as a diagnostic support tool for mastitis detection. Integrating BIA into herd management could provide a rapid, non-invasive, and cost-effective method for monitoring udder health, supporting early intervention and improving overall dairy goat productivity.

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Sustainable Site-Specific Fodder Management Using Geospatial Tools and Modeling. B. Clarke, A. Siddique, A. K. Mahapatra, T. H. Terrill, Department of Agricultural Sciences, Fort Valley State University, Fort Valley, GA 31030;

S. S. Panda, Institute for Environmental Spatial Analysis, University of North Georgia, Oakwood, GA 30566; E. R. Morgan, Institute for Global Food Security, Queen's University Belfast, UK; J. A. van Wyk, Department of Veterinary Tropical Diseases, Faculty of Veterinary Science, University of Pretoria, Onderstepoort, South Africa

Smallholder farmers in the southeastern United States increasingly struggle to sustain forage production under conditions of erratic rainfall, inherently low soil fertility, and limited access to precision agriculture technologies. These constraints necessitate site-specific, climate-resilient strategies to support livestock systems on marginal lands. This study introduces a Site-Specific Fodder Management Decision Support System (SSFM-DSS) for optimizing the cultivation of Lespedeza cuneata (sericea lespedeza), a perennial, drought-tolerant, nitrogen-fixing legume with high suitability for degraded soils. The system integrates high-resolution geospatial technologies including Geographic Information Systems (GIS), Global Navigation Satellite Systems (GNSS), and remote sensing with empirical field measurements and predictive modeling. A multi-criteria evaluation framework was implemented to assess spatial suitability across Alabama, Georgia, and South Carolina, incorporating soil physicochemical properties, topography, rainfall variability, and temperature regimes. Spatial outputs were validated against field observations and then operationalized through a WebGIS Dashboard designed for farmer use. The dashboard provides real-time, location-specific recommendations on site preparation, sowing, and management practices, translating complex geospatial analyses into actionable decision support. Results demonstrate that SSFM-DSS can substantially improve the precision of fodder production planning, enhance resilience under climate stress, and contribute to sustainable livestock productivity. Beyond immediate forage benefits, the approach advances climate-smart agriculture by promoting efficient land use, reducing dependence on external inputs, and strengthening food security in vulnerable agroecosystems. The integration of geospatial analytics with farmer-centered digital platforms represents a scalable model for site-specific forage management in regions facing similar climatic and resource constraints.

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Sustainable Anemia Detection in Goats Using radiofrequency-Domain Biomarkers: Advancing Agricultural Resilience and Precision Animal Health. A. Forgue*, A. Siddique, G.K. Isai, R. Kota, D. Brown, N. Whitley, T.H. Terrill Department of Agricultural Sciences, Fort Valley State University, Fort Valley, GA 31030. J. A. van Wyk, Department of Veterinary Tropical Diseases, Faculty of Veterinary Science, University of Pretoria, Onderstepoort, South Africa;

Sustainable livestock systems require tools that improve animal health while reducing reliance on chemical inputs and costly diagnostics. In smSouth Africa.production, anemia caused by gastrointestinal parasites threatens animal welfare and farm productivity, leading to excessive use of anthelmintics and unsustainable management practices. This study explored the potential of frequency-domain features as diagnostic biomarkers for anemia detection in goats, aligning with sustainable agriculture objectives. Using data from 10 male Spanish intact goats scored with the FAMACHA© system (1–3), we conducted exploratory data analysis, clustering, and Tukey's HSD post-hoc tests. Cluster analysis in principal component space revealed three coherent groups that broadly matched FAMACHA strata, confirming signal-based structure. Tukey's analysis identified low-frequency bands (≈2.00–2.74) as effective in differentiating FAMACHA 1 vs. 2, supporting early anemia detection and proactive intervention. Mid-frequency ranges (≈7.03–9.03) distinguished FAMACHA 1 vs. 3, enabling identification of severe anemia. However, no frequency consistently separated moderate and severe cases, underscoring the need for integrative approaches that combine spectral features with other animal-based indicators. By identifying specific diagnostic frequency bands, this work provides a foundation for portable, non-invasive, and cost-effective tools to support targeted deworming strategies. Such innovations reduce drug overuse, slow resistance development, and improve smallholder productivity, contributing to resilient food systems and sustainable agricultural practices. These findings highlight how frequency-domain analytics can underpin next-generation decision support technologies for precision livestock management in resource-constrained farming environments.

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AI Empowerment of Water Quality Improvement in Southwest Mississippi. U.S. Nwaneri*, Department of Advanced Technologies Alcorn State University, Lorman, MS 39096; C. Fells, Department of Advanced Technologies Alcorn State University, Lorman, MS 39096; and S. O. Nwaneri, Department of Advanced Technologies Alcorn State University, Lorman, MS 39096.

Most locations that demand emergency response are risky for humans to navigate through. This challenge prompted the facts and advantages of AI empowerment of unmanned ground vehicles (UGV), for which this project built a remotely controlled ground vehicles (RCGV). The vehicle can be deployed under different conditions during emergencies. The motion control console uses “send and receive” radio frequencies for navigation. The received frequencies engages a 3D motion console to cause the RCGV to move in any of these six different directions: 1) forward, 2) backward, 3) left, 4) right, 5) left-tangent, and right-tangent turns. The speed of the RCGV is relative to the combined weight of the vehicle and equipment on board. The objective of this project was successfully demonstrate with a laboratory version of the vehicle, which operated the movement and direction differentials console through a hot-wire joystick. This approach was converted to a hand-held remote-control unit with five on-board channels of the send-and-receive operational signals. The channel are central parts of the navigation steering console, to determine the vehicle’s navigation capability and response dynamics. This methodology was focused on validations of the direction differentials of the console, for which this project is now recommended to upgrade, by incorporating the console to a golfcart size RCGV with robotic embodiment of artificial intelligence. The project is on-going and anticipates contributions for AI empowerment.

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Technology and Inflation in Agricultural Systems: Understanding Farm Input Costs and Food Prices in Oklahoma. Z. Harris-Gulley*, N. De Silva, M. Lowery, S. Giscombe: Department of Agriculture and Natural Resources, Sherman Lewis School of Agriculture and Applied Sciences, Langston University, Langston, OK 73050

Recent inflationary pressures have affected both farm input costs and consumer food prices nationwide. In Oklahoma, farmers face increasing expenses for fuel, fertilizer, equipment, and the adoption of new technologies, while consumers experience rising food prices. This study examines the relationship between key farm input costs—fuel and fertilizer—and consumer food prices in Oklahoma from 2005 to 2025, while evaluating the stimulating role of agricultural technology adoption. The study utilized secondary data collected from the U.S. Bureau of Labor Statistics (Consumer Price Index for Food), the Energy Information Administration (gasoline prices), the U.S. Department of Agriculture's Economic Research Service (fertilizer price indices), and the U.S. Department of Agriculture's National Agricultural Statistics Service (technology adoption surveys). Trend analysis and multiple linear regression models were used to quantify the impact of input costs and technology adoption on food price fluctuations. The results indicate that increases in fuel and fertilizer costs are positively associated with higher food prices, demonstrating Oklahoma's exposure to input cost shocks. Conversely, greater adoption of precision agriculture and digital technologies partially offsets these inflationary pressures by improving production efficiency and reducing per-unit costs. These findings suggest that technology-driven strategies can enhance the operational stability of Oklahoma's agribusiness systems. Policy recommendations include expanding access to agricultural technologies, encouraging energy-efficient practices, and supporting cooperative input procurement. Integrating technological tools into agricultural systems can help manage input cost volatility and stabilize food prices, strengthening Oklahoma’s agricultural economy and supporting long-term economic viability.

Student Poster Presentation – Graduate Competition

Agricultural Systems and Technology

1082

Assessing the Impacts of Droughts on Agricultural Productivity and Adaptive Options for Alabama Farmers. L. Ebbuah*, Department of Agricultural and Environmental Sciences, Tuskegee University, Tuskegee, AL 36088; J. Quansah, Department of Agricultural and Environmental Sciences, Tuskegee University, AL 36088; and S. Fall, Department of Agricultural and Environmental Sciences, Tuskegee University, AL 36088.

Drought is an increasingly pressing issue that poses significant challenges to agricultural systems worldwide. It has profound implications for food security, economic stability, and community well-being. For communities and stakeholders who often rely heavily on agriculture as a primary source of income and sustenance, the impacts of drought can be particularly devastating. This research aims to assess and quantify the impacts of droughts on agricultural productivity and evaluate adaptive options available to increase the resilience and productivity of Alabama farmers. The study uses Decision Support System for Agrotechnology Transfer (DSSAT) crop model and the United

States Geological Survey Integrated Water Prediction (USGS IWP) drought duration metrics to simulate responses to drought conditions within select counties in Alabama. The results are expected to show a correlation between drought conditions and significant reductions in crop yields and productivity, in the absence of adaptive measures. The project will help with the identification of adaptive strategies, including crop diversification, sustainable irrigation, and water conservation techniques, to help increase the resilience of farmers. Research outcomes and tools will allow decision-makers to better estimate and understand the economic and socioeconomic impacts of drought, in order to develop adequate policies and impactful measures for addressing different levels of vulnerability to droughts.

1083

Labor Substitution and Employment Effects of Artificial Intelligence in the Crop Sector: A View on the Production Side. E. C. St Preux*, Department of Agriculture and Resource Economics, Tuskegee University, AL 36088.

Artificial Intelligence (AI) has emerged as a mainstay in innovation, leading to a profound change in agriculture, specifically in the crop sector. Different innovations are needed in agriculture, which is why human-designed innovations influence practices such as speed breeding and precision agriculture. Some technological advances in agriculture seem to benefit the production process. However, the main issue is that while they may help producers, they can also affect the workforce. The purpose of the study is to examine how ai, as an essential tool for innovation, can affect the agricultural production sector and to understand its impact on employment. Based on existing research on ai in agriculture, crop production, and the innovation of farming systems, the inclusion criteria focused on peer-reviewed research, resulting in 20 articles published between 2024 and 2025. A key economic concept, "creative destruction," helps clarify the idea. This concept explains the process of innovation and technological change that replaces old technologies, business models, or practices with entirely new ones. The results found that ai, as a force for the growth and transformation of agriculture, can be advantageous for some producers and disadvantageous for workers. On the one hand, it boosts yield, efficiency, and management in crop production. On the other hand, manual jobs are declining because they are being replaced by more efficient and effective machines. Focusing on these different aspects, ai already plays a significant role in society and cannot be ignored because of its usefulness in the world of innovation we all live in.

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Drone-Based Thermal Imaging for Monitoring Meat Goat Body Temperature. S. Smith-Harrell*, T. Wright, and K. Matthews, Department of Agriculture and Natural Resources, Delaware State University, Dover, DE 19901; E. Otchere, Department of Poultry Science, 101 Kleberg, College Station, TX 77843; D. O'Brien, Virginia Cooperative Extension, Virginia State University, 1 Hayden Drive, Petersburg, VA 23806.

Small ruminants are vital in agriculture because of their remarkable ability to adapt and thrive in harsh conditions. As their numbers in the United States increase, the demand for non-invasive, less time-consuming methods to monitor animal health has also grown. Advanced technology, especially drones, might offer an innovative solution for health monitoring. This project aims to evaluate how effective drone-based thermal imaging is in measuring body temperature in meat goats. Forty-five meat goats (n = 45) were divided into nine paddocks with five goats each (n = 5) and observed over 98 days. Rectal and thermal temperatures were recorded every 14 days. Rectal temperatures were measured with a calibrated Rexall 9-Second Digital Thermometer inserted about 3 cm into the rectum. Thermal images were captured using a DJI Matrice M350 RTK drone with an H20T thermal camera. The drone operated at 50 ft; environmental conditions were documented for calibration before image capture. Average surface temperatures for each goat were obtained by defining a region of interest (ROI) over the body in the DJI Thermal Analysis Tool, with emissivity set at 0.98. Drone thermal data were processed with DJI Thermal Analysis Tool 3 and analyzed using a linear mixed-effects model and Bland-Altman analysis in RStudio (version 4.4.2). Regression analysis revealed a linear relationship ($R^2 = 0.69$) between drone thermal readings and rectal temperatures, with Bland-Altman analysis indicating a mean difference of +0.6°F (limits of agreement: −0.8°F to +2.0°F). Overall, drone-based thermal imaging provides a non-invasive method for temperature monitoring in meat goats.

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Perceptions of Black Producers Toward Their Role in United States Agriculture: A Q Methodology Study. T. Peebles*, Department of Agricultural and Environmental Sciences, Tuskegee University, Tuskegee, AL, 36088; C. Brown, Department of Agricultural Education, Communications, and Leadership, Oklahoma State University, Stillwater, OK 74078; and C. Cearly, Department of Agricultural Education, Communications, and Leadership, Oklahoma State University, Stillwater, OK 74078.

The experiences of Black producers are an underexplored aspect of U.S. agriculture. With fewer than 50,000 Black farmers nationwide, including nearly 2,000 in Oklahoma, this group offers unique perspectives about their agricultural experiences. Although research on general producer experiences is plentiful, there is a dearth of literature on the explicit viewpoints of Black producers. This study utilizes Q methodology to examine Black farmers' perspectives of their roles in the U.S. agriculture industry. Participants (P-set) sorted 36 statements reflecting opinions about Family Tradition, Policy, Capital, Self-Perception, Government Support, and Industry Organizations. The guiding condition of instruction was: "What are your thoughts about your role as a Black producer in the U.S.?" Twenty-eight Q sorts were analyzed, resulting in a two-factor solution ($p = 0.43$) in addition to a bipolar factor. Six exemplars were identified; two from each factor and contacted for personal interviews. Eighteen consensus statements were identified, and six distinguishing statements. Three themes emerged as Black Leadership & Resource Equity (Factor 1), Business-Minded, But Systemically Hindered (Factor 2a), and Sustainability Concern & Limited Connection (Factor 2b). Findings from this study demonstrate not only the need to further investigate Black farmers and their roles in agriculture but also the sustaining roots that agriculture maintains for these producers despite the trials they face. Ultimately, this research aims to illuminate the diverse viewpoints of Black producers as well as encourage more inclusive research designs, advocates, and policymakers to strengthen the support of equitable and sustainable growth of Black producers.

1086

The Economics of Nitrogen Optimization: The Case for North Carolina. A. Mukunzi*, K. Jefferson-Moore, Department of Agribusiness, Applied Economics and Agriscience Education; J. Ng'ombe, Department of Economics; H. Sharma, Department of Natural Resources and Environmental Design, North Carolina Agricultural and Technical State University, Greensboro, NC 27411.

Nitrogen (N) is essential for crop productivity, yet its inefficient use increases costs and environmental risks. This study estimates optimal N application rates for corn production in North Carolina to reduce over- and underapplication, enhance profitability, and minimize environmental impact. Corn was selected due to its economic significance in the state. We address two key questions: (1) What N rates maximize yield and profit while minimizing losses? and (2) How do spatial and temporal variations in N use across counties inform better fertilizer guidelines? Using county-level panel data (2012, 2017, 2022) from USDA-NASS, field experiments, and Cooperative Extension trials, we apply statistical simulations and production function models—including quadratic, Cobb-Douglas, translog, and the Linear Response Stochastic Plateau (LRSP) model. LRSP simulations with Markov Chain Monte Carlo (MCMC) methods identify yield plateaus and inefficiencies. Field trials validate model outcomes and support site-specific recommendations. This study, which integrates county-level data with field validation to estimate stochastic yield plateaus and optimal N rates, is novel in North Carolina. Findings will inform sustainable fertilizer guidelines, improve farm profitability, and reduce nitrogen runoff.

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Assessment of Low-temperature Plasma for Improving the Performance of Tissue-cultured Turmeric (Curcuma longa) Plants. N.O. Adeniyi*, S.R Mentreddy, L.M. Nyochembeng, Department of Natural Resources and Environmental Sciences, Alabama A&M University, Normal, AL 35762.

Low-temperature plasma (LTP), a weakly ionized gas, offers a chemical-free approach to boosting crop productivity and safety. In plants, LTP enhances in vitro growth and secondary metabolites. Turmeric (Curcuma longa), valued for curcumin's anti-inflammatory, anticancer, and digestive benefits, underperforms in the southeastern U.S. due to poor sprouting and curcumin levels. This study tested argon/helium LTP to improve curcumin yield and morphological development in Alabama. Prior to culture initiation, rhizomes were exposed to argon or helium plasma for 0, 30, 60, or 90 seconds. The experiment was arranged in a split-plot design with gas type as the main plots and exposure times as sub-plots with four replications. Time to sprouting, percentage of rhizomes sprouted, and seedling growth were

determined across the culture period. All data were subjected to ANOVA (GLM, SAS), with means separation using Tukey's HSD at $p \leq 0.05$. Low-temperature plasma markedly improved germination relative to control (1%), with effects dependent on gas and exposure time. Helium consistently outperformed or matched argon, reaching the highest sprouting at 90 s (35% vs. argon 32.5%); argon showed little effect at 30–60 s but significantly increased at 90 s. Seedling height also increased in direct relation to increasing exposure times to either gas. Exposure to LTP for 90 s of Ar (12.34 cm) or He LTP (13.31 cm) showed a strong time-dependent effect and a slight overall advantage for helium LTP. Overall, LTP offers potential for enhancing turmeric growth, yield and curcumin levels.

1088

Effect of PFAS Exposure Regimen and Soil Amendment on Soybean. F. Rostami*, J. Pitula & W. Omagamre, Department of Natural Sciences, University of Maryland Eastern Shore, Princess Anne, MD, USA.

Per- and polyfluoroalkyl substances (PFAS) are long-lasting pollutants that increasingly threaten environmental and human health. Soybean is a globally important crop that provides protein and oil for food and livestock feed and supports soil fertility through nitrogen fixation. In this context, PFAS contamination poses risks to food security and agricultural sustainability. However, there is limited understanding of how different PFAS exposure regimens affect soybean growth and reproduction or whether soil amendments can reduce these impacts, and this stidy aims to explore this knowledge gap. In this study, soybeans were cultivated in greenhouse pots under five treatment groups with six replications each. Exposure was introduced through irrigation water or contaminated soil, with or without biochar or modified biochar amendments. Plant height, pod number and weight, and seed development were recorded throughout the growth cycle. Vegetative traits were not significantly affected, but the reproductive stage was sensitive to PFAS. Soil exposure resulted in greater toxicity than water exposure. Soil-exposed plants produced up to 40 percent fewer yellow pods (intermediate maturity) and 30 to 35 percent fewer and lighter beans compared to controls. Water exposure caused moderate reductions of about 15 to 20 percent. Biochar partially mitigated these adverse effects in soil-exposed plants by improving pod and seed traits by 15 to 20 percent. These results show that the PFAS exposure regimen strongly influences toxicity outcomes. Biochar amendments show potential to reduce PFAS risks and support more resilient soybean production. Nutritional profiles and PFAS accumulation data for each treatment will be presented.

1089

Multiomics Approaches to Explore Reniform Nematode Resistance in Cotton. S. K. Sanathanam*, A. Bibi, S. G. Kommireddypally, Department of Natural Resources and Environmental Sciences, Alabama A&M University, Normal, AL 35762; S. M. Punnuri, College of Agriculture, Family Sciences and Technology, Fort Valley State University, Fort Valley, GA 31030; K. Lawrence, Department of Entomology and Plant Pathology, Auburn University, Auburn, AL 36849; and L. T. Walker, V. R. Sripathi, Department of Natural Resources and Environmental Sciences, Alabama A&M University, Normal, AL 35762.

Cotton (Gossypium spp.) is an important crop in tropical and subtropical regions, primarily grown for its natural textile fiber, which makes up 35% of global fiber production. All parts of the cotton plant, including seeds and lint, have economic importance. Cotton is cultivated in over 80 countries, with the U.S. being the second-largest producer after China. In 2024, cotton was produced on approximately 33.1 million hectares, yielding about 117 million bales, or an average of 770 kg/ha (~687 pounds/acre). Frequent exposure to pests such as reniform nematodes (RN) threatens cotton production. Although the genotypes have been identified for RN tolerance, their underlying mechanisms for tolerance are poorly understood. A detailed understanding of the mechanism and identification of critical factors participating in RN stress tolerance is essential. Developing RN-tolerant cultivars through conventional breeding is challenging due to the complex genetic nature of tolerance. Recent omics techniques, including transcriptomics, genomics, metabolomics, and proteomics, have significantly enhanced our understanding of cotton's response to RN stress. These methods have helped identify quantitative trait loci (QTLs), gene regulatory networks, and pathways that contribute to RN tolerance. In this study, we explored a regulatory network involving key metabolites and differentially expressed genes (DEGs) between two contrasting genotypes under RN stress. Our analysis revealed over 1,000 differentially accumulated metabolites and more than 10,000 co-expressed genes. These findings, organized into three clusters based on accumulation patterns and gene expression, highlight important metabolic pathways. This dataset offers valuable insights into cotton breeding strategies and advances in plant biology.

1090

Optimization of Ultrasonication and Ball-milling Parameters for Yield of Nanobiochar. B. Khanal* and H.P. Singh, Nanotechnology Laboratory, Department of Agricultural Sciences, College of Agriculture, Family Sciences and Technology, Fort Valley State University, Fort Valley, GA 31030.

Nanobiochar possesses enhanced surface area, porosity, and adsorption capacity which makes it a promising avenue for applications in pollutant removal, soil remediation, and sustainable agriculture. Top-down methods such as ultrasonication and ball-milling have been considered effective methods for nanobiochar synthesis. However, systematic optimization of ultrasonication and ball-milling parameters to maximize yields of nanobiochar using less energy have dearth of literatures, often resulting in low efficiency and inconsistent particle sizes. This research aims to optimize the ultrasonication and ball-milling parameters independently to obtain higher yield in short time and lower energy consumption, using Response Surface Methodology (RSM) with a Central Composite Design (CCD) consisting of two factors in ultrasonication, that is processing time (X1 = 30 to 80 min) and ultrasonication amplitude (X2 = 60-80%) and three factors in ball-milling, that is rotational speed, time and ball-to-powder mass ratio, with yield as a response variable. For nanobiochar synthesis, biochar powder was ultrasonicated, centrifuged and dried in ultrasonication method. Nanobiochar was characterized by particle size using Transmission Electron Microscope (TEM). The results showed that time and amplitude of ultrasonication do not have significant effect on yield of nanobiochar ($p<0.05$). The optimum conditions with low energy consumption and less time were 60% amplitude and 58 min. Particle size of nanobiochar varied from 11-70 nm. In ball-milling method, biochar will be ball-milled, centrifuged, dried and characterized for particle size. The research strengthens green nanotechnology by promoting efficient, eco-friendly synthesis of nanobiochar from renewable biomass, effectively used in water treatment, carbon sequestration and climate-smart agriculture.

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Comparative Analysis of Radiation Attenuation in Cobalt-60 and Cesium-137 Using Copper, Lead, and Aluminum Shielding. C. D. James*, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096; J. K. Billa, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096; J. Adjaye, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096; and M. Bolugallu Padmayya, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096.

Health physics and nuclear safety require consideration of radiation protection, especially with high-energy gamma-emitting isotopes, for example, cobalt-60 (^{60}Co) or cesium-137 (^{137}Cs). Effective shielding materials assist in dose reduction and implementation of the As Low As Reasonably Achievable (ALARA) principle. This study evaluated by an experimental method, the attenuation effectiveness of three commonly utilized shielding materials; copper, lead, and aluminum exposure from ^{60}Co, and ^{137}Cs, sources. In the experimental tests, a variety of material thickness was utilized as directed, while a calibrated detector detected dose rate reductions. Distance and mass attenuation coefficients were calculated to provide material comparisons. Lead attenuated maximum dose rates in front of both isotopes, and then copper and then aluminum, typically based on density and atomic number. Copper also provided adequate, effective shielding that could be used due to a cost-benefit effect. In the shield design phase, while lead provided maximum attenuation performance. Copper provided usefulness in quality, weight, or cost. While recognizing the utility of the material to radiation protection is important, the validation of experimentally created data was an addition beyond the minimum degree an application would attenuate with shielding in the performance use with an application design.

1092

Characterization of Legacy Waste at the TRIGA (Training, Research, Isotopes, General Atomics) Reactor. S.Kipikpitse*, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096; J. Billa, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096; M. Beitollahi, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096; J. Adjaye, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096; and M. Bolugallu Padmayya, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096.

Waste is generated in the laboratory every day. Typically, through contamination with radioactive materials that are beyond the background level. In the Utah Nuclear Engineering Facility lab, much of the waste generated is not well

labeled, and so it is hard to determine its possible contamination; thus, considered a legacy waste. This study aims to utilize gamma spectroscopic techniques to identify the radioisotopes that are present with detailed analysis for calculations for activity. Since Gamma radiation can penetrate very deep into the body and requires several centimeters of lead shielding and water, contaminated objects must be tested with such advanced techniques for proper management. Using a selection criterion, 27 items from the shelf in the Utah Nuclear Engineering Facility lab were characterized. The criteria involve using the GM counter to measure the count per minute (cpm). If the cpm is doubled and/or more than the background, we proceed to count the items using the High-Purity Germanium detector (HPGe). The results indicate the presence of some Naturally Occurring Radioactive Materials (NORM). The isotopes that were found include: CO-60, CO-59, CS-137, K-40, ZN-65. A further analysis of the peak and energy levels were used to calculate the Full Width Half Maximum (FWHM), activity, and efficiency manually to confirm consistency with the HPGe and to help document a catalog for proper waste management in the future. All items that remain background counts were thrown away since they do not pose any potential threat to living organisms and the environment.

1093

The Construction of the Circuit Breaker Robot. A. Barnes*, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096; E. Sarigul, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096; J. Adjaye, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096; J. Billa, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096; and M. Bolugallu Padmayya, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096.

Manual sorting of objects based on visual characteristics is time-consuming and prone to error, especially in dynamic environments. To address this challenge, we investigated the development of a robot capable of autonomously identifying and sorting objects by color. It was designed and assembled using Tetrix aluminum components and integrated into a color-detection sensor to distinguish between colored balls. The robot was programmed using the Arduino IDE, combining autonomous control via the PRIZM Pro controller and manual override through a Tele-Op module. System evaluation confirmed stable locomotion, responsive obstacle avoidance, and reliable transitions between manual and autonomous control modes. The integration of sensor feedback with motor control logic allowed the robot to adapt effectively to varied terrain and environmental conditions. We recommend expanding the robot's capabilities to include shape and size recognition for broader sorting applications. The modular hardware and programmable control system make this robot a strong candidate for scalable automation and STEM education.

1094

Enhancing Phishing Detection Using Generative AI: A Comparative Study of Human vs. AI-Generated Threats. A. Essel*, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096; K. Agyepong, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096; J. Billa, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096; E. Sarigul, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096; and M. Bolugallu Padmayya, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096.

Phishing remains one of the most prevalent cybersecurity threats, exploiting human vulnerabilities to gain unauthorized access to sensitive data. Traditional detection systems rely on manually labeled datasets and fixed linguistic patterns, limiting their adaptability to emerging, sophisticated attacks. With the rise of Generative Artificial Intelligence (GenAI), attackers can now produce realistic, multilingual phishing emails that mimic human tone and organizational style. Thus, detecting phishing messages is now one of the most important challenges in cybersecurity. In this study, I trained a computer model to tell the difference between real and fake (phishing) emails. Using Python, Pandas, and scikit-learn, I cleaned the email text by changing all letters to lowercase, removing common stopwords, and turning the text into numbers using TF-IDF. Then I trained a Logistic Regression model to classify emails as phishing or legitimate. I tested the model using a confusion matrix along with precision, recall, and F1 score to see how well it worked. The model did a good job on regular phishing emails from the dataset. However, when I used an AI tool to create new phishing messages in both English and French, the model missed some of them. This showed that even strong models can be fooled by realistic, AI-generated messages. Overall, this study shows that machine learning can help detect phishing, but attackers using AI are making it harder. To stay ahead, future systems should train on AI-created examples and learn to catch subtle patterns that make phishing emails seem human-written.

1095

AI-Driven Intrusion Detection for Smart Transportation Networks. D. Jackson*, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096; K. Agyepong, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096; J. Billa, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096; and E. Sarigul, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096.

Smart transportation networks increasingly rely on interconnected sensors, controllers, and communication technologies to manage traffic flow, logistics, and public mobility. However, this expanded connectivity also introduces new cyber vulnerabilities that can disrupt critical infrastructure. This thesis investigates the use of artificial intelligence techniques to improve real-time intrusion detection in intelligent transportation systems. Machine learning models, including Random Forest, Support Vector Machines, and Deep Autoencoders, were implemented in Python using Scikit-learn and PyTorch to identify anomalous network traffic. The system was trained and evaluated using publicly available datasets, such as CICIDS2017 and TON_IoT, supplemented with simulated sensor traffic typical of roadway and signal-control environments. Feature extraction focuses on protocol behavior, packet timing, communication frequency, and traffic-flow-based indicators. Results demonstrate that AI-driven detection significantly improves the identification of malicious activity compared to traditional signature-based methods, particularly in recognizing novel or stealthy attacks. The research presents a validated intrusion-detection pipeline specifically designed for smart transportation infrastructure, providing a scalable and adaptive cybersecurity solution for state and municipal transportation agencies.

1096

Circuit Breaker Robot: Claw Design and Development. L. Gibson*, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096; E. Sarigul, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096; K. Agyepong, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096; J. Billa, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096; and J. Adjaye, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096.

This project focuses on the design and development of the robotic claw attachment for the Circuit Breaker robot, a TETRIX-based. The purpose of the claw was to serve as the robot's primary end-effector for grasping, lifting, and releasing objects of varying shapes and sizes while navigating a predefined course. Majority of this project focuses on the design and construction of the claw mechanism, including its mechanical structure, motion system, and integration with the robot's control electronics, navigation, programming, and sensor integration. Using Autodesk Fusion 360, I designed a compact 3×3×0.5-inch frame capable of holding two aluminum arms and accommodating a rack-and-pinion mechanism powered by a 12V servo motor. This system converts rotational motion from the servo into horizontal linear motion of the arms allowing precise opening and closing for object retrieval. The claw was mounted on the robot and initially tested for smooth movement, structural stability, and gear engagement. While the mechanism demonstrated proper function during early trials, the project was not fully completed due to limited time, and final calibration and software integration with the robot's color-detection sensors were still pending. Future improvements include increasing servo torque for stronger gripping, refining the rack-and-pinion alignment for smoother operation, and incorporating automated feedback for adaptive control. These modifications would allow the claw to handle a wider range of objects and enhance the robot's capabilities for tasks such as automated sorting or search-and-rescue operations. The design of claw was critical to this project's functionality and project focuses on demonstration of importance of interdisciplinary teamwork in robotic design.

1097

AI-Powered Journaling for Mental Health. P. P. Kandikatla*, Mathematics and Computer Science Department, Alcorn State University, Lorman, MS 39096; L. Yu., Mathematics and Computer Science Department, Alcorn State University, Lorman, MS 39096; M. Bolugallu Padmayya, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096; J. Billa, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096; and J. Adjaye, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096.

In an era of digital overload and rising emotional stress, mental health support has become increasingly vital, especially for students and young professionals. This project, AI-Powered Journaling for Mental Health, explores how Artificial Intelligence can transform traditional journaling into an intelligent and empathetic tool for emotional well-being. The proposed system integrates Natural Language Processing (NLP) to analyze journal entries, detect emotional tone, and identify stress or mood patterns over time. Using sentiment analysis and lightweight machine learning models, it provides reflective prompts, personalized feedback, and visual summaries that help users recognize emotional triggers and personal growth trends. Focusing on ethical AI practices, the journaling platform protects user privacy by processing data locally and providing transparent emotional insights. Interactive data visualizations help users monitor their emotional progress, encouraging mindfulness and self-awareness. This project shows how AI can go beyond automation to foster empathy, trust, and well-being—highlighting technology's ability to support human reflection and personal growth instead of replacing it.

1098

Optimizing Retail Forecasting Through Big Data Analytics. B. Grisham*, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096; K. Agyepong, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096; J. Billa, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096; and M. Bolugallu Padmayya, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096.

Understanding sales trends is critical for businesses seeking to improve forecasting accuracy and respond effectively to shifts in consumer demand. Many retail organizations face challenges interpreting large volumes of sales data, which limits their ability to make timely, data-driven decisions. This project applies big data analytics techniques to analyze historical retail sales data obtained from public sources such as Kaggle and the U.S. Census Bureau. Using Python, Pandas, and PySpark, the data were cleaned, transformed, and analyzed to identify seasonal patterns, product category trends, and regional variations in sales performance. The results reveal clear seasonal peaks during holiday months and significant differences across product categories and geographic regions. Time-series forecasting models that incorporate historical seasonality achieved greater predictive accuracy than baseline methods. These findings demonstrate how predictive analytics can improve inventory management, marketing strategies, and business planning. Future work will explore integrating live-streaming sales data and real-time forecasting models to enhance decision support in the retail sector.

1099

AI Network for Academic Collaboration. B. Kaanadka Purushothama*, Department of Mathematics and Computer Science, Alcorn State University, Lorman, MS 39096; P. Zhang, Department of Mathematics and Computer Science, Alcorn State University, Lorman, MS 39096; J. Billa, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096; and M. Bolugallu Padmayya, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096.

This project introduces an intelligent platform designed to help students, faculty, and researchers discover suitable collaborators across universities based on common research interests. The system employs Natural Language Processing (NLP) to analyze academic content such as papers, abstracts, and project summaries, extracting essential keywords and identifying major research themes. Through machine learning-based clustering and recommendation techniques, it compares researcher profiles and recommends the most compatible collaboration opportunities. The platform gathers information from institutional research portals, publications, and user-submitted profiles to provide precise and diverse recommendations. A web interface enables users to browse, filter, and communicate with suggested collaborators, encouraging partnerships across departments and universities. Moreover, it integrates with academic databases to maintain up-to-date and reliable results. By combining AI, NLP, and intelligent recommendation models, the system promotes innovation through seamless academic networking. It minimizes the time and effort needed to find research partners while supporting interdisciplinary collaboration. Ultimately, this project enhances research efficiency, fosters knowledge exchange, and strengthens global academic connections through data-driven insights.

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Virtual STEAM Outreach for Middle School Learning in Southwest Mississippi. S. Bunga*, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096; P. Gorthi, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096; J. Adjaye, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096; J. Billa, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096; K. Agyepong, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096; and M. Bolugallu Padmayya, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096.

Students in rural Mississippi often face limited access to advanced educational tools and modern learning environments, particularly in Science, Technology, Engineering, Arts, and Mathematics (STEAM) subjects. To address this challenge, the Department of Advanced Technologies at Alcorn State University initiated the Virtual STEAM Outreach Program to integrate immersive learning technologies into middle school education. The program was implemented across four middle schools serving grades 6–8. Two groups were created: a traditional control group and a virtual STEAM group using Virtual Reality (VR) headsets. In partnership with M/s Beta Flix inc, the university developed interactive VR modules aligned with the Mississippi state curriculum, focusing on topics such as Light and Matter, Plate Tectonics and Rock Cycling, Ecosystem Dynamics and Biodiversity, and Space in Earth. Students in the VR-based STEAM group showed higher engagement, enthusiasm, and understanding of scientific concepts compared to those in traditional instruction. Teachers reported noticeable improvements in participation, focus, and conceptual retention during lessons. Integrating VR into classroom instruction can enhance student motivation, bridge learning gaps, and make STEAM subjects more interactive and accessible. Future expansions of this outreach program can strengthen community engagement and continue to promote educational innovation in Southwest Mississippi.

1101

Enhancement of Outdoor Wi-Fi Coverage at Alcorn State University. K. Kondeti*, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096; P. Gorthi, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096; J. Adjaye, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096; J. Billa, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096; K. Agyepong, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096; and M. Bolugallu Padmayya, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096.

Reliable outdoor Wi-Fi is crucial for facilitating digital learning, communication, and campus engagement. At Alcorn State University, several outdoor and high-traffic areas had limited wireless coverage, making it difficult for students to stay connected during academic and social activities. Ensuring strong, uninterrupted Wi-Fi across open spaces became a key priority to enhance campus experience. To address this, the Department of Advanced Technologies conducted a comprehensive wireless site survey using the Ekahau Sidekick 2 system. The survey identified signal dead zones and highlighted weak coverage areas through detailed heat maps. Based on these insights, XV2-23T Wi-Fi 6 outdoor access points were strategically installed across key areas, including dormitories, the Student Union, cafeterias, and libraries. Additionally, X7- 35X Wi-Fi 7 indoor access points were deployed nearby to ensure seamless transitions between indoor and outdoor connectivity. Post-installation evaluations showed notable improvements in signal strength, coverage consistency, and connection reliability throughout outdoor spaces. Students benefited from faster internet speeds and more stable connections in recreational, study, and gathering areas. This project reflects Alcorn State University's commitment to a smart, connected campus, supporting better learning, collaboration, and innovation while laying the groundwork for future expansion into Wi-Fi 7 and other advanced smart-campus technologies.

1102

Advancing Academic Computing Through Infrastructure Modernization and Network Optimization. R. Downer*, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096; J. Billa, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096; Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096; M. Bolugallu Padmayya, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096; and P. Kumar Gorthi, Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096.

Rapid developments in information technology make it essential for institutions to regularly update computing and networking infrastructures to maintain high performance, security, and scalability. The Simmons Industrial Technology Building, a key facility within Alcorn State University's Advanced Technologies Department, recently underwent a comprehensive modernization initiative designed to enhance academic and research capabilities. The project encompassed three main components: replacement of legacy computer lab workstations with high-performance systems, installation of updated software to improve operational efficiency and data protection, and integration of advanced network switches offering enhanced traffic control, greater bandwidth capacity, and built-in security functions. In addition, new cybersecurity protocols were implemented to protect sensitive information and reduce exposure to potential threats. Post-implementation analysis revealed marked improvements in computing speed, network stability, data security, and overall system reliability. The upgraded infrastructure establishes a resilient and scalable foundation capable of supporting future technological integration, promoting innovation, and ensuring a secure and efficient academic computing environment for years to come.

1103

Evaluation of Co-Application of Biochar and Cow Manure Compost for Improving the Soil Health of A Poor Alfisol. S. Floyd*, Department of Agriculture, Alcorn State University, Lorman, MS 39096; B. Bhatta, Department of Agriculture, Alcorn State University, Lorman, MS 39096; and I.A. Atoloye. Department of Agriculture, Alcorn State University, Lorman, MS 39096.

A major restriction facing crop cultivation in the southeastern part of United States is soil degradation. Soil degradation occurs when soil health and fertility decrease, accelerated by anthropogenic activities, such as excessive use of synthetic fertilizers, which leads to chemical and biological changes in the soil. The purpose of this research is to investigate the effects of cow manure compost-biochar mixture (CMBC) on physical, biological, and chemical soil health indices, and agronomic performance of okra (Abelmoscus esculentus)in an Alfisol in Mississippi. A randomized complete block design with three replications was established. The treatments include control, cow manure compost, cow manure compost mixture with biochar, and NPK fertilizer. Soil samples were collected from 0-10 and 10-20 cm depth. Physical soil health indicators (bulk density, aggregate stability, water infiltration rate), chemical (pH, electrical conductivity, soil organic matter), and biological (microbial biomass carbon, enzyme activities, potentially mineralizable nitrogen, soil respiration, earthworm population) were measured. Preliminary results indicate improvement in selected soil health indicators. The results could be useful for farmers considering approaches to rebuild soil organic matter on their lands.

1104

Vertical and Controlled Environment Agriculture: A Meta-Analytic Synthesis of Performance, Sustainability, and Economic Viability. C. Vroom* and S. Geleta, College of Agriculture, Environmental and Human Sciences (CAEHS), Lincoln University of Missouri, Jefferson City, MO 65101.

Climate change and food security pose interconnected global challenges. The agrifood system--encompassing production, processing, distribution, and waste--contributes approximately one-third of anthropogenic greenhouse gas emissions (Crippa et al., 2021), while facing growing pressure to feed rapidly urbanizing populations. Vertical farming (VF) and controlled environment agriculture (CEA) offer innovative solutions by decoupling crop production from land and climate constraints. However, empirical evidence comparing these systems to conventional agriculture remains fragmented. This study presents a meta-analysis quantifying VF and CEA performance across four dimensions: yield optimization, resource efficiency, economic viability, and environmental sustainability. Following PRISMA guidelines, we systematically searched seven databases (Web of Science, Scopus, PubMed, AGRICOLA, CAB Abstracts, Google Scholar, and ScienceDirect) for peer-reviewed studies published between 2010 and 2025. Effect sizes were calculated using standardized mean differences and log response ratios, with random-effects models employed to estimate pooled effects. Meta-regression analysis identified moderators, including crop type, system configuration, and climatic context. A Cobb–Douglas production function framework was applied to assess input--output elasticities and comparative economic efficiency across hydroponic, aeroponic, and aquaponic systems. Our results provide insights for policymakers designing climate-resilient food strategies, investors evaluating technology-scaling opportunities, and practitioners optimizing system configurations across diverse biophysical and socioeconomic contexts. This work provides an integrated synthesis of VF and CEA technologies across agronomic,

environmental, and economic metrics. By advancing evidence-based understanding of urban agriculture performance, this study contributes to sustainable food production in climate-challenged urban environments.

1105

Adaptive Grazing and Soil Monitoring Strategies for Invasive Species Control in Regenerative Pasture Systems. M. Adler*, C. Shilpakar, A. Kwarteng and M. Acharya, College of Agriculture, Environmental and Human Sciences (CAEHS), Lincoln University of Missouri, Jefferson City, MO 65101.

Invasive species encroachment across the central United States presents significant barriers to developing resilient, pasture-based livestock systems. Adaptive grazing can be a useful tool to reduce invasive species encroachment and promote native vegetation in pastures, but its effectiveness depends on the invasive plant type and the timing of management relative to the plant's growth cycle. To suppress Lespedeza cuneata (sericea lespedeza) invasion and restore ecological function in research paddock, we are combining adaptive grazing with real-time soil and forage monitoring at Elm Spring Farm, a historic 1840 homestead established by War of 1812 veteran General David Thomson and listed on both the Missouri State and National Registers of Historic Places. Preliminary data were collected on pasture size, soil nutrient variability, and invasive coverage from paddocks infested with L.cuneata. Early results indicate that the water table at research plots ranges from 2-4 feet deep, with moderately well-drained soils. Most research areas fall under Alfisols and Mollisols soil orders, with silty loam texture. Current L. cuneata cover ranges between 40-70 percent of the paddock area. Field trials will evaluate how variable stocking pressure, guided by soil sensor data and mapped animal movement, can suppress L. cuneata while supporting desirable forage recovery. This producer-driven research aims to develop a replicable model that reduces chemical inputs, enhances soil resilience, and strengthens regenerative livestock systems. The project functions as a working "living lab" for small and mid-scale producers and supports the 1890 Land-Grant mission of advancing sustainable, economically viable, and ecologically sound livestock production.

Scientist Poster Presentation

Animal Health and Production and Animal Products

1106

Effect of Breed-type on Goat Carcass Traits. L. Kinman*, W. Foxworth, M. Franklin, S. Horner, I. Gilmore. CAFNR Research, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446.

Demand for goat meat continues to increase in the United States. While Spanish goats are the predominant U.S. meat-type breed, Boer goats, originating from South Africa and known for superior muscularity, are gaining popularity. However, Boer goats are less adaptable to poor forage conditions than Spanish goats. A larger project is underway to develop a composite breed that combines the hardiness and maternal ability of Spanish goats with the muscle development of Boer goats. This preliminary study evaluated carcass characteristics among breed types during the early stages of composite development. Breed types included purebred Boer, purebred Spanish, F1 crosses (Boer × Spanish; Spanish × Boer), and F2 composites (F1 × Spanish; F1 × Boer), sourced from the International Goat Research Center at Prairie View A&M University. Goat kids (average 200 days old) were slaughtered at the PVAMU Meat Science Center. Carcass traits measured included pH (initial and 24 h), carcass length, leg circumference, loin eye area, body wall thickness, and physical composition (muscle, fat, and bone). Data were analyzed as a completely randomized design using the GLIMMIX model in SAS. No significant differences were observed among breed types for most carcass traits, except carcass length, which was greater in F1-SB goats (109.34 cm) than F2-BSS goats (91.91 cm). These preliminary findings suggest minimal carcass differences among breed types.

1107

Black Soldier Fly Larvae as a Sustainable Feed Ingredient: Impacts on Broiler Growth, Carcass Traits, and Physiology. J. Lohakare*, A.A.A. Abdel-Wareth, M. Salahuddin, P.K. Goswami, K.G. Stamps, C.D. Gray, A.M.W. Aviña, T. Carr, A. Argueta, and J.S. Dennis, CAFNR Research, Prairie View A&M University, Prairie View, TX 77446.

Rising feed costs and environmental concerns have prompted interest in Black Soldier Fly Larvae (BSFL) as a sustainable alternative to soybean meal in poultry production. This study evaluated the effects of replacing soybean meal with BSFL at inclusion levels of 0%, 20%, 40%, and 60% on broiler performance, carcass quality, and blood biochemistry. A total of 160 Ross 308 broiler chicks (*Gallus gallus domesticus*) were randomly assigned to four dietary treatments, each with 8 replicates of 5 birds. From 10 to 42 days of age, growth performance revealed a linear decline in body weight, daily gain, feed intake, and feed conversion efficiency with increasing BSFL levels, indicating reduced growth at higher inclusion rates. Carcass yield decreased significantly, while gizzard weight increased linearly and quadratically, suggesting digestive adaptation. Meat quality parameters, including breast muscle color (L*, a*, b*), remained largely unaffected. Blood biochemical analysis showed marked changes in electrolyte balance and enzyme activity. Sodium, chloride, calcium, cholesterol, and total protein exhibited quadratic responses, while potassium, phosphorus, aspartate aminotransferase, and creatine kinase exhibited linear declines, indicating potential effects on liver and muscle physiology. Other metabolites, such as glucose, uric acid, and blood urea nitrogen, remained stable across treatments. Overall, BSFL inclusion influenced metabolic and physiological responses in broilers, with moderate levels (20–40%) supporting better biochemical stability and organ development. These findings highlight BSFL's potential as a sustainable protein source in poultry diets, though optimal inclusion rates should be carefully managed to maintain growth performance and health.

1108

Effect of Heat Stress on the Transcriptome of Lambs During the Weaning Period. Z. Estrada-Reyes*, S. Ikuejamoye-Omotore, and A. Pech Cervantes, CAFNR Research, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446; J. Adebayo, and M. Harrison, Department of Animal Science, North Carolina A&T State University, Greensboro, NC 27411; and T. Terrill, College of Agricultural, Family Sciences, and Technology, Fort Valley State University, Fort Valley, GA 31030.

This study investigated the impact of heat stress on the transcriptomic profile of Florida Cracker lambs. Twenty-four lambs were randomly assigned to either a heat stress (HT; $n = 12$) or cooling (CTL; $n = 12$) group for six weeks. HT lambs were exposed to natural summer temperatures, while CTL individuals had access to an evaporative cooling fan. Ambient temperature and humidity were recorded weekly to calculate the Temperature-Humidity Index (THI). Blood samples were collected via jugular venipuncture at weeks 1, 4, 8, and 12, and stabilized using RNAprotect tubes. Total RNA was extracted with the RNeasy Protect Animal Blood Kit (Qiagen), and libraries were prepared using the KAPA RNA HyperPrep Kit with RiboErase Globin Reduction (Roche). Sequencing was performed on the Illumina NovaSeq 6000 platform. Quality filtering of FASTQ files was done using FastQC, and differential gene expression analysis was conducted with DESeq2. Genes with a false discovery rate (FDR) ≤ 0.05 were considered differentially expressed (DEGs). Functional enrichment of DEGs was performed using SR-plot. Comparative analysis revealed 2 DEGs (ADGRA1 and ATP10A) at week 1, and 14 DEGs at week 12 (CDC42EP2, LY6G5B, POGLUT1, ALOX15, QTRT2, SLC16A1, CHD4, NUDT12, PABPN1, ENSBTAG00000046372, PER1, ZNF821, ZFPM1, and GTF2H3). Week 1 DEGs were linked thermogenesis and energy expenditure; week 12 to metabolism, cell cycle and chromatin structure. Our results evidence the ability of Florida Cracker sheep to adapt to heat stress in the summer season. Further studies are needed to understand these molecular mechanisms affected by heat stress in sheep.

1109

Creation of a Supervised and Unsupervised Machine Learning Predictive and Classification Model Utilizing FAMACHA Score, Hematocrit, and Fecal Egg Count for Anemia Detection in Small Ruminants. R. Tunner*, A. Siddique, A. A. Pech-Cervantes, A. K. Mahapatra, and T. H. Terrill, Department of Agricultural Sciences, Fort Valley State University, Fort Valley, GA 31030; S. S. Panda, Institute for Environmental Spatial Analysis, University of North Georgia, Oakwood, GA 30566; E. R. Morgan, Institute for Global Food Security, Queen's University Belfast, UK; and J. A. van Wyk, Department of Veterinary Tropical Diseases, Faculty of Veterinary Science, University of Pretoria, Onderstepoort, South Africa.

A comprehensive dataset was systematically collected from intact Spanish male goats over a time frame of two years, including measurements of hematocrit levels, fecal egg counts, and FAMACHA scores. These parameters serve as crucial indicators of goat health and parasitic infection. By utilizing the available data, a predictive and classification model framework was developed using Bootstrap Forest, Random Forest, and Random Forest regression. The

evaluation of the model performance was conducted by assessing their predictive performance. The Bootstrap Forest model had a high level of explanatory power for the variance in the data, as indicated by an R-square value of 84.23%, and Boosted Tree analysis yielded an R-square value of 83.70%. The classification accuracy of the model exhibited notable variations across all categories of FAMACHA scores, which serve as a visual indicator for anemia and frequently demonstrate a correlation with the degree of parasitic infection. The achieved accuracy rates were as follows: 56.8% for FAMACHA score 1, 53.8% for score 2, 93.1% for score 3, 55.9% for score 4, and 84.4% for score 5. This study found models with varying levels of predictive ability, with high levels of accuracy in categorizing anemia of moderate to severe severity, as indicated by FAMACHA scores 3 and 5. The observed variations in classification accuracy among the scores indicate that specific FAMACHA levels may be more predictable based on the hematocrit and fecal egg count data of goats. This will inform targeted actions for the management of animal health.

1110

AI-Driven Approaches for Enhancing Anemia Detection in Livestock Health Monitoring. P. Gurrapu*, P. Batchu, G. K. Isai, and A. Siddique, Fort Valley State University, Fort Valley, GA 31030; S. S. Panda, University of North Georgia, Oakwood, GA 30566; E. R. Morgan, Queen's University Belfast, UK; J. A. van Wyk, University of Pretoria, Onderstepoort, South Africa; A. K. Mahapatra, and T. H. Terrill, Fort Valley State University, Fort Valley, GA 31030.

Livestock health monitoring is central to sustainable agriculture, food security, and animal welfare. Traditional diagnostic methods for anemia, such as blood tests and FAMACHA© scoring, are widely used for managing gastrointestinal parasites like *Haemonchus contortus* in small ruminants. While effective, these approaches face limitations, including subjectivity, inter-observer variability, and labor-intensive procedures, particularly in large-scale or resource-limited settings. Artificial Intelligence (AI) and Machine Learning (ML), including Natural Language Processing (NLP), are emerging as transformative tools for automating and standardizing anemia detection. This systematic literature review (SLR) evaluated the application of AI-driven methods—such as deep learning, Support Vector Machines (SVMs), Backpropagation Neural Networks (BPNNs), and Convolutional Neural Networks (CNNs) alongside RF wave-based monitoring and Bioelectrical Impedance Analysis (BIA). A structured search across Web of Science, PubMed, Scopus, and Google Scholar identified 1,928 research nodes and 2,897 citation links, revealing rapid growth in AI-powered livestock diagnostics. CNN-based FAMACHA© scoring achieved accuracies above 92%, surpassing traditional visual assessments by eliminating observer bias. RF-based sensors, including ultra-wideband radar and RFID, enabled remote, real-time monitoring, while BIA provided insights into parasite-induced physiological changes. Comparative keyword analysis showed stronger research focus on RF (120 mentions) than FAMACHA© (88) or BIA (15), although NLP remains underexplored despite its potential to convert unstructured veterinary data into actionable knowledge. Future work should integrate NLP with multi-sensor data, adaptive deep learning, and mobile applications to enhance scalability and cost-effectiveness. Such advances could establish AI-driven livestock monitoring as a precision-based, automated, and accessible diagnostic solution, improving sustainability and resilience in animal agriculture.

1111

Comparative Analysis of Intake, Feed Efficiency, Milk Yield, And Milk Fatty Acid Profiles of Dairy Sheep and Goats. A.A. Pech-Cervantes*, and M. Hitit, CAFNR Research, Prairie View A&M University, Prairie View, TX, 77446; and I.M. Ogunade, Division of Animal and Nutritional Science, West Virginia University, Morgantown, WV 26506.

Small ruminants, such as dairy sheep and goats, are often considered similar in terms of nutritional management and performance. Thus, we conducted a comparative analysis between high-producing dairy sheep and goats fed with similar diets across the literature. A comprehensive database from 2009 to 2024 with 1280 dairy goats (45.3±8.6 kg) and 1350 sheep (62.7±14.4 kg) fed with a similar diet was used to compare intake, feed efficiency, milk yield, and milk fatty acid profiles. The model was adjusted based on days in milk (DIM), weight, diet (CP, NDF, ADF, EE), and metabolic weight. Despite the differences ($P < 0.01$) in intake between sheep and goats (2.27 vs. 1.8 kg/d), no differences ($P > 0.05$) in metabolic intake (0.102 vs. 0.103 kg/ BW0.75), % BW (3.62 vs. 3.97%), total-tract digestibility (65.4 vs. 67.3%) were observed among species. Conversely, dairy goats showed higher ($P < 0.05$) milk yield (2.1 vs. 1.6 kg/d), feed efficiency (1.2 vs. 0.9), but lower ($P < 0.05$) milk fat (3.8 vs. 6.9%), milk protein (3.21 vs. 5.21%) compared to dairy sheep. Dairy sheep showed higher levels of PUFA (5.9 vs. 3.78 g/ 100 FAME), CLA

(0.86 vs. 0.51 g/100 FAME), but lower levels of SCFA (24.7 vs. 27.4 g/100 FAME) and saturated FA (69.8 vs. 72.7 g/100 FAME). Although high-producing sheep and goats had similar metabolic intake and digestibility, dairy goats produced more milk than dairy sheep. Differences in yield between sheep and goats were associated with milk fatty acid composition between species.

1112

Assessing the U.S. Goat Meat Demand and Consumers' Willingness to Pay. J. Zhang *, S. P. Dhoubhadel, and B. Khanal, CAFNR Research, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446.

Goat meat offers superior nutritional qualities and environmental performance compared to mainstream red meats, making it a promising alternative protein source that can contribute to a healthier and more sustainable food system. However, in the United States, goat meat remains a niche product characterized by limited domestic production, low consumer familiarity, and a heavy reliance on imports. This study investigates whether and how domestic goat meat can become a viable alternative to mainstream red meats and a meaningful component of the U.S. protein supply. Using a national survey of household grocery and restaurant consumers, we collect data on perceptions, consumption patterns, preferences, and barriers related to goat meat. We apply a basket-based stated preference method, which allows us to examine consumer preferences for novel products by presenting participants with hypothetical baskets of meat products described by attributes such as meat type, price, processing form, and cut, and asking them to make selections based on a fixed budget. By analyzing these choices, we estimate consumers' preferences and willingness to pay for goat meat and its attributes. Our findings reveal that targeted improvements in production, processing, and retail distribution could mitigate adoption barriers and reshape consumer demand. The results provide evidence of substantial market potential and highlight the feasibility of expanding domestic goat meat consumption, benefiting producers, retailers, and policymakers seeking to foster a more diverse and sustainable red meat market in the United States.

1113

Assessing the Impact of Postbiotics on the Ruminal Microbiome, Animal Performance, and Immune Responses in Dairy Calves. B.R. Min*, M. Hilaire, H. Wang, A. Kumi, S. Chaudhary, V. Kanyi, N. Gurung, H. Abdo, H. Ismael, B. Gines, Department of Agricultural and Environmental Sciences, Tuskegee University, Tuskegee, AL 36088; I. Min, E. Kim, and I. Ha, Loveless Academic Magnet Program High School, Montgomery, AL 36111; and S. Yang, Verdesian Life Sciences LLC., South Salt Lake City, UT 84115.

This study aims to investigate the effects of supplementing postbiotics in growing pre- and post-weaned dairy calves over 95 days on growth performance, digestibility, rumen fermentation characteristics, microbial populations, blood metabolites, immune response, and immune-related gene expression. Thirty healthy, gonadally intact Holstein male calves, 5 days of age, with an average body weight of 45.0 kg ± 0.23 kg, were randomly assigned to three treatment groups (n = 10). The control group received no postbiotics. In contrast, the other two treatment groups received 1.75 g/d and 3.5 g/d of a post-biotic, respectively, added to their milk for 50 days during the pre-weaning period. During the post-weaning period, calves in the control group received no postbiotics, while the other treatment groups received 3.5 g/d and 7.0 g/d per calf for 45 days, totaling 95 days of the experimental period. The statistical analysis was performed using the GLM procedure of SAS. Results showed that, with post-biotics supplementation, animal body weight ($P < 0.01$), average daily gain (ADG) ($P < 0.01$), and immune response ($P < 0.01$) were significantly higher in the treatment groups than in the control. Blood metabolites were varied among treatments. Among bacterial phyla, Bacteroidetes decreased ($P < 0.05$), while Pseudomonadota increased ($P < 0.05$). Immune cells from the blood of supplemented calves showed increased expression of TNF-α, IL-6, and IFN genes. Postbiotic feeding strengthened immune responses without causing adverse effects on rumen microbiome diversity, ADG, and blood metabolites in dairy calves compared to controls.

1114

***Haemonchus contortus* Infection Modulates the Colostrum Metabolomic and Lipidomic Profiles in Florida Cracker Ewes**. S. Ikuejamoye-Omotore*, Z. Estrada-Reyes, and A. Pech Cervantes, CAFNR Research, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446; J. Adebayo, M.

Harrison, Department of Animal Science, North Carolina A&T State University, Greensboro, NC 27411; and T. Terrill, College of Agricultural, Family Sciences, and Technology, Fort Valley State University, Fort Valley, GA 31030.

Haemonchus contortus poses a major threat to sustainable sheep production in the southern U.S., significantly affecting ewe health and productivity. Infected ewes often exhibit disruptions in biochemical, hematological, and metabolic profiles, which may compromise colostrum quality, an essential source of nutrition and immunity for newborn lambs. This study aimed to evaluate the effects of *H. contortus* infection on the chemical composition, metabolomic, and lipidomic profiles of colostrum in Florida Cracker ewes. Twenty pregnant ewes were assigned to infected (INF; n = 10) or control (CTL; n = 10) groups at 90 days of gestation. All animals were housed under similar conditions and dewormed on day 110 of pregnancy. At day 120, INF ewes received 10,000 L3 *H. contortus* larvae orally, while CTL ewes received 3 mL of distilled water. Colostrum samples were collected immediately after lambing. Chemical composition (fat, protein, lactose, total solids) was analyzed using a milk analyzer. Metabolomic and lipidomic profiles were assessed via mass spectrometry. No significant differences were found in basic colostrum composition between groups. However, metabolomic analysis revealed 23 differentially abundant metabolites ($p < 0.05$, FC > 1.5), linked to immune and antioxidant pathways (tyrosine, ubiquinone terpenoids). Lipidomic analysis identified 4,702 lipid species, with three (FA 15:1, MG 20:5, PE 41:6) emerging as potential biomarkers. These findings suggest that *H. contortus* infection alters the molecular profile of colostrum, potentially affecting lamb development and immunity. Further research is needed to understand our findings.

1115

Evaluation of Laser Methane Detector Measurements Relative to Calorimetry in Meat Goats. D. Tadesse*, R. Puchala, S. Adekayode, H. Yirga, A.K. Patra, and I. Tovar-Luna American Institute for Goat Research, Sherman Lewis School of Agriculture and Applied Sciences, Langston University, Langston, OK 73050

The development of simple and practical techniques for methane measurement as an indicator of energy utilization efficiency is important given the limited feasibility of standard methods such as calorimetry under on-farm conditions. This study evaluated the use of a portable laser methane detector (LMD) for estimating methane output from goats and compared its performance with a calorimetry system. Thirty-six Spanish doelings were assigned to a 6 × 6 Latin square design and subjected to different feeding regimes across six 3-week periods. Methane concentrations were measured using the LMD over a short sampling period (5 minutes) for three consecutive days while animals were housed in controlled rooms. On the third day, 24-hour methane production was measured using calorimetry for comparison. Correlation and regression analyses were conducted to evaluate relationships between methane measurements obtained using the LMD and calorimetry. Mean methane concentrations recorded by the LMD were moderately correlated with daily methane production measured by calorimetry. The relationship was stronger when peak values detected by the LMD were used than when all recorded data points were included. Regression models explained a moderate proportion of variation, with improved performance when peak values were used. These findings indicate that the LMD can provide a reasonable prediction of methane output and energy loss in goats and may be suitable for practical application following further refinement. A follow-up study with mature goats has been completed, and a combined analysis of both datasets is underway to confirm the reliability of LMD-based estimation against calorimetry.

1116

Essential Oils Used in Animal Feed: Effects on Feed Quality and Ruminal Efficiency in Alpine Goats. F. Belkasmi*. Sherman Lewis School of Agriculture and Applied Sciences, Langston University, OK 73050.

The use of essential oils (EOs) as natural feed additives has gained increasing attention as an alternative to synthetic growth promoters and antibiotics in ruminant nutrition. This study aimed to evaluate the effects of dietary EO supplementation on feed stability, volatile fatty acid (VFA) production, ruminal pH, and fermentation patterns in Alpine goats. Conducted within the framework of the CA-2501 experiment, the trial compared five dietary treatments, eight animals per treatment: a control diet and four diets supplemented with undegradable protein (RUP), bypass fat (BF), a blend of essential oils (EO-mix), or a combination of all additives (MIX). Feed and ruminal samples were collected to assess chemical composition, fermentation characteristics, and rumen pH dynamics. Preliminary observations suggest that EO inclusion may contribute to improved feed stability, moderated pH fluctuations, and modulated fermentation activity without compromising dry matter intake. Differences among treatments are being

further analyzed to determine their effects on VFA profiles, fermentation efficiency, and rumen stability. These findings are expected to provide insights into the potential of essential oils as functional dietary components supporting feed quality, nutrient utilization, and robust production efficiency in dairy goats. This ongoing work seeks to clarify the role of essential oils in improving rumen health and digestive efficiency, ultimately contributing to the development of efficient, antibiotic-free feeding systems.

1117

Comparing Phytochemical Concentrations of Stinging Nettle Across Phenotypic Expressions and Maturity Stages. S. S. S. Narina* and V. W. Temu, Forage Ecology Research; and M. K. Kering, Plant Nutrition and Physiology, Agricultural Research Station, Virginia State University, Petersburg, VA 23806.

Stinging nettle (*Urtica dioica* L., Urticaceae) provides nutritional and medicinal benefits to humans, and its bioactive compounds have anti-helminthic properties. As a forage, it is rich in macro and microelements, proteins, vitamins, and phytochemicals, like flavonoids, phenolics, and carotenoids. The high phytochemical content and anti-helminthic properties make stinging nettle ideal for forage in small ruminant operations. A study was established to evaluate phytochemical compositions in leaf and stem components of reddish and green stinging nettle phenotypes at vegetative and reproductive growth stages. Extracts from harvested materials were analyzed for antioxidant activity (% inhibition of DPPH, µM TE), total flavonoid content (TFC, mg of QE/g), and total phenolic content (TPC, µg/mL GAE) using spectrophotometry, following AOAC methods. The red phenotype leaves at the flowering stage had the highest TPC (108–112 µg/mL GAE), DPPH inhibition (69.9 %), and antioxidant activity (45.5 µM TE), compared to those from the green phenotype (85–91 µg/mL GAE). Leaf TFC in the green phenotype remained high during both stages (18.9 and 16.9 mg QE/g), while stem TFC in the red phenotype increased markedly from vegetative (12.94 mg/g) to reproductive (19.91 mg/g). The results indicate a strong developmental regulation of phenolic compounds biosynthesis, which is linked to tissue differentiation. The elevated TPC in red phenotypes likely reflects anthocyanin accumulation, often associated with enhanced antioxidant and antiparasitic potential, and may suggest this phenotype's greater potential for phyto-therapeutic uses in controlling gastrointestinal nematodes through antioxidant-mediated parasite suppression mechanisms. Thus, harvesting timing and phenotype selection could enhance the antiparasitic efficacy of nettle-derived forages or extracts. Analysis to quantify specific phytochemicals is ongoing.

11168

Monitoring Emergent Animal Diseases for Food Security in the Americas (Dec 5th, 2024, Symposium Proceedings). V. Uyanga * and J. Epple-Farmer, College of Agriculture, Environmental and Human Sciences (CAEHS), Lincoln University, Jefferson City, MO 65101.

Trade is a vital component of the U.S. economy; this makes the animal pests and diseases that affect our trading partners of interest to the U.S Department of Agriculture. In our globally integrated world, the growth and stability of our partners have significant implications to the U.S.'s national food security and to the global food system. We share with our Latin American partners the important production of sheep and goats as well as the need for livestock disaster preparedness. It is this commonality of shared food where our symposium series builds, allowing us to address food security and defense in the Americas. These webinars cover a variety of information including pest and disease recognition, mitigation strategies, modern detection tools and disease monitoring. As a part of the Latin American cohort, programing was joined and contributed to by our colleagues in Guatemala, Mexico, as well as fellow 1890 institutions. This funded project is a part of the Center of Excellence for Global Food Security and Defense (CEGFSD). It is designed to foster international partnerships that strengthen agricultural integrity in developing countries and engage international researchers in addressing new and emerging animal pests and diseases

1119

Effect of Pasteurization on Cheese Yield and Coagulation Properties of Goat Milk. A. Lindert*. Sherman Lewis School of Agriculture and Applied Sciences, Langston University, Langston, OK 73050

Cheese yield is a key determinant of dairy processing efficiency and profitability. Numerous studies have compared the effects of raw and pasteurized milk on cheese yield in both cows and goats; however, most focus on specific cheese types, limiting the ability to draw broader conclusions. Heating the milk prior to coagulation affects the cheese yield and composition. At elevated temperatures, whey proteins such as β-lactoglobulin become denatured and interact with

κ-casein on the surface of casein micelles. During rennet coagulation, these complexes remain incorporated into the curd matrix, reducing syneresis and increasing water retention. This study aims to evaluate the impact of pasteurization on overall cheese yield and coagulation properties of goat milk from two dairy breeds, Alpine and LaMancha, which are widely used in commercial and research herds. Milk from each breed was collected and divided into two treatments: raw and pasteurized. Cheese yield is measured gravimetrically using the 9-milca procedure, while coagulation characteristics, including rennet coagulation time and curd firmness, will be determined using a Lactodynamograph. It is hypothesized that pasteurized goat milk will produce a lower cheese yield than raw milk due to heat-induced modifications in protein structure and enzyme activity. It is expected that moderate heating will promote partial denaturation of whey protein, thereby enhancing curd hydration and apparent yield, whereas excessive heating may negatively affect the curd structure and texture. The findings from this work will help optimize heating parameters to improve cheese yield and quality in goat milk processing.

1120

Modification and Verification of the SEAL Analytical Ammonia in Soil Extracts Method to Determine Ammonia-Nitrogen Concentrations in Rumen Fluid. C. Toerien-Hayes*, Sherman Lewis School of Agriculture and Applied Sciences, Langston University, Langston, OK, 73050; P. Schultz, SEAL Analytical, Mequon, WI, 53092; F. J. Redovich, Jr, SEAL Analytical, Mequon, WI, 53092.

Our aim was to modify the established SEAL Analytical autoanalyzer method for use with rumen fluid samples preserved with 4% trichloroacetic acid (TCA; 3:2). The method is based on the Berthelot reaction in which ammonia reacts with salicylate and chlorine from dichloroisocyanuric acid (DCA) to form indophenol blue in an alkaline environment at 37ºC. Sodium nitroprusside is the catalyst, and the developed color is measured at 660 nm. Modifications included decreasing the sodium hydroxide concentration in the DCA solution from 30 to 15 g/L and using TCA, diluted similarly to the samples, for preparation of standards and baseline. Samples were centrifuged (3,500g; 20 min), and the supernatant was analyzed. The modified method showed a highly linear relationship between 1.5 and 400 mg/L ($R^2 > 0.999$), and no samples required additional dilution to fall within this range. However, low-end deviation of the standard curve resulted in overestimation of standard concentrations ≤10 mg/L by 5 – 44%. Therefore, a separate standard curve is recommended for samples <20 mg/L, which is similarly linear ($R^2>0.999$). To determine accuracy, samples were spiked with 0, 20, 60, or 100 mg/L ammonia-nitrogen. Spike recovery ranged from 103 to 106% (Exp 1; n=9) and 93 to 108% (Exp 2; n=89), with 88% of results being between 97% and 103%. Both precision and repeatability were excellent, with %CV ≤1.3%. In conclusion, the modified method is suitable for analyzing ammonia-nitrogen in rumen fluid; it is sensitive, accurate, linear over a wide range, requires minimal sample preparation, and allows for high throughput.

1121

Beef & Forage Guide for Limited-Resource Farmers. C.P. Bagley*, M. K. Tate, and C. R Walker, Southern University Agricultural Research and Extension Center, Baton Rouge, LA 70813; and R. R. Evans (retired) Prairie Research Unit, Mississippi State University, Prairie MS 39730.

A book has been published by the Southern University Ag Center that presents information on beef and forage production in a question-and-answer format. The book is broken into sections for General Information, Cow management, Replacement Heifer Management, Bull Management, Nutrition, Diseases/ Health Problems, Forages, Livestock-Forages Interactions, Hay Production and Storage, Forage and Weed Identification. The book presents information, starting as a question, and then giving a brief answer. It then expands upon the answer in a much fuller context increasing the depth to more fully answer those more difficult questions that require greater explanation. The book will soon be available on-line. There are several hundred pictures and graphs to better explain such things as Body Condition Scores, graphs related to digestibility, pictures of grasses, clovers and weeds for better identification, and additional sources of information. There is even a section on how to balance beef cattle rations using multiple feeds. The 208-page book also has a glossary of terms and terminology which can be useful to producers. Producers are encouraged to read and comment on the publication, and if they have additional questions they wish to ask, to forward those to the author. Over 12,000 of these books have been printed and distributed.

1122

Focusing on Improved Forage Production and Soil Health in Rotationally Grazed Pastures in South Louisiana. 1. Forage Yield and Botanical Composition. C.P. Bagley*, J. B. Crabtree, and R.L. Palfreyman, Southern University Agricultural Research and Extension Center, Baton Rouge, LA 70813.

Three privately owned farms in southern Louisiana were cooperators in a 3-yr study funded by NRCS to evaluate soil health, forage quality, forage yield, and botanical composition. Forage yield, quality attributes, and botanical composition assessments were taken monthly at cooperator farms in Clinton, Palmetto, and DeRidder from April 2021through October 2023. Each farm employed rotational grazing using 3, 5 and 12 paddocks. The forage assessments were delayed in mid-summer 2022 due to a prolonged and serious drought, resulting in cattle removed from grazing pastures due to a lack of forage availability. Each month during the sampling period three pastures at each of the three locations were sampled for forage attributes of forage yield, plant height and botanical composition. Forage samples were analyzed for crude protein, NDF, ADF, cellulose, lignin, and several minerals. Pastures were overseeded each fall with ryegrass (25 lb/ac), white clover (3 lb/ac) and red clover (8 lb/ac). Generally, forage yield, quality, and percent ryegrass and clover were greatest in April and became lower by June and into summer months. As summer progressed crude protein declined along with declining clover populations in pastures, and fiber constituents (NDF, ADF, and lignin) increased. Year 2 was an historic drought with wildfires resulting in cow numbers reduced by at least 50% at all three farms. “Pasture Walks” were held at each of the three farms each of the three years with local producers attending ranging from 12 to 78 in attendance.

1123

Focusing on Improved Forage Production and Soil Health in Rotationally Grazed Pastures in South Louisiana. 2. Soil Health. C.P. Bagley*, J.B. Crabtree, and R.L, Palfreyman, Southern University Agricultural Research and Extension Center, Baton Rouge, LA 70813; and L.M. Fultz, Louisiana State University Agricultural Center, Baton Rouge, LA 70803.

Three privately owned farms in southern Louisiana were cooperators in a 3-yr study funded by NRCS to evaluate soil health, forage quality, forage yield, and botanical composition. Soil health assessments were taken at cooperator farms in Clinton, Palmetto, and DeRidder in April 2021, 2022, and 2023 and in October 2021, 2022, and 2023. The assessments were delayed in 2022 due to a prolonged and serious drought, resulting in cattle being removed from grazing pastures. The farm in Clinton has 4 pastures being sampled, Palmetto also has 4, and DeRidder has 3; the pastures were chosen at random. The soil health assessment consists of several aboveground visual observations such as soil cover, surface crust, residue breakdown, ponding/infiltration, and biological diversity. Once the visual observations were taken, two 1-ft-deep holes were dug in each pasture, from this the belowground observations were taken such as soil structure, soil color, plant root depth, and biopores. Soil penetration resistance was also measured using a penetrometer, 6 different readings were taken per pasture. Soil samples were obtained from each hole and mixed to perform in-lab analyses such as organic matter, water-aggregate stability, soil respiration, soil enzymes, POXC (Active C)-Permanganate oxidizable C, available N-Autoclaved Citrate Extractable N (ACE N), and FAMEs. Soil health measurements were generally improved over the 3 years with rotational grazing, with an almost 30% increase in soil organic matter.

1124

Broiler Litter as a Feed or Fertilizer in Livestock Operations. C.P. Bagley*, M. K. Tate, and C. R Walker, Southern University Agricultural Research and Extension Center, Baton Rouge 70813; and R. R. Evans (retired) Prairie Research Unit, Mississippi State University. 36720.

Broiler production is primarily located in the Southeastern US and houses are located on individual farms in sets of 4 or more. Chicken consumption per capita has increased some 600% since 1940 and now is the most consumed meat in the US. Louisiana had an estimated 642 broiler houses in 2022, down from 681 houses in 2017 (2022 Census of Agriculture). In general, each broiler house has about 28,000 chickens, with a grow-cycle averaging about 7 weeks, with each house growing 6 cycles of birds each year. This equates to over 1 million lb of live chickens produced per house annually. Each broiler house is usually cleaned out once per year, yielding about 100 tons per house of broiler litter with growers mandated to have a proper litter disposal plan. Broiler litter is comprised of a bedding material, often wood shavings, and bird excreta, and is often used as a fertilizer. Generally, broiler litter will have a mineral composition of 60 – 50 – 40 lb per ton of N – P_2O_5 – K_2O, respectively. Often broiler litter is applied to pastures at a

rate of 4 tons per ac annually, equating to a set of 4 broiler houses needing 100 ac of pasture for proper disposal of broiler litter. But if properly managed and composted, broiler litter can be used as a feed source for beef animals. Mixtures of broiler litter and corn at 80%/ 20%, 65%/35% and 50%/50%, respectively have been successfully fed to dry cows, lactating cows, and stocker cattle.

1125

Impacts of Programming on Beef Calf Productivity as Impacted by Nutrition. C.P. Bagley*, R. L. Palfreyman, and J. B. Crabtree, Southern University Research and Extension Center. Baton Rouge, LA 70813.

This 3-yr study evaluated impacts of pre-calving and post-calving nutrition on subsequent calf production traits. Approximately 80 Angus X Brahman X Hereford cows were divided into one of two herds and four nutritional treatments applied. Cow treatments were either 2lb or 5lbs of supplemental feed prior to calving and post-calving, resulting in four treatment groups: Trt 1. 2lb pre-calving, 2 lb post-calving; Trt. 2. 2 lb pre-calving, 5 lb post-calving; Trt. 3. 5 lb pre-calving, 2 lb post-calving, and Trt. 4. 5 lb pre-calving and 5 lb post-calving until about day 75 post-calving. Supplemental feeding of cows was halted at about d 75 and calves were blocked by previous treatment and allotted to a calf-treatment only of ad lib creep feed or no creep feed until weaning. While there were no significant treatment differences through d 75 d of the post-calving treatments, as expected cows fed more supplemental feed were slightly heavier in weight and body condition scores, but differences were not significant. Calves of cows fed higher levels of supplemental feed were slightly heavier though not significant (P>.05). Creep feeding did result in calves heavier at weaning (+ 47 lb) and both steers and heifers maintained these differences through first calving and final finishing weights. Creep-fed steers had final finishing weights 45 lb heavier than non-creep fed steers, and heavier carcass weights (810 vs. 786 lb), and slightly higher carcass quality grades. Creep-fed heifers were heavier at first calving, and their calves had slightly higher weaning weights (P>.05).

1126

Meeting Beef Heifer Phosphorus Requirements with Supplemental Protein from Dried Distillers Grains. C.P. Bagley*, R.L. Palfreyman, and J.B. Crabtree, Southern University Agricultural Research and Extension Center, Baton Rouge, LA 70813.

In this study 3 groups of 11 head each (n = 33) of 15-month-old Angus X Brahman X Hereford beef replacement heifers were supplemented while on pasture with one of three mineral treatments containing different levels of phosphorus or different levels of enzyme. Heifers were grazed on bermudagrass-bahiagrass-white clover pastures beginning in mid-May. Because of differences in clover content of the pastures, heifers remained on the same pastures throughout the trial and treatments rotated so that each group of 11 heifers received each of the three treatments for a 28-d period without changing pastures. Forage samples were harvested at the midpoint of each 28-d grazing period and forages analyzed for quality and mineral content attributes. On day 28 of each trial period, heifers were weighed, received body condition scores, fresh fecal samples taken and blood collected via venipuncture of the jugular vein. Experimental treatments were 1): complete mineral premix (CMP) with no P; 2): CMP no P, but with enzyme, and 3): CMP with 4% P. All heifers were supplemented with 2 lb/head daily of DDGS (Dried Distillers Grains) in open troughs and group fed. Level and bioavailability of P is reported to be high in DDGS. Results reported there was no difference in the treatment groups for P content in either blood or feces. Apparently DDGS contains ample available P to meet grazing heifer P requirements without the need for expensive P added to a complete mineral supplement.

1127

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house annually. Each broiler house is usually cleaned out once per year, yielding about 100 tons per house of broiler litter with growers mandated to have a proper litter disposal plan. Broiler litter is comprised of a bedding material, often wood shavings, and bird excreta, and is often used as a fertilizer. Generally, broiler litter will have a mineral composition of 60 – 50 – 40 lb per ton of N – P_2O_5 – K_2O, respectively. Often broiler litter is applied to pastures at a rate of 4 tons per ac annually, equating to a set of 4 broiler houses needing 100 ac of pasture for proper disposal of broiler litter. But if properly managed and composted, broiler litter can be used as a feed source for beef animals. Mixtures of broiler litter and corn at 80%/ 20%, 65%/35% and 50%/50%, respectively have been successfully fed to dry cows, lactating cows, and stocker cattle.

1128

Effects of Dietary Protein Level and Gastrointestinal Nematode Parasite Infection on Carcass and Non-Carcass Yield and Composition in Mutton. A. Yousuf*, Agricultural Research Station, Virginia State University, Petersburg, VA 23806.

A study was conducted to assess the effects of dietary protein level and parasite infection on carcass and non-carcass yields of sheep challenged with the gastrointestinal nematode *Haemonchus contortus*. Sixteen growing, intact male Barbados Blackbelly hair sheep were assigned to infected (INF) or non-infected (NIF) groups and fed either a high-protein (HP, 20% CP) or low-protein (LP, 17% CP) diet, with four animals per treatment. At the end of the experiment, following an overnight fast, animals were weighed for empty body weight, slaughtered at a commercial abattoir, and measurements were taken for hot carcass, blood, and non-carcass components (head, hide, and visceral organs including intestine, lung, liver, kidney, and spleen). Dressing percentage was calculated as hot carcass weight relative to empty body weight. Results showed no significant effects of dietary protein level or infection status on carcass yield, blood weight, or non-carcass pool weight. These findings indicate that increasing dietary protein above maintenance requirements does not improve carcass or non-carcass yield in *H. contortus*-challenged sheep.

1129

Growth Performance and Nutrient Efficiency. M. K. Tate, Sr*, F. Chappelle, J. Snowden, and C.P. Bagley, Southern University Agricultural Research and Extension Center, Baton Rouge, LA 70813.

This study quantified the impact of targeted deworming on growth performance, nutrient efficiency, and welfare indicators in weaned beef calves under precision monitoring conditions. Forty-nine calves were randomly assigned to Ivomec Plus, Synanthic, or Control treatment groups for a 42-day field trial at the Southern University Agricultural Research and Extension Center experimental farm. Body weight, body condition score (BCS), fecal egg count (FEC), and eBolus telemetry data (core temperature, rumination duration, and pH) were continuously recorded for cattle on pastures to assess treatment efficacy and physiological response. Average daily gain (ADG) was significantly higher ($P < 0.05$) in treated groups compared with controls of these freshly weaned Angus X calves. Treated calves also exhibited greater feed efficiency (feed-to-gain ratio) and improved BCS which is a visual estimated by trained personnel. Regression modeling revealed that ADG correlated positively with FECRT efficacy and rumination time, confirming the link between parasite suppression, nutritional utilization, and recovery using telemetry methodology. Telemetry trends demonstrated that treatments induced no sustained deviations in core body temperature or rumination, supporting welfare stability which had been a concern. Integrating these physiological datasets with production metrics provided a robust, quantitative measure of treatment value, both economically and biologically. These findings validate the use of eBolus telemetry as a companion decision-support technology for real-time growth tracking and health monitoring of beef cattle. The research contributes directly to Southern University's Smart Ranching Initiative, illustrating how precision livestock systems can enhance sustainability, animal well-being, and producer profitability across small and mid-scale operations.

1130

Body Condition Score Validation and Welfare Indicators. M. K. Tate, Sr*, B. Armstrong, J. Snowden, and C.P. Bagley, Southern University Agricultural Research and Extension Center, Baton Rouge, LA 70813.

The Body Condition Score (BCS) visually appraises cattle on a 9-point scale for body fat, and is a fast, repeatable measure corelated with performance data. BCS was validated as a practical welfare and productivity measure closely

associated with parasite load reduction and physiological stability in beef calves. Forty-nine calves were visually scored by trained personnel on Day 0 and Day 42 using the standardized 1–9 BCS visual scale, which evaluates subcutaneous fat deposition that is easily repeatable by trained personnel. Inter-observer reliability exceeded 0.9 (Cohen's Kappa), confirming consistency across evaluators for this quick, simple observation. Treated groups demonstrated a marked improvement from their BCS mean score while control animals exhibited only minimal improvement. BCS improvement correlated inversely with fecal egg count (FEC) and positively with rumination time, reinforcing its sensitivity as a welfare-linked indicator of internal parasite burden and nutritional recovery. Statistical modeling revealed significant treatment effects ($p < 0.01$) but no interaction with sex or baseline weight. Complementary eBolus telemetry data supported welfare interpretations by documenting stable core temperature, pH, and activity profiles among animals showing the highest BCS gains. These integrated data streams collectively validate BCS as a simple, repeatable, reliable, low-cost welfare metric when interpreted alongside physiological sensor data. Incorporating visual condition scoring with IoT-based telemetry provides a scalable, data-driven approach to welfare monitoring that enhances precision livestock management. This hybrid model supports both animal well-being and production efficiency, offering small producers a practical method for continuous health assessment and decision-making in real-world field conditions.

1131

Experimental Design and Statistical Modeling for Repeated Measures. M. K. Tate, Sr*, C. Adams, J. Snowden, and C.P. Bagley, Southern University Agricultural Research and Extension Center, Baton Rouge, LA 70813.

A mixed-model repeated-measures experimental research design was applied to evaluate treatment and sex effects of freshly weaned beef calves (Angus X steers and heifers) on growth and parasitological outcomes across three experimental treatments of Synanthic + Ivomec Plus, and Control. The analytical structure incorporated treatment and sex as fixed effects, individual animal nested within treatment as a random effect, and repeated observations for weight, fecal egg count (FEC), and visual body condition score (BCS) across multiple time points. Mixed ANOVA revealed a significant main effect of treatment on both average daily gain and fecal egg count reduction test (FECRT) efficacy, while no significant sex × treatment interaction was detected in this study conducted at the Southern University Research Farm. Inclusion of eBolus telemetry covariates including core body temperature, rumen pH stability, and rumination index all improved overall model precision by 18% and enhanced interpretation of physiological stability associated with growth response. Temporal analysis identified significant within-subject variation across 14-day intervals ($p < 0.05$), with recovery trajectories mirroring parasite suppression curves and BCS improvement trends in these beef calves. The final model achieved $R^2 = 0.82$, indicating high explanatory power for production variability and treatment response using these technologies. This mixed-model framework demonstrates how integrating IoT-derived physiological variables strengthens inference in livestock trials with limited numbers of experimental units. The study underscores the importance of robust statistical design and advanced data integration for reproducible precision livestock research, setting a methodological precedent for future field-scale validation of digital animal health technologies.

1132

Translating Dewormer Trial Findings into Producer-Facing Extension Tools. M. K. Tate, Sr*, F. Chappelle, J. Snowden, and C.P. Bagley, Southern University Agricultural Research and Extension Center, Baton Rouge, LA 70813.

A deworming study was conducted at the Research Farm of the Southern University Ag Center to produce a high-resolution dataset linking fecal egg count reduction (FECRT), body condition scores (BCS), growth performance, and eBolus telemetry profiles using freshly weaned beef calves. These validated, multi-parameter data now form the foundation for a new generation of producer-ready digital tools that democratize precision livestock management across the Gulf Coast region. The Precision Deworming Calculator automatically transforms producer-input FEC results into quantitative efficacy metrics, resistance trend reports, and real-time treatment alerts. Simultaneously, the SUN Beef Smart Ranch Dashboard integrates telemetry data of body temperature, rumination, and ruminal pH with weight and BCS trajectories to visualize herd-level responses to deworming treatments and environmental stressors. Together, these tools directly translate complex research findings into intuitive, field-deployable interfaces that guide deworming dosing decisions, optimize timing, and minimize anthelmintic overuse. By pairing artificial intelligence with bilingual (English/Creole) mobile interfaces and on-farm Extension workshops, the SU Ag Center ensures equitable access to technology for underserved producers and smallholder beef cattle operations. Initial field

deployment projections indicate a 12–15% increase in herd-level return on investment (ROI) through reduced drug waste, improved feed efficiency, and early detection of treatment failure involving internal parasites. This translational digital platform demonstrates a replicable model for how agricultural research can deliver actionable intelligence to end users, aligning with Southern University Ag Center's mission to integrate science, technology, and community development in pursuit of resilient, sustainable livestock systems and increase animal profitability using these technologies.

1133

Building a Regional Surveillance Model for Anthelmintic Resistance in Southern U.S. Beef Herds. M. K. Tate, Sr*, C.P. Bagley, J. Snowden, and T. Collins, Southern University Agricultural Research and Extension Center, Baton Rouge, LA 70813.

This research presents a practical framework for developing a regional surveillance network to monitor anthelmintic resistance in beef cattle. The concept originates from a 42-day precision-livestock dewormer study that compared Ivomec Plus, Synanthic, and untreated controls with freshly weaned beef calves (both steers and heifers) using the Modified McMaster technique under Louisiana forage conditions. Average fecal egg count reduction (FECR) values were over 90% for both Ivomec Plus and Synanthic as compared to untreated controls confirming the critical need for deworming freshly weaned beef calves and the high efficacy of deworming while revealing early signs of tolerance among individual animals. Building on these data, the team designed a proposed regional model connecting diagnostic laboratories, university herds, and producer collaborators across Louisiana and neighboring states. The network would standardize fecal sampling intervals, data recording, and laboratory testing protocols across a wide area. Integration of behavioral telemetry—tracking rumination and activity—would allow early detection of parasitic stress in beef cattle, while genetic confirmation via β-tubulin sequencing could identify resistant parasite strains. Although regional deployment has not yet begun, the framework demonstrates how precision-livestock data can expand into collaborative 1890-based monitoring systems particularly adapted to under-served beef producers in the region. It provides a foundation for producers to make data-driven treatment decisions, optimize animal welfare, and sustain long-term drug efficacy in their cattle herds. This blueprint supports USDA-NIFA objectives for regional coordination and sustainable beef production while reinforcing Southern University's leadership in precision-livestock research and producer engagement.

1134

Blockchain-Enabled Traceability: Creating a Value-Added Market for Precision-Managed Beef. M. K. Tate, Sr*, M. K. Tate, Jr., J. Snowden, C.P. Bagley, F. Chappelle, and T. Collins, Southern University Agricultural Research and Extension Center, Baton Rouge, LA 70813.

This poster introduces a commercialization model linking precision-livestock data to blockchain verification for value-added beef marketing by interfacing producers with university researchers in beef cattle production. The system builds upon findings from Southern University's 42-d telemetry-based dewormer study using freshly weaned (n=49) Angus X beef steers and heifers, where data collected included real-time rumination, body temperature, and activity data established welfare and performance baselines for each calf in the study. These data form the foundation of the *SUN Beef Verified*™ initiative, designed to authenticate animal health, welfare, and environmental integrity through blockchain certification. Each animal's physiological profile reflecting stress recovery, feed efficiency, and average daily gain following various animal treatments is encoded into a blockchain ledger that generates a dynamic QR-linked certificate. This certificate can serve as both a digital passport and a non-fungible token (NFT), giving consumers transparent access to welfare and traceability records on individual animals. Premium cattle with consistent low-stress metrics qualify for "Welfare-Verified Beef" status, while underperforming animals can be redirected to other treatments, enhancing profitability and sustainability. The approach combines ethical animal management with transparent digital authentication, transforming data into an economic differentiator for small and mid-sized producers. By aligning animal welfare with technology-based certification, this model provides a path for limited-resource producers to enter premium beef markets. It supports the Southern University Ag Center's Smart Ranching initiative by connecting scientific data with blockchain tools that elevate trust, traceability, and producer income within sustainable beef supply chains.

1135

Precision Telemetry for Detecting Handling Stress and Early Health Changes in Beef Cattle. M. K. Tate Sr.*, J. Snowden, and C.P. Bagley, Southern University Agricultural Research and Extension Center, Baton Rouge, LA 70813.

This study demonstrates the use of continuous telemetry as a precision-livestock monitoring tool to quantify handling stress and identify early health changes in beef cattle. Six calves, representing treatment and control groups, were equipped with Smaxtec eBolus sensors during the forty-two-day dewormer study conducted at the Southern University Ag Center. Telemetry data were collected for internal temperature, rumination, and activity both before and after routine handling events. Within thirty minutes of chute restraint, rumination declined between 20–45%, and activity levels tripled, indicating acute stress response. Temperature increases of 0.5–0.8 °C normalized within six hours, signifying physiological recovery. Animals that required more than twelve hours to stabilize later displayed mild clinical signs of reduced appetite or gastrointestinal disturbance. These results confirm that eBolus telemetry provides objective, continuous welfare monitoring and supports early detection of subclinical illness. Integration of this data stream with weight gain, fecal egg counts, and behavioral recovery patterns enhances precision management decisions and reduces human observation error. This research underscores the potential for real-time physiological tracking to replace subjective assessment, ensuring rapid response to welfare deviations. It reflects Southern University's leadership in Smart Ranching and data-driven animal management while aligning with USDA-NIFA's priority of improving livestock sustainability through innovation and welfare analytics.

1136

Effects of Dietary Hempseed Meal Levels on Feed Intake, Digestion, and Methane Emission by Boer Does in Late Lactation. I. Tovar-Luna*, R. Puchala, D. Tadesse, H, Yirga, A.L. Goetsch, A.K. Patra, American Institute for Goat Research, Langston University, Langston, OK 73050; N. Gurung, Tuskegee University, Tuskegee, AL. 36088.

Hempseed meal is a byproduct of oil extraction from hemp seeds and is rich in crude protein (CP), with an amino acid profile comparable to that of soybean meal. This study evaluated the effects of dietary hempseed meals (HSM) on feed intake, nutrient digestion, and methane emissions in Boer does during late lactation. Twenty-four Boer goats were assigned to diets containing 0, 10, 20, or 30% HSM on a dry matter (DM) basis. Diets consisted of 50% mixed grass hay and 50% concentrate, formulated to contain 16% CP, with decreasing levels of rolled corn and soybean meal as HSM increased. Goats were fed the experimental diets throughout lactation and, around day 81, were placed in metabolic cages for a nine-day period. The first four days were for adaptation, followed by five days of feces and urine collection, with oxygen consumption and emissions of carbon dioxide and methane measured on the final day using an indirect calorimetry system. Feed intake was similar among treatments, whereas neutral detergent fiber intake increased linearly ($P < 0.01$) with increasing dietary HSM. Digestibility of DM and organic matter decreased linearly ($P < 0.01$) as HSM inclusion increased, while digestible DM intake did not differ among treatments. Methane emissions decreased linearly ($P < 0.01$) with higher levels of HSM in the diet. In conclusion, hempseed meal can be included at moderate levels (10–20% of DM) in diets of lactating meat goats without adversely affecting intake and digestion while contributing to reduced methane emissions.

1137

Evaluation of Underutilized Leguminous Seeds as Alternative Protein Sources in Animal Feed D. Brown*, Department of Agriculture, Food and Resource Sciences, University of Maryland Eastern Shore, Princess Anne, MD 21853; O. J. Alabi, Department of Research, Administration and Development, University of Limpopo, Private Bag X1106, 0727 Sovenga, South Africa; M. Adeyanju, S.A. Egena, and E.Z. Jiya, Department of Animal Production, Federal University of Technology, P.M.B. 65, Minna, Niger State, Nigeria.

The increasing competition between humans and livestock for conventional feed ingredients presents challenges in animal nutrition. This study evaluated the nutritional potential of three underutilized leguminous seeds - *Albizia*, *Parkia biglobosa* (locust bean), and *Leucaena leucocephala* - as alternatives to soybean and groundnut cake in livestock feed. The objective was to analyze their proximate composition, amino acid profile, macro-mineral content, and anti-nutritional factors after undergoing different processing methods: boiling, sprouting, and roasting. Twelve treatments were formulated: Raw Albizia (RawAL), Boiled Albizia (BAL), Sprouted Albizia (SAL), Roasted Albizia (RoAL); Raw Locust Bean (RawLB), Boiled Locust Bean (BLB), Sprouted Locust Bean (SLB), Roasted Locust Bean (RoLB); and Raw Leucaena (RawLL), Boiled Leucaena (BLL), Sprouted Leucaena (SLL), Roasted Leucaena (RLL).

Standard methods were used for processing and chemical analysis. Results showed clear differences among treatments. Raw locust bean contained the highest ether extract, whereas sprouted locust bean had the highest crude protein and essential amino acids, including arginine, lysine, methionine, phenylalanine, threonine, tryptophan, and valine. Mineral analysis revealed that raw locust bean had the highest calcium and magnesium, while sprouted *Leucaena* had the highest phosphorus content. Anti-nutritional analysis indicated that roasted locust bean contained the highest phytate, raw locust bean the highest saponin, and roasted *Albizia* the highest tannin and oxalate. Overall, sprouting improved protein content and amino acid quality, particularly in locust bean, suggesting its potential as a viable alternative protein source for livestock feed.

1138

Effects of Trace Minerals on Conception Rates of Artificially Inseminated Beef Cattle. C. Okere*, N. Gurung, F. Abrahamsen, and D. Tate, Department of Agricultural and Environmental Sciences, Tuskegee University, Tuskegee, AL 36088.

The beef cattle industry in Alabama is diverse and thriving, encompassing various breeds, production systems, and management practices. Trace minerals play a critical role in the reproductive performance of beef cattle, influencing hormonal balance, ovarian function, and embryo viability. This study investigated the effects of key trace minerals—particularly selenium (Se), zinc (Zn), copper (Cu), and manganese (Mn)—on the conception rate of artificially inseminated beef cattle. Six-year-old Angus cross cows were randomly assigned to each of the treatments: control (n=18 traditional minerals) and treated (n=17; 25% chelated trace minerals). All traditional minerals were delivered utilizing loose minerals, and the chelated minerals were delivered utilizing a molasses-based poured tub with a controlled intake rate of 114 g per day. Before breeding by artificial insemination (AI), the cows were on the respective mineral programs for three months. After three months, the animals were bred utilizing 7 & 7 Synch fixed-time artificial insemination protocol. Thirty days post-breeding, blood samples were analyzed to determine mineral status, conception rate, serum glucose concentration, and blood urea nitrogen (BUN) concentration. Conception rates were evaluated via ultrasonography at 30- and 60-days post-insemination. Results indicated that cows with adequate levels of Se, Zn, and Cu exhibited significantly higher conception rates compared to mineral-deficient groups. Supplementation enhanced estrus expression, oocyte quality, and uterine environment, contributing to improved fertilization success. These findings suggest that proper trace mineral management is essential for optimizing reproductive efficiency and the success of AI programs in beef cattle herds managed by limited -resources producers.

1139

Assessing a Cattle Electronic Estrus Detection System for Use in Hair Sheep. S. Wildeus*, Agricultural Research Station, Virginia State University, Petersburg, VA 23803; and D. O'Brien, Cooperative Extension and Agricultural Research Station, Virginia State University, Petersburg, VA 23803.

Estrus detection in sheep is traditionally accomplished by painting the brisket of rams or use of a marking harness. With artificial insemination in cattle more widespread, electronic heat-mount detection systems have become commercially available. This pilot trial evaluated the feasibility of their use in hair sheep. The HeatSieker© system uses a pressure-sensitive switch glued in a pouch to the anterior tail head of the cow and transmits signals to a mobile app when activated (mounting). Following a 10-day estrus synchronization period, ewes (n=47) were fitted with heat mount patches and turned out in two groups with a single ram for 25 days. Rams were also fitted with a marking harness, and marks were recorded daily. Crayon color was switched after 10 days to identify ewes bred on a second estrus. Heat mount activity was also recorded via the HeatSieker© app. Heat marks were detected in all ewes using the crayon markers, but in only 77% of ewes via electronic detection. Heat-mount reading aligned with harness marks in only 49% of ewes. The frequency of mounts per estrus period averaged 7.1 mounts with a range of 3 to 16 hours, and an average duration of 17.8 hours and a wide range of 1 to 60 hours. Similar values were observed for the two rams. To create a viable system for sheep, the size of the patches should be reduced, and there is a need for continuous visual observations to validate alignment of mounting with the signal received.

1140

Applications of Oxford Nanopore Sequencing in Livestock for Galectin Base Modification Detection and Reference Genome Assembly at NC A&T State University. M. R. Uzzaman*, P. Pande, S. Ghimire, Y. Asfaw, and

M. Worku, Department of Animal Sciences, North Carolina Agricultural and Technical State University, Greensboro, NC 27411.

Oxford Nanopore Technologies' MinION and PromethION platforms provide transformative capabilities for real-time, long-read sequencing in livestock genomics. At North Carolina A&T State University, our research group is pioneering the use of these technologies in cattle, sheep, and goats to advance rapid diagnostics, base modification detection, reference genome assembly, and genomic prediction. A major focus is the detection of Galectin gene base modifications, which play essential roles in immune regulation and reproduction. Leveraging the portability and scalability of Nanopore sequencing, we aim to develop field-deployable workflows for SNP genotyping in livestock systems. DNA was extracted from a cow blood sample using the PureLink® Genomic DNA Kit and sequenced on a PromethION flow cell (PBE07622) for 72 hours. Pore activity declined from 5,319 total pores (2,289 active) at the start to 315 total pores (232 active) by the end, indicating progressive pore loss. The run generated 3.58 Gb of data from 1.7 million reads with an N50 read length of 4.85 kb. Of the basecalled reads, 1.04 million achieved a minimum Q score of 9, producing 2.69 Gb of high-quality bases, while 505.35 Mb were classified as pass reads. Preliminary trials with both MinION and PromethION devices highlight the need tooptimize DNA concentration, pore performance, and run repeatability. Ongoing efforts aim to enhance read accuracy, throughput, and base modification sensitivity, positioning Oxford Nanopore sequencing as a versatile platform for advancing genomic research and precision breeding in livestock.

1141

Genomic Analysis of Caprine SNP Variants Reveals Links to Health and Environmental Adaptation Across Diverse Climates and Regions. M. R. Uzzaman*, and M. Worku, Department of Animal Sciences, North Carolina Agricultural and Technical State University, Greensboro, NC 27411; and B. Rosen, Animal Genomics and Improvement Laboratory, USDA ARS, Beltsville, MD 20705.

Advances in comprehensive genomic assessment of global goat breeds have enabled a deeper understanding of genetic diversity and the discovery of gene variants associated with health, immunity, and environmental adaptation. Among these, galectins—a family of β-galactoside–binding lectins—play essential roles in immune regulation, inflammation, and parasite defense. This study examined single nucleotide polymorphism (SNP) variation, linkage disequilibrium (LD) structure (non-random association of alleles), and haplotype diversity (inherited variant combinations) in two immune-related genes, LGALS1 (Galectin-1) and LGALS3 (Galectin-3). High-density SNPs spanning LGALS1 (Chr 5:108.3–108.4 Mb) and LGALS3 (Chr 10:355.9–389.3 Mb) were analyzed across ten goat breeds from Africa, Asia, and Europe. LD and haplotype frequencies were estimated using genotype data in PLINK format, followed by phasing and haplotype reconstruction in Beagle to infer frequency distributions across genomic regions. Distinct LD architectures and haplotype profiles were observed across geographic and climatic contexts. LGALS1 exhibited extended LD in temperate, intensively managed breeds, whereas LGALS3 showed greater haplotype diversity and fragmented LD among tropical breeds, indicating recombination and adaptation to parasite-rich environments. Shared *LGALS1* haploblocks in African breeds from hot, endemic regions suggest selection for parasite resistance, while tighter *LGALS3* LD clusters in Asian and European goats may reflect artificial selection for productivity traits. Overall, this study reveals galectin variants suggestive of potential adaptive signals, and future studies are needed to confirm whether specific genotypes are functionally linked to climate resilience and infection resistance in goats.

1142

Effects of Melatonin on Sperm Fatty Acid Profiles in Bucks Exposed to Heat Stress. M. Hitit*, M. Bodu, S. Woldesenbet, Z. Erdogan, O.C. Greenwood, R.D. Murray, A. P Cervantes, and E. Memili, College of Agriculture, Food and Natural Resources Research, International Goat Research Center, Prairie View A&M University, Prairie View, TX 77446.

Heat stress disrupts testicular thermoregulation, increases reactive oxygen species (ROS) production, and induces oxidative stress and apoptosis in spermatogenic cells. Sperm membranes are rich in polyunsaturated fatty acids (PUFAs) and are highly vulnerable to ROS-induced lipid peroxidation. This study evaluated the effect of melatonin administration on sperm fatty acid profiles of bucks subjected to induced heat stress. Six Alpine bucks were divided into Control (CTL, n = 3) and Melatonin (MLT, n = 3) groups. Heat stress was induced by insulating the testes with disposable baby diapers for 72 h. Bucks in the MLT group received a single 18 mg melatonin implant subcutaneously

behind the ear. Semen samples were collected on days 7 intervals. Lipids were extracted using chloroform–methanol, and fatty acid methyl esters were analyzed by GC–MS (Agilent 7890A GC and 5975C MSD). Several fatty acids showed significantly higher concentrations in the MLT group compared to CTL at specific time points: methyl palmitoleate ($p = 0.014$), methyl cis-10-heptadecenoic acid ($p = 0.017$), and methyl cis-13,16-docosadienoate ($p < 0.001$) at week 2; methyl cis-13,16-docosadienoate ($p = 0.016$) and methyl erucate ($p = 0.005$) at week 4; methyl arachidate ($p = 0.019$) and methyl lignocerate ($p = 0.030$) at week 5; methyl cis-10-heptadecenoic acid ($p = 0.047$) at week 6; and methyl cis-13,16-docosadienoate ($p = 0.015$) at week 7. These results indicate that melatonin administration may alters sperm fatty acid composition during and after heat exposure suggesting an additional modulatory effect on sperm membrane lipid profiles.

1143

Growth and Fitness of Pasture-born Landrace Hair Sheep Lambs Provided Agro-byproduct Supplementation in Different Seasons. S. Wildeus*, Agricultural Research Station, Virginia State University, Petersburg, VA 23803; D. O'Brien, Cooperative Extension and Agricultural Research Station, Virginia State University, Petersburg, VA 23803; and K. Matthews, Department of Agriculture and Natural Resources, Delaware State University, Dover, DE 19901.

Forage-based production systems are limited by seasonal fluctuations in forage quality and quantity, and may not always meet the nutritional needs of sheep. Here we evaluated growth and fitness of lambs nursing landrace hair sheep ewes provided with agro-byproduct (soy hull and corn gluten feed) supplementation. Ewes (Barbados Blackbelly and St. Croix; 30 -36 per season) were bred in March, July, and November and rotationally grazed fescue and annual pastures. Ewes were allocated balanced by breed, parity and fetal numbers to either soy hull only or soy hull/corn gluten feed (50:50 mix) with supplementation starting the last trimester of pregnancy. Lambs were born on pasture, had access to the supplement provided to their dams, and were weaned around 9 weeks. Lamb birth and weaning weights were recorded, and fecal egg counts (FEC), packed cell volume (PCV), and body condition (BC) were determined at weaning. Data (n=157) were analyzed in a model with supplement type, mating season, breed, sex, and birth type as main effects. Supplement type had no effect on lamb daily gain and weaning weight, or indicators of fitness (FEC, PCV), but lambs on the mix had a 11% higher survival than lambs on soy hull only. There was a supplement type by breed interaction for weaning weight and preweaning daily gain, with St. Croix, but not Blackbelly, lambs performing better on the mix. The higher crude protein content of the mix may have allowed the St. Croix lambs to better express their higher growth potential.

1144

Genome-Wide Association Uncovers the Genetic Basis of Albinism in Honey bees (Apis mellifera). C.R. Gray* Agricultural Research and Development Program, Central State University, Wilberforce, OH 45384; R. Shultz, and M. Fikere, Department of Entomology, Purdue University, West Lafayette, IN 47907; H. Li-Byarlay, Agricultural Research and Development Program, Central State University, Wilberforce, OH 45384; and B.A. Harpur, Department of Entomology, Purdue University, West Lafayette, IN 47907.

Albinism and pigmentation defects have been documented across various insect orders; however, no confirmed cases have been reported in Hymenoptera. In honeybees (Apis mellifera), newly eclosed adults typically have a single recessive allele mutation causes the marshmallow phenotype ally undergo rapid cuticle sclerotization and melanization, processes which are essential for exoskeletal hardening and protection from pathogens, injury, and predation. This study aims to describe and characterize an albinism like phenotype in honeybee drones, termed the "marshmallow phenotype," and to identify its underlying genetic basis. A North Carolina colony was producing approximately equal proportions of wild-type and soft, unpigmented drones. The colony's phenotypic division indicates that the marshmallow phenotype is caused by a single recessive allele mutation. A Genome-Wide Association Study (GWAS) was used to identify the mutation linked to the observed phenotype. The analysis revealed that a single nucleotide variant on chromosome 16 is most significantly associated with the marshmallow drone. A G/C substitution occurs within the coding region of DOPA decarboxylase (DDC), a key enzyme in the melanin biosynthetic pathway. This study provides the first evidence of albinism in Hymenoptera. The distinctive "marshmallow" phenotype potentially results from a single recessive mutation in the DDC locus, which disrupts normal processes of melanization and sclerotization. These findings expand our understanding of the genetic basis of pigmentation in honeybees and

open new avenues for exploring how such mutations influence other physiological systems. Future research should investigate potential behavioral and neurological consequences of this mutation in both drones and worker bees.

1145

Challenges and Adaptations in Implementing a Mobile Processing Unit Program in Virginia. D. O'Brien*, Cooperative Extension and Agricultural Research Station, Virginia State University, Petersburg, VA 23803; and S. Wildeus, Agricultural Research Station, Virginia State University, Petersburg, VA 23803.

Mobile Processing Units (MPUs) offer a potential solution for limited meat processing infrastructure in rural areas. Virginia State University's MPU was designed and built to train producers and provide access to inspected slaughter services. However, operational, compliance, and logistical challenges impacted the feasibility of the program, leading to restructuring. Initially launched in 2021, the MPU Certification Program (MPUCP) aimed to train producers as butchers to lease the MPU for custom, state, or federal inspected processing. By October 2022, 40 participants, including small ruminant farmers and extension agents, graduated; five producer farms obtained grants of inspection. However, the program was discontinued due to operational complexities, including equipment failures, maintenance needs, labor turnover, liability concerns, and logistical issues such as travel, moisture damage, and limited processing capacity. Compliance requirements, skill variability, and site infrastructure further constrained efficiency. Even with these constraints, from 2022–2023, 4 USDA-inspected (three on producer farms) and 12 custom processing events were conducted. In response to these challenges, the program pivoted to offering inspected slaughter exclusively at Virginia State University (VSU), revising food safety plans, and emphasizing HACCP and humane handling. From 2023–2025, 7 USDA-inspected and 19 custom processing events were conducted. Current priorities include providing processing services to underserved producers, maintaining processing compliance, and creating educational opportunities for farmers, students, and community members. The MPU initiative continues to support small meat processors and individuals pursuing careers in meat science while addressing infrastructure and regulatory limitations.

1146

Evaluation of the "From Bright Leaf to Berkshires" Extension Outreach Program for Small-Scale Farmers. D. N. Jones*, K. J. Branch, H. Pettress, B. K. Carter, C. Y. Carroll, and D. J. Coble, College of Agriculture and Environmental Sciences, North Carolina Agricultural and Technical State University, Greensboro, NC 27411.

In this study, we evaluated the *"From Bright Leaf to Berkshires"* program, a Cooperative Extension program that was developed from a North Carolina Tobacco Trust Fund Commission (NCTTFC) grant. The program was designed to assist farmers throughout the "Tobacco Belt" who have experienced economic hardships due to the decline in tobacco consumption, tobacco-related policies, and the disrupted tobacco export markets. Considering North Carolina's swine industry that contributes $5.9 billion to the state's economy, limited resource farmers can employ low-cost production systems, retained ownership, and niche marketing to secure a place in the pork supply chain. The participants attended 10 sessions that ranged from understanding swine breeds and swine genetics to them earning their PQA+ and TQA+ certifications from the Pork Checkoff program of the National Pork Board. We used the Kirkpatrick Model of Evaluation to assess the effectiveness of the program by gauging their "Reaction" (engagement, relevance, and customer services) and "Learning" (knowledge, skills, attitude, and confidence in implementation). All 17 participants were interviewed and their responses were scored on a 4-point Likert Scale. "Engagement" scores averaged 3.77, while "Learning" scores average 3.68. Data were open-coded and the following themes emerged "Needs for Infrastructure and Technical Assistance", "Barriers Related to Labor & Finance", "Interest in Cooperatives", "Appreciation for Hands-on Learning". From our results, we recommend providing on- going, hands-on training and technical assistance, increasing cost-share assistance, further exploration of the difference between beginning and experienced farmer learning, and increasing market outreach to recruit from broader regions of the state.

Family, Youth, Community and Economic Development

1147

Striking Out Cavities: Teen-Led Oral Health Program Focusing on Community Wellness. S. Hayes, B. Clark* and T. Jones, Cooperative Extension, Florida A&M University, Tallahassee, FL 32301; and C. Hunter, Cooperative Extension, Florida A&M University, Quincy, FL 32351.

Florida A&M University's Cooperative Extension Program is advancing youth-led public health education through its dynamic "Striking Out Cavities" initiative, a collaboration between 4-H Youth Development and Family & Consumer Sciences Health Agents. Originating from a lead-to-change proposal submitted at Ignite by 4-H, a national teen summit focused on leadership and community impact, this innovative program empowers teen leaders to educate their peers on oral hygiene, preventive care, and healthy habits using culturally relevant and interactive approaches. Teen ambassadors played key roles in curriculum design, workshop facilitation, and community outreach, showcasing the transformative power of youth leadership in advancing public health. Participants reported increased oral health literacy, improved hygiene practices, and greater confidence discussing dental care with guardians. "Striking Out Cavities" demonstrates how empowering youth as change agents can lead to lasting improvements in community wellness. Through collaboration between 4-H Agents, Health Agents, and local partners, the program integrates leadership development, peer education, and preventive health strategies to address oral health disparities. Measurable outcomes, ranging from enhanced knowledge to stronger community partnerships, highlight its effectiveness and long-term potential. By blending evidence-based practices with youth-led innovation, Florida A&M University's Cooperative Extension Program has developed a sustainable and scalable model that promotes not only healthier smiles but also cultivates future leaders dedicated to advancing public health and community wellness.

1148

Experiential Learning Experience in Nepal to Prepare Global Agricultural Workforce. B. Gyawali*, M. Gebremedhin, S. Upadhaya, S. Acharya, College of Agriculture, Health and Natural Resources, Frankfort, KY 40601

The food, agriculture, natural resources, and related sciences in the United States face a shortage of qualified workers needed to address international agricultural challenges. With changing weather patterns, population growth, shifts in farm ownership, and evolving tariffs and trade policies, the ability of the agrarian food system to operate sustainably is diminishing. Increasingly, the U.S. farm sector is becoming more connected to and influenced by the global market, and overseas demand for American farm products is likely to be affected. Agricultural science, knowledge, and technology are continually advancing worldwide in response to shifting social, economic, and environmental factors, emphasizing the need for adequate training of U.S. students to solve global agricultural issues. This presentation shares students' experiences from recent trips to Nepal and Peru. Twenty-five students participated in two-week experiential learning and research trips to various regions of Nepal and Peru, where they learned about sustainable farming practices, terrace farming, agribusiness, the circular economy, recycling centers, community forestry, and local agricultural and labor issues. The post-trip survey showed that students gained a deeper sense of learning and purpose by stepping outside their comfort zones. Each student felt a personal connection to the organizations they visited, sparking their passion to give back to the community. These experiences are especially meaningful for students with limited access to international opportunities, helping to broaden their horizons in ways they might not have otherwise achieved.

1149

Integrating Smart Agriculture Research and Precision Ag Training to Empower Louisiana's Farming Communities. M.L.Ford*, Southern University Agricultural Research and Extension Center, Baton Rouge, LA 70791.

The rapid evolution of Smart Agriculture and Precision Agriculture (PA) technologies presents transformative opportunities for enhancing productivity, sustainability, and resilience among Louisiana's small and mid-scale farmers. However, adoption gaps persist due to limited technical knowledge, infrastructure, and access to data-driven tools. This research-extension initiative aims to bridge that divide by advancing applied research in Smart Agriculture systems while delivering hands-on community training through Cooperative Extension networks across Louisiana's Delta and urban-agricultural corridors. The research focuses on developing and validating precision agriculture technologies that integrate IoT-enabled sensors, AI-based analytics, unmanned aerial systems (UAS/drones), and automated irrigation and nutrient management tools. Field trials conducted at Southern University Agricultural Research and Extension Center (SUAREC) and partner demonstration farms will evaluate sensor calibration accuracy, drone imagery-based crop health diagnostics, and machine learning models for predictive yield and soil moisture management. The research will generate spatial datasets and decision-support algorithms tailored for Louisiana's diverse cropping systems ranging from specialty crops in controlled environments to open-field row crops. The

extension component emphasizes technology translation through a community-based Precision Ag Training Program. Workshops, certification courses, and on-farm demonstrations will equip small farmers, extension professionals, and students with practical skills in data collection, GPS mapping, drone operation, and real-time decision-making using precision tools. Partnerships with 4-H, Jr. MANRRS, and rural youth academies will foster the next generation of ag-tech innovators. This integrated research and outreach effort will enhance agricultural literacy, climate adaptability, and economic viability among Louisiana's farming communities.

1150

Hospitality Meets Agriculture: A Framework for Integrating Agritourism, Wellness, and Entrepreneurship at HBCUs. S. Tennessee*, College of Agriculture, Virginia State University, Petersburg, VA 23806.

Historically Black Colleges and Universities (HBCUs) are uniquely positioned to lead the convergence of hospitality education, agricultural innovation, and wellness entrepreneurship. As consumer demand grows for authentic, culturally grounded experiences that promote health and sustainability, agritourism emerges as a strategic opportunity to revitalize rural economies while preserving Black cultural heritage. This session presents an integrated framework for HBCU hospitality and agriculture programs to develop wellness-focused agritourism initiatives that prepare students as future entrepreneurs and community leaders. The proposed model bridges three interconnected domains: culinary heritage tourism (farm-to-table experiences rooted in African American foodways), wellness spa tourism (incorporating traditional healing practices and herbal agriculture), and small-scale farming enterprises (supporting local food systems and economic self-sufficiency). By embedding these components into curriculum and community engagement, HBCUs can cultivate student competencies in sustainable business development, cultural preservation, and health-equity advocacy. This framework addresses critical workforce needs while honoring the agricultural legacy of land-grant HBCUs. Students gain experiential learning through partnerships with local farmers, wellness practitioners and hospitality venues, developing skills in operations management, cultural tourism design, and social entrepreneurship. For surrounding communities, these initiatives generate employment, preserve foodways knowledge, and increase access to fresh, culturally relevant foods. Participants will explore replicable curriculum modules, community partnership models, and revenue-generating strategies that transform HBCU campuses into living laboratories for agri-wellness innovation.

1151

Lifting the Voices of Families' Unresolved Trauma and Stories of Resilience Related to the Impact of COVID-19. J. M. Beasley*, and V. J. McMillan, Department of Family and Consumer Sciences; J. Wolfgang, and M. Vazquez, Department of Counselling, North Carolina Agricultural and Technical State University, Greensboro, NC 27411.

Extant literature documents the empirical strains experienced by families during the pandemic (Chen et al, 2021; Russell et al., 2020) and hails from a deficit-based perspective magnifying existing pre-disparities. Less is known regarding the nuanced experiences of families with young children from varying backgrounds related to COVID-19 and its lingering impact. In this study, 6 focus groups (N=25 family members with young children) were utilized to understand the complexities of the impact of COVID-19 including challenges and resilience factors through the lens of families with young children. Sampling and data collection procedures were intentionally created with the intent to include and lift the voices of families from backgrounds not typically included in the research. The concept of *Master Bridge Builders*, individuals serving as liaisons that "bridge" the researchers to family participants, was developed to support recruitment and data collection of families whose voices remain largely unheard until now. Findings reveal that families are carrying unresolved trauma with them, however they also report instances of families flourishing, resiliency, and empowerment. These insights suggest that it is important to a) understand the nuanced experiences of families with young children related to COVID-19 and b) to support families in sharing their unique, lived experiences from the pandemic, ultimately moving toward families flourishing and resilience winning. Implications for families, those serving families such as educators, those employing families, and policymakers will be discussed, emphasizing the need for resilience-based approaches to inform service delivery and interventions.

1152

SEED Mobile APP Impact on NextGen Scholars at Tennessee State University. J. Norwood and J.C. Ricketts*, Department of Agricultural Business and Education, College of Agriculture, Tennessee State University, Nashville,

TN 37209; A. Rockers, Department of Agricultural Education and Studies, Iowa State University, Ames, IA 50011; T. Broyles, Department of Agricultural Business and Education and S. Roy, Department of Agricultural Sciences and Engineering, College of Agriculture, Tennessee State University, Nashville, TN 37209.

Tennessee State University received a USDA NextGen award that included developing the Students Exploring Employment and Development (SEED) mobile app to centralize access to food, agriculture, natural resources, and human sciences (FANHS) opportunities. Guided by the Theory of Planned Behavior and Social Identity Theory, this qualitative case study used two semi-structured focus groups with NEXTGEN Scholars (*n*=9) to examine the SEED app's usability and influence on students' perceived support, behavioral intentions, and career persistence. Thematic analysis identified nine themes: access to opportunities, academic resources, career guidance, accessibility/awareness of scholarships, centralized opportunities, agriculture-related background, SEED app updates, SEED app filters, and career reassurance. Students valued SEED's one-stop hub for internships, jobs, scholarships, and events and reported increased awareness; however, they still relied heavily on faculty, peers, and organizations (e.g., MANRRS) for mentorship and decision support. Usability gaps – outdated listings, limited search filters, and lack of mentorship features – constrained perceived behavioral control and dampened intentions to act on opportunities. Findings suggest digital tools alone are insufficient; combining SEED with structured mentorship, timely content management, and personalized filtering could strengthen retention and career entry. We recommend auto-updating the opportunity list (i.e., old posts drop off, new posts surface), adding filters for major/location/GPA/interests, and building in-app mentorship alongside mixed-methods follow-up to gauge long-term FANHS workforce effects.

1153

Mobile Harvest Exchange: A Regional Model for Surplus Sharing, Shared Logistics, and Direct-to-Consumer Innovations to Strengthen Small-Farm Market Access. J. Muriuki * and S. Noor, Department of Agricultural Business and Education; A. Kilonzo, Department of Food and Animal Sciences; R. Archer, Department of Environmental Sciences; and K. Seaman, Department of Agricultural Sciences and Engineering, College of Agriculture, Tennessee State University, Nashville, TN 37209.

Small-scale farmers across Tennessee often lack efficient and equitable market channels for surplus produce, leading to income loss and food waste and weakening local food system resilience. The proposed Mobile Harvest Exchange (MHE) initiative introduces a scalable, technology-enabled coordination model that connects small producers to community and institutional buyers through surplus sharing and shared logistics. MHE integrates a mobile and SMS platform that allows farmers to list, swap, or sell surplus crops; coordinated refrigerated pickup routes linking farms with food hubs, schools, and food banks; and honor-system farm stands equipped with peer-to-peer (P2P) payment options such as CashApp and Venmo to expand cashless direct-to-consumer transactions. Preliminary simulation of pilot data suggests that participation in MHE could reduce post-harvest losses by approximately 30% and increase direct-to-consumer transactions by a comparable margin. Early indications also show potential for modest revenue gains as digital coordination and P2P payments enhance farmer reach and marketing efficiency. The pilot, scheduled for implementation across Davidson, Haywood, and Knox counties, will evaluate farmer adoption, platform usability, and surplus movement efficiency. Data collected will also inform cost-benefit and participation models that quantify economic and logistical outcomes across farm types. Designed for adaptability through Extension and community partnerships, MHE represents a broad-participation, regionally grounded approach to improving food access and farm income. It exemplifies technological innovation, ecological stewardship, and economic sustainability, providing a replicable framework for strengthening small-farm viability across diverse food systems.

1154

Professional Development Needs for Delivering Food, Agriculture, Natural Resources and Human (FANH) Sciences and STEM: Reports from Secondary Educators. P. E. Faulkner*, Department of Agribusiness, Applied Economics, and Agriscience Education; J. Beasley, Department of Family and Consumer Sciences; D. Williams, Department of Agribusiness, Applied Economics, and Agriscience Education, North Carolina Agricultural and Technical State University, Greensboro, NC 27411.

Land Grant Universities produce 36,100 Food, Agriculture, Natural Resources, and Human (FANH) Sciences graduates annually, covering roughly 60% of the needed 59,400 jobs yearly. Traditionally, few students from various backgrounds pursue careers in FANH Sciences and STEM. The study's goal was to address the needs of secondary

educators to be prepared to educate their students about FANH Sciences and STEM. The objectives guiding the study were What do participants report related to their knowledge about major aspects of the agricultural industry? What do participants report related to their knowledge of STEM concepts? What perceived benefits do participants report to assess professional development to address their knowledge of Agriculture and STEM concepts? What perceived barriers do participants report for gaining knowledge of Agriculture and STEM concepts through targeted Professional Development? Twenty-five participants participated during the summer workshop. An online survey (pre and post) was administered for participants to report level of familiarity on topics ranging from agriculture, family and consumer sciences, careers in agriculture and digital agriculture. Participants reported enhanced knowledge across all topics. Participants reported as being most familiar with how high school teachers and counselors can play important roles in helping students "see" themselves as scientists and the least familiarity distinguishing between the field of agriculture and agricultural sciences. It was concluded that educators and students' exposure to FAHN Sciences and STEM is crucial. Recommendations are to provide educators with professional development and other resources so they can then prepare students for future education and careers.

1155

Soil-Mates: Promoting Coastal Literacy in Louisiana Youth. C. Vance*, J. McComb, College of Agriculture, Human, and Environmental Sciences, Southern University and A&M College, Baton Rouge, LA 70813.

The Southern University Laboratory School Initiative is part of the broader Mississippi Delta Initiative; a five-year consortium project focused on increasing experiential learning opportunities for underrepresented groups in coastal research and workforce development. The Mississippi Delta Initiative primarily seeks to test alternative scenarios and solutions that promote the sustainability of both the Mississippi River Delta's ecosystem and the economy that depends on it. Southern University's College of Agriculture, Family and Consumer Sciences will launch a pilot program in collaboration with the Southern University Laboratory School to engage middle school students in agricultural and environmental sciences. Through the "Scientists for a Day" experience, students will explore topics such as soil erosion, water quality testing, and sustainable land-use practices by conducting hands-on investigations around the university campus. Building on this pilot, the Soil-Mates Program**,** a mini educational camp, will expand student engagement through experimental learning, gamification, and educational field trips focused on conservation and coastal resilience. The objectives of this initiative are to (1) provide meaningful experiential learning for underrepresented students, (2) increase awareness of coastal and environmental challenges, (3) cultivate early interest in agricultural and environmental careers, and (4) strengthen the educational pipeline between Southern University and the Laboratory School. Through these efforts, the program aims to increase student enrollment in agricultural sciences and enhance minority representation in coastal research and workforce development fields.

1156

Advancing Graduate Readiness through the Mississippi Delta Post-Baccalaureate Research Internship. J. McComb*, C. Vance, College of Agriculture, Human, and Environmental Sciences, Southern University and A&M College, Baton Rouge, LA 70813.

The Mississippi Delta Post-Baccalaureate Research Internship (MD-PBRI) is a workforce development and graduate readiness initiative administered by the College of Agricultural, Human, and Environmental Sciences at Southern University and A&M College, with support from the Mississippi River Delta Transition Initiative. The program addresses the need to diversify participation and institutional representation in coastal-deltaic and environmental sciences across the Gulf of Mexico region. Designed for recent graduates of the 1890 land-grant system, the MD-PBRI provides structured research experiences, faculty mentoring, and graduate preparation to strengthen the pathway from undergraduate to advanced study. The primary objectives are to (1) recruit and retain diverse 1890 land-grant graduates in agricultural and environmental research, (2) enhance graduate school readiness, and (3) increase the representation of underrepresented scholars addressing Gulf Coast challenges. Core components combine experiential research, structured faculty mentoring, and professional development to strengthen graduate preparation through portfolio completion, GRE readiness, and research presentation. By combining academic guidance with experiential learning and cross-institutional collaboration, the MD-PBRI strengthens the 1890 pipeline for recruitment and retention. This initiative demonstrates how strategic investment through the MS Delta Initiative enhances institutional capacity, promotes equity in research participation, and cultivates a new generation of scholars equipped to address critical environmental and agricultural issues in the Gulf region.

1157

Experiential Approach to Beef Cattle Production Feedlots for Undergraduate Students. T.N. Tolen*, L.A. Kinman, M. Daley, A. Herring[3], Department of Agriculture and Nutrition and Human Ecology, College of Agriculture and Human Sciences, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446. CAFNR Research, College of Agriculture and Human Sciences, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446. Department of Animal Science, College of Agriculture and Life Sciences, Texas A&M University, College Station, TX 77843

To address the need to provide tactile, experiential learning experiences members from Prairie View A&M University (PVAMU) and Texas A&M University (TAMU) have worked collaboratively to create a feedlot on the PVAMU farm. This learning opportunity has engaged students with hands on animal husbandry, livestock management and decision-making skills aiming to increase recruitment and retention of students in livestock production areas of study. The central hypothesis is that students who participate feedlot related activities will be more likely to continue into career paths related to livestock. Specific objectives of this study were to start a feedlot on the PVAMU University farm, provide knowledge of how to manage and maintain the herd, enhance student interests in livestock management, and to promote the matriculation of undergraduate students into industry roles related to production animals. This was done by acquiring steers between 600 and 700lbs initially and feeding them to targeted finish weight of no less than 1200lbs. During the growth period students attended workshops related to the health and maintenance of the steers, and answered questions prior to the workshop and afterwards to assess their gain of knowledge.

1158

Empowering Rural Communities Through Creative Expression and Digital Literacy. L. N. Ford[1] & Y. E. McFerrin[2], Communications, Conferencing, and Technology, College of Agriculture, Family Sciences, and Technology, Fort Valley State University, 1005 State University Drive, Fort Valley, GA 31030

Fort Valley State University Cooperative Extension Writer's Playground is a free creative writing and technology program designed to cultivate young people's imaginative thinking, writing proficiency, and presentation skills. Participants engage with diverse literary works, including poems and short stories, through critical analysis and creative application of literary devices. The program launched at Turner County High School in Ashburn, Georgia, in 2022, with sessions held each Saturday in October. It later expanded to include a weeklong after-school format in Ashburn (2023) and a full-day summer session in Fort Valley (2024 and 2025). Both Ashburn and Fort Valley are rural communities, where access to enrichment programs is limited. Finally, Writer's Playground introduced a student competition in creative writing and spoken word at the Sunbelt Ag Expo in Moultrie, Georgia, in October 2025. This event gave students a platform to craft compelling quatrains or deliver original spoken word performances, showcasing their creativity and confidence. By engaging students in literary analysis, blogging, and digital resource evaluation, Writer's Playground addresses gaps in college and career preparedness. The program leverages mobile technology, virtual learning platforms, and strategic partnerships to deliver high-impact educational experiences. By fostering critical thinking, self-expression, and digital competence, Writer's Playground equips students with tools to thrive academically and socially, contributing to the long-term vitality of their communities.

1159

Bridging the Digital Divide: FVSU Cooperative Extension's Model for Inclusive Community Development. Y. E. McFerrin* & T.R. Wolfork, Communications, Conferencing, and Technology, College of Agriculture, Family Sciences, and Technology, Fort Valley State University, 1005 State University Drive, Fort Valley, GA 31030

FVSU Cooperative Extension efforts in digital equity in communities across Georgia foster economic growth, strengthen community resilience, and promote inclusive development. These collaborations have enabled the deployment of wireless infrastructure, the delivery of customized training programs, and the distribution of essential digital resources. By expanding technology education and increasing device access, FVSU Cooperative Extension is building sustainable, technology-focused pathways that support workforce development, educational progress, and civic participation. These efforts highlight the essential role of land-grant institutions in promoting equitable innovation and creating thriving, connected communities across Middle and South Georgia. FVSU's initiatives

directly address the persistent digital disparities identified in the Georgia Digital Connectivity Plan (2004), which highlights barriers such as limited access to devices, inadequate infrastructure, and insufficient digital education. In response, FVSU Cooperative Extension secured targeted funding to close these gaps by offering affordable access to technology and delivering comprehensive, community-centered training programs. Acting as a community empowerment intermediary (Green, Gallardo, and Scammarhorn, 2025), FVSU Extension Educators received specialized training and ongoing mentorship, employed the Digital Skills Toolkit (Scammarhorn and Kelly, 2023), and built partnerships with local organizations and leaders to ensure programming was responsive to community needs. This comprehensive approach not only improved individual digital skills but also strengthened community connectivity and resilience. By enabling residents to actively participate in the digital economy, FVSU Cooperative Extension has created a repeatable model for community-focused innovation, one that turns digital access into a driver for economic mobility, educational progress, and civic participation.

1160

Analysis of Technical Efficiency of Small-Scale producers of sweet potatoes, tomatoes, and watermelons in Missouri. W. Wollo*, College of Agriculture, Environmental and Human Sciences (CAEHS), Lincoln University of Missouri, Jefferson City, MO 65101; and D. Bouras, School of Business, Lincoln University Jefferson City, MO 65101.

The Census of Agriculture classified 74,000 (84%) farms in Missouri as small farms. Since the farm crisis of the 1980s, small scale farmers have been encouraged to seek alternatives to traditional crops (soil beans, corn, wheat, etc.) Horticultural crops appear most attractive to small-scale farmers. This project focuses on three crops: sweet potato, tomato, and watermelon. Previous research on producing horticultural crops in Missouri has focused on factors such as yield, quality, and nutritional contents of the crops. However, profitable production does not only depend on the yield, quality, or nutritional contents of the crop, but also on the efficient use of resources to produce the crop. The goal of this project is twofold: (1) to estimate the technical efficiency scores of small-scale famers of sweet potatoes, tomatoes, and watermelons in Missouri; (2) to examine factors that influence technical efficiency. To achieve this goal, survey questionnaire will be used to collect data from producers of sweet potatoes, tomatoes, and watermelon in Missouri. Stochastic frontier parametric methods will be used to estimate technical efficiency scores. Linear regression will be used to examine the major factors likely to affect the level of technical efficiency.

1161

Enhanced STEAM Awareness and Education for K-12 students Through Summer Residential Experience. J. Yang* and S. Khadka. College of Agriculture, Environmental and Human Sciences (CAEHS), Lincoln University of Missouri, Jefferson City, MO 65101.

United State is currently facing a critical challenge of workforce shortage in science, technology, engineering, agriculture, and mathematics (STEAM). In an effort to promote STEAM awareness and education among K-12 students and sustain future STEAM workforce, Lincoln University of Missouri initiated a residential summer camp program in support by NASA and NIFA and collaborations with state/federal agency, industry and academia. The program provides a one-week residential education and experiential learning experience with 40-hour innovative curriculum in various STEAM fields, including data science, artificial intelligence (AI), machine learning (ML), digital agriculture, geographic information system (GIS), remote sensing technology, robotics, and drone operation. The curriculum integrated with classroom lectures with laboratory and field hands-on experience. During the summer camp, students actively expose themselves to STEAM education and learned about skills in various STEAM fields. The students are also provided with opportunities for various field trips to farm, research institution, federal or state agency, industry, museum and interact with STEAM professionals in various areas. In addition, students participated in professional development activity, such as resume writing, interview skill, job search and application, college life, college application to prepare themselves ready for higher education or STEAM career. With completion of the summer camp, many students learned a wide array of STEAM knowledge and skills and found their interest or path in STEM career. This program is particularly beneficial to high school students as they are considering their college majors and future career.

1162

Student Perception of Teacher Behavior and Classroom Community on Belongingness of 1890 Land-Grant University Agriculture Majors. K. A. Cash*, College of Agriculture, Environmental and Human Sciences (CAEHS), Lincoln University, Jefferson City, MO 65101; J. D. Tummons, University of Missouri, Columbia, MO 65211.

One of the most important factors in choosing a college is feelings of belonging. Retention as a function of belonging and is particularly important for 1890 Land-Grant colleges of agriculture. Colleges of agriculture are tasked with educating future leaders of agricultural science and natural resources, and graduates are essential in addressing national priorities of food security, sustainable energy, and environmental quality. Research was based on the Theory of Model of Support, Belonging, Motivation, and Engagement in the Classroom (Zumbrunn, 2014) which predicted student belonging and motivation are perceived by supportive classroom environments. The purpose of this research was to determine what differences in post-secondary supportive classroom environments explains differences in student belonging at an 1890 Land-Grant University, with students majoring in Agriculture. All agriculture majors (n = 107) were surveyed. Results determined that the contribution of Caring and Supportive Behavior and Professional Competency and Communication Skills was significant in Classroom Connectedness explaining 10% of the variance and Classroom Learning was significant explaining 35% of the variance as perceived by agriculture students of agriculture instructors. It is suggested that students who experience a stronger sense of belonging via classroom connectedness and classroom learning may be more willing to devote effort to academic tasks and persist when confronted with academic challenges because of the motivational benefits associated with perceived belongingness.

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Building the Next Generation of Diverse Agricultural Leaders: A Multi-Institutional Consortium for Experiential Learning and Workforce Development. Q. Yang* , Y. Barazandegan and J. Yang, College of Agriculture, Environmental and Human Sciences (CAEHS), Lincoln University of Missouri, Jefferson City, MO; H. Li-Byarlay, College of Engineering, Science, Technology, and Agriculture (CESTA), Central State University, Wilberforce, OH; X. Ma, Zachry Department of Civil and Environmental Engineering, Texas A&M University, College Station, TX; H. Yang and J. C. Wang, Linda and Bipin Doshi Department of Chemical and Biochemical Engineering, Missouri University of Science and Technology, Rolla, MO.

The USDA NEXTGEN Consortium—uniting Lincoln University of Missouri (LU), Central State University (CSU), Texas A&M University (TAMU), and Missouri University of Science and Technology (S&T)—advances a collaborative model to prepare a diverse and skilled agricultural workforce. During the second year, the consortium expanded scholarships, experiential learning, and outreach initiatives that engaged over 30 undergraduate and graduate students and reached more than 2,000 community participants. Students conducted hands-on research in sustainable agriculture, environmental remediation, biotechnology, bee health, forest ecology, and precision agriculture, gaining technical experience with UAVs, GIS, LC–MS, and metabolomics tools. CSU progressed toward launching a new M.S. program in Agricultural Sciences, TAMU strengthened school-based sustainability projects, LU broadened state-wide outreach, and S&T introduced new GIS and drone mapping courses. By integrating mentoring, research, and professional exposure, the NEXTGEN program continues to empower underrepresented students with the knowledge and skills essential for leadership in modern agriculture—fostering a resilient, inclusive, and future ready workforce. Details will be elaborated during the conference.

1164

Mapping the Divides: A Typology for Understanding Perceived Access to Healthy Environments during Abnormal Weather Events in the U.S. L. Tran* and Y. Su, College of Agriculture, Environmental and Human Sciences (CAEHS), Lincoln University of Missouri, Jefferson City, MO 65101.

The escalating impacts of extreme weather disproportionately burden vulnerable populations, creating a critical environmental challenge for them. Effectively addressing this disparity requires a clear understanding of the public perception, which is shaped by unique socioeconomic and experiential factors within the United States. Utilizing data from a nationwide survey conducted between December 2024 and February 2025, this study first established a nuanced five-segment typology of U.S. public perception on health environment access: “Informed Advocates,” “Aware but Action-Sceptical,” “Principled but Unaware,” “Ambivalent or Disengaged,” and “Sceptical or Resistant.” A multinomial logit regression was then employed to investigate the determinants driving the public into these distinct segments. Our analysis identifies the specific socioeconomic, experiential, and knowledge-based factors that

characterize each segment's position on this issue. This research provides a crucial public perception map, offering highly actionable insights for designing targeted communication strategies and equitable, segment-specific policy interventions. Ultimately, these findings aim to foster greater public engagement and support for equitable access to a healthy environment across the diverse U.S. population.

1165

The Effects of Agricultural Subsidies on Agricultural Productivity in the State of Missouri. M. Ansah* and Y. Su, College of Agriculture, Environmental and Human Sciences (CAEHS), Lincoln University of Missouri, Jefferson City, MO 65101.

This study examines the impact of federal agricultural subsidies on agricultural productivity in Missouri using county-level panel data from 2002 to 2017. Data were obtained from the USDA's Economic Research Service, National Agricultural Statistics Service, and PRISM Climate Group. Empirical analysis employs pooled ordinary least squares (POLS), random effects (RE), and fixed effects (FE) models based on a Cobb-Douglas production function. The results reveal that subsidies exert a statistically significant and positive effect on agricultural output across all model specifications, with the FE model indicating that a 1% increase in subsidy raises output by approximately 0.07%. Additionally, weather conditions, particularly temperature and precipitation, significantly influence productivity, with higher temperatures negatively affecting output. Technological progress, captured by the time trend, also plays a significant role in driving productivity gains, potentially offsetting declines in subsidies. While the effects of population are inconclusive across models, land, variable inputs, and machinery consistently contribute to output. The findings support existing literature on the productivity-enhancing role of subsidies while highlighting the importance of technology and weather adaptation strategies The findings suggest that while subsidies promote output expansion, improvements in technology adoption and climate adaptation strategies remain critical to sustaining productivity gains. The study concludes that targeted and transparent subsidy programs, complemented by investments in innovation and resilience measures, can enhance Missouri's agricultural competitiveness and long-term sustainability.

1166

Economic Impact of the Missouri Small Ruminant Production. Y. Su* and H. Salinas-Gonzalez, College of Agriculture, Environmental and Human Sciences (CAEHS), Lincoln University of Missouri, Jefferson City, MO 65101; A. Spell and J. Lutes, University of Missouri Extension, Columbia, MO 65201.

Small ruminants are more environmentally friendly than their larger counterparts and require less initial investment than other livestock animals. The small ruminant industry has grown rapidly in the U.S. and Missouri over the past few decades, mainly driven by the increase in small producers. Missouri is one of the top producers of both goats and sheep. However, compared with cattle and swine, less public information is available. The purpose of this study is to evaluate the economic impact and contribution of goat and sheep production to the Missouri economy. Economic contribution measures the gross economic activities of a given industry. The economic impact measures the net changes in the new economic activities in a given industry due to the change in policies, events, or others. The economic impact includes a direct effect from the initial production, an indirect effect from their by-products, and a multiplier effect through the community and the entire economy. All these effects sum to the total effect. Both economic contribution and impact can be measured by an Input-Output model. We use data from a Missouri small ruminant producer survey and NASS, along with the IMPLAN model, to estimate jobs, labor income, gross domestic product (GDP), and gross sales. The results can inform policy decisions on industry investment and help understand how small ruminant production can improve the lives of small producers and the state economy.

Food Safety, Nutrition and Health

1167

Tracking the Drop: pH Trends in Onion Fermentation under Different Salting and Brining Methods. S. Acharya* and M. Koirala, College of Agriculture, Environmental and Human Sciences (CAEHS), Lincoln University of Missouri, Jefferson City, MO 65101.

Fermentation is a low-cost and sustainable preservation method that ensures microbial safety and product stability. This study evaluated the fermentation of different varieties of onions to determine pH trends under various salting and brining conditions. The study examines how naturally occurring lactic acid bacteria and fermentation aids influence fermentation outcomes. Three fermentation treatments: dry salting, brine, and brine supplemented with sugar were compared to assess their effects on acidification and potential microbial safety. Initial findings demonstrated that in both dry-salted and brined fermentations, naturally occurring lactic acid bacteria rapidly reduced pH to levels that can potentially inhibit foodborne pathogens while stabilizing the fermentation process. Supplementation with sugar in the fermentation brine showed similar results. A pathogen challenge study will assess the inactivation of the foodborne pathogens *Escherichia coli* O157, *Salmonella,* and *Listeria monocytogenes* during optimized fermentation. The results are expected to support the development of practical, culturally relevant guidelines for household and small-scale producers, with an emphasis on microbial safety, reduction of food spoilage, and sustainable utilization of local produce.

1168

Survival of *Escherichia coli* in inoculated cow manure-amended soil and its transfer to growing strawberries. M. Kim*, C. Dixon, P. Ampim, and J. Barouei, CAFNR Research, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446.

Application of livestock manure provides essential nutrients to soil and crops; however, improper use of raw or inadequately treated manure can introduce foodborne pathogens to fresh produce, as they originate from livestock intestinal reservoirs. This study aimed to assess the survival of rifampin-resistant *Escherichia coli* (r*E. coli*) in cow manure-amended soil and its transfer to growing strawberries. A three-strain r*E. coli* cocktail was applied to composted cow manure-amended soil to simulate raw manure usage, and the survival of r*E. coli* was monitored for six months. The microbiological quality of strawberries, including generic and foodborne pathogens, was evaluated following FDA Bacteriological Analytical Manual protocols. Three soil treatments; natural soil, natural soil mixed with composted cow manure, and natural soil mixed with composted cow manure inoculated with r*E. coli* was prepared (8.60 log CFU/g). Data were analyzed using ANOVA followed by Tukey's post hoc test ($P < 0.05$). Soil treatments had no significant effect on overall microbiological levels ($P > 0.05$). While high fungal and yeast counts were detected, foodborne pathogens such as *Salmonella* spp., *Listeria monocytogenes*, or *E. coli* O157:H7 were not present. However, r*E. coli* persisted in the soil at over 3 log CFU/g by strawberry harvest (week 20). This may indicate that the 90-120 day interval, as recommended by the National Organic Program, may be insufficient for the complete elimination of r*E. coli* in cow manure amended soil. These findings emphasize the importance of exercising caution when using raw manure on strawberries.

1169

Modified Produce Prescription Program at TAACU Shows Dietary Improvement: A Pilot Study. J. Antwi*, R. Agbolegbe, P. Dunyo, K. Ofori-Panyin, N. Onyeani Bosio, M. Udodirim Guimaraes, L. Amo Gyau, and O. Akwaa Harrison, Cooperative Agricultural Research Center, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446.

College students attending Traditionally African American Colleges and Universities (TAACUs) face high levels of food insufficiency and diet-related chronic conditions. Conventional nutrition interventions often overlook their cultural, financial, and logistical realities. This study evaluated the effects of a tailored produce prescription program on dietary behaviors among food-insecure students. A 12-week pre-post-controlled intervention was implemented among 55 students. The intervention group received weekly "Produce Prescription" bags containing fruits and vegetables selected in consultation with a registered dietitian following United States Department of Agriculture MyPlate guidelines, along with nutrition education and cooking demonstrations. The control group received only education and demonstrations. Culturally relevant recipes and individualized dietary goals were incorporated to address campus-specific barriers related to time, preferences, and food access. Dietary quality, nutrition knowledge, and consumer behaviors were assessed using structured questionnaires and 24-hour dietary recalls. Participants in the intervention group reported notable improvements in dietary quality, greater fruit and vegetable intake, increased use of nutrition labels, and enhanced nutrition knowledge compared with controls. Although food insufficiency levels remained largely unchanged, participants perceived the program as beneficial and sustainable within a college environment. This pilot suggests that a culturally adapted, campus-based produce prescription model can enhance diet

quality and promote healthier food behaviors among TAACU students, supporting the value of personalized nutrition strategies in higher education.

1170

Hemp Flower Extract Attenuates the Proliferation of Hepatocellular Carcinoma Cells through Multiple Signaling Pathways. *H. Li**, Agricultural Research Station, Virginia State University, Petersburg, VA 23806; R. Dhakal, Agricultural Research Station, Virginia State University, Petersburg, VA 23806; M.O. Faison, Department of biology, Virginia State University, Petersburg, VA 23806; and D. Sarkar, School of Medicine Human and Molecular Genetics, Virginia Commonwealth University, Richmond, VA 23298

Hepatocellular carcinoma (HCC) is a highly lethal malignancy with wide variation in incidence, mortality, and survival rates. Effective treatment remains challenging due to limited therapeutic options and the significant toxicity of current therapies. Given the urgent need for safer and more effective alternatives, this study investigated the antiproliferative effects of hemp (Cannabis sativa L.) flower extracts on HCC cells and their underlying molecular mechanisms. Hemp is an emerging nutraceutical crop recognized for its broad health benefits extending beyond cannabidiol (CBD). Increasing evidence suggests that bioactive compounds in hemp seeds and leavesincluding polyphenols, flavonoids, and terpenes exhibit potent antioxidant and anti-inflammatory activities that may contribute to cancer prevention. Flowers from sixteen hemp varieties were characterized for polyphenol content, antioxidant activity, cannabinoids, and terpenes. Among them, the KY-Plume variety exhibited the highest levels of polyphenols, terpenes, and antioxidant capacity. Treatment with KY-Plume extract significantly inhibited the proliferation of HepG2, Hep3B, O/20, and HuH-7 HCC cell lines, with IC_{50} values ranging from 20–25 μg/mL. Mechanistically, the extract downregulated key mediators in the interferon-I (IFN-I) signaling pathway including Jak1, Tyk2, STAT1, and STAT2, as well as the mTOR signaling cascade, which is essential for tumor growth and survival. These findings demonstrate that hemp flower extract exerts antiproliferative effects by targeting multiple signaling pathways involved in HCC progression. Overall, this study provides novel evidence that hemp flower, particularly the KY-Plume variety, may serve as a promising complementary or dietary approach to support conventional therapies for hepatocellular carcinoma.

1171

Enhancing Spinach Safety: Reduction of *Escherichia coli* Using Pulsed UV Technology. S. Manne, H. L. Degala*, R. Gyawali, and A.K. Mahapatra, Food Engineering Laboratory, College of Agriculture, Family Sciences, and Technology, Fort Valley State University, Fort Valley, GA 31030.

Following a series of foodborne illness outbreaks associated with *E. coli* contamination linked to spinach, the demand for non-chemical decontamination techniques is growing. This study evaluates the efficacy of pulsed ultraviolet light (PUVL) in reducing *Escherichia coli* (*E. coli*) on baby spinach. Fresh baby spinach leaves were spot-inoculated with nalidixic acid-resistant *E. coli* (ATCC 8739; ~7 log CFU/leaf), dried in laminar hood for 30 min, and treated using a Z-1000 PUVL system at 8.28 cm from the lamp for 0, 2, 4, 6, and 8 s at a fluence of 1.27 J/cm². Microbial inactivation, color, texture, chlorophyll, moisture content, and water activity were evaluated before and after treatment (0 d) and in storage (7 d). The *E. coli* population on baby spinach was reduced by 2.74 ± 0.22, 3.15 ± 0.18, 3.89 ± 0.31, and 4.35 ± 0.24 $\log_{10}$ CFU/leaf at 2, 4, 6, and 8 s, respectively. No significant changes in color and firmness of baby spinach leaves between control and treated were observed at 0, and 7 d. Similarly, chlorophyll, and water activity of samples in both groups were insignificant ($p > 0.05$) at 0, and 7 d. However, the PUVL treatment resulted in significant change ($p < 0.05$) in moisture content between the control and treated samples on 0, and 7 d. The results of this study showed that PUVL has the potential in enhancing safety without altering the quality of baby spinach and can be optimized for industrial applications in fresh produce.

1172

Quality Evaluation of Pancakes Fortified with Enzyme-Hydrolyzed Peanut Flour. M. A. Farooq*, K. Lawrence, W. Kwarteng, and J. Yu, Department of Family and Consumer Sciences, North Carolina Agricultural and Technical State University, Greensboro, NC 27411.

Peanut flour is rich in protein (50%), dietary fiber, B vitamins, minerals, and phytosterols. Enzyme hydrolysis of peanut flour generates multifunctional bioactive peptides. Therefore, the objective of this study is to demonstrate the feasibility of using protease-hydrolyzed peanut flour (HPF) as a functional ingredient in pancake making. Peanut flour was hydrolyzed with a food-grade protease for 0.25 to four hours. After freeze drying, the water and oil-holding capacities of hydrolyzed and unhydrolyzed samples were determined. Pancakes were prepared by adding HPF at substitution levels of 5% to 20%, and the control contained no peanut flour. Protease hydrolysis reduced water-holding capacity but increased oil-binding capacity of peanut flour. Pancakes made with regular and hydrolyzed peanut flour were browner, and the brownness increased with increasing amounts of peanut flour. Pancake thickness decreased significantly with increasing amounts of peanut flour. The hydrolysis time had a negligible effect on pancake color and dimension. The hardness, springiness, and chewiness of pancakes decreased with increasing amounts of hydrolyzed peanut flour. The protein content increased remarkably, fat, ash, and carbohydrate contents increased slightly with hydrolysis time and substitution level, but the moisture content of pancake decreased significantly. The DPPH and ABTS antioxidant activities of pancakes containing hydrolyzed peanut flour were significantly higher than those of their counterparts, and increased further with incremental substitution levels. Overall, replacing 10-15% of all-purpose flour with hydrolyzed peanut flour resulted in pancakes with acceptable quality characteristics, which contribute to the value-added application of peanut flour and the sustainability of the peanut industry.

1173

Inhibition of Reducing Sugar Induced Oxidative Damage of Pancreatic Beta (b) Cells by Sodium Sulfide (Na_2S), a Donor of Hydrogen Sulfide (H_2S). K.N. Islam*, Agricultural Research and Development Program, Central State University, Wilberforce, OH 45384

Diabetes is a major cause of multiple serious health complications because chronically high blood glucose damages blood vessels, nerves, and various organs. Elevation of oxidative stress is associated with diabetic patients because of increased levels of blood sugar concentration. Hydrogen Sulfide (H_2S) is a gasotransmitter and antioxidant with various health benefits for many disease conditions. The pancreatic b-cells are insulin-producing cells located in the islets of Langerhans in the pancreas. The present study investigated the effects of H_2S on reducing sugar-induced oxidative stress in pancreatic b-cells from a Chinese hamster. We found that reducing sugar induced marked oxidative stress in starved b-cells as it was judged by determining thiobarbituric acid reactive substances (TBARS) and protein carbonyl (CO) formation. We tested the effects of Na_2S on reducing sugar-induced oxidative stress in serum-starved b-cells, and we found that H_2S markedly inhibited sugar-induced oxidative stress in serum-starved b-cells. Treatment with Na2S caused significant induction of cell viability and a marked reduction of cellular cytotoxicity in serum-starved b-cells incubated without or with sugar. Na_2S treatment of starved b-cells antagonized expression levels of inflammatory cytokines, TNF-a, and inhibited the activation of the transcription factor, NF-kB signaling pathway. In addition, Na_2S treatment increased antioxidant activity and activated the Nrf2 (nuclear factor erythroid 2-related factor 2) signaling pathway in starved b-cells. Taken together, our findings suggest that H_2S or its donors may be used as therapy to cure diabetes by inhibiting oxidative stress, thereby decreasing blood sugar levels in diabetic patients.

1174

Understanding the Impact of Technology Use and Physical Activity on Adolescent Health in Mississippi. M. Manthati *, Department of Human Sciences, Alcorn State University, Lorman, MS 39096; M. Ravola, Department of Human Sciences, Alcorn State University, Lorman, MS 39096; and B. George, School of Business, Alcorn State University, Lorman, MS 39096.

Persistent adolescent obesity in Mississippi presents the need for detailed characterization of the interactions among technology use, dietary behavior, and physical activity in youth populations. This study leverages secondary data from the CDC Youth Risk Behavior Surveillance System (YRBSS) and American Community Survey (ACS) to quantitatively assess associations and cluster patterns relevant to obesity risk. Utilizing statistical and machine learning techniques in R and Python including Pearson correlation, K-Means clustering analysis, and multivariable logistic regression the analysis interrogates predictors such as average daily screen exposure, physical activity episode frequency, diet quality indices, and socioeconomic metrics (e.g., household income, parental education). Adolescents are algorithmically classified into behavioral typologies based on emergent patterns, enabling identification of population subgroups with elevated inactivity or obesity prevalence. Key outcome measures include odds ratios for obesity risk factors and the relative influence of technology engagement which include physical

activity and nutrition. The findings are intended to inform evidence-based public health approaches, including targeted school wellness policies, digital media regulatory education, and tailored community health promotions. Emphasis is placed on modifiable risk factors that are actionable within school and community program frameworks, providing a foundation for interventions designed to rebalance digital and physical behaviors among Mississippi adolescents.

1175

Poetry, Prose, and Parody: Using Creative Arts to Engage College Students in a Nutrition and Wellness Classroom. J. Robinson*, Cooperative Agricultural Research Center, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446.

Performing arts such as poetry, comedy, and multimedia may offer innovative avenues to increase awareness of food and nutrition issues. This study explored student responses to three videos that integrated artistic expression with food and nutrition-related content. Students completed semi-structured questionnaires after viewing each video, reflecting on food and nutrition recall, personal and social eating habits, engagement, and the potential of performing arts to spark conversations about health. Analysis revealed that students commonly remembered specific foods and nutrition-related terms, considered the impact of their own and peers' diets, and reported high engagement, particularly with multimedia formats. These findings highlight the potential of integrating creative arts into nutrition and health education strategies to engage learners and foster awareness. Future research could explore the impact of arts-based interventions on actual dietary behaviors, extending beyond awareness to influence behavioral outcomes.

1176

Muscadine Grape Polyphenolics: A Nutriceutic to Prevent Coronary Heart Diseases. M. B. Sheikh*, I. M. Ahmed, T. Dhanani, and M. Agarwal, Center for Viticulture & Small Fruit Research, College of Agriculture and Food Sciences, Florida A&M University, Tallahassee, FL 32317.

Polyphenols are bioactive compounds with potent antioxidant, anti-inflammatory, and vascular-protective properties, making them key agents in preventing cardiovascular diseases (CVD). Muscadine grapes (*Vitis rotundifolia*), native to the southeastern United States, are uniquely rich in polyphenols such as ellagic acid, resveratrol, anthocyanins, and quercetin, particularly in their thick skins and seeds. This study evaluated muscadine grape varieties "Southern Home," "Pineapple," "Sweet Jenny," and "Pride" for their potential to prevent and manage CVD. Extracts from "Southern Home" and "Pineapple" significantly inhibited cell cycle progression and modulated cholesterol metabolism in Caco-2 cells by reducing triglyceride and LDL-C absorption while increasing HDL-C levels. These effects suggest that muscadine polyphenols may interfere with cholesterol uptake and transport, lowering cellular cholesterol and reducing atherosclerosis risk. High-performance liquid chromatography analysis confirmed elevated levels of total phenolics and flavonoids, particularly in "Southern Home" and "Pineapple," correlating with superior antioxidant activity. These findings highlight the ability of muscadine grape phytochemicals to modulate cholesterol and lipoprotein metabolism, reduce inflammation, and enhance apoptotic pathways relevant to CVD prevention. Overall, this research supports the potential of muscadine grapes as functional food ingredients and nutraceuticals for promoting cardiovascular health. Dissemination of these results aims to enhance consumer awareness, diversify muscadine utilization, and support the sustainability of the grape industry.

1177

Dynamics of the Catfish (*Ictalurus punctatus*) Microbiome Under Natural Preservative Treatments: Implications for Refrigerated Spoilage Control and Product Quality. G. Yourek* and J.L. Lee, DNA and Data Science Core; Food Science and Biotechnology Program, College of Agriculture, Science and Technology, Delaware State University; Dover, DE 19901.

Fish is an essential source of lean protein worldwide, but it deteriorates quickly due to microbial spoilage. As consumers become more concerned about using chemical preservatives, we suggest natural preservatives as safer alternatives to prevent microbial spoilage. In this study, we employed Next-Generation Sequencing (NGS) metagenomics to analyze catfish fillets microbiomes at early, middle, and late points. Store-bought and aquaculture-raised catfish were treated separately with natural preservatives. We observed bacterial populations and sequenced

NGS libraries of catfish microbes. Vinegar treatment exhibited the greatest suppression of bacterial growth, while grapefruit seed extract (GSE) and lemon treatments showed similar levels of suppression at the middle and late points. Aquaculture-raised vinegar-treated samples maintained similar proportional taxonomy abundance throughout storage. *Pseudomonas, Janthinobacterium,* and *Camobacteriaceae* were initially dominant in store-bought fish, but vinegar suppressed *Pseudomonas* at the middle point, leading to less biased relative abundances. In aquaculture-raised fish, bacteria such as *Chryseobacterium, CK-1C4-19,* and *Cetobacterium* remained predominant in vinegar-treated samples at the middle and late stages, maintaining a profile like that of fresh fish. *Pseudomonas* became dominant in most lemon and GSE samples at later stages. This study improves understanding of bacterial spoilage and shows that natural preservatives can extend fish shelf life.

1178

Food Safety Impacts from Animal Grazing on a Cover-Cropped Fresh Spinach Production System in Maryland. A. Kenney*, F. Hashem, S. Parveen, E. N. Escobar; Department of Agriculture, Food, and Resource Sciences, School of Agriculture and Natural Sciences, University of Maryland Eastern Shore, Princess Anne, MD 21853; P. Millner, USDA–ARS-NEA-BARC, Beltsville, MD 20705; A. F. A. Pires, Department of Population Health and Reproduction, School of Veterinary Medicine, University of California-Davis, Davis, CA 95616.

Food safety and agricultural sustainability remain challenges for fresh produce safety in cover crop livestock integration systems. Microbial food safety concerns center on the transfer of pathogens from livestock grazing to raw/minimally processed produce. This study examined pathogen risks associated with sheep grazing on cover crops compared to tilled-crop termination (non-livestock integration) and winter fallow (no cover cropping/livestock grazing) pre-spinach planting, pathogen persistence/soil survival/transfer-to-produce. This RCB experiment (3-treatments, 4-replications, 3-subsets/replicate), conducted at UMES Agriculture Research Station (2021-2022), focused on foodborne pathogen (*E. coli* O157, non-O157, Shiga toxin-producing *E. coli* (STEC), *Listeria monocytogenes*) survival/persistence, and generic *E. coli* in soil and transfer to produce. Effectiveness of the 90-to-120-day manure application-to-harvest wait intervals for fresh produce post-livestock cover-crop grazing was determined. Results show that gEC populations in the three soil treatments (Winter-Fallow, Winter-Cover-Crop-Tilled, and Winter-Cover-Crop-Grazed) fluctuated throughout post-grazing but were not statistically significantly different. The gEC concentrations were influenced by year, precipitation, sampling day, soil temperature, and relative humidity. *E. coli* O157:H7 was detected in WF, WCCT, WCCG soils; 2021 pre-sheep grazing, 2022 post-sheep grazing; 120 days (2021, 2022-spinach post-sheep grazing). *Listeria monocytogenes* was detected in 2021 WCCT, WCCG, 2022 WF, WCCG, 2021 pre-sheep grazing, 2022 post-sheep grazing; day 120 (2021, 2022-spinach post-sheep grazing). Non-O157 in WF, WCCT, WCCG, was present in manure pre-(2022) and post-sheep grazing (2021), but not in spinach (120- and 150-days post-sheep-grazing, 2021). Results revealed low spinach contamination rates for *E. coli* O157:H7 and *L. monocytogenes* at the 120-day post-grazing period, similar to those of non-grazed open-field treatments.

1179

Shotgun Metagenomic Assessment of Microbial Community Composition and Food Safety Risks in Soil-Based and Soilless Control Agriculture Systems. A. J. Punchihewage Don*, S. Parveen, F. Hashem, Department of Agriculture, Food, and Resource Sciences, University of Maryland Eastern Shore, Princess Anne, MD 21853; C. Grim, U.S. Food and Drug Administration, College Park, MD 20740; P. Millner, USDA-ARS-Environmental Microbial and Food Safety Laboratory, Beltsville, MD 20705; N. A. Hasan, EzBiome Inc., Gaithersburg, MD 20878.

This study compared microbial communities of 'Outredgeous' lettuce (*Lactuca sativa*) grown in soilless (hydroponic) and soil-based systems using shotgun sequencing. In a greenhouse, lettuce was grown in two, 36-plant nutrient-film hydroponic systems, and in 12, 6" pots containing organically-managed field soil. Samples [soilless: water (weekly), rockwool with seedling (at transplant), rockwool with shoot, and roots (at harvest); soil-based: soil (at transplant and harvest), roots, rockwool with seedling (at transplant), and leaves (at harvest)] were collected to evaluate changes in the lettuce microbiome over time. Extracted DNA was analyzed using shotgun sequencing on an Illumina NextSeq-2000. Results indicate that the soilless system contained 1,343 species of bacteria (98.92%), viruses (0.85%), fungi (0.21%), metazoa (0.003%), and protists (0.02%). Conversely, soil-based system had 2,333 species, comprising bacteria (98.44%), viruses (1.33%), fungi (0.19%), and archaea (0.04%); indicating the soil-based system provided greater species richness and substrate for microbial growth compared to this soilless system. Neither system harbored major foodborne pathogens (*Salmonella*, *Escherichia*, *Listeria*, or norovirus). However, pathogenic *Pseudomonas*,

Clostridium, and members of the family Enterobacteriaceae (*Citrobacter*, *Klebsiella*, *Enterobacter*) were prevalent in soil-based samples. Species richness and evenness differed significantly across systems and sample types, while Bray-Curtis dissimilarity revealed distinct microbial community composition between the two systems. Soilless system water and soil-based system soil demonstrated the highest species richness and evenness, while leaves had the least. This study reveals a higher abundance of foodborne pathogens from Enterobacteriaceae and Clostridiaceae in the soil-based system, thereby providing insights to enhance understanding of microbial risks and food safety.

1180

Nitric Oxide Mediated Mitochondrial Protection Improves Cardiac Function in Ischemia-Induced Heart Failure in Rodents. K. N. Islam*, Agricultural Research and Development Program, Central State University, Wilberforce, OH 45384

Reduced nitric oxide (NO) bioavailability and decreased expression of mitochondrial transcription factor A (TFAM) occurs in the setting of heart failure (HF). TFAM promotes transcription of mitochondrial DNA, mitochondrial biogenesis, respiratory chain activity, and ATP synthesis. We investigated the effects of oral sodium nitrite ($NaNO_2$) therapy to increase NO in chronic HF following acute myocardial infarction and examined the effects of $NaNO_2$ on the activation of TFAM, mitophagy, and antioxidant signaling pathways. The present study was undertaken to investigate NO-mediated cardioprotection via mitochondrial function in ischemia-induced HF mice. $NaNO_2$ administration markedly preserved left ventricular ejection fraction (LVEF) and improved left ventricular diastolic and systolic dimensions at 4 weeks as compared to the vehicle (VEH) control. Mitochondrial antioxidant proteins, SOD2 (Mn-superoxide dismutase), peroxiredoxin-3 (Prx-3), and thioredoxin 2 (TXN2) ($p < 0.05$) were markedly increased in $NaNO_2$-treated mice compared to VEH. Expression of mitophagic markers, p62 ($p < 0.05$) and Map1lc3 ($p < 0.05$), was significantly increased in $NaNO_2$-treated HF mice as compared to VEH. Expression of mitochondrial quality control, such as PINK1 and PARKIN2, was also markedly increased in HF mice after being treated with nitrite therapy as compared with VEH. Marked induction of sulfhydration of interferon regulator factor 1 (IRF-1), as well as upregulation of TFAM ($p < 0.05$) and suppression of DNA methyltransferase 3a (Dnmt-3a) ($p < 0.05$) were observed in $NaNO_2$-treated ischemic HF mice as compared with controls. Together, these data indicate that NO therapy improves heart function by protecting mitochondrial function in the ischemia-induced HF mouse model.

1181

An *In Vitro* Study on the Effect of Different Dietary Fibers on Gut Microbiota. S. Das, C. Fletcher, S. Zhang, Y. Myles, and Y. Wu*, Department of Food and Animal Sciences, Tennessee State University, Nashville, TN 37209.

Studies have revealed that microbes produce different enzymes that respond to different types of dietary fiber, and that these microbes and their metabolites are associated with various health functions. This study's objective was to investigate the effect of different types of dietary fiber on gut microbiota using *in vitro* methods. Human stool sample was used for *in vitro* fermentation. We mixed the sample with three different types of dietary fiber: citrus pectin, barley beta-glucan, and inulin. The molecular weight (Mw) of the fibers and the microbiota profile were determined before and after fermentation. The results showed a decrease in Mw for all tested dietary fibers, indicating a degradation of the molecules due to the microbes' enzyme activities. The microbiota profile differed among the various types of fibers. The relative abundance of microbiomes at the phylum level showed higher *Firmicutes* and lower *Proteobacteria* in all dietary fiber groups compared to the control group. The pectin group showed the highest *Firmicutes/Proteobacteria* (F/B) ratio and the greatest microbial diversity, followed by inulin and beta-glucan. The heteropolysaccharide, citrus pectin, was better fermented by the stool microbiome and enhanced the proliferation of *Firmicutes.* Monosaccharide type, linkage pattern, Mw, and the solubility of the dietary fibers all contributed to the microbiome profile. Further studies will incorporate dietary fibers in real foods to better understand how they impact the microbiome profile. The findings generated from this work will help fill the knowledge gap on dietary fibers from various food sources and their impact on gut health.

1182

An Assessment of Farmers' Perspectives of Medical Marijuana as an Alternative Treatment for Chronic Pain: A Survey. C. J. Lyttle-Nguessan* and V. Adigun**,** Florida A&M University, Tallahassee, FL 32307.

Many farmers suffer from chronic pain conditions needing constant/continuous medical treatment. Research studies found higher drug-related deaths among rural farming communities due to misuse and a divide in access to health-related information. The literature also suggests that using alternative treatments to opioids to treat chronic pain would be helpful. Given the clinical and economic burden of chronic illnesses on patients and society, evaluating potential treatment options to achieve the most desirable outcomes would be beneficial. Knowing individuals' views of medical marijuana as an alternative treatment for chronic pain may help policy decisions and development. The main aim is to assess individuals' perspectives about medical marijuana as a treatment alternative for chronic pain. We conducted a survey to elicit individuals' views on treating chronic pain conditions. Individuals 18 years or older were selected to participate in the study. We developed, pre-tested, and administered the revised survey via an electronic anonymous survey link to a farmers' database. We used descriptive statistics to summarize the data. Of those responding, 85% would use, and 25% would consider using medical marijuana to treat a covered illness if health authorities designate it as safe and effective. Only eight percent of them were or have ever been medical marijuana patients. The preliminary results suggest that farmers are willing to use medical marijuana as an alternative treatment for chronic pain. This outcome underscores the importance of considering individuals' perspectives in healthcare policy decision-making.

1183

Microbiological Contamination and Food Safety Risks Associated with Leafy Greens Grown Under Soilless Production Systems. R.C. Korir*, Agricultural Research and Development Program, Central State University, Wilberforce, OH 45384; A.F. Mechesso, Agricultural Research and Development Program, Central State University, Wilberforce, OH 45384; and O. Bowe, Agricultural Research and Development Program, Central State University, Wilberforce, OH 45384

This work examines microbial communities and food safety implications of soilless production systems, particularly aquaponics and hydroponics, which are increasingly used to produce fresh crops in controlled environments. Despite their advantages, limited understanding remains regarding the microbiological quality and potential food safety risks of produce grown in these systems. By reviewing published studies, we summarized evidence of microbial contamination in aquaponic and hydroponic environments and their crops, noting that several factors can facilitate pathogen survival and transfer to edible plant parts. Operational practices and environmental conditions may introduce pathogens through contaminated fingerlings, fish feed, recirculating water, pest intrusion, improper handling, and inadequate worker hygiene. Studies detected foodborne pathogens of public health concern, including Salmonella spp., Listeria monocytogenes, Pseudomonas aeruginosa, Shiga toxin–producing Escherichia coli O157:H7, and various molds. Beneficial microbes were also documented as essential components of soilless systems. In hydroponics, Bacillus spp., Gliocladium spp., Trichoderma spp., and Pseudomonas spp. are well recognized for biocontrol activity, while Bacillus spp., Pseudomonas spp., and Streptomyces griseoviridis may reduce phytopathogens or enhance plant growth. In aquaponics, nitrifying bacteria play a critical role in converting fish waste and uneaten feed into plant-available nutrients. Fresh produce from soilless systems is often consumed raw, increasing the potential food safety risks associated with microbial contamination. These findings highlight the need for further research and improved mitigation strategies to ensure consumer protection while maintaining the environmental and production benefits of aquaponic and hydroponic agriculture.

1184

Therapeutic Horticulture for Mental Health: Innovations in Student Wellness at Central State University. K. Carter*, Agricultural Research and Development Program, Central State University, Wilberforce, OH 45384; M. Nagle, Agricultural Research and Development Program, Central State University, Wilberforce, OH 45384, K. Harris, Department of Human Sciences, University of Arkansas at Pine Bluff, Pine Bluff, AR, 76101; and J. Trauth, Department of Health and Social Sciences, Central State University, Wilberforce, OH 45384

Depression and anxiety are the most common issues reported among college students. About 16% of the Black population experience one or more mental health concerns, with rates ranging from 12%–50% among Black college students. Central State University (CSU) has seen a 60% increase in students seeking help with depression and anxiety, placing significant strain on staff providing trauma-informed care. Therapeutic Horticulture (TH), a horticultural activity designed to support psychological healing, has been shown in several studies to improve college students' mental health, self-awareness, and psychological adjustment. This project implements a TH program on campus to provide an additional avenue for CSU mental health professionals to support students dealing with trauma and

depression/anxiety. Implementation involves establishing a greenhouse near counseling services specifically for TH and training counselors and peer support personnel. Students are referred to TH by counseling staff based on interest in horticulture or alternative therapy. Counselors are also training students to serve as peer supporters who will help facilitate TH activities. The project compares the pre- and post-mental health of students who participate in TH with those who take part in other group activities offered by CSU counseling services. Standardized, reliable, and valid psychological questionnaires will assess stress, anxiety, depression, and adverse childhood experiences. Once results are available, CSU Extension will begin offering TH to the broader community through its outreach offices.

1185

Qualitative Perceptions of a Fruit and Vegetable Prescription Program in a TAACU. O. A. Harrison*, R. Agbolegbe, P. Dunyo, K. Ofori-Panyin, N. O. Bosio, M. U. Guimaraes, L. A. Gyau, and J. Antwi, CAFNR Research, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446.

Students at Traditionally African American Colleges and Universities (TAACUs), face high levels of food insufficiency and related health challenges. This study explored student perceptions of a structured fruit and vegetable prescription program designed to improve access to nutritious foods. A 12-week pre-post-controlled pilot intervention provided fresh produce, nutrition education, and cooking demonstrations to 28 students in the intervention group and 27 controls. Three 45-minute Focus Group Discussions were conducted at baseline and endpoint, and transcripts were analyzed using thematic content analysis. Analysis identified eight major domains encompassing barriers, preferences, food behaviors, and contextual factors shaping dietary practices. Baseline findings indicated limited produce access, financial constraints, inadequate cooking facilities, and a shortage of culturally appropriate healthy foods. Participants nevertheless expressed interest in improving their diets. At the endline, students described enhanced fruit and vegetable consumption, improved meal planning, mindful eating, and healthier cooking habits. Additional reported benefits included improved sleep, increased physical activity, and better mental well-being. Participants valued incentives and the sense of community fostered by the program, while recommending more recipe diversity, improved communication, and stronger campus support. These findings suggest that a culturally tailored produce prescription model can positively shape dietary attitudes and behaviors among TAACU students. Sustained institutional engagement and student-centered program design are essential to enhance nutritional equity and long-term health outcomes in higher-education settings.

1186

Characterization and Bioactive Potential of Bacterial Communities Associated with Muscadine Grape Berries. M. Agarwal*, A. Kaplan, T. Dhanani, I. Ahmed and M. B. Sheikh, Center for Viticulture and Small Fruit Research, College of Agriculture and Food Sciences, Florida A&M University, Tallahassee, FL 32317.

Muscadine grapes, valued for fresh consumption and boutique wine production, offer a unique ecological niche for investigating endophytic yeast communities. Despite their potential significance, the cultivable diversity and functional roles of these yeasts remain poorly characterized. In this study, we isolated and identified culturable endophytic yeasts from unskinned berries of multiple muscadine and bunch grape cultivars. Molecular and morphological analyses revealed 48 distinct isolates representing 18 species across 12 genera, with a strong predominance of non-*Saccharomyces* yeasts. *Hanseniaspora guilliermondii* emerged as the most abundant species, followed by members of the *Pichia* genus. Importantly, the discovery of novel grape-associated species such as *Nakaseomyces nivariensis* and *Wickerhamiella sorbophila* expands the recognized biodiversity of endophytic yeasts within grape systems. Literature-based functional insights suggest that many of these species possess strain-specific abilities relevant to wine aroma development, pathogen suppression, plant growth promotion, and broader biotechnological applications. The observed morphological diversity further indicates ecological adaptability and potential functional specialization among isolates. Collectively, this work deepens our understanding of yeast–grape interactions and highlights muscadine berries as reservoirs of diverse and functionally versatile microorganisms.

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1187

Exploring the Diversity and Multifaceted Functions of Yeast Endophytes in Muscadine Grapes. M. Agarwal*, A. Kaplan, T. Dhanani, I. Ahmed and M. B. Sheikh, Center for Viticulture and Small Fruit Research, College of Agriculture and Food Sciences, Florida A&M University, Tallahassee, FL 32317.

Muscadine grapes, valued for fresh consumption and boutique wine production, offer a unique ecological niche for investigating endophytic yeast communities. Despite their potential significance, the cultivable diversity and functional roles of these yeasts remain poorly characterized. In this study, we isolated and identified culturable endophytic yeasts from unskinned berries of multiple muscadine and bunch grape cultivars. Molecular and morphological analyses revealed 48 distinct isolates representing 18 species across 12 genera, with a strong predominance of non-*Saccharomyces* yeasts. *Hanseniaspora guilliermondii* emerged as the most abundant species, followed by members of the *Pichia* genus. Importantly, the discovery of novel grape-associated species such as *Nakaseomyces nivariensis* and *Wickerhamiella sorbophila* expands the recognized biodiversity of endophytic yeasts within grape systems. Literature-based functional insights suggest that many of these species possess strain-specific abilities relevant to wine aroma development, pathogen suppression, plant growth promotion, and broader biotechnological applications. The observed morphological diversity further indicates ecological adaptability and potential functional specialization among isolates. Collectively, this work deepens our understanding of yeast–grape interactions and highlights muscadine berries as reservoirs of diverse and functionally versatile microorganisms.

1188

Evaluating Bagasse-Based Soil Amendments for Leafy Vegetable Production. J. Reason*, M. Walker, J. Snowden, M. Tate Sr., C.P. Bagley, D. Kambiranda, Southern University Agricultural Research and Extension Center, Baton Rouge, LA 70791; M. Walther, E. Autin, IFUS International, Napoleonville, LA 70390.

Sugarcane (*Saccharum officinarum*) bagasse is the fibrous residue remaining after sugar extraction from cane stalks. Supreme AG™ is a proprietary soil amendment produced by Impact Fusion International (Napoleonville, LA), formulated with native minerals, naturally occurring compounds, and sugarcane bagasse. This study evaluates the effects of three soil amendment treatments—regular sugarcane bagasse, Supreme AG™, and untreated soil—on the growth and health of six leafy vegetable crops: mustard greens, collard greens, kale, Swiss chard, broccoli, and cauliflower. A split-plot design was employed, with crop species as the main plots and bagasse treatments (untreated soil, Supreme AG™ mulch, and regular bagasse mulch) as the subplots. Both Supreme AG™ and regular bagasse were applied as 2–3-inch mulch layers around the base of each plant, four times during the growing season. Key growth parameters included plant height, leaf width, and visible pest or environmental damage, recorded weekly throughout the season. Data was collected weekly throughout the growing season to assess the comparative performance of each treatment across all vegetable types. Preliminary results indicate improved plant height and leaf expansion in most crops, suggesting enhanced nutrient availability and soil structure. Soil showed moderate benefits over regular bagasse, while regular bagasse plots exhibited lower growth metrics and higher incidence of leaf damage. The study contributes to ongoing efforts to repurpose agricultural byproducts for improved soil health and crop productivity, offering a promising avenue for environmentally friendly farming practices in regions with abundant sugarcane processing residues.

1189

Host Association and Biological Characteristics of *Bedelia somnulentella* (Lepidoptera: Bedellidae) on the Wild *Ipomoea* Species. M. J. S. Cabral* and M. Haseeb, Center for Biological Control, College of Agriculture and Food Sciences, Florida A&M University, Tallahassee, FL 32307 and M. A. Soares, Departamento de Agronomia, Universidade Federal dos Vales do Jequitinhonha e Mucuri, Diamantina, Minas Gerais 39100000, MG, Brazil.

The development, survival, and reproduction of herbivorous insects are closely influenced by the suitability of their host plants. The polyphagous microlepidopteran *Bedellia somnulentella* (Zeller, 1847) (Lepidoptera: Bedelliidae), commonly known as the sweet potato leaf miner, is a defoliator of *Ipomoea batatas* (L.) (Convolvulaceae). Its population dynamics and infestation levels depend largely on the availability of alternative wild hosts, particularly during off-season periods when cultivated sweet potato is absent. This study aimed to evaluate the biology and life history of *B. somnulentella* feeding on wild *Ipomoea* species and on *I. batatas* cv. Beauregard. Vegetative and reproductive parts of *Ipomoea hederifolia*, *I. indica*, *I. purpurea*, and *I. batatas* were collected in 2021, and the biology of *B. somnulentella* was assessed using twenty adult pairs per host plant under controlled laboratory conditions. The

experiment followed a completely randomized design with ten replications. Daily observations recorded egg hatching, larval instars, prepupal, pupal, and adult stages. Distinct color variations were noted among larvae feeding on different *Ipomoea* hosts. Larval and adult survival were significantly higher on *I. batatas* and *I. hederifolia* compared with *I. indica* and *I. purpurea*. Larval coloration varied noticeably between individuals reared on *I. indica* and *I. purpurea*. The results confirm that certain wild *Ipomoea* species, particularly *I. hederifolia*, can serve as alternative hosts supporting the persistence of *B. somnulentella* populations. These findings enhance understanding of host-plant relationships and seasonal persistence of this pest, offering valuable insights for integrated management strategies.

1190

Genetic Basis of Parthenocarpy in Muscadine Grapes: Towards Seedless Cultivar Development. I. M. Ahmed*, M. Agarwal, T. Dhanani and M. B. Sheikh, Center for Viticulture & Small Fruit Research, College of Agriculture and Food Sciences, Florida A&M University, Tallahassee, FL 32317; and M. A. Rahman, Alabama State University, Montgomery, AL 36104.

Seedlessness in grapes occurs through parthenocarpy or stenospermocarpy. Muscadine grapes (*Vitis rotundifolia*) are limited as table grapes due to large seeds, and introgression of seedlessness from bunch grapes (*Vitis vinifera*) is not feasible because of genetic incompatibility. Reduced expression of AGAMOUS-LIKE11 (*VvAGL11*) is known to confer stenospermocarpic seedlessness in Sultanina-derived cultivars. We identified and characterized the *VvAGL11* ortholog in muscadine grapes (*VroAGL11*). Seedlessness-related transcripts were highly expressed in pea-stage berries but nearly undetectable in leaves and harvest-ripe berries. RT-PCR and ORF sequencing indicated conservative splicing, and the predicted proteins were 99% identical to seeded bunch cultivars, differing by a single amino acid. Expression levels correlated significantly with seed content but not with berry or seed size. Comparative genomic and transcriptomic analyses between seeded muscadine (e.g., 'Noble') and seedless bunch grapes (e.g., 'Fry Seedless') reveal key differences in seed development genes. Functional validation is being conducted using tomato (Solanum lycopersicum cv. Micro-Tom), where silencing the D-class MADS-box *SlyAGL11* gene produced seedless fruit. Seed coat development genes (*VPE1* and *VPE2*) are also being assessed in muscadine via tomato as a model. CRISPR-Cas9 constructs are being developed for delivery to calli and protoplasts to knockout/knockdown seedlessness-related genes, providing a pathway for developing seedless muscadine grapes. This study advances understanding of grape seedlessness and provides genetic and methodological insights toward breeding seedless muscadine cultivars.

1191

Molecular Regulation of Sugar Accumulation in Muscadine Grape Genotypes. I. M. Ahmed*, M. Agarwal, T. Dhanani and M. B. Sheikh, Center for Viticulture & Small Fruit Research, College of Agriculture and Food Sciences, Florida A&M University, Tallahassee, FL 32317.

Sugar accumulation is a key determinant of grape berry quality, influencing sweetness, texture, and overall consumer preference. Muscadine grapes *(Vitis rotundifolia*), distinct from hybrid and traditional bunch grapes (*Vitis vinifera*), exhibit unique sugar metabolism patterns during berry development. This study investigates the molecular mechanisms regulating sugar accumulation in diverse muscadine grape genotypes across developmental stages. Enzymes involved in sucrose and hexose metabolism, including invertases, sucrose synthases, and sugar transporters, were analyzed for their activity and gene expression profiles. Comparative analyses revealed genotype-specific differences in the timing and magnitude of enzyme activities, correlating with variations in sugar content and composition. Transcriptomic data further identified candidate genes associated with enhanced sugar transport and storage in muscadine berries, providing insights into the regulatory networks controlling carbohydrate partitioning. These findings highlight the complex coordination between metabolic enzymes and gene expression that underpins sugar accumulation and offer molecular targets for breeding and biotechnological strategies aimed at improving fruit sweetness and quality in muscadine grapes.

1192

'FAMU Aurora', A Very Early Ripening Muscadine Grape Cultivar. Z. Ren*, V. Tsolova and I. El-Sharkawy, Center for Viticulture & Small Fruit Research, College of Agriculture and Food Sciences, Florida A&M University, Tallahassee, FL 32317.

'FAMU Aurora' is a very early ripening muscadine grape cultivar developed by the grape breeding program in Florida A&M University recently. 'FAMU Aurora' was obtained from the cross of 'O28-12-2 and 'Nesbitt'. The fruits of 'FAMU Aurora' ripen in late July, with about 10 day harvesting window that end in early August in Tallahassee, FL. 'FAMU Aurora' is the earliest ripening muscadine grape cultivar available and is harvested approximately one month earlier than the most muscadine grapes in that region. For short post-harvest natured muscadine grapes, this earliness possesses high potential in extending the table muscadine grape market period and enhancing the profits for muscadine grape growers. The self-fertile flower, satisfied productive, uniform in both fruit ripening and fruit size of 'FAMU Aurora', would make it a preferred cultivar by industry. 'Famu Aurora' fruits taste sweet, pleasant, and have attractive smooth deep red skin. The seeds of 'FAMU Aurora' are remarkably smaller than those of other muscadine grapes.

1193

Empowering Small Farmers through Controlled Environment Agriculture (CEA) to Enhance Agricultural Production in Louisiana. M.L.Ford*, Southern University Agricultural Research and Extension Center, Baton Rouge, LA 70791.

Small-scale farmers in Louisiana face persistent challenges including unpredictable weather, limited access to fertile land, rising input costs, and market instability. These barriers have constrained productivity and profitability, particularly among limited-resource farmers in both rural and peri-urban regions. This proposal seeks to address these challenges by introducing and scaling Controlled Environment Agriculture (CEA) systems as a sustainable solution for enhancing agricultural productivity, economic resilience, and food security across Louisiana. The research focuses on developing, optimizing, and validating CEA systems specifically hydroponic, aquaponic, and aeroponic production models that could be adapted to Louisiana's climatic conditions. The project will analyze plant growth performance, energy efficiency, water use, and nutrient management under different controlled environments. Through applied research at the Southern University Agricultural Research and Extension Center (SUAREC) and partner demonstration sites, the project will generate data to guide climate-smart agricultural design and small-scale commercialization strategies. The extension and education component will empower small farmers, students, and community members through comprehensive hands-on training, workshops, and Cooperative Extension programming. Participants will gain technical skills in system management, crop selection, and marketing of value-added CEA products. The initiative will also foster entrepreneurship by connecting participants to resources for business planning, financing, and local food distribution networks. The merging of research, innovation, and community engagement aims to establish Louisiana as a leader in sustainable, technology-driven agriculture. Expected outcomes include increased local food production capacity, reduced environmental impact through resource-efficient farming, expanded rural and urban economic opportunities, and enhanced resilience to climate change.

1194

Performance comparison of micro-propagated and rhizome propagated turmeric. T. Taghavi*, M. Bushema, A. Rahemi, O. Akande, D. Galam, M. K. Kering, R. Rafie, , Agricultural Research Station, Virginia State University, Petersburg, VA 23806

Turmeric (*Curcuma longa*) is the spice and medicinal herbs originally from India. The yellow powder comes from dried and ground rhizome which grows underground. In an experiment under mid-Atlantic conditions the potted turmeric plants 'Hawaiian Red' were planted at the Randolph farm (Virginia State University) on May 26, 2021. The potted plants came from two sources: 1- Propagated by commercial method (rhizome division), and planted in the one gallon pots on Dec 15, 2020; 2- Propagated by tissue culture techniques (meristem culture), adapted to *ex-vitro* environment and transplanted on Dec 11, 2020 into the quart pots. The whole pots from both sources were kept in the greenhouse until transplanting to the outside field. Fifteen plants from each sources were planted with three feet intra row and six feet inter-row spacing at the farm and ridges were covered with wooden mulches. They were irrigated once to twice a week depending on the temperature by sprinkler system till harvesting time at Oct 27, 2021. Three fully expanded leaves from the canopy/top from the south side was used for the chlorophyll concentration ($\mu mol\ m^{-2}$) reading by SPAD for two times (Sep 22, 2021, and Oct 20, 2021). The tallest leaf height, fresh and dried parts including shoots, rhizomes and roots, shoot numbers, diameter of the canopy, TSS, TA, were measured separately for each sample. The results showed although the tissue cultured plants had fewer yield compared to the commercials in the first year, but they had no sign of disease or contamination visually.

1195

A Unique CLFB Domain in Portulaca Oleracea DRM2 Modelates Genome-wide DNA Methylation and Negatively Regulates CHH Methylation Maintenance. S. Ren*, Agriculture Research Station, Virginia State University, Petersburg VA 23806; J. Huang, Agriculture Research Station, Virginia State University, Petersburg VA 23806.

Epigenetic modifications, especially DNA methylation, are vital for plant growth, development, and environmental adaptation. In plants, DOMAINS REARRANGED METHYLTRANSFERASE 2 (DRM2) mediates de novo DNA methylation in all sequence contexts via the RNA-directed DNA methylation (RdDM) pathway and maintains CHH methylation. We previously cloned the Purslane DRM2 gene (*PoDRM2*) and discovered a unique N-terminal clfB domain absent in other DRM2 homologs. To investigate its function, yeast two-hybrid (Y2H) assays were conducted using the clfB domain and the remaining PoDRM2 region containing the ubiquitin-like (USB) and methyltransferase domains. The Y2H screen revealed 14 proteins interacting with clfB and 18 with the USB/methyltransferase region, with several shared interactors suggesting redundancy in partner recruitment. Notably, the clfB domain interacted uniquely with *Arabidopsis thaliana* DRM2, implying a role in DRM2 dimerization or regulation. To examine its potential function, we overexpressed full-length PoDRM2 and a clfB-only construct in Arabidopsis, followed by whole-genome bisulfite sequencing. As expected, overexpression of PoDRM2 gene significantly increased methylation changes at all three types of methylation sites. However, overexpression of the clfB domain alone caused measurable DNA methylation changes in CG and CHG methylation sites but a marked reduction in CHH methylation site. These results suggest that the clfB domain modulates genome-wide methylation, potentially by interfering with endogenous DRM2 activity and negatively regulating CHH methylation maintenance.

1196

Innovating Urban Farms: From Grafted Crops to Plant-Based Pest Defense. S. Ren*, Agriculture Research Station, Virginia State University, Petersburg, VA23806.

Urban agriculture (UA) is expanding rapidly in the U.S. due to increasing demand for locally produced food. However, limited space in cities requires innovative methods to maximize productivity. Grafting—an ancient horticultural technique known to enhance plant stress tolerance—offers new potential for efficient UA systems. This study explores two novel grafting-based approaches to optimize space use in urban farming. First, we developed a "PoTomato" system by grafting tomato (*Solanum lycopersicum*) onto potato (*S. tuberosum*), enabling simultaneous harvests of fruit and tubers from a single plant. Although tomato–potato grafting is relatively simple, consistent fruit and tuber yields depend on selecting compatible variety combinations, which we identified through screening. Second, in high-tunnel environments, we used perennial wild eggplant (*S. torvum*) as a rootstock to support grafted tomato and eggplant (*S. melongena*) scions. This "two-layer agriculture" design produces fruiting crops in the upper canopy while maintaining a productive ground layer of leafy greens and herbs, thus increasing total yield per unit area. In addition to grafting-based innovations, we addressed pest management challenges common in urban farms due to their proximity to human dwellings. A novel plant extract was evaluated for its potential to reduce pest damage, offering an environmentally friendly alternative to conventional chemical control. Together, these studies highlight complementary strategies—grafting for spatial efficiency and botanical repellents for safer pest management—that contribute to more sustainable and productive urban agriculture systems.

1197

A Preliminary Report on Edamame Multiple-Location Evaluation. G.-L. Jiang*, S. Gu, T. Nartea, Z. Mersha, S. Ren, and Y. Xu, Agricultural Research Station, Virginia State University, Petersburg, VA 23806; B. Fallen, and R. Mian, USDA-ARS Soybean & Nitrogen Fixation Research Unit, Raleigh, NC 27606; and C. Ortel, Tidewater Agricultural Research and Extension Center, Virginia Tech Tidewater AREC, Suffolk, VA 23437.

Vegetable soybean (*G. max*), known as edamame, has higher market value and excellent nutritional profiles. It is regarded as an alternative or new niche crop in the USA. Virginia State University has been dedicated to edamame development since 1990s. To facilitate release of new cultivars and promote edamame production, 55 promising breeding lines along with five released varieties as checks were selected and evaluated during 2023-2025 in Virginia and North Carolina. Data of 43 genotypes from 2023 and 2024 trials indicated that most of the tested lines exhibited

a good performance in various traits. The effects of genotypes, years and locations were significant in most cases. All the new lines, excluding two exceptions, averaged 25.24 – 29.52 g in 100-seed weight, but four checks averaged 23.16 – 24.00g g. Genotype effects were not statistically significant in fresh pod yield, however, the fresh pod yields of 15 lines (11.21 – 13.04 kip/a) were higher than the average of five checks (11.16 kip/a). Twelve new lines averaged a higher mature seed yield (39.58 – 44.72 bu/a) than the average of five checks (39.47 bu/a). Average seed protein contents in 19 new lines were 44.0 – 46.4 g, like or exceeding the checks, and most new lines showed a higher oil content than the checks and a comparable sucrose content. Most new lines also exhibited shorter plant heights and better tolerance to lodging and pod shattering. These results indicated that the new lines would have good market acceptability and potential for commercial production.

1198

Effects of Chitosan and Bioproducts on Safeguarding Ginger Transplants from Fusarium Yellows and Rhizome Rot Disease. Z. Mersha*. Agricultural Research Station, Virginia State University, Petersburg, VA 23806.

The demand for ginger (*Zingiber officinale* Roscoe) continues to grow due to its culinary, medicinal, aromatherapeutic, and beverage applications. However, production is hindered by seed-piece and soil-borne diseases (SSDs) including yellows and root rots caused by fungi, bacteria, oomycetes and nematodes. These issues are exacerbated by the vegetative propagation of rhizomes, which limits genetic resistance options. This study evaluated the efficacy of chitosan (1 or 5 g/L) and two bioproducts (Trichoderma- and Streptomyces-based) alone or combined with a post planting drench of the two chitosan rates compared to a non-treated control. Seven total treatments were applied to three cultivars (Chinese, Yellow, Peruvian-Yellow) with three replications each. Plants were grown in 10-lb grow-bags inside a 30 x 48 ft high tunnel equipped with fans and vents. Three-month-old transplants were inoculated with *Fusarium oxysporum* f.sp. *zingiberi* (2 X 10^3 conidial/ml) and treated twelve hours later. Preliminary results from the 2024 trial, to be repeated in 2025, indicated that treated plants had improved growth, reduced foliar yellowing and higher yields than the non-treated control. Chitosan, particularly with the higher rate and when followed by rhizosphere drenches with biological products significantly reduced foliar disease severity (FDS) compared to the non-treated control. Notably, the non-treated Chinese cultivar exhibited significantly the highest FDS compared to the other two cultivars. These findings support the integration of chitosan and biocontrol agents as promising strategy for SSD management in ginger. The approach offers potential for enhancing transplant health and yield while reducing pathogen pressure in ginger propagation systems.

1199

Phytochemical Profile, Antioxidant Capacity and Phenolic Content of Leaves of Five *Hibiscus sabdariffa* Accessions. S. L. Chin, Louisiana Housing Corporation, Baton Rouge, LA 70808; Y. Qi*, K.L. Chin, Vanessa Ferchaud, Southern University Agricultural Research and Extension Center, Baton Rouge, LA 70813.

Hibiscus sabdariffa, a member of Malvaceae family, known as Roselle, Bissap, Jamaica Sorrel is a non-native species to the United States of America. Its calyces are commonly used in beverage and foods and are also used as traditional medicines to treat hypertension, liver disorders and inflammation. Because of the medicinal properties of the calyces, research has mainly focused on the calyces. Its leaves, most abundant portion of the roselle plant, are also consumed as leafy green vegetable in Sub-Sahara Africa and are underutilized. Limited studies have sought to identify the phytochemicals in the leaf which may have similar medicinal properties as calyces. In this study, five roselle accessions were evaluated for their phytochemical profiles, total phenols and antioxidant activities. LC/MS was used to analyze the leaf extracts qualitatively and quantitatively. Folin-Ciocalteu assay expressed as gallic acid equivalent was used to determine the total phenolic content. ABTS radical scavenging assay expressed as Trolox equivalent was used to determine the antioxidant capability of the leaf extracts.

1200

Effect of Leaf Age on Volatile Compound Distribution in Kaffir Lime (*Citrus hystrix*) Grown in a Soilless Substrate. S. Kennedy*, D. Pitchay, and R. Ravi, College of Agriculture, Tennessee State University, Nashville, TN 37209.

Kaffir lime (*Citrus hystrix*) leaves are harvested for their rich aromatic volatile compounds. The composition of these compounds is known to be influenced by the specific plant tissue sampled. This study investigated the impact of leaf developmental stage (recently matured vs. old leaves) on the volatile compound distribution in kaffir lime grown in a greenhouse using a peat-lite soilless substrate. Fresh leaf samples from both age groups were analyzed using an electronic nose. A total of 79 compounds were identified. While both leaf ages shared several compounds (e.g., citronellal, N-nonanal, myrcene, and γ-terpinene) at similar concentrations, the dominant volatile constituents were completely different between the two. The profile of recently matured leaves was dominated by 5-Propyldihydro-2(3H)-Furanone (32.9%), (β)-Pinene (7.6%), Terpinen-4-ol (2.4%), 1-Hexanol (1.3%), and (Z)-3-Hexen-1-ol-Acetate (1.0%), which were not detected in old leaves. Conversely, the profile of old leaves was dominated by 1-Nonanol (30.8%), 3-Methyl Butanoic Acid (4.6%), ρ-Methyl Acetophenone (1.5%), Trans-Hex-2-Enyl Acetate (1.4%), and Methyl Eugenol (1.1%), which were absent in the recently matured leaves. These findings demonstrate that volatile compound presence and concentration are critically impacted by leaf age. Harvesting tissue at specific developmental stages is therefore crucial for obtaining desired aroma profiles for culinary or industrial applications.

1201

Growing Medium is Critical for Selecting Right Nitrogen Form for Optimal Growth and Yield of Chives (*Allium schoenoprasum*). S. Gurung*, S. Kennedy, and D. Pitchay, College of Agriculture, Tennessee State University, Nashville, TN 37209.

The physiological response of plants to distinct nitrogen (N) forms, including ammonium (NH_4^+), nitrate (NO_3^-), and urea [$CO(NH_2)_2$], is critically modulated by the physicochemical and biological properties of the growing medium. Two studies were conducted to investigate the response of chives (*Allium schoenoprasum*) to N forms in two distinct media: solution culture (hydroponics) and containerized topsoil. In both parallel experiments, plants were supplied with one of five NH_4^+:NO_3^- ratios (0:100, 10:90, 20:80, 50:50, and 100:0) or a urea-only treatment. In solution culture, plants were highly sensitive to NH_4^+ and urea. The growth rate for the 100% NO_3^- treatment was 3.22 cm·day^{-1}, which was drastically reduced in the 100% NH_4^+ (0.31 cm·day^{-1}) and urea (0.29 cm·day^{-1}) treatments. Compared to the 100% NO_3^- treatment, fresh biomass was reduced by over 85% in treatments containing $\geq$ 50% NH_4^+ and by over 97% with urea. These treatments also caused severe visual toxicity/deficiency symptoms, including chlorosis and necrosis. In soil, the negative effects were significantly buffered. Growth rates for 100% NO_3,100% NH_4^+, and urea were 3.00, 2.11, and 2.82 cm·day^{-1}, respectively. While treatments with $\geq$ 50% NH_4^+ still reduced biomass (by up to 35.3% compared to 100% NO_3^-), the urea treatment showed no significant reduction in growth and produced no toxicity symptoms. These findings demonstrate that the growing medium is a critical determinant for N management. The buffering capacity of soil, likely via microbial nitrification, mitigated NH_4^+ toxicity and allowed for the safe use of urea, whereas solution culture lacks this buffering, making urea and high NH_4^+ ratios toxic.

1202

Drone-Based Agrophenotyping of Amaranth: Advancing Non-Invasive Monitoring of Phenological Development and Biomass Dynamics. S. Lymanska* and M.W. Blair, Department of Agricultural Sciences and Engineering, Tennessee State University, Nashville, TN 37209.

Modern agriculture increasingly relies on precision monitoring tools to improve management and selection efficiency. Among emerging technologies, drone-based agrophenotyping provides spatially accurate data, enabling high-throughput assessment in field conditions. This approach is valuable for underutilized crops such as grain amaranth (*Amaranthus spp.*), which have high nutritional and agronomic potential plus wide ecological adaptability. Experiments to evaluate multiple grain amaranth varieties using a multispectral drone and bi-weekly flight intervals for phenological monitoring were carried out in a field at TSU's Nashville farm in 2024 and 2025. The experimental design included different sowing dates and genetic backgrounds to capture variability in growth dynamics and stress responses. Drone-derived imagery was processed to quantify canopy development, ground cover, and transitions between key phenological stages from panicle initiation to full maturity. Ground-based measurements complemented aerial data to calibrate biomass-related indices and assess the consistency of remotely sensed parameters. TSU Tiger, a locally bred orange variety, was found to be later maturing but had a higher biomass than Hopi Red, a commercial standard. Both varieties have similar cream-colored, small-seeded grain, but Hopi Red was lower-yielding than TSU Tiger. Future studies might examine other red-flowering varieties, such as Crimson Glow, as a substitute for this genotype. This research highlights the potential of drone-assisted monitoring – which enables continuous tracking of

growth and development – as a non-invasive and cost-efficient tool for studying phenotype in amaranth. The findings show the usefulness of remote sensing in accelerating breeding and improving the management of new alternative crops such as grain amaranths.

1203

Evaluating Recombinant Fungal and Bacterial Peroxidases for *In Vitro* Lignin Depolymerization towards Heterologous Expression in Switchgrass. M. Deguchi[1]*, J.Soares[1]**, A. Ligaba-Osena[2], D. Schneider[3], N. Siva[4], C. Anderson[4], N. Nichols[5], P. Azadi[6], B.B. Hankoua[1]. [1]Plant Biotechnology Laboratory, Department of Human Ecology, College of Agriculture, Science and Technology, Delaware State University, Dover, DE; [2]Department of Biology, North Carolina State University, Greensboro, NC;[3]Department of Agriculture, Cornell University, Ithaca, NY; [4]College of Life Sciences, Department of Biology, The Pennsylvania State University, PA; [5]National Center for Agricultural Utilization Research, Agricultural Research Service, Peoria, IL; [6]Complex Carbohydrate Research Center, University of Georgia, Athens, GA. **Deceased

The use of lignin-degrading microorganisms and their enzymes offers a promising biological approach for biomass pretreatment, reducing the need for chemical inputs and high-energy processing. In this study, we evaluated the biochemical properties of two ligninolytic peroxidases: a fungal versatile peroxidase (VPL2) and a bacterial DyP-type peroxidase (DyP2). Codon-optimized gene constructs of each enzyme, along with two domain-swapped chimeras, were expressed in *E. coli* BL21. The soluble DyP2 protein was purified by Ni-chelating affinity chromatography using a histidine tag, whereas soluble VPL2 and N-DyP2-C-VPL2 proteins were obtained from amylose affinity chromatography using MBP tag. These purified proteins were tested for oxidative activity against model lignin substrates (ABTS, DMP, and veratryl alcohol), kraft lignin, and lignin extracted from multiple hardwood and softwood species. DyP2 exhibited the most vigorous activity toward the model substrates DMP and veratryl alcohol, indicating high catalytic efficiency on small lignin-related molecules. In contrast, N-DyP2-C-VPL2 demonstrated superior activity on kraft lignin and plant-derived lignins, suggesting improved interaction with complex lignin polymers. These findings indicate that computationally guided protein engineering can yield a functional chimeric peroxidase with enhanced lignin-modifying capabilities. Furthermore, recombinant VPL2, DyP2, and N-DyP2-C-VPL2 proteins were applied to cryosectioned stems of switchgrass cultivar Alamo to analyze their effects on lignin abundance and localization in plant cell wall, as well as deconstruction efficiency, using quantitative advanced microscopy and biochemical analysis. These analyses yielded interesting changes in saccharification efficiency. These imaging, molecular and biochemical data will support heterologous expression of these novel ligninases in switchgrass to reduce lignin recalcitrance.

1204

Root Disease Stress and Flatheaded Borer Activity in Red Maple. C. Oksel[1*], S. Dawadi[1], T. Simmons[1], M. Parajuli[2], and F. Baysal-Gurel[1]; [1]Department of Agricultural Sciences and Engineering, College of Agriculture, Tennessee State University, Otis L. Floyd Nursery Research Center, McMinnville, TN 37110; [2]USDA Agricultural Research Service, National Arboretum, McMinnville, TN 37110.

Soilborne pathogens are known to induce stress in nursery trees, potentially increasing susceptibility to pests such as flatheaded borers (FHB). This study investigated whether inoculation with *Rhizoctonia solani* or *Phytopythium vexans* influences FHB attacks on red maple (*Acer rubrum* 'Franksred' Red Sunset) and evaluated the efficacy of fungicide and biofungicide treatments in mitigating root disease and associated stress. Two- to three-year-old containerized red maples were transplanted into field plots in May 2024 and drench-inoculated with *R. solani* or *P. vexans*. Inoculated plants were treated with commercially available fungicides or biofungicides, while non-inoculated and non-treated plants served as controls. At the end of the growing season (Oct. 16, 2024), roots were washed, and disease severity was rated on a 0-100% scale. Pathogen recovery was determined via culturing root segments on selective media. FHB attacks were assessed by peeling trunks, recording galleries, larvae, and fungal colonization. Inoculated, non-treated plants exhibited the highest disease severity (53.9% for *R. solani*; 45.7% for *P. vexans*) and pathogen recovery (37.5% and 44.3%, respectively). Fungicide and biofungicide treatments, particularly Empress (*R. solani*) and Pageant or Subdue Maxx (*P. vexans*), significantly reduced disease severity and pathogen recovery. A total of 31 FHB attacks were observed, with 19 larvae recovered. Non-inoculated, non-treated plants had more FHB attacks than inoculated plants, and no significant differences in FHB incidence were observed across inoculated plants. These findings indicate

that pathogen-induced stress may play a limited role in FHB attacks. Managing root diseases may help reduce, but not completely prevent, borer damage.

1205

Pollinator Preferences Shaped by Floral Traits in Sweet Potato (*Ipomoea batatas* L.) Cropping System. B. Dingha*, K. Gandham, L. Jackai, Department of Natural Resources and Environmental Design, North Carolina Agricultural and Technical State University, Greensboro, NC 27411.

Pollinators are essential for both food production and ecosystem health, providing over $1 billion annually to U.S. agriculture. Their decline poses serious ecological and food security risks. Sweet potato, North Carolina's state vegetable, supports diverse pollinators and serves as a model for studying crop–pollinator interactions. A field study was conducted using 15 sweet potato cultivars to evaluate the influence of floral morphology in plant-pollinator interactions. Results showed that bumble bees were the most frequent and significant pollinators (2.49 ± 0.24), followed by sweat bees (0.40 ± 0.06) and wasps (0.27 ± 0.04). Pollinator activity varied significantly between the morning (70.80 ± 11.80) and afternoon (24.20 ± 6.65) periods. Among the tested cultivars, Garnet (5.60 ± 1.24), Red Japanese (5.00 ± 1.32), Murasaki (4.80 ± 1.11), Korean (3.70 ± 1.18), and Radiance (3.40 ± 1.02) consistently attracted the highest numbers of pollinators over the five-week sampling period. The different cultivars varied significantly in their ability to attract pollinators, reflecting genetic differences that could affect specific floral traits. Among these, corolla width was wider (44.19 ± 0.95 mm) in Garnet, the most visited cultivar, compared to a narrower width (33.21 ± 1.09 mm) in Beauregard B94-14, the least visited cultivar. Larger floral structures favor bumblebee visits and emphasize the role of corolla morphology in pollinator attraction. Understanding how floral traits affect pollinator visitation offers important insights into pollination success, genetic diversity, and crop yield. This knowledge aids pollinator conservation and guides cultivar selection and breeding for pollinator-friendly traits.

1206

Differential Responses of Redbud Cultivars to *Ceratobasidium*-Associated Vascular Streak Dieback. C. Oksel*, T. Simmons, M. Adhikari, C. Jennings, and F. Baysal-Gurel**,** Department of Agricultural Sciences and Engineering, College of Agriculture, Tennessee State University, Otis L. Floyd Nursery Research Center, McMinnville, TN 37110.

Redbud (*Cercis* spp.) is a valuable ornamental tree widely cultivated in the U.S. nursery industry. Vascular streak dieback (VSD), associated with *Ceratobasidium* sp., has emerged as a major limiting factor in redbud production. VSD causes foliar scorch, interveinal chlorosis, vascular streaking, wilting, and progressive branch dieback, which severely reduces plant marketability. This study investigated cultivar responses to VSD. Foliar symptom severity was assessed among multiple redbud cultivars under field conditions. DNA extracted from symptomatic leaves was analyzed using a *Ceratobasidium*-specific quantitative PCR (qPCR) assay, and diseased tissues were incubated to confirm fungal growth and morphology. Preliminary results revealed notable variation in symptom expression and disease severity among cultivars, indicating potential differences in host susceptibility. The qPCR assay consistently detected *Ceratobasidium* DNA in symptomatic samples, confirming its association with observed symptoms. Hyphal structures resembling *Ceratobasidium* were successfully recovered from incubated tissues. Redbud cultivars with yellow foliage and papery leaves exhibited severe leaf scorch symptoms and higher *Ceratobasidium* DNA concentrations detected by qPCR compared to other cultivars. Understanding cultivar-level variation will support breeding for resistance and guide integrated VSD-management strategies in redbud production systems.

1207

Ginger Micropropagation Using Vegetative Stem Tissue. G. Yang, J. Robinson*, Z. Moore, and W. Lashley, Department of Natural Resources and Environmental Design, North Carolina Agricultural and Technical State University Greensboro, NC 27411**.**

Ginger (*Zingiber officinale* Roscoe) is known for its medicinal properties, such as working as an anti-inflammatory anti-cancer agent, and helping with motion sickness and diabetes. Micropropagation of ginger generally uses buds extracted from the rhizome of the plant. However, ginger plants typically produce about 2-3 buds per rhizome finger. Vegetative tissues such as stems or leaves could potentially and significantly increase the availability of explants for ginger micropropagation, thus enabling efficient mass production of ginger plants. This study aimed to develop a

protocol for ginger micropropagation using vegetative stem tissues. Stem tissues were excised (~0.5 cm long) from sterile *in vitro* cultures of two ginger cultivars Big Kahunna (BK) and Madonna (MD). Additionally,20 thin-cut stem explants (5 petri dishes each/ 4 replicates per petri dish) were initiated in MS medium supplemented with 3% sucrose and 0.75% agar (pH 5.8). This study investigated plant growth regulator (PGR) cytokinin, with auxin ratios at 0.1, 0.5, 1.0, 1.5, and 2.0 mg/L for each PGR. Cytokinins tested were BA, Kinetin, Zeatin, 2i), and Thidiazuron combined with auxins NAA and IBA. Cultures in Petri dishes were grown in 16/8-hour light photoperiod cycles at 23/18°C. *In vitro* culture performance (callus and shoot initiation and morphological observation) data will be analyzed and presented at the symposium.

1208

Growth and Rhizome Yield Performance Evaluation of Tissue Culture Ginger Cultivars on Stakeholder's Farm. G. Yang*, J. Robinson, W. Lashley, D. Tetteh, T. McGee, and H. Talton. College of Agriculture and Environmental Sciences, North Carolina Agricultural and Technical State University Greensboro, NC 27411.

North Carolina farmers have a strong desire to grow ginger as an alternative cash crop, and have for many years faced a significant seed ginger sourcing issue, with uncertainty about seed ginger quality and variety. Using our expertise in plant tissue culture, North Carolina A&T State University has transitioned to 100% tissue culture (TC) ginger seedlings that are disease-free and consistently produced excellent growth and yield for the last few years on our university farm. We are simultaneously testing our tissue culture ginger plants of four cultivars (Kali Ma, Hawaii Yellow, Peruvian Yellow, and Big Kahunna) directly from our lab (same year) at a stakeholder's farm, Plum Granny Farm, in Stokes County, NC, under complete care by our stakeholder. Results show vigorous ginger plant growth and resulting excellent developmental and physiological data that are comparable to the studies conducted on our university farm. Specific data collected include the number of stems per TC ginger seedling, SPAD chlorophyll level, stomatal conductance, leaf vapor pressure deficit (VPD), and ΦPSII, as well as light conditions (light quality and intensity). Significant differences in growth and physiological performance were observed among TC ginger cultivars. There is a clear correlation between ginger growth and physiological parameters (PAR, SPAD, VPD, and ΦPSII). Such data indicate that our TC ginger plants will produce excellent, marketable ginger rhizome yields. The ginger plants are still growing. Upon harvesting, ginger rhizome yield data will be analyzed and presented at the symposium, along with detailed growth and physiological data.

1209

Building a Collaborative Network to Address Vascular Streak Dieback (VSD) in Woody Ornamentals. F. Baysal-Gurel*, Department of Agricultural Sciences and Engineering, Tennessee State University, Otis L. Floyd Nursery Research Center, McMinnville, TN 37110.

Vascular streak dieback (VSD) is an emerging disease threatening woody ornamental crops, first identified in redbud five years ago. Since then, it has been confirmed in more than 50 plant species and has severely impacted the nursery industry across at least 13 U.S. states. Disease symptoms vary by host but typically include stunted growth, leaf scorch, tip dieback, and vascular streaking. In 2023, losses on redbud alone exceeded $5 million, and the combined potential economic impact on redbud, red maple, and dogwood is projected to surpass $175 million. Given the expanding distribution and economic implications of VSD, a coordinated, multi-state, and multidisciplinary approach is critical. To address this challenge, we assembled a team of researchers and extension specialists representing plant pathology, diagnostics, fungal genetics, breeding, plant physiology, nursery production systems, and agricultural economics. Supported by a USDA-NIFA Specialty Crop Research Initiative Planning Grant, the team conducted a national needs-assessment survey to evaluate the impact of VSD and current management strategies. Following the survey, scientists and stakeholders convened to develop a comprehensive research and extension plan to mitigate the threat of VSD to the nursery industry. Future initiatives include pursuing competitive funding to implement the identified research and outreach priorities.

1210

Influence of Soil Management Practices on Soil Enzymatic Activity and Soil Biological Indicators on the Eastern Shore of Maryland. D. P. Gurung*, R. Knight, K. Bucca, A. L. Allen, F. M. Hashem, Department of Agriculture, Food, and Resource Sciences, University of Maryland Eastern Shore, Princess Anne, MD 21853; A. S.

Collick, Morehead State University, Morehead, KY 40351; and S. A. Klick, USDA-ARS, Southeast Watershed Research Unit, Tifton, GA, 31793.

Soil enzymes such as arylsulfatase and N-acetyl-β-glycosaminidase, along with active carbon and autoclaved citrate-extractable (ACE) protein, are widely recognized as key indicators of soil health. These enzymes serve as crucial catalysts in energy transfer processes, facilitating the breakdown of organic matter and the cycling of nutrients within the soil ecosystem. In the current study, soil samples were collected from three excavated pedons at each of seven different locations on the Eastern Shore of Maryland, and oil samples were collected from three excavated pedons at each of these seven field sites. The soil sites represented a variety of soil management practices: Three with no-till management, three with reduced-till management, and one forested site serving as a reference. The study goals were to: (1) evaluate arylsulfatase and N-acetyl-β-glycosaminidase activities under these different soil management practices, and (2) examine how these practices affect soil carbon and ACE protein levels. The study's results showed that the highest enzyme activities and the most significant levels of active carbon and ACE protein were found in soil management with no till methods. Soil enzyme activities were highest in the surface layers of the soil and declined with increasing soil depth, a pattern also observed for active carbon and ACE protein levels. Increased organic matter in surface layers boosted soil enzyme activities and significantly raised both active carbon and ACE protein concentrations. These results underscore the crucial role of soil organic matter in promoting soil biological activity and improving soil health indicators across various tillage practices.

1211

Developing an Artificial Intelligence Framework to Identify Drought-Resilient Bean Cultivars in the Delmarva Region. A. Ahmed*, A. Y. Alkhaled, F. Hashem, Department of Agriculture, Food, and Resource Sciences, University of Maryland Eastern Shore, Princess Anne, MD 21853.

Beans play a vital role in food and nutritional security while enhancing soil health. However, their productivity in the Delmarva region is increasingly affected by recurrent droughts and irregular rainfall. This study assessed drought resilience across four bean genotypes comprising eleven cultivars using multi-year field data (2014–2020 and 2023) under weather variability. Agronomic traits (plant height, pods per plant, seeds per plant, total biomass, and grain yield) were evaluated alongside drought indices, Drought Impact Index (DII) and Drought Sensitivity Index (DSI), with temperature and precipitation recorded each season. Multi-year agronomic and environmental data were integrated into an artificial intelligence (AI) workflow using Random Forest (RF) and Extreme Gradient Boosting (XGBoost) to predict yield and identify drought-resilient cultivars. Yield ranged from 93.5kg ha^{-1} (2014) to 6,279.9 kg ha^{-1} (2023). DII exceeded 100 in 2015 and 2023 for pigeon pea and cowpea, while DSI remained ≤1.0 in wet years but reached 33.6 in dry years. Correlations were generally weak; pods, seeds, and biomass related consistently to yield, while the heat stress index (HSI) showed collinearity (r = 0.88). Feature-importance highlighted genotype and weather patterns (XGBoost: cultivar 0.36, HSI 0.34; RF: HSI 0.20, pods 0.17, precipitation 0.17). Model fits were strong ($R^2 \leq 0.98$ in RF; ≤ 0.96 in XGBoost) in 2017–2019 and 2023 but weaker in 2014–2015. These results reveal resilient cultivar groups and demonstrate that integrating multi-year field data with AI enables targeted selection of drought-tolerant beans for sustainable crop improvement under climate variability in the mid-Atlantic region.

1212

Evaluation of Supreme AG™ Bagasse on Vegetable Growth and Yield. M. Walker,* J. Reason, J. Snowden, M. Tate Sr., C.P. Bagley, D. Kambiranda, Southern University Agricultural Research and Extension Center, Baton Rouge, LA 70791; M. Walther, E. Autin, IFUS International, Napoleonville, LA 70390.

Sugarcane bagasse is a solid waste that is produced after the extraction of juice from the sugarcane. Supreme AG™ is a proprietary product formulated with native minerals and other naturally occurring substances and bagasse from Impact fusion International, Napoleonville, LA. In the current project, research was conducted to evaluate the effects of Supreme AG™ on the growth, disease incidence and yield of five different vegetables, Tomatoes, Okra, Bell Pepper, Cucumber and Eggplant. The study was carried out using a split-plot design with crops as the main-plots and the Bagasse Treatments [regular soil, Supreme AG™ as mulch, Bagasse mulch] as the sub-plots. Both Supreme AG™ and regular bagasse was applied around the base of each plant in a 2-3-inch layer four times for the growing season. These treatments were used to compare how each mulch type affected plant performance under the same

growing conditions. Control plants were planted in regular soil. Data was collected for plant height, flowering, fruit set, pests and diseases and total yield. During the early stages of growth, plants in the bagasse plots showed more vigor indicating the positive effects of Supreme AG™ and regular bagasse. At harvest, clear differences were observed between the treatments. The control plots produced the lowest yields overall and displayed more stress symptoms such as wilting and slower growth. The use of sugarcane bagasse mulch and Supreme AG™ had a positive impact on vegetable growth and yield.

1213

Evaluation of Fresh Table Muscadine Grapes Post Harvest Shelf- Life Under Controlled Storage Conditions. J. Reason*, M. Walker, L. Fisher, J. Snowden, D. Kambiranda, Southern University Agricultural Research and Extension Center, Baton Rouge, LA 70813.

Muscadine grapes (*Vitis rotundifolia*) are native to the southeastern United States and well adapted to the region's hot and humid climate. Their high antioxidant content, rich flavor, and unique texture make them ideal for both fresh consumption and value-added processing. The Southern University Agricultural Research and Extension Center established a fresh market muscadine production study to evaluate cultivar performance, yield potential, and fruit quality under Louisiana growing conditions. Several commercially available bronze, red, and black cultivars were assessed for vine vigor, productivity, ripening period, berry quality and post-harvest shelf life under controlled conditions. Postharvest, berries were analyzed for their fruit weight loss, color and leakiness, while biochemical analyses measured soluble solids content (°Brix), total phenolics, flavonoids, anthocyanins, antioxidant activity, titratable acidity, and pH. Results revealed differences in bud break, flowering time, and sugar accumulation, with an average Brix value of 18.0° across cultivars. Berries from different cultivars also varied in their response to cold storage, with some maintaining better firmness and lower weight loss, while others exhibited increased leakiness and reduced market quality. These findings will provide valuable insights into cultivar-specific production data and post-harvest behavior, informing growers, distributors, and retailers on optimal handling practices and selection for fresh-market Muscadine grapes for the region.

1214

Investigating the Effects of Acetic Acid and Salt on Plant Performance in Chinese tallow (*Triadica sebifera*). E. El Dakkak, Y. Qi*, Department of Urban Forestry, Environment and Natural Resources, W. Gray, Department of Chemistry, F. Lacy, Y. Ismail, J. Luo, C. Aghadinuno, F. Dad, Department of Electrical Engineering, Southern University and A&M College, Baton Rouge, LA 70813.

Chinese tallow (*Triadica sebifera*) is a fast-growing, deciduous tree native to East Asia that is highly invasive in the southeastern USA. This study evaluated the effects of acetic acid (AA) and salt (SC, sodium chloride) on one-year-old containerized Chinese tallow over 10 weeks in a greenhouse. Plants were treated with 8 AA concentrations and 7 SC concentrations respectively, with 6 replicates per treatment. Each replicate received 200mL of one of the AA or SC concentrations through soil application at the beginning of the experiment. Plant height, chlorophyll, visual appearance, and mortality were monitored twice weekly. Data were analyzed by ANOVA followed by Tukey's HSD test. Results show that lower AA concentrations did not affect plant height or chlorophyll content, while higher concentrations significantly reduced both parameters. Mortality rates of 50% and 100% were recorded with zero in lower AA treatments. For SC treatments, lower concentrations had minimal effects on growth. However, high concentrations caused substantial reductions in chlorophyll content, particularly in young leaves, and significantly reduced plant height. This study confirmed Chinese tallow can tolerate low levels of AA and SC with minimal effects on plant growth, but higher levels of AA and SC caused significant physiological stress and mortality. These findings may have implications for the management of Chinese tallow.

1215

Effects of Acetic Acid on Plant Height, Crown Spread, Chlorophyll, and Nutrient Elements of Azalea (*Rhododendron indica* 'Judge Solomon'). E. El Dakkak, Y. Qi*, Department of Urban Forestry, Environment and Natural Resources, W. Gray, Department of Chemistry, F. Lacy, Y. Ismail, J. Luo, C. Aghadinuno and F. Dad, Department of Electrical Engineering, Southern University and A&M College, Baton Rouge, LA 70813.

Azalea (*Rhododendron indica* 'Judge Solomon') is a popular ornamental plant due to its vibrant flowers and adaptability to acidic soils. Still, changes in soil chemistry affect plant growth, development, and health. Acetic acid (AA) is a commonly used contact herbicide for weed control. We evaluated the effects of five AA concentrations (0%, 2.5%, 3.5%, 4.5%, and 5.5%) on 1-gallon containerized azalea plants over 10 weeks inside a greenhouse. AA treatments were applied only once at the beginning of the experiment, with 3 replicates per treatment. Each replicate received 200 mL of one of the AA concentrations through soil application. Plant height, crown spread, chlorophyll content, visual appearance, and mortality were monitored weekly. Plants were harvested at the end of the experiment. Roots and shoots were separated, dried, weighed, and analyzed for nutrient element contents. Results showed that the higher AA concentrations at 4.5 and 5.5% significantly reduced plant height, crown spread, shoot biomass, chlorophyll contents in young and mature leaves, carbon content in shoots, and contents of phosphorus, potassium, and manganese in roots, than the lower AA concentrations. In addition, both AA concentrations at 4.5% and 5.5% caused a 66.7% plant mortality rate, while the lower AA concentration at 3.5% initially induced some leaf chlorosis at the lower portion of the plants, which later recovered. These findings indicate that AA concentrations at 4.5% and above hurt azalea growth, biomass allocation, nutrient balance, and overall health, while lower concentrations below 3.5% have minimal impacts on the plant, guiding safe horticultural practices.

1216

Leaf-Derived Allelopathy in Sweet Potato (*Ipomoea batatas*): Chlorogenic Acid Accumulation and Weed Suppression. Z. Yue*, Y. Meng, V. Njiti, C. Zhang, Department of Agriculture, Alcorn State University, Lorman, MS 39096; T.M. Tseng, Department of Plant and Soil Sciences, Mississippi State University, Starkville, MS 39762; and M. Shankle, Department of Plant and Soil Sciences, Mississippi State University, Starkville, MS 39762.

Sweetpotato (*Ipomoea batatas*) is an important food security crop but is highly susceptible to weed interference due to its prostrate growth habit and limited herbicide options. While root-derived allelopathy in sweetpotato has been studied, leaf-derived allelopathy remains poorly understood. This study provides the first formal evidence of leaf-mediated allelopathy and its role in natural weed suppression. Two cultivars, Heart-O-Gold and 529, were analyzed for chlorogenic acid (CGA) concentration using HPLC. Results showed that CGA content increased with leaf age, reaching up to 1% of fresh weight, with leaf tissues containing significantly higher levels than roots. Field and greenhouse experiments indicated that leaf shedding began in the fourth week after planting and increased quadratically, contributing an estimated 1.2–2.8 t ha^{-1} of dry matter during the growing season. Pot experiments using shed leaves as mulch demonstrated complete suppression of Palmer amaranth and grasses, with only minimal nutsedge emergence along pot edges. These findings suggest that decomposing leaves release allelopathic compounds, particularly CGA, forming a natural mulch that extends weed suppression beyond the critical 2–6 week weed-free period after transplanting. The increased leaf shedding in late season suggests stronger allelopathic activity toward maturity. At harvest, 37–52% of total leaves remain attached, representing a large allelopathic resource that can be collected and reused early in the next season. This leaf-dominated de-vining material shows broad-spectrum weed-suppressive potential and offers a sustainable complement to limited herbicide options in sweetpotato production.

1217

Transgene-Free CRISPR/Cas Genome Editing of the Phytoene Desaturase Gene in Rhizoma Peanut for Hardiness Breeding S. Basak*, S. B. Samuels, S. Dhir, College of Agriculture, Family Sciences and Technology, Fort Valley State University, Fort Valley, GA 31030; M. Egnin, College of Agriculture, Environment and Nutrition Sciences, Tuskegee, AL 36088; S. Tallury, Agricultural Research Service, Griffin, GA 30223.

Rhizoma peanut (RP, *Arachis glabrata* Benth.) is a perennial warm-season legume native to South America that has gained popularity as a forage crop for its positive effect on animal health and productivity. Long-term RP cultivation enhances soil fertility through carbon and nitrogen inputs from rhizomes. Despite these advantages, RP exhibits limited seed production and relies mainly on underground rhizomes for propagation. Combined with its polyploidy and poor cold hardiness, these traits have constrained improvement through conventional breeding approaches. Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR) and associated proteins (Cas) offer a reproducible system for genetic modification, creating opportunities to develop germplasm with enhanced cold-tolerance and broader adaptability. The phytoene desaturase (PDS) gene, which encodes an enzyme required for chlorophyll biosynthesis, is commonly used as a marker in plant genome editing. This PDS gene will serve as a visual marker to assess the efficiency of CRISPR/Cas editing in RP. Our objective, therefore, is to develop a

CRISPR/Cas editing strategy targeting the RP PDS gene. To identify the RP PDS gene, the reference PDS gene from peanut (*Arachis hypogaea*, cultivar Tifrunner) available in NCBI will be used. Multiple single guide RNAs (sgRNAs) will be designed and tested for efficiency through *in vitro* transcription and sgRNA screening systems. The most effective sgRNA will then be used for CRISPR/Cas-mediated editing in RP, followed by regeneration and mutation detection to validate proof of concept. The expected outcome is the establishment of a robust, highly efficient CRISPR/Cas editing strategy targeting the RP PDS gene.

1218

Ultrastructural Characterization of Peanut Seed Coat: Potential Role in *Aspergillus flavus* Tolerance. A. Pawar*, S. G. Saroja, P. Lakkarsu, and N. Joshee, Agricultural Research Station, Fort Valley State University, Fort Valley, GA 31030.

Aflatoxin contamination by *Aspergillus* species poses significant threats to global peanut production, with the seed coat serving as the primary structural defense against pathogen invasion, yet comprehensive ultrastructural analysis of peanut seed coat morphology and its relationship to pathogen resistance remains limited. This study provides detailed ultrastructural characterization of peanut seed coat microstructures across nine commercial cultivars (Runner, Valencia, Virginia market types) and wild species (*A. batizocoi*, *A. duranensis*, *A. ipaensis*) using scanning electron microscopy at 500×, 1000×, and 3000× magnifications with gold-coated samples imaged using a Hitachi S-3400N SEM at 15 kV. Substantial variation in seed coat thickness was observed across genotypes, ranging from approximately 18 µm in wild species (*A. duranensis*) to 57 µm in commercial varieties (Georgia runner). SEM analysis revealed distinct surface topographies characterized by varying degrees of roughness, micro-pores, and structural integrity, while cross-sectional analysis demonstrated multilayered structures including outer epidermis, parenchyma layers, vascular bundles, and inner protective barriers. The observed morphological diversity provides valuable insights into natural defense mechanisms against *A. flavus*, suggesting that thicker seed coats with compact cellular arrangements contribute to enhanced physical barriers against pathogen penetration. This barrier supports the idea of a seed coat-mediated pathogen resistance and provides screening criteria for developing aflatoxin-resistant peanut varieties addressing critical food safety and economic concerns in global peanut production.

1219

Evaluation of Herbage and Nutritive Value of Rhizoma Peanut Genotypes in Response to Fertilizer Treatment and Grazing Management. S. B. Samuels*, S. Basak, College of Agriculture, Family Sciences and Technology, Fort Valley State University, Fort Valley, GA 31030; S. Tallury, Agricultural Research Service, Griffin, GA 30223.

Georgia is an ideal state for forage and livestock production with its nature geographic and environmental diversity yielding production of both cool and warm season species. However, these native forages leave gaps in high quality nutrition. Forages like tall fescue have increased levels of toxins caused by hot weather. Georgia forage production is currently centered on perennial warm-season grasses, such as bermudagrass and bahiagrass. In late summer, these grasses have elevated lignin levels, decreased crude protein, and overall lower digestibility. Rhizoma peanut (RP) is a high-quality warm-season legume with good late-summer growth that could enhance animal production as forage, hay or silage. RP, while most nutritious when still immature boast 14-20 % crude protein and has shown to be more resistant to storage than other forage crops. We will establish four varieties of RP and assess their adaptation and nutritive performance as a feed supplement for livestock. We will monitor establishment rate and response to nitrogen and potassium considering dry matter, crude protein, neutral detergent fiber (NDF), and acid detergent fiber (ADF). Harvested RP will be stored as hay or ensiled, and assessed for nutritional value for pH, moisture content, water activity, nitrate (NO_3^-), ammonia (NH_4^+), CP, NDF, and ADF. Following year 3, goats will be fed a portion of their daily feed in PR and evaluated for average daily weight gain, serum chemical analysis and fermentation profiling. This project would also enable us to integrate forage and grazing animals as systems that could benefit both production and environmental gains.

1220

Evaluating Host Plant Resistance and Yield Response of Snapbean Cultivars to *Bemisia tabaci* (MEAM1) in Southeastern Georgia. A. Singh*, S. Warsi, and G. N. Mbata, Fort Valley State University, Fort Valley, GA, 31030; A. Simmons, USDA/ARS, Charleston, SC 29414

The sweet potato whitefly, *Bemisia tabaci* Gennadius (Hemiptera: Aleyrodidae) Middle East-Asia Minor 1 (MEAM1), is an economically important pest of Snapbean, *Phaseolus vulgaris* Linnaeus (Fabaceae) in the southern United States. Developing and refining integrated strategies that provide effective control is key to managing this pest. The current study evaluated the *B. tabaci* infestation and yield performance of snap bean cultivars (Royal Burgundy, Jade, Golden Rod, Long Tendergreen, PV-857, Momentum, Affirmed, and Tema) in middle Georgia, in fall 2024 in insecticide-treated and untreated fields. *Bemisia tabaci* adult and nymph numbers were recorded weekly from week 4 following seedling emergence to harvest. Yields were measured at harvest. *Bemisia tabaci* adult and nymph numbers peaked during the second week of sampling. Gold Mine had high adult numbers in both fields, while Momentum consistently recorded the lowest. *Bemisia tabaci* adult infestation levels were similar across fields. Nymph numbers showed greater variation, with Sybaris exhibiting 1.6-fold higher numbers in the untreated field. Momentum again showed the lowest nymph numbers, with a 2.4-fold reduction in the treated field. Momentum produced higher yields in both conditions and showed a 2.25-fold increase in the treated field. High temperatures, moderate relative humidity, and low wind speeds positively correlated with *B. tabaci* numbers. These findings suggest that selecting less susceptible cultivars like Momentum in addition to targeted insecticide application in an integrated approach can reduce *B. tabaci* populations while maintaining high snap bean yields.

1221

Structural Diversity of Condensed Tannins in *Lespedeza cuneata*: Insights from LC-MS Analysis. P. Batchu*, A K Biswal, A. Siddique, Fort Valley State University, Fort Valley, GA 31030; S. S. Panda, University of North Georgia, Oakwood, GA 30566; E. R. Morgan, Queen's University Belfast, UK; J. A. van Wyk, University of Pretoria, Onderstepoort, South Africa; A. K. Mahapatra, T. H. Terrill, Fort Valley State University, Fort Valley, GA 31030.

Condensed tannins (CTs) are polyphenolic compounds known for their roles in plant defense, nutritional quality, and medicinal properties. *Lespedeza cuneata*, a leguminous species, produces structurally diverse CTs. This study examined the structural composition and relative abundance of CTs extracted from two field plots (Plot 29 and Plot 105) using liquid chromatography–mass spectrometry (LC-MS). Samples were extracted with 70% aqueous acetone, purified to remove pigments and impurities, and analyzed on a Thermo Q Exactive mass spectrometer coupled with a Vanquish LC system. LC-MS profiling identified sixteen distinct tannins in Plot 29 and eight in Plot 105. In Plot 29, the most abundant compounds corresponded to ions at m/z 565 (25.6%), m/z 595 (15.3%), and m/z 449 (12.4%). By contrast, Plot 105 displayed a dominant ion at m/z 535 (38.4%), which was not detected in Plot 29. Moderate similarities were noted at m/z 344 and 207 across both plots, although overall, qualitative and quantitative differences reflected variability in tannin biosynthesis. Structural predictions were made for several ions using MS1 and MS2 fragmentation data, though some remained unidentified due to the absence of reference spectra in current databases. These compositional differences may reflect genetic variation or environmental influences on secondary metabolite pathways. This study highlights the complexity of CT profiles in *L. cuneata* and emphasizes the need for further validation with nuclear magnetic resonance (NMR). The findings provide insights into tannin diversity and its implications for ecological function, agricultural utility, and potential medicinal or nutritional applications.

1222

Enhancing ultraviolet radiation resilience in entomopathogenic nematodes: a systematic review of strain selection, tolerance assessment, and protective formulations. F. Robinson*, S. Warsi, and G.N. Mbata Sciences, Fort Valley State University, Fort Valley, GA 31030.

Entomopathogenic nematodes (EPNs) are widely used biological control agents against insect pests in various agroecosystems. However, their effectiveness in the field is often constrained by environmental stressors such as ultraviolet (UV) radiation, extreme temperatures, desiccation, and exposure to agrochemicals. Among these, UV radiation and desiccation on exposed plant surfaces (e.g., leaves, stems, soil surface) are especially detrimental to EPN survival and infectivity. While EPNs, such as *Steinernema* and *Heterorhabditis* species, vary in their tolerance to these stresses, current data indicate significant inter- and intra-species variability, possibly linked to strain-level adaptations. Studies assessing EPN resilience typically focus on mortality or infectivity after short-term exposure; however, there is no standard methodology across studies, which limits direct comparisons. This kitchenham systematic review compiles available evidence through network analysis, research gap analysis, and trend analysis on EPN environmental tolerance and outlines formulation strategies such as polymer matrices, UV protectants, and humidity-

retaining gels that may enhance persistence. Despite promising lab-based improvements, field results are often inconsistent, underscoring the need for standardized exposure protocols and a deeper understanding of EPN interactions with microclimates and substrates. By identifying robust strains and refining application techniques, this paper aims to support more reliable deployment of EPNs under varying field conditions.

1223

Transcriptome profiling of axillary bud dormancy in response to shade signals and defoliation in sorghum. Q. Li* and T. Kebrom, CAFNR Research, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446.

Shoot branches develop from axillary buds and determine plant shoot architecture, which influences crop yield. Axillary buds can either grow into branches or remain dormant. Understanding the mechanisms regulating axillary bud dormancy and outgrowth may facilitate breeding new varieties with optimal shoot architecture and higher crop yield. The current study investigated axillary bud dormancy induced by shade signals (supplemental Far-Red light, FR) and defoliation and associated transcriptomic changes in the sorghum 100M genotype. The results showed that defoliation inhibited bud outgrowth faster than shade signals, which was further supported by the rapid upregulation of *SbDRM1* in the buds of defoliated plants. Transcriptome profiling also revealed that FR altered the expression of 10, 4073, and 5905 genes at 1, 24, and 48 hours, respectively, while defoliation affected 293, 9908, and 7971 genes at the same time points. A substantial number of differentially expressed genes (DEGs) from both treatments encoded transcription factors belonging to bHLH, NAC, MYB, WRKY, bZIP, and ERF families. MapMan analysis identified 220 DEGs involved in hormone metabolism and signaling, including auxin, CK, SL, ABA, BR, GA, ethylene, JA, and SA. The expression of marker genes for sugar levels indicated reduced sugar levels in the dormant buds following both treatments. Genes related to cell division, light signaling, circadian rhythm, and flowering were also differentially expressed following both treatments. The findings from this study provide insights into the regulatory networks underlying bud dormancy in sorghum and may contribute to designing potential strategies for controlling shoot branching and improving crop yield.

1224

Farming System and Cultural Practices on Sweet Potato Leaf Nutritional Composition and Storage Root Yield. W. Kaluwasha*, S. Pathan, G. Ndunguru and U. Kamboj; College of Agriculture, Environmental and Human Sciences, Lincoln University of Missouri, Jefferson City, MO 65101.

Sweet potato *(Ipomoea batatas* L. Lam*)* is one of the most important food crops in the world, primarily produced in China, some countries in Africa, India and Indonesia. Its popularity in part is due to its ability to persist in a wide range of environments, multiple uses, nutritional richness and human health benefits. This presentation explores the impact of farming system and cultural practices on the nutritional composition of sweet potato leaves and on the yield of storage roots. Slips of three sweet potato cultivars namely Covington, Murasaki and White Bonita were transplanted into plots that either received a cover crop treatment or not at two field locations/farming systems (conventional and organic) arranged in a randomized complete block design with three replications. Cover crops were planted at both locations in the fall and incorporated into the soil as green manure in the spring, four weeks prior to transplanting sweet potato slips in the summer. Approximately 6 weeks after transplanting leaf tissue was collected for analysis of nutrients, minerals and amino acid content. Storage roots were harvested four months after transplanting and the yield was recorded. A significant difference was observed in the nutritional composition of leaves and root yield grown under conventional farming system with cover crops. This research highlights the potential of sustainable farming practices to enhance nutritional value and productivity.

1225

Effects of Planting Date and Strawberry Variety on Yield in Southeast Texas. M. A. Salisu*[1], P.A.Y. Ampim[1], E. Obeng[2], E.A. Faluyi[2] and R. Wallace[3], [1]CAFNR Research, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446, [2]Formerly of the Cooperative Agricultural Research Center, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446, [3]Retired, formerly of Texas A&M AgriLife Research, Lubbock, TX 79403

Strawberry production in diverse ecological zones of Texas is faced with several challenges ranging from weather to agronomic issues. This study evaluated the impacts of planting date and variety (Albion, Camino Real, Fronteras and Merced) on yield and plant parameters. The treatments were arranged in randomized complete block design with three replications per treatment. The berries were planted 30.5 cm apart using bare roots on plastic mulch covered beds supplied with drip irrigation. Twenty bare roots were planted per plot for each variety. The first planting date was October 2, 2021, and the second October 16, 2021. Nutrient needs were supplied using Hasta Grow fertilizer (6-12-6). Weed control around the strawberry plants was done manually while in between row control was done through cultivation. Yield and plant parameters measured were analyzed using the JMP software and conclusions were drawn at the 5% significance level. No significant differences were observed for planting date across all the parameters evaluated. However, significant differences were observed for number of culls and cull weights among the plant's variety. Camino Real and Fronteras produced nearly twice as many culls as Albion and Merced. Cull weight for Fronteras was significantly different from the other varieties. Similarly crown count, and average plant weight for Fronteras were significantly higher than the other varieties evaluated ($p < 0.05$). No significant differences were observed for marketable fruit yield. These results suggest that cultivar-specific management could improve fruit quality, reduce losses, and boost yield.

1226

Correlation of *Drosophila suzukii* Populations with Fruit Crop Phenological Stages in Missouri. Y. Cheng*, B. Pandey, S. Turner, and W. Kaluwasha; College of Agriculture, Environmental and Human Sciences, Lincoln University of Missouri, Jefferson City, MO 65101.

Spotted wing drosophila (*Drosophila suzukii*), an invasive pest of soft-skinned fruits, has become a major concern for fruit producers in Missouri. Understanding the temporal relationship between pest population dynamics and crop phenological stages is critical for the timely implementation of integrated pest management strategies. This study monitored *D. suzukii* adult populations across multiple small fruit crops, including blueberries, blackberries, Elderberries, strawberries, and grapes, during the 2025 growing season. Adult male and female *D. suzukii* were captured weekly using Pherocon® SWD traps baited with commercial SWD lures. Traps were hung at approximately 3 ft above the ground and checked weekly. Crop phenological stages were recorded simultaneously, from early flowering to harvest. Preliminary observations indicate that *D. suzukii* populations remain low during pre-fruit set stages but increase sharply during fruit ripening, coinciding with the onset of susceptibility of host crops. These results suggest that monitoring efforts should intensify at the fruit coloring stage, and control measures should be aligned with phenological development to prevent economic losses. This study contributes to the development of predictive models for *D. suzukii* activity and supports growers in optimizing management timing to minimize damage and reduce pesticide inputs.

1227

Cover Crops and Weed Seedbank Emergence Dynamics. A.O. Kwarteng*, T. Hurisso, P. Karki, N. Al- Awwal, and K. Afari, College of Agriculture, Environmental and Human Sciences, Lincoln University of Missouri, Jefferson City, MO 65101.

Cover crops represent a critical non-chemical tool for managing weed populations in organic production systems by suppressing weed seedbank emergence. This study examined impacts of cover crop mixtures on weed seedbank dynamics at Lincoln University's Alan T. Busby Farm in Jefferson City, Missouri. After three years of cover crop establishment, soil samples were collected from field plots and subjected to greenhouse emergence studies to quantify weed suppression and characterize temporal emergence patterns. Three cover crop treatments were evaluated: sorghum-sudangrass (*Sorghum bicolor* x *Sorghum sudanense*) with sweet clover (*Melilotus officinalis*), orchardgrass (*Dactylis glomerata*) with red clover (*Trifolium pratense*), and perennial ryegrass (*Lolium perenne*) with white clover (*Trifolium repens*), compared against conventionally tilled controls. All cover crop treatments significantly reduced total weed seedbank emergence by approximately seventy-five percent compared to tilled controls. Cover crops demonstrated particularly strong suppression of annual broadleaf weeds while showing differential impacts on perennial grass populations. Temporal emergence analysis revealed that cover crops altered weed germination phenology by suppressing early-season emergence flushes and extending the emergence period. Weed emergence intensity heatmaps demonstrated that tilled systems exhibited concentrated early emergence, while cover crop systems distributed emergence more gradually over time. These findings provide valuable insights for optimizing the timing of weed

control interventions and developing integrated weed management strategies for organic farming systems.

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1228

Assessing the Detection and Distribution of Heavy Metals & Lower Tallapoosa within the Lower Tallapoosa Sub-Basin. B. Smith*, Department of Agricultural and Environmental Sciences, Tuskegee University, Tuskegee, AL 36088.

Environmental pollution remains a critical global challenge influenced by multiple drivers, including rapid industrialization, urban expansion, and the release of emerging contaminants such as Heavy Metals (HMs) and per- and polyfluoroalkyl substances (PFAS). These pollutants disrupt the earth's ecosystems and contribute to widespread ecological degradation. Moreover, toxic contamination poses significant threats to water quality and increases health risks for human populations. This study investigated the detection of Heavy Metals and Per- and polyfluoroalkyl substances (PFAS) levels within the Lower Tallapoosa Sub-Basin through sample collection and water resource databases. Together, these approaches provided valuable insight into the spatial distribution and environmental persistence of HMs and PFAS pollution. Field sampling of local water bodies was conducted to collect samples for further analytical testing for potential contaminants in the collected water samples. Water resource databases were reviewed to compare measured concentrations and identify potential sources or hotspots of detected pollutants. Results detected the presence of two types of HMs and nine types of PFAS at surveyed sampling locations, including positive detections in Tapwater data obtained from a public water resource database, indicating significant pollution. The publicized detection of contaminants raises significant concerns for the health and quality of aquatic ecosystems and long-term environmental sustainability, magnifying the urgent need for targeted investigations, and comprehensive remediation and monitoring strategies.

1229

Characterizing Biochar by Multi-Element Scanning Thermal Analysis (MESTA). Y. P. Hsieh and G. C. Bugna*, Center for Water Resources, College of Agriculture and Food Sciences, Florida A&M University, Tallahassee, FL 32307.

Biochar amendment in soil offers multiple benefits, including improved soil health, reduced fertilizer usage and contamination, and sequestered atmospheric carbon. The properties of biochar can vary depending on the type of feedstock and the pyrolysis conditions. Characterizing biochar is therefore essential for biochar research and quality control in production. Characterizing biochar, however, is far from convenient using the traditional methods. In this study, we applied a much simpler multi-element scanning thermal analysis (MESTA) technology to characterize biochar and feedstock. We used eight feedstocks and their corresponding 16 biochars, produced at various pyrolysis temperatures. The results showed that MESTA can simultaneously determine the contents of C, N, H, S, and O, as well as the thermal stability of biochar. We also examined the extent of organic C conversion to carbonate due to pyrolysis and loss-on-ignition processes, which may affect the accuracy of biochar organic oxygen determinations. We found that the MESTA thermogram of a feedstock can be used to predict the yield and thermal stability of its biochar, as well as the biochar-to-energy byproduct ratio. We identified a pyrolysis temperature of 400-450 °C for biochar production, which balances the desired biochar properties and energy consumption. This study showed that MESTA is a convenient and powerful tool for biochar research and production.

1230

Monitoring of Pharmaceuticals and Personal Care Products (PPCPs) in Surface Water and Wastewater in Tallahassee, Florida. A. Jain*, P. Dangal, and O. Mbuya**,** Center for Water Resources, College of Agriculture and Food Sciences**,** Florida A&M University, Tallahassee, FL 32307.

There is a growing concern about the prevalence of pharmaceuticals and personal care products (PPCPs) in water and their detrimental effects on human health and the environment. The objective of this research was to assess the concentrations and distribution of targeted PPCPs in surface waters and wastewater in the City of Tallahassee, Florida. Water sampling was conducted from June 2023 through April 2025. Surface water samples were collected from four

lakes in Tallahassee — Lake Ella, Lake Elberta, Lake Munson, and Lake Talquin — selected to represent different watersheds. Wastewater samples were collected at the Thomas P. Smith Wastewater Treatment Plant from three key treatment stages: the primary clarifier, secondary clarifier, and tertiary effluent. Samples were collected three times per season (summer, fall, winter, and spring). All samples were filtered through 0.45 μm vacuum filters and stored at 4°C until analysis. The water samples were analyzed for a suite of thirteen target compounds, including caffeine, sucralose, acetaminophen, carbamazepine, primidone, sulfamethoxazole, triclosan, erythromycin, ibuprofen, bisphenol A, methylparaben, ethylparaben, and propylparaben, using liquid chromatography–mass spectrometry (LC-MS/MS). Of the thirteen target analytes, seven were detected in surface waters and eleven in wastewater samples. Caffeine, acetaminophen, and sucralose were detected most frequently in surface water samples, whereas carbamazepine, sulfamethoxazole, acetaminophen, sucralose, and caffeine were the most commonly detected compounds in the wastewater samples. Seasonal variation had a statistically significant effect on analyte concentrations in surface water, but not in wastewater.

1231

Assessing Soil Hydrothermal Dynamics Under Humid Conditions. A. O. Adelabu, and B. Masasi*, Department of Natural Resources and Environmental Design, North Carolina Agricultural and Technical State University, Greensboro, NC 27411.

Soil moisture and soil temperature are key drivers in crop productivity, yet their interactions under humid subtropical conditions remain insufficiently characterized. This study investigated soil hydrothermal dynamics in a cornfield at North Carolina A&T State University during the 2024 growing season. A capacitance-based CropX probe continuously monitored soil moisture and temperature at depths of 10, 30, and 56 cm. Results showed substantial fluctuations at 10 cm moisture (18.4–41.8%) and temperature (20–31 °C), while deeper layers exhibited more stable moisture conditions (≈47–49%). Moisture depletion at 30 cm consistently began when surface moisture at 10 cm declined to 34.2%, indicating the vertical propagation of water loss. Soil temperature correlated strongly with air temperature ($r \approx 0.95$) and inversely with surface moisture ($r \approx -0.58$), reflecting the moderating effect of water on thermal stress. These results highlight the importance of depth-specific sensor monitoring for optimizing irrigation management, enhancing water-use efficiency, and improving crop resilience in humid agricultural systems.

1232

Hydrothermal Carbonization-Wet Oxidation (HTC-WO) of Agricultural Wastes for Producing a Nanostructured Adsorbent and Soilless Growing Medium. B. Salehi*, and L. J. Wang, Department of Natural Resources and Environmental Design, North Carolina Agricultural and Technical State University, Greensboro, NC 27411.

An agricultural wastes-based refinery can extract and transform fertilizer nutrients from wastes to produce sustainable soilless growing media with the needed nutrients and controlled release capability and meanwhile converting the carbon residue into activated carbon (AC) as an adsorbent for various applications. The goal of this project was to study a hydrothermal carbonization-wet oxidization (HTC-WO) refinery for producing adsorbent-AC and soilless plant growing medium from agricultural wastes. The effects of biomass type (chicken manure and corn stover), solid content (5–20 wt%), temperature (150–250 °C), and residence time (30–180 min) on the yield and quality of the AC, and the chemical composition of the liquid stream were examined. The use of nano iron oxide additives during the refinery was studied to enhance mineral extraction and the conversion of nitrogen-containing compounds in the wastes into NH_3 and improve the thermal conductivity and quality of the AC. The elemental composition, morphology, porosity, surface chemistry, and thermal properties of the feedstocks, hydrochar, and AC were characterized, along with measurements of the chemical profiles of the HTC and WO liquid streams. Various machine learning (ML) algorithms are used to correlate the yield and quality parameters of hydrochar, AC, and liquid stream as a function of the properties of the feedstocks and HTC-WO conditions. The experimental data are used to train and test the ML model. The ML model is further be used to optimize feedstock composition and HTC–WO parameters for maximizing AC production and nutrient recovery.

1233

Carbon Sequestration Potential for Private Woodland Owners and Urban Forests of Tennessee. H.B. Tecimen*, H.G. Singh, Department of Environmental Sciences, College of Agriculture, Tennessee State University, Nashville, TN 37209.

Tennessee's forest assets are mostly (85%) privately owned. While some of these woodland areas are managed under official forest management plans or registered land development plans, the majority are not – which means owners are falling short in terms of the income-generation potential their lands can provide. Carbon marketing (under certain conditions) is an expanding income opportunity option for woodland owners. Landowners who wish to enhance carbon sequestration opportunities can plant additional trees – which will also maximize the environmental benefits of trees – and existing forests can be managed with this objective in mind. To achieve this aim, we are pursuing two main research objectives: (i) increasing awareness about carbon marketing and carbon sequestration opportunities among woodland owners and forestry professionels; and (ii) exploring potential management practices that can enhance carbon sequestration across Tennessee's forested landscapes. To achieve the project goals, we will use Tennessee Forestry Department management plans and available literature to assess current forest structure and existing levels of carbon sequestration in both rural and urban forests. We will also identify potential tree-planting areas across the state to estimate how much additional carbon could be sequestered through future afforestation and reforestation efforts. To evaluate current knowledge and awareness of carbon sequestration, status-assessment surveys will be administered to landowners and TSU-UT Extension agents. Expected outcomes include increased awareness of carbon sequestration, increased implementation of management practices that promote carbon accumulation, and measurable gains in forest biomass.

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Soil Organic Matter Composition and Management Impacts on Soil Wettability in Southeastern Cropping Systems. F.A. Ogunmokun*, D. Kayode, S. Oladeji, M. Ayodele, and A. Akuley-Amenyenu, Department of Environmental Sciences, College of Agriculture, Tennessee State University, Nashville, TN 37209.

Soil wettability influences infiltration, water retention, and plant-available water, yet the extent to which agricultural management practices alter wettability by altering soil organic matter (SOM) composition remains poorly understood. This study is investigating how long-term combinations of tillage, cover cropping, and poultry litter fertilization influence SOM functional composition and surface soil wettability in Tennessee. Undisturbed surface soil cores (0-5 cm) were collected from six management treatments: (1) No-Till + Cover Crop + Poultry Litter, (2) No-Till + No Cover Crop + No Poultry Litter, (3) No-Till + Cover Crop + No Poultry Litter, (4) Tilled + No Cover Crop + No Poultry Litter, (5) Tilled + No Cover Crop + Poultry Litter, and (6) Tilled + Cover Crop + Poultry Litter. Soil wettability will be evaluated using Water Drop Penetration Time (WDPT) and contact angle measurements, while SOM will be fractionated into particulate (POM) and mineral-associated (MAOM) pools and characterized for hydrophobic and hydrophilic functional groups. We hypothesize that management systems with greater biological inputs will exhibit more hydrophilic SOM and increased wettability, whereas tilled systems with limited organic additions may show greater hydrophobicity. Data generated from this work will clarify the role of SOM composition in governing soil hydraulic behavior. Results from these measurements will have important implications in the context of improving infiltration and drought resilience in southeastern cropping systems.

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Cutting Frequency vs. Carbon Opportunity: First-Year Evidence from Above- and Below-Ground Switchgrass Biomass. T. O. Isimikalu*; X. Li; D. Hutch; N. Ftwi; J. L. Kleinsasser; G. F. Custer; and J. R. Cumming, Department of Natural Sciences, University of Maryland Eastern Shore, Princess Anne, MD 21853.

Sustainable management of perennial bioenergy crops requires balancing harvestable biomass with long-term carbon (C) sequestration and nutrient retention. This study examined how harvest frequency regulates C allocation and soil–plant interactions in *Panicum virgatum* L. (switchgrass). Three cutting regimes—single-cut, double-cut, and triple-cut—were imposed during the first growing season of the Kanlow variety at the Lower Eastern Shore Research and Education center in Quantico, Maryland. Cumulative season aboveground biomass and end-of-season root biomass were assessed, with roots evaluated at four depth increments (0–10, 10–20, 20–30, and 30–60 cm). Concurrent measurements were made of root and soil C and nitrogen (N), and lysimeter leachate nutrients (NO_3^-, NO_2^-, NH_4^+, PO_4^{3-}) were collected during rainfall events. Derived indices—root:shoot ratio and root vertical distribution—were

employed to quantify allocation trade-offs, while correlation and ordination analyses were used to explore linkages between root traits and nutrient fluxes. Increasing harvest frequency maintained aboveground yield but markedly reduced root biomass and shifted its allocation toward shallower depths. This redistribution, coupled with altered root C:N ratios near the surface and early signs of dynamic soil C and N pools, suggests potential constraints on deeper C stabilization and microbial turnover. Patterns of soil C–N concentration and early-season nutrient leaching further suggest that intensified harvest frequency may accelerate nutrient cycling but weaken belowground C retention capacity. These findings highlight a mechanistic trade-off between sustaining biomass supply and promoting root-driven soil C accrual, underscoring how cutting intensity shapes long-term carbon opportunity in bioenergy systems.

1236

A New Method for Measuring Soil Heterotrophic Respiration in Forests. X. Li* and J. R. Cumming, Department of Natural Sciences, University of Maryland Eastern Shore, Princess Anne, MD, 21853; Quanlai Zhou, Xingbo Zheng, Institute of Applied Ecology, Chinese Academy of Sciences, Shenyang City, 110016 China; Bingzhu Hou, Forestry Bureau of Longtan District, Jilin City, 132206 China; Zhengguo Yu, Cong Yu, Department of Forestry, Beihua University, Jilin City, 132013 China.

Soil heterotrophic respiration (Rh), a critical component in the global forest C budget, has been poorly quantified due to technical limitations. Root-exclusion method is the most widely employed for measuring Rh in forests, but it significantly alters the soil environment and excludes organic C inputs into the root-exclusion plots, resulting in great bias. We developed an improved ingrowth core-based method in which root-cutting (RC) and non-root-cutting (NRC) ingrowth cores were created, and Rh was estimated as soil CO_2 efflux multiplied by the CO_2 efflux ratio of RCs to NRCs. Rh can be reliably measured after the organic C loss and input in RCs reach a balanced state. We applied this method to three forest types in Northeast China. Our study showed that, on average, Rh in an oak forest, a broadleaved pine forest, and a spruce forest accounted for 61%, 60%, and 55%, respectively. Our method minimizes the effects of severed roots on Rh, reduces differences in microbial community composition and activities between RCs and NRCs, and generates organic C inputs into NRCs. These features enable it to measure Rh more accurately than the conventional root-exclusion method.

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Environmental DNA Characterization of Soil Communities in Agricultural Systems with a focus on bacteria, fungi, and invertebrates D.V. Ruiz-Ramos*, A. Britton, R. Thompson, and E.B. May, Department of Natural Sciences, University of Maryland Eastern Shore, Princess Anne, MD 21853.

Changes in environmental conditions influence the sustainability and productivity of crop production. Increased drought and intense rainfall events, combined with the continued use of fertilizers, may intensify the impacts of nutrients on the ecosystems surrounding agricultural lands. Much attention has been paid to microbial communities that regulate nutrient production in agricultural systems, but the contributions of soil's fungal and invertebrate members remain understudied. This project is a collaborative effort between private farms and UMES scientists to evaluate soil community composition and nitrogen cycling, to minimize nutrient pollution in the Chesapeake Bay. To examine how shifts in environmental conditions affect community composition and function of the soil community, we constructed a controlled environment drainage system to assess changes under various temperatures, precipitation, and nitrogen treatments. We collected soil samples from the three ditch sites over the course of two years to characterize the baseline soil community. For each ditch, six soil cores of 15 cm were collected at distances of 1 meter during the Fall of 2024 and 2025 (n = 24). The top 5 cm soil layer was homogenized, and DNA was extracted using the Invitrogen Soil Extraction Kit and quantified. DNA is being amplified for the bacterial (16S), fungal (ITS), and invertebrate (18S, COI) barcode genes and barcoding primers are in the process of optimization. Samples meeting the quality criteria will be sent for amplicon sequencing to compare community structure.

1238

Extension approach to enhance extreme-weather-resilient practices among smallholder farmers in Maryland. L. B. Karki*, A. Dhakal, Department of Agriculture, Food, and Resource Sciences, UMES Extension, University of Maryland Eastern Shore, Princess Anne, MD 21853.

Anthropogenic emissions remain persistently high, intensifying extreme weather variability (EWV) and significantly disrupting agricultural productivity and ecological stability. Alley cropping, a weather-resilient agroforestry practice, has demonstrated its potential to enhance farm productivity, resource-use efficiency, and overall system resilience. Despite these benefits, adoption remains limited, largely due to a lack of awareness and understanding of its economic and environmental benefits. To bridge this gap, UMES Extension has established three demonstration sites in the Lower and Mid-Shore region of the Eastern Shore: two on-farm and one community demonstration site. These sites integrate research with extension activities, offering hands-on learning opportunities and farmer-centered knowledge sharing. Each site incorporates perennial fruit trees, specifically fig (*Ficus carica*) intercropped with eggplants, bell peppers, and tomatoes during the growing season. In the cool season, cover crops are cultivated to improve soil moisture retention, enhance nutrient cycling, and promote soil health. Additionally, soil sampling and the quantification of anthropogenic emissions (CO_2, CH_4, and N_2O) are conducted both before planting and after harvesting alley crops. Biofertilizer use is encouraged, and one demonstration site features Comfrey (*Symphytum spp.*), valued for its soil-enhancing properties, antimicrobial benefits, and potential economic value in integrated agroecological systems. Educational materials, including fact sheets, brochures, and pamphlets, as well as field days, workshops, and training sessions, are being developed, distributed, and organized to facilitate effective knowledge transfer. These collective efforts aim to improve production practices, improve livelihoods, and strengthen resource management skills among farmers, students, and other stakeholders.

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Response of Breeding Bird Community to the Longleaf Pine Restoration at William B. Bankhead National Forest of Alabama. Y, Wang*, W. K. Freesland, A. W. Cantrell, Department of Natural Resources and Environmental Sciences, Alabama A&M University, Normal, AL 35762; C. J. Schweitzer, USDA Forest Service, Southern Research Station, Huntsville, AL 35801.

The longleaf pine (*Pinus palustris*) ecosystem has declined dramatically since European settlement, with major impacts on associated avian communities. Understanding bird responses to longleaf pine restoration is critical for evaluating restoration success. We examined avian community responses across three restoration stages (Early, Late, and Mature) and compared them with unrestored control stands in the William B. Bankhead National Forest, Alabama, during the 2023–2025 breeding seasons. A total of 65 bird species were detected, including 43% residents and 57% migrants; 89% were of low conservation concern and 11% were declining. Avian responses were largely species-specific. Restoration stands supported early successional species such as Prairie Warbler (*Setophaga discolor*), Yellow-breasted Chat (*Icteria virens*), White-eyed Vireo (*Vireo griseus*), and Indigo Bunting (*Passerina cyanea*), whereas control stands hosted mature-forest species including Red-eyed Vireo (Vireo olivaceus), Worm-eating Warbler (*Helmitheros vermivorum*), Black-throated Green Warbler (*Setophaga virens*), and Wood Thrush (Hylocichla mustelina). Species richness, abundance, and diversity were generally higher in restoration stands than in controls, though the combination of control and mature restoration stands supported the greatest overall diversity. These findings highlight the importance of maintaining a mosaic of forest structures across the landscape to conserve a broad range of avian diversity. The absence of longleaf pine obligate species—the Red-cockaded Woodpecker (*Dryobates borealis*) and Bachman's Sparrow (*Peucaea aestivalis*)—suggests that current restoration stands may lack critical habitat features such as large stand size, connectivity, or structural elements. Continued monitoring will be essential to evaluate long-term avian responses to restoration.

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Breeding Ecology of An Isolated Cerulean Warbler (*Setophaga cerulea*) Population at William B. Bankhead National Forest of Alabama. Y. Wang*, T. A. Thompson, A. W. Cantrell, Department of Natural Resources and Environmental Sciences, Alabama A&M University, Normal, AL 35762; C. J. Schweitzer, USDA Forest Service, Southern Research Station, Huntsville, AL 35801.

The Cerulean Warbler (*Setophaga cerulea*; CERW) is one of North America's fastest-declining songbirds, having lost more than 70% of its breeding population since the 1960s, primarily due to habitat loss. Northern Alabama once represented the species' southernmost breeding range, where it was formerly common but is now of highest conservation concern. An isolated population persists in the Bankhead National Forest (BNF), yet little is known about its population status, breeding success, or habitat requirements. In response to management and conservation needs, this study aimed to assess the breeding ecology and habitat associations of CERW at BNF and evaluate the influence

of forest composition, structure, and management on their occurrence. From 2022 to 2024, we conducted point counts, habitat assessments, mist-netting, radio telemetry, and nest searches in both CERW-occupied and random sites. We detected 16 to 19 individuals annually, totaling 53 birds, mostly males. Ceruleans were frequently associated with Red-eyed Vireo (*Vireo olivaceus*), Northern Parula (*Setophaga americana*), and Hooded Warbler (*Setophaga citrina*). They occupied the upper canopy of dominant and codominant trees, with a preference for oaks (*Quercus* spp.), and were most often found on mesic northwest-facing slopes with canopy gaps. Estimated home ranges (2.6 ha) and core areas (0.3 ha) were smaller than those reported elsewhere. Captured birds had lower body mass and shorter wing chords compared to populations in northern breeding areas, and reproductive indices indicated low breeding success. Continued research is needed to identify factors limiting reproduction and clarify the ecological significance of this southernmost breeding population.

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Flue Gas Desulfurization Gypsum as a Sustainable Amendment for Coal Mine Soil Reclamation and Camelina-Based Bioenergy Crop Production. B. Deo, B. Muthan, S. Patil*, Department of Biology, Agricultural and Environmental Research Station and Energy and Environmental Science Institute, West Virginia State University, Institute, WV 25112, USA; T. Cruise, T. Mukherjee, D. Allen, Donald Danforth Plant Science Center, 975 North Warson Road, St. Louis, MO 63132, USA; and S. Sanjaya, Department of Biology, Agricultural and Environmental Research Station and Energy and Environmental Science Institute, West Virginia State University, Institute, WV 25112, USA

Flue gas desulfurization (FGD) gypsum, a byproduct generated during the chemical treatment of flue gas emissions in coal-fired power plants, poses environmental challenges due to trace levels of heavy metals and metalloids. This study evaluated the potential of FGD gypsum as a sustainable soil amendment for reclaiming degraded coal mine soils and promoting the cultivation of *Camelina sativa*, a promising bioenergy crop. Application of FGD gypsum supplied essential nutrients, particularly calcium and sulfur, which improved soil structure, reduced heavy metal toxicity, and enhanced plant growth and productivity. Compared with lime, FGD gypsum provided superior long-term soil benefits, resulting in increased biomass, seed yield, and improved fatty acid composition favorable for biodiesel production. The sulfur component of FGD gypsum stimulated glutathione and phytochelatin biosynthesis, promoting heavy metal sequestration and stress tolerance in plants. Additionally, FGD gypsum treatment enhanced photosynthesis and extended the vegetative growth phase, accompanied by increased biosynthesis of glutamic acid and proline, key metabolites involved in stress adaptation. In contrast, lime application rapidly increased soil pH, facilitating early establishment but inducing heavy metal bioaccumulation in seeds, negatively impacting seed quality. Soils amended with FGD gypsum, however, yielded higher-quality seeds with traits desirable for bioenergy applications. Overall, these findings highlight FGD gypsum as a cost-effective and environmentally sustainable soil amendment that supports both ecological restoration of coal mine lands and bioenergy crop production.

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Genetic Engineering of Switchgrass to Produce Bioenergy on Reclaimed Surface Mine Lands. B. Muthan, S. Khathiwada, Karikalan Jayaraman*, Agriculture Experimental Research Station, Energy and Environmental Science Institute, West Virginia State University, Institute, WV 25112; and S. Sanjaya**,** Department of Biology, Agriculture Experimental Research Station, Energy and Environmental Science Institute, West Virginia State University, Institute, WV 25112.

Developing breakthrough technologies for bioenergy crops adapted to marginal Appalachian surface coal mine lands offers a sustainable approach to addressing both land reclamation and renewable energy challenges. Switchgrass (*Panicum virgatum* L.), a perennial, warm-season grass, is a leading dedicated bioenergy crop in the United States due to its high biomass potential and adaptability across diverse agroclimatic conditions. Recent studies in West Virginia have demonstrated that switchgrass established on reclaimed surface mine lands can achieve biomass yields exceeding those obtained from conventional agricultural soils. In this study, the full-length cDNA (1463 bp) of the *Arabidopsis thaliana* transcription factor WRINKLED1 (WRI1), a key regulator of fatty acid biosynthesis, was cloned using gene-specific primers. The open reading frame was inserted into a binary vector under the control of the maize ubiquitin promoter (ZmUbi1), co-expressed with terminal enzymes of the fatty acid biosynthesis pathway, and included a hygromycin resistance marker for selection. Using optimized transformation protocols developed in our laboratory, we successfully generated putative transgenic switchgrass plants. In vitro–rooted transgenic lines were

acclimatized in growth chambers and subsequently transferred to soil, exhibiting high survivability and normal growth and development. Molecular and biochemical analyses are underway to confirm transgene integration and expression. Preliminary results using thin-layer chromatography indicate elevated triacylglycerol (TAG) accumulation in transgenic leaves. These findings demonstrate the potential of metabolic engineering to enhance lipid biosynthesis in switchgrass, advancing its value as a bioenergy feedstock suitable for cultivation on reclaimed mine lands.

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Tough Plants in Toxic Environment: Plant Strategies Against Heavy Metal Stress. B. Muthan, B. Deo, S. Khatiwada, V. Garhwal*, Agriculture Experimental Research Station, Energy and Environmental Science Institute, West Virginia State University, Institute, WV 25112; J. Wang, K. Childs, Department of Plant Biology, Michigan State University, East Lansing, MI, USA; R. Welti, T. Durrett, Division of Biology, Kansas State University, Manhattan, KS 66506-4901, USA; D. Kosma, V. Vulavala, Department of Biochemistry and Molecular Biology, University of Nevada, Reno, NV 89557, USA; L. Yu, C. Xu, Biology Department, Brookhaven National Laboratory, Upton, NY 11973, USA and S. Sanjaya, Department of Biology, Agriculture Experimental Research Station, Energy and Environmental Science Institute, West Virginia State University, Institute, WV 25112.

Unlike terrestrial angiosperms, the freshwater aquatic plant duckweed (*Spirodela polyrhiza*) grows directly in water and exhibits unique physiological and metabolic responses to heavy metal stress. Although duckweed accumulates metabolites such as lipids and carbohydrates under stress, the mechanisms by which it maintains metabolic balance and the underlying gene networks remain poorly understood. In this study, we demonstrate that heavy metal stress induced by flue gas desulfurization (FGD) wastewater significantly reduces chlorophyll content, inhibits growth, suppresses membrane lipid biosynthesis, and stimulates lipid degradation in *S. polyrhiza*. These metabolic alterations lead to the accumulation of triacylglycerols (TAGs) and carbohydrates. Lipid profiling revealed that degradation products of monogalactosyldiacylglycerol, primarily polyunsaturated fatty acids (18:3), were redirected into TAG synthesis in FGD-treated plantlets. Transcriptome analysis showed that genes associated with early fatty acid biosynthesis, β-oxidation, and lipid degradation were upregulated, while those involved in cuticular wax biosynthesis were downregulated. Notably, the transcription factor WRINKLED3 (SpWRI3) was strongly induced in FGD wastewater–treated duckweed. Ectopic expression of *SpWRI3* in *Arabidopsis thaliana* enhanced tolerance to FGD wastewater, accompanied by increased glutathione content and reduced malondialdehyde accumulation under stress. These findings suggest that *SpWRI3* plays a critical role in regulating lipid remodeling and oxidative stress responses under heavy metal exposure. Overall, this study provides novel insights into the molecular mechanisms underlying heavy metal stress tolerance in aquatic plants and highlights potential strategies for phytoremediation and bioindustrial applications.

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Genetic Engineering of Soybean for Increased Environmental Resilience and Oil Production. B. Muthan, Chaitra*, Agriculture Experimental Research Station, Energy and Environmental Science Institute, West Virginia State University, Institute, WV 25112; and S. Sanjaya**,** Department of Biology, Agriculture Experimental Research Station, Energy and Environmental Science Institute, West Virginia State University, Institute, WV 25112**.**

Soybean (*Glycine max* (L.) Merr.) is a major oilseed crop of global economic importance, serving as a key source of food, feed, fuel, and industrial raw materials. As global food demand is projected to double with population growth, optimizing crop productivity and resource use within the constraints of environmental change presents an increasing challenge. While conventional breeding and agronomic improvements have significantly enhanced soybean yield, oil content, and stress tolerance, the relatively narrow genetic base of soybean, compared with crops such as maize, may limit future gains achievable through traditional approaches alone. To address these challenges, this study focuses on metabolic engineering of soybean to enhance both oil production and environmental resilience. The *Arabidopsis thaliana* WRINKLED1 (WRI1) transcription factor, a key regulator of fatty acid biosynthesis, was ectopically expressed individually and in combination with terminal enzymes involved in oil biosynthetic pathways. Transgenic T_0 soybean lines were generated via *Agrobacterium*-mediated transformation using optimized conditions. Preliminary observations indicate stable transformation and normal plant development under controlled growth conditions. Comprehensive molecular and biochemical analyses are in progress to confirm transgene integration and expression, as well as to quantify changes in seed storage compounds, including oil and protein levels. The outcomes of this study are expected to advance understanding of lipid metabolic regulation in soybean and contribute to the development of

genetically improved cultivars with enhanced oil yield and resilience suitable for sustainable agricultural and bioenergy applications.

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Comprehensive Assessment of Water and Sediment Pollution in Silver Lake, Dover, Delaware: Chemical, Physical, Heavy Metal, and Microplastic Indicators of Ecosystem Health. L. Roberts*, N. Boukari, C. Krejczman, X. Rosado, C. Wetherill, J. Ramos, K. Jahan, G. Ozbay, One Health Lab, College of Agriculture, Science & Technology, Delaware State University, Dover, DE 19901

This study assesses the pollution status of Silver Lake in Dover, Delaware by monitoring six distinct sampling sites distributed across the lake. The research aims to evaluate both chemical and physical parameters of the water and sediment to determine the lake's overall environmental health and potential risks to aquatic life, particularly fish safety, without directly analyzing fish tissue. Chemical parameters measured include nitrate, nitrite, calcium hardness, alkalinity, ammonia, and phosphorus, which collectively indicate nutrient enrichment, potential eutrophication, and the water's buffering capacity. Physical parameters such as salinity, pH, total dissolved solids (TDS), dissolved oxygen (DO%), water temperature (°C), and oxidation-reduction potential (ORP) provide insights into the lake's physicochemical balance and its ability to support aquatic organisms. In addition, sediment and water samples are being analyzed for the presence and concentration of heavy metals (e.g., chromium, manganese, lead, mercury, cadmium) and microplastics to understand long-term contamination trends and pollutant accumulation in the ecosystem. The integration of these parameters allows for a comprehensive evaluation of Silver Lake's current pollution status. This research not only identifies spatial variations in contamination across the six sites but also serves as an indirect indicator of fish safety for human consumption. By focusing on water quality and sediment characteristics rather than biotic samples, the study offers an efficient, non-invasive approach to predicting ecosystem health and guiding future conservation and remediation strategies for Silver Lake.

1246

Generative data through the diffusion model in environmental and agricultural engineering applications. F. Rojano. Agricultural and Environmental Research Station (AERS), West Virginia State University, Institute, WV, 25112

Machine learning tools capable to generate data are explored in environmental and agricultural applications with the aim to address several challenges, such as highly dynamic weather, limited sensing systems and complex biological systems. On the other hand, those technologies should also be robust, computationally efficient and aligned to fundamentals of physics, biology and chemistry. Diffusion models (DMs) are well known for successfully generating high-fidelity images, superseding other generative adversarial networks and being promising tools for accurate forecasting. Extensive research efforts of DMs have been conducted to identify applications in diverse areas of knowledge. This research examines the use of DMs in environmental and agricultural engineering problems, highlighting their strengths and limitations when facing real-world applications. For environmental engineering applications, DM can simulate complex physical systems often observed in fluid dynamics associated to weather data and being adhered to fundamental governing physical laws. For agricultural engineering, DM can generate data associated to precision agriculture in problems having limited annotated datasets and high noise. Both applications inherently involve substantial complexity and hidden variables that DMs can integrate more effectively than process-based methods. Thus, DMs are emerging as a valuable technological resource, where synthetic data may lessen dependence on extensive experimental data, thereby accelerating the development of computational representations that in turn allows scalability and enable the exploration of optimal performance.

1247

Application of High Resolution Hyperspectral and Lidar Metrics for Tree Species Classification for Mature Mixed Hardwood Forest of North Alabama. E**.** Tenorio*, D. Lemke, Department of Natural Resources and Environmental Sciences, Alabama A&M University, Normal, AL 35762.

Remote sensing of forest ecosystems involves complex interactions among sensor types, forest structure, phenology, and species traits. Identifying tree species in dense temperate forests is challenging due to overlapping spectral

signatures and complex canopy structures. Few studies have evaluated the combined use of hyperspectral and LiDAR data across seasonal conditions for species classification. This study explores combining drone-based hyperspectral and LiDAR-derived metrics for canopy tree species classification in a dense, temperate deciduous forest. Multiple metrics from both sensor types were evaluated across seasonal conditions (leaf-on, leaf-off, and combined) to understand their contribution to species discrimination. These analyses were conducted on metrics derived from tree species within the Paint Rock Forest Dynamic Plot, a fully censused ForestGEO site in the southeastern United States. A partial least squares discriminant analysis (PLS-DA) was used to identify hyperspectral wavebands with above-average importance in distinguishing tree species based on their spectral signatures. Additionally, variable importance was assessed across a wide range of hyperspectral and LiDAR-derived metrics to determine which metrics most effectively contributed to species classification. Given the high correlation among many metrics, a conditional random forest model was employed to identify the most important predictors while accounting for multicollinearity. The highest performing model was the conditional random forest model using the 23 top performing metrics, which produced an average F1 score of .596. These approaches demonstrate the value of integrating structural and spectral information and provide insights into the specific types of remote sensing data that enhance species-level classification in complex forest environments.

1248

Metagenome-assembled Genomes Reveal a Single-Step Pathway for Propionate Degradation by the Pct Enzyme Under High Propionate Levels in Co-Digestion with Chicken. T. Espinosa-Solares, Department of Agri-Food Science and Technology, Bioprocess Laboratory, Universidad Autónoma Chapingo, MX 56230; Y. Jung, Agricultural and Environmental Research Station, West Virginia State University, Institute, WV 25112; M. Sánchez-Aguirre, Department of Agri-Food Science and Technology, Bioprocess Laboratory, Universidad Autónoma Chapingo, MX 56230; T. G. Ochoa-Bernal*, Agricultural and Environmental Research Station, West Virginia State University, Institute, WV 25112 and Department of Agricultural Engineering and Integral Water Use, Bioprocess Laboratory, Universidad Autónoma Chapingo, MX 56230.

Propionate serves as an essential intermediate for methane production in the anaerobic digestion (AD) system. Its accumulation leads to the acidification of the medium and the inhibition of methanogenesis. Propionate is degraded exclusively by a small group of propionate-syntrophic bacteria at low hydrogen pressures. Recent developments in metagenomics hold great promise for overcoming the challenges posed by propionate accumulation. This research aimed to identify metagenome-assembled genomes (MAGs) that best represent a highly stressed microbiome with 1 to 24 g L^{-1} of propionate in co-digestion with 3 % chicken litter, which has helped maintain system stability. Metagenomic analyses resulted in the recovery of 68 high-quality MAGs, comprising 64 bacteria distributed across 15 classes and 4 archaea in 2 classes. One of the identified pathways involves the degradation of propionate through a direct one-step pathway, where propionate + acetyl-CoA + lactoyl-CoA is converted to propionyl-CoA + acetate + (S)-lactate via pct and ldh enzymes. The bacteria that have the latter enzymes were, class *Basilli*: *s_Enterococcus_I aquimarinus*, *s_Jeotgalicoccus aerolatus*, s_UACHl03; class *Clostridia*: s_UACHpl01, s_DUPK01 sp012838345, s_UACHl04, s_UACHpl02; class *Desulfotomaculia*: s_DTU098 sp002305915, and class *Limnochordia*: s_UBA5420 sp012838305. Methane is mainly synthesized by carbon dioxide and Methanethiol by the class *Methanosarcinia*, while Me/Di/Tri-methylamines are produced by the class *Thermoplasmata*. Methane is produced through hydrogenotrophic, methylamines, methanethiol, and acetoclastic pathways. Propionate is efficiently transformed into acetate in just one step, facilitating methane production through newly identified bacterial species in the AD process. This innovative pathway highlights the potential of these bacteria to enhance biogas production.

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A Decision Tree Approach for Quantifying Soil Moisture Threshold on Soil CO_2. A. Veettil*, A. Rahman, R. Awal, and A. Fares, CAFNR Research, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446.

Organic amendments are widely used to maintain yields while reducing atmospheric releases. This study examined soil-moisture thresholds associated with soil CO_2 fluxes from organically amended sweet corn plots in the greater Houston area, Texas. We used a classification and regression tree (CART) to identify moisture thresholds, and multiple linear regression (MLR) and generalized additive models (GAMs) to predict short-term CO_2 fluxes due to the influence of soil moisture and weather variables (air temperature, relative humidity, solar radiation). Treatments included

biochar at 2,268 and 4,536 kg ha^{-1} and chicken and dairy manure at 0, 224, and 448 kg N ha^{-1}. CART revealed a direct link between soil moisture and CO_2 flux. For the biochar level I (2,268 kg ha^{-1}) plus chicken manure at the recommended N rate (CXBX) treatment, a moisture threshold of 0.103 m^3 m^{-3} was identified: when moisture was below this value, the median CO_2 fluxes were 142 kg ha^{-1} d^{-1}. Applying biochar at 4,536 kg ha^{-1} reduced CO_2 fluxes by 14.5% relative to the control. Across predictive models, GAMs outperformed MLR, with the strongest performance under combined chicken-manure and biochar applications. Quantifying soil-moisture thresholds can guide management aimed at mitigating soil CO_2 fluxes.

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Analysis and Evaluation of Saturated Hydraulic Conductivity of an Organic Agricultural Field Based on Machine Learning. A. El Hassan*, R. Awal, A. Fares, A. Veettil, A. Rahman, and B. Thapa, CAFNR Research, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446.

Adopting organic-based agricultural practices, such as applying biochar and organic amendments, is a key strategy for improving soil health and mitigating the effects of environmental change. These amendments can significantly alter soil physical and chemical properties. This research quantifies the effects of such practices on soil saturated hydraulic conductivity (Ksat), a primary parameter influencing local water balances, and the efficiency of irrigation systems. The study employs a factorial randomized block design to evaluate twelve treatment combinations, consisting of two biochar rates (2,268 and 4,536 kg ha^{-1}), two organic manure sources (chicken and dairy), and three nitrogen fertilizer rates (0, 224, and 448 kg N ha^{-1}). To evaluate the Ksat, a soil sample was obtained from each plot using a 250 ml ring sampler. Initially, we performed analysis of variance (ANOVA) to evaluate the effects of amendment types and rates on soil hydraulic conductivity. The hydraulic conductivity was then tested using a Ksat meter group apparatus in the lab. We applied three machine-learning models, multiple linear regression, random forest, and generalized additive models, to assess how soil physical (porosity, bulk density) influence saturated hydraulic conductivity. The generalized additive model performed best, outperforming random forest and multiple linear regression. This finding suggests a synergistic effect between the two amendments, which the model identified as the optimal strategy for enhancing soil water infiltration.

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The Alchemist's Harvest: Enchanted Biochar Blends for Soil Revival and Plant Prosperity. A. Shembo[*1], D. Guthrie[1], A. Geremew[1], R. Ray[1], O. Kuloyo[2], C. Davies[2], J. Mugundan[3], L. Carson[1], [1]CAFNR Research, College of Agriculture, Food and Natural Resources, Prairie View, TX 77446; [2]Shell International Exploration and Production Inc. (USA), Shell Technology Centre Houston, Houston, TX 77082; J. Mugundan, [3]Shell India Markets Private Limited, Shell Technology Center, Bangalore, Karnataka, India, 562149

Agricultural intensification is vital for meeting global food demands but often leads to nutrient depletion and increased heat-trapping gases due to synthetic fertilizer use. This study investigates alternatives by characterizing and evaluating two commercial biochars (BC-I and BC-II) to enhance crop productivity. Advanced analytical techniques such as SEM, XRD, FTIR, TGA, BET, IC, ICP-OES, EC, CHNS, and TOC revealed BC-I's superior physicochemical properties. An initial trial in plant growth house tested biochar types, and application rates (2.5–15%), and identified 5% BC-I as optimal for improving soil nutrients and plant growth. However, both biochars lacked nitrogen, necessitating supplementation with nitrogen-rich organic fertilizers. A subsequent field study using mustard (*Brassica juncea*) applied 17 treatment combinations (T1–T17, including control T11) across 51 randomized plots, integrating biochar with chicken manure, cow manure, and chitosan. The release of heat-trapping gases (CH_4, CO_2, N_2O) were monitored using a smart soil chamber and Li-COR analyzer. Moreover, assessments of soil (IC, ICP-OES, EC, pH) and plant health (leaf area, chlorophyll, water content, biomass) were also done. Five biochar formulations were found to improve nitrogen availability without significantly increasing discharge of heat-trapping gases. A third-phase field trial with sorghum compared these formulations to conventional NPK fertilizer. Treatments T7 (BC/Ch/ChM) and T17 (BC/CoM) matched NPK in promoting plant growth. The study concluded that a 5% biochar rate in pots and 14 t/ha in field conditions is optimal for sandy loam soils. T7 and T17 show promises for sustainable agriculture, warranting further validation across diverse soils and agroecological zones.

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Application of Tree-Based Machine Learning Algorithms to Predict Microalgae Biomass Production and Nutrient Removal Efficiency in Wastewater Treatment Systems. A. Rahman*, A. Veettil, R. Awal, and A. Fares, College of Agriculture, Food, and Natural Resources, Prairie View A&M University, Prairie View, TX 77446.

Microalgae-based wastewater treatment presents a viable strategy for simultaneous nutrient remediation and biomass generation, with applications in biofertilizer production and resource recovery. The efficiency of microalgal growth and nutrient removal is governed by complex interactions among multiple process parameters, including nutrient concentrations, carbon availability, microbial community dynamics, temperature, pH, and hydraulic retention time (HRT). A comprehensive understanding of these interactions is critical for optimizing cultivation conditions to enhance both wastewater treatment efficacy and biomass productivity. This study employs decision tree-based machine learning, specifically Classification and Regression Tree (CART) models, to identify key cultivation parameter combinations that maximize nutrient removal and biomass yield. Experimental data were obtained from four photobioreactors operated in a semi-continuous mode over 30 days, with varying HRTs and influent characteristics. One reactor was maintained at an HRT of 10 days with 2:1 diluted wastewater, while the remaining three were operated at HRTs of 10, 8, and 6 days with undiluted sewage. A total of 18 parameters, encompassing influent and effluent composition, microalgal species distribution, and physicochemical conditions, were analyzed to develop predictive models. CART analysis identified several optimal parameter combinations for high biomass productivity, along with distinct sets of conditions for maximizing nitrogen and phosphorus removal efficiencies. These findings provide a data-driven framework for optimizing microalgal cultivation conditions, reducing the need for extensive empirical trials, and accelerating the scalability of wastewater treatment applications.

1253

Implications of Precision Agriculture Utilizing a Network of IoT Devices for Real-time Remote Monitoring. R. Jackson*, R.L. Ray, CAFNR Research, College of Agriculture, Food and Natural Resources, Prairie View A&M University, Prairie View, TX 77446.

Agriculture fuels economies, sustains global population productivity, and drives technological innovations, but can also introduce obstacles arising from resource management and shifting environmental conditions. Manual data collection and maintenance of equipment deployed in pasture-like environments can be labor-intensive, time-consuming, and often lack the use of real-time remote monitoring. Remote monitoring equipment can help alleviate the labor required for inspecting field-deployed instruments and sensors. Farmers' productivity is consistently hindered by weather fluctuations and inefficient soil quality management, resulting in reduced yields and increased production costs. Data-driven approaches to agriculture enable better management of resources and environmental parameters. In this study, we are developing an infrastructure for agricultural research by utilizing a network of Internet of Things (IoT) devices capable of remote sensing, which can provide real-time, location-specific data to promote smart, sustainable solutions for agriculture, enhance productivity, and promote sustainable resource use.

1254

Machine Learning Approaches for Predicting Sorghum Yield Using Key Growth Traits under Varying Organic Amendment Types and Rates. B. Thapa*, R. Awal, A. Fares, A. Veettil, and A. El Hassan, CAFNR Research, College of Agriculture, Food, and Natural Resources, Prairie View A&M University, Prairie View, TX 77446.

Sorghum [*Sorghum bicolor* (L.) Moench] is a resilient cereal crop with significant potential under variable environmental and weather conditions, particularly under semi-arid conditions. A field experiment was conducted at Prairie View A&M University, Texas, with two biochar rates (2268 and 4536 kg ha^{-1}) and two types of manure (chicken and dairy) at three nitrogen rates (0, 180, and 360 kg N ha^{-1}) in a factorial design with three replications. This study evaluated the effects of manure type, manure rate, and biochar rate on sorghum growth, phenology, and yield, and employed machine learning models to predict yield performance from crop traits. Machine learning analyses revealed that Multiple Linear Regression ($R^2 = 0.767$; MAE = 0.2249; MSE = 0.0721) outperformed tree-based models in terms of predictive accuracy. However, ensemble approaches, such as Random Forest and XGBoost ($R^2 = 0.658$-0.686), consistently identified panicle length and maturity rating as the dominant predictors. These findings validate phenological and reproductive traits as reliable indicators of sorghum yield. The study highlights the importance of optimized manure management for sorghum productivity and demonstrates the complementary role of predictive modeling in yield estimation. The integration of manure-based strategies with data-driven tools fostered resource-

efficient, adaptive, and environmentally sustainable sorghum production systems that enhance resilience under changing environmental conditions.

1255

Cellulose Hydrogels: Origin and Uses for a Sustainable Future. A. Howlader*, and H. P. Singh, College of Agriculture, Family Sciences, and Technology, Fort Valley State University, Fort Valley, GA 31030.

Hydrogel, a polymer having three dimensional networks, can retain up to 1000 times higher water or saline solution than its dry weight. Hydrogels can be classified as natural or synthetic, based on their origin. One of the most accepted polymers to develop natural hydrogels is cellulose. Natural hydrogels are preferred over synthetic hydrogels due to biodegradable and biocompatible characteristics. The primary objective of this study is to provide an overview of cellulose sources used in developing cellulose hydrogels, their water retention values, applications and biodegradability comparison to their synthetic counterparts. Different sources of cellulose could range from agricultural waste, grass and wood with cellulose content of 25%- 50%. The water retention ability of cellulose hydrogels can range from 50-610 g/g. Most synthetic hydrogels are not biodegradable except some polyacrylate, and polyacrylamide-based hydrogels and can degrade from 0.12% to 77.9% in soil within a year. On the contrary, 0.9% to 96% of the biobased hydrogels degraded by 90 days. Application of cellulose hydrogel has enhanced the yield of corn, wheat, and tomato significantly. In future, cellulose hydrogel can be used in agricultural sector for irrigation and providing fertilizers, wastewater treatments, pharmaceutical sectors and assisting in various fields for a sustainable environment.

1256

Valorization of Cellulosic Biomass into Hydrophobic Aerogels and Superabsorbent Hydrogels. H.P. Singh*, Z. Chambers, M. Dauda and V.N. Degala, Nanotechnology Laboratory, Department of Agricultural Sciences, College of Agriculture, Family Sciences and Technology, Fort Valley State University, Fort Valley, GA 31030.

Cellulosic biomass waste derived from various agricultural and industrial processes, is highly underutilized but offers potential for sustainable resource valorization and production of value-added renewable products. These waste materials, rich in cellulose, serve as a sustainable feedstock for advanced material development. Recent advancements have demonstrated the efficacy of transforming cellulosic biomass into highly porous hydrophobic cellulose aerogels and superabsorbent hydrogels. Research into cellulose-derived superabsorbent hydrogels has highlighted their capacity for significant soil moisture retention and water conservation. Beyond cellulose, superabsorbent hydrogels synthesized from starch and chitosan among some other biopolymers are also known for their superior water retaining capacity, biodegradability and potential for functionalization in controlled release systems. Simultaneously, hydrophobic aerogels commonly produced from cellulose, starch, or lignin exhibit lightweight porous structures and with water-resistant interfaces. These properties have been exploited in the applications of wastewater treatment, oil sorption, and environmental remediation. The versatile applications of hydrophobic cellulose aerogels and superabsorbent hydrogels derived from different cellulosic biomasses represent promising value-added products and presents substantial opportunities across biomedical engineering, material sciences, and agriculture. This study explores the development of value-added products including hydrophobic cellulose aerogels and superabsorbent hydrogels from such abundant renewable materials These cellulose-rich waste streams offer a versatile platform for creating advanced functional materials.

1257

Development of a Polymerase Chain Reaction Assay to Detect Chicken-Origin *Escherichia coli* . H. Al Hamami* and G. Zheng, College of Agriculture, Environmental and Human Sciences (CAEHS), Lincoln University of MO, Jefferson City, MO 65101.

Escherichia coli (*E. coli*) is commonly used as an indicator organism for detecting fecal contamination in freshwater environments. The objective of this study was to develop a polymerase chain reaction (PCR) assay capable of distinguishing *E. coli* of chicken origin from those associated with other host species. Through whole-genome comparisons of 819 published draft genomes of *E. coli* isolates from humans, cattle, chickens, and pigs, a signature sequence—designated 7A—was identified as being highly associated with chicken-derived *E. coli*. Based on this sequence, an endpoint PCR assay, termed PCR-ch7A, was developed to specifically detect chicken-origin *E. coli*. The specificity and sensitivity of the PCR-ch7A assay were evaluated using a panel of 497 *E. coli* isolates obtained from

fecal samples representing ten host sources collected in mid-Missouri. These included humans (n = 51), chickens (n = 56), cattle (n = 50), pigs (n = 60), geese (n = 80), sheep (n = 48), cats (n = 25), dogs (n = 50), goats (n = 16), and ducks (n = 17). Initial results demonstrated that the PCR-ch7A assay detected chicken-origin *E. coli* with a sensitivity of 62.5% and a specificity of 98.6%. Further validation of the assay is ongoing, utilizing a broader range of *E. coli* isolates from additional geographic locations to improve reliability and performance.

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Technical Feasibility of the Ohio River Prawn Larviculture. D.L. Flickinger*, C. dos Santos, C.A. King, College of Agriculture, Environmental and Human Sciences (CAEHS), Lincoln University of Missouri, Jefferson City, MO 65101

The production of *Macrobrachium* prawn species in artificial rearing systems has shown little development due to difficulties related to their management during the larval phase. The larviculture of freshwater prawns is the bottleneck to producing prawn post-larvae since it depends on strict control of the water quality, adequate feeding and other specialized management. The Ohio River prawn (*Macrobrachium ohione*) shows prolonged and irregular larval development. No commercial scale larvicultures have been performed for the *M. ohione* and interest has grown for more domestic production of animal protein. Nevertheless, the larvicultures of the *M. ohione* may be improved when considering advances in feeding regimes and maintenance of water quality. Thus, the present research aims to establish the technical feasibility of producing post-larvae of the *M. ohione* in static closed recirculating aquaculture systems. Different feeding regimes will be tested as to their influence on survival and larviculture progression through the different developmental stages. Adults and broodstock will be obtained from various Texas river systems in the early spring and maintained at Lincoln University of Missouri.

1259

Ecotoxicological Effects of Metallic Engineering Nanoparticles on Soil Microbial Communities and Enzymatic Activities. N. Tu*, K.C. Dipsana, S. Mahdi, K. Bhusal, X. Jones, T. Wuliji, Q. Yang and J. Yang. College of Agriculture, Environmental and Human Sciences (CAEHS), Lincoln University of Missouri, Jefferson City, MO 65101.

Engineered nanoparticles (ENPs) are emerging soil contaminants, but their impacts on soil microbial communities and biochemical processes are not fully understood. This study evaluated the ecotoxicological effects of Ag, CuO, ZnO, and CeO_2 nanoparticles on agricultural soil biological properties. Microbial community composition was analyzed using phospholipid fatty acid (PLFA) profiling and 16S rRNA gene sequencing, while β-glucosidase, β-glucosaminidase, acid phosphatase, and arylsulfatase activities served as indicators of soil health. All ENPs induced dose-dependent responses. Ag and CuO nanoparticles had the strongest inhibitory effects, reducing both key enzyme activities and sensitive microbial taxa. ZnO nanoparticles showed a biphasic response, stimulating microbial activity and enzyme function at <100 mg kg^{-1} concentrations but suppressing them at higher doses (200 mg kg^{-1}). CeO_2 nanoparticles exhibited minimal ecotoxic effects. Integration of microbial and enzymatic data indicated that shifts in community structure were closely linked to functional declines, reflecting the intimate relationship between soil microbial diversity and biochemical properties. These results emphasize the ecological sensitivity of soil microbiota to ENPs and underscore the need for safety management of nanoparticle applications in agriculture, along with long-term field studies to assess soil ecosystem resilience under increasing nanomaterial use. More results and details will be discussed during the presentation.

1260

Soil temperature and *Juniperus virginiana* density in Oak-Hickory dominated forest in North America. A .Sparer*, College of Agriculture, Environmental and Human Sciences (CAEHS), Lincoln University of Missouri, Jefferson City, MO 65101.

Analyzing how specific tree species effect the microclimate of North American Temperature Forest is important for managing forests sustainably. 3 m tripods with HOBO weather stations were deployed in the Baskett Forest in central Missouri to monitor photosynthetically active radiation, rainfall/through fall, wind speed and direction, air temperature, relative humidity, soil moisture, and soil temperature. The tripods were stationed at 6 sites. 5 of the sites

were chosen because they were located at the terminus of each transect associated with the Missouri Ozarks Ameriflux (MOFLUX) tower. The 6th site was cleared, open, mowed, area of the forest that would serve as an additional comparison to the forested sites (the National Atmospheric Deposition Program, NADP site). At the 5 forested, cedar trees (Juniperus virginiana) were counted in 4.2 x 4.2 square, based off of the 3m transects radiating outward for the microclimate station. The results showed that there was a significant difference between sites in soil moisture content (p-value <0.001). The highest average soil temperature (16.069 °C) was found at the NADP transect. The lowest average soil temperature was found at the West site (9.614 °C) which also contained the second most cedar trees.

1261

Do cover crops established in alleyways impact soil health in adjacent vegetable production beds? T. Hurisso*, P. Karki, K. Afari, N. Al-Awwal, B. Alsunuse, College of Agriculture, Environmental and Human Sciences (CAEHS), Lincoln University of Missouri, Jefferson City, MO 65101; T. Reinbott, University of Missouri, Columbia, MO 65201.

Soils that are being converted to organic production often are of poor quality, and vegetable growers often face low yields due to inadequate soil fertility and increased weed pressure. In anticipation of building soil health within a short timeframe, some growers take land out of cash crop production every other year or more to grow cover crops. A better alternative would be to grow cover crops that tolerate occasional mowing in narrow strips of ≈ 6-feet-wide alleyways between vegetable production beds, which would allow cash crop production to continue within the same field. We determined how perennial and annual grass/legume cover crop bi-cultures established in alleyways affect soil health in adjacent vegetable production rows. Perennial ryegrass/white clover and sorghum sudangrass/sweet white clover mixes resulted in increased soil organic C [SOC], total N [TN], active C [POXC], potentially mineralizable N [PMN], β-glucosidase [BG], and β-glucosaminidase [NAG]) values in adjacent vegetable production rows compared to tilled no-cover alleyways, with results showing trends of being higher in the upper 7.5 cm than 7.5-20 cm depth. Results also showed patterns with distance from the alleyways, with SOC, TN and PMN values being greater farther away from the cover cropped alleyways (1.5 feet); whereas BG and NAG activities higher near the cover cropped alleyways (0.5 feet). These results show that growing annual and perennial cover crops in alleyways is a more effective way to build soil health within actively cropped vegetable fields without having to take land out of cash crop production.

1262

Uptake and Fate of Ag and Zn Engineering Nanoparticles in Corn Under Single and Binary Systems. J. Yang* and Q. B. Yang, College of Agriculture, Environmental and Human Sciences (CAEHS), Lincoln University of Missouri, Jefferson City, MO 65101; L. Xu, Chemical and Biochemical Engineering, Missouri University of Science & Technology, Rolla, MO 65409; X. M. Ma, College of Engineering, Texas A&M University, College Station, TX 77843

Engineered metallic nanoparticles (ENPs) are often used simultaneously in agricultural operations. This study is to address critical safety concerns of plant multiple ENP exposure by investigating the fate and uptake of silver (Ag) and zinc (Zn) ENPs in corn under single or binary dosing in soil. Results showed that elemental Zn and Ag concentrations in roots increased with increasing ENP dose. Only Ag ENPs, not Zn ENPs, were detected in tissues, suggesting Zn uptake in ionic form. Ag ENP concentration was higher in roots at low dosing, and the size became smaller in shoots. ENP uptake was confirmed dominantly through fine root hair breaches. The co-existed Zn ENPs lowered the Ag elemental concentration by > 42.9% in roots and > 54.9% in shoots but increased Ag ENP concentration by 88.7% in roots at 100 mg/kg Zn ENPs + 50 mg/kg Ag ENPs group in compared with single Ag ENPs dosing. Higher Zn ENP and moderate Ag ENP treatments elevated corn height and shoot biomass in single ENP group. It is noteworthy that the 50 mg/kg ZnO NPs + 25 mg/kg Ag NPs treatment significantly increased maize shoot biomass by > 49.0% compared to the single ENP dosing. ENP treatment also altered the micronutrient status in tissues. For instance, Zn ENPs decreased Cu content but Ag ENPs elevated Mo levels. This work provides the first insights of the Ag-Zn ENP interactions in soil-plant ecosystem, highlighting implications for nano-agrochemical efficacy, safety and corn productivity.

Agricultural systems and Technology

1263

Advancing Sustainable Precision Agriculture Through Conversational Ai, Autonomous Technologies, Outreach And Experiential Learning. R. Padmanabhan-Menon*, G. C. Bernard, C. Jones, K. Jones, N. A. Bakari, V. York, A. Brown, V. Abera, D. Wilson, M. Egnin, I. Ritte, M. Okoma, G. Aguti, S. Critchlow, T. Nobles, C. Thompson, and O. Idehen. Department of Agricultural and Environmental Sciences, Plant Biotechnology and Genomics Research Laboratory, Tuskegee University, Tuskegee, AL 36088.

Modern agriculture faces growing demands for productivity and sustainability while reducing labor and resource inputs. Tuskegee University is advancing autonomous phenotyping systems and AI-powered analytics to enhance research, student training, and farmer outreach in sustainable agriculture. The initiative integrates above-ground and below-ground crop monitoring via unmanned aerial vehicles (UAVs), autonomous terrestrial robots, and AI platforms to support real-time, high-throughput crop health assessment. CropWizard is a conversational analytics chatbot developed with the National Center for Supercomputing Applications and the Center for Digital Agriculture at the University of Illinois Urbana–Champaign that transforms aerial and ground sensor data into actionable, farmer-friendly reports using advanced image processing and predictive modeling tools. In current field trials, CropWizard evaluated plant height, photosynthetic activity (chlorophyll), stomatal conductance (GSW), and Normalized Difference Vegetative Indices (NDVI) across 45 samples to guide site-specific management for smallholder producers. At four weeks, the mean NDVI was 0.74, indicating healthy crop vigor. Plant height reached 11.0 in (47.2% increase from week 2). Correlation and variation analyses revealed significant row differences for plant height and NDVI, but not chlorophyll. Height and NDVI were moderately correlated ($p = 0.037$). Only height at week 2 predicted week 4 values ($p = 0.016$); chlorophyll and GSW showed greater temporal variation, with no strong correlations. CropWizard identified outliers and guided targeted interventions to improve crop performance. By combining conversational AI tools with autonomous phenotyping systems and data analytics, this initiative delivers real-time diagnostics, experiential learning opportunities for students, and accessible crop-health assessments for small-scale farmers.

1264

Identifying Soybean Phenology Using UAV Based Multispectral Indices. S. Poudel*, A. Chiluwal, 1890 Land-Grant Program, Kentucky State University, Frankfort, KY, 40601

Accurate tracking of soybean phenological stages is important for effective crop management and yield optimization. Soybean growth relies on type of cultivars and their interaction with environment and field management practices such as soil conditions, planting dates and nutrient availability. This study aimed to identify different phenological stages of soybean using multispectral vegetation indices (VIs) derived from unmanned aerial vehicle (UAV) imagery during the entire crop growing season. Field experiment was conducted at Harold R. Benson Research and Demonstration Farm, KSU, Frankfort, KY. Three different cultivars representing different maturity groups were sown across a range of planting dates from early to late planting seasons. Biochar was used as soil amendment, and different levels of nitrogen inputs were used to evaluate their effects on soybean phenology. A UAV equipped with a multispectral camera captured high-resolution imagery in multiple spectral bands (Red, Green, Blue, Red edge, and near-infrared) to track soybean growth until maturity. VIs such as NDVI, GNDVI, and EVI2 were derived from aerial images to monitor canopy development. Phenological stages of each plot were recorded manually through visual field observation and correlated with UAV-derived indices to assess the accuracy of aerial imagery in tracking soybean development. Machine learning algorithms, including both classification and regression methods such as Random Forest (RF), were used to classify and predict growth stages based on UAV-derived spectral signatures. Data processing is ongoing. Final results along with the potential of UAV-derived multispectral indices for high-throughput phenological mapping in soybean will be presented and discussed.

1265

Advancing Roselle Hibiscus (Hibiscus sabdariffa) Production for Sustainable Agriculture and Economic Development in Louisiana. M.L.Ford*, Southern University Agricultural Research and Extension Center, Baton Rouge, LA 70791; N. Whittington, Department of Agricultural Sciences and Technology, College of Agricultural, Human and Environmental Sciences, Southern University and A&M College, Baton Rouge, LA 70813.

Roselle hibiscus (Hibiscus sabdariffa), valued for its drought tolerance, rapid growth, and diverse by-products including edible leaves, nutrient-rich calyces for teas and jams, and durable fibers for crafts presents a promising opportunity for small and medium-scale farmers across Louisiana. Given the state's humid subtropical climate,

Roselle's adaptability aligns well with existing environmental conditions, suggesting high potential for localized production and market development. This research aims to evaluate Roselle's climate adaptability, soil health benefits, and economic viability through a multidisciplinary framework combining agronomic trials, value-added processing, and extension-based education. Experimental studies will assess yield optimization, phenological responses, and seasonal performance across Louisiana's varied microclimates. Complementary soil and rotation studies will explore Roselle's contribution to sustainable systems when integrated with staple crops such as sugarcane and rice. Economic and processing analyses will focus on developing value-added hibiscus products including teas, jams, and herbal extracts—to enhance farm profitability and create new rural and urban market opportunities. Concurrently, Extension programs led by Southern University Agricultural Research and Extension Center will develop educational modules and demonstration sites to train farmers, youth, and community members in Roselle cultivation, pest management, harvesting, and post-harvest processing. Integrating research, education, and outreach, this initiative aligns with the 1890 Land-Grant mission of Southern University and A&M College, fostering sustainable agriculture, entrepreneurship, and community resilience among Louisiana citizens. The expected outcomes include improved small-farm competitiveness, diversified crop systems, and expanded access to high-value agricultural markets.

1266

Empowering Louisiana Small Farmers through Artificial Intelligence-Driven Agricultural Technologies for Sustainable Production and Climate Resilience. M. L. Ford, *, Southern University Agricultural Research and Extension Center, Baton Rouge, LA 70791.

Louisiana's small-scale farmers face increasing production challenges driven by climate variability, rising input costs, labor shortages, and limited access to precision agriculture tools. This research explores the integration of Artificial Intelligence (AI) within small farm operations to enhance decision-making, optimize productivity, and promote sustainable agricultural practices across the Louisiana Delta and southern parishes. The study examines the role of AI-driven systems such as predictive analytics, machine learning-based crop modeling, autonomous monitoring (via drones and sensors), and controlled environment agriculture (CEA) management algorithms that improve yield forecasting, water efficiency, and pest control in small-scale, resource-limited contexts. The research employs a mixed-methods approach that combines quantitative field data collection from demonstration farms with qualitative insights from farmer surveys and Cooperative Extension workshops. AI-enabled decision support tools are evaluated for their capacity to provide actionable recommendations on irrigation scheduling, nutrient delivery, and climate control, particularly in hydroponic and aquaponic systems. Preliminary results indicate that AI-enhanced sensor networks and data visualization dashboards can reduce input costs by 20–30% while improving crop yield uniformity and quality consistency. Additionally, the adoption of AI technology fosters greater resilience to weather fluctuations and supports climate-smart farming strategies aligned with USDA and 1890 land-grant sustainability initiatives. This research underscores the transformative potential of AI-based agricultural innovation in strengthening the economic viability of Louisiana's small farms. By bridging the digital divide through accessible training, local demonstration sites, and Cooperative Extension support, the project positions small farmers to lead in the state's transition toward data-driven, sustainable food systems.

1267

Bridging the Digital Divide: Empowering Rural Entrepreneurs with Artificial Intelligence (AI) in Internet-Desert Communities. A. N. Goodwin, Cooperative Extension, College of Agriculture, Virginia State University, Petersburg, VA 23806.

Rural and underserved communities continue to face structural barriers to economic growth due to limited broadband access, technological inequities, and reduced exposure to digital innovation. With many rural U.S. counties reporting significantly lower broadband adoption rates compared to urban areas, these inequities remain a persistent obstacle to entrepreneurial and business development. This study explores the transformative potential of Artificial Intelligence (AI) as a catalyst for entrepreneurial development and capacity-building in "internet desert" regions. Drawing on the mission of Cooperative Extension and the community-centered framework of Land-Grant Universities, this research examines how AI-driven tools—such as predictive analytics, market intelligence platforms, and virtual technical assistance—can democratize access to information, enhance business decision-making, and strengthen resilience within rural economies. Through a review of emerging models and pilot initiatives, this work emphasizes that AI adoption should be approached not merely as a technological intervention but as an integral component of community

development. Effective integration requires investment in digital literacy, localized data infrastructures, and culturally responsive training programs delivered through Extension networks. By embedding AI within Cooperative Extension's outreach framework, universities can play a pivotal role in narrowing the rural innovation gap and ensuring that entrepreneurs in low-connectivity areas are not excluded from the digital economy. This research contributes to the broader dialogue on inclusive innovation and equitable technological access, providing recommendations to support sustainable rural economic growth in the twenty-first century.

1268

Smart agricultural technology and gender-differentiated food, and water security: Evidence from smallholder sunflower (Helianthus annuus L.) Farmers. A.O. Omotayo* Department of Agriculture, Food and Resource Sciences, University of Maryland Eastern Shore, Princess Anne, MD 21853.

Environmental variability remains a critical threat to agriculture globally, with South Africa facing acute challenges due to persistent water scarcity and food insecurity. Addressing these issues requires innovative strategies, particularly those tailored to smallholder farming communities. This study investigates how Smart Agricultural Technology (SAT) adoption influences gender-differentiated food-nutrition and water security (FNWS) outcomes among smallholder sunflower farmers in selected South African villages. Using a multistage sampling approach, both qualitative and quantitative data were collected. An Endogenous Switching Regression (ESR) model was employed to control for selection bias and estimate the causal impact of SAT adoption on FNWS. The Water Poverty Index measured water security, while the Simpson Dietary Diversity Index and calorie intake per adult equivalent captured food-nutrition security. Findings show that SAT adoption significantly improves FNWS across gender groups. For female-headed households, dietary diversity and calorie intake rose by 28% and 30%, respectively, while the water poverty index fell by 18%. Male-headed households recorded a 21% and 35% increase in dietary diversity and calorie intake, respectively, and a 23% reduction in water poverty. Access to extension services, environmental variability information, and off-farm income were key drivers of adoption. These results confirm the potential of SAT to strengthen resilience and resource use efficiency. Policy interventions should prioritize investments in farmer training, extension service delivery, and targeted support for resource-limited and women farmers to scale up SAT adoption and sustainably enhance FNWS in South Africa.

1269

Cold Atmospheric Pressure Plasma Inactivates Seed-borne Pathogen Xanthomonas campestris pv. vesicatoria on Bell Pepper Seeds. M. Bomma*, Department of Biological Sciences, Alabama A&M University, Normal, AL 35762; S. Madison, Department of Natural Resources and Environmental Sciences, Alabama A&M University, Normal, AL 35762; B. Ramkorun, Department of Physics, The University of the South, Sewanee, TN 37383; S. C. Thakur, Physics Department, Auburn University, Auburn, AL 36830; N. Nagarajan, Department of Mechanical and Aerospace Engineering, University of Alabama in Huntsville, Huntsville, AL 35899; F. Okafor, Department of Biological Sciences, Alabama A&M University, Normal, AL 35762; L. Nyochembeng, Department of Natural Resources and Environmental Sciences, Alabama A&M University, Normal, AL 35762; E. Thomas Jr., Physics Department, Auburn University, Auburn, AL 36830; and S.R. Mentreddy, Department of Natural Resources and Environmental Sciences, Alabama A&M University, Normal, AL 35762.

Microbiological contamination continues to pose a significant challenge across multiple sectors, including food production, agriculture, medicine, and environmental protection. In response, alternative, environmentally sustainable decontamination strategies are being explored. Among these, cold atmospheric pressure plasma (CAPP) has gained attention as a promising, non-thermal, and eco-friendly technology for microbial control. This study evaluated the effectiveness of a helium-driven CAPP against Xanthomonas campestris pv. vesicatoria, a seed-borne bacterial pathogen known to cause leaf spot disease in bell pepper plants. Bacterial suspensions were exposed to plasma discharge at 6 and 8 kilovolts (kV) for 6 or 8 minutes. Growth kinetics were analyzed through optical density (OD) measurements over 24 hours using a Bioscreen microplate reader, while morphological alterations were examined via scanning electron microscopy (SEM). Untreated controls exhibited the highest OD mean value of 0.40, indicating robust bacterial growth. In contrast, plasma-treated cells at 6 minutes displayed the lowest OD values of 0.26 (8 kV) and 0.29 (6 kV), corresponding to growth reductions of 33.5% and 26%, respectively. Slight increases in OD at 8 minutes (0.30 and 0.31) suggested decreased efficacy at longer exposure durations. SEM analysis revealed pronounced membrane disruption, cell shrinkage, and surface pitting in samples treated for 6 minutes, whereas 8-minute exposures

produced fewer visible damages, suggesting a saturation threshold. Overall, results confirm that exposure duration critically influences the antimicrobial efficacy of CAPP, with 6 minutes representing the optimal treatment time for bacterial inactivation. Thus, CAPP offers a sustainable, effective strategy for controlling seed-borne pathogens in agriculture.

1270

Teaching Through Research: Expanding Experiential Learning Across Agricultural and Human Sciences. S. L. Kennedy Benson*, Department of Human Sciences, Southern University and A and M College, Baton Rouge, LA 70813; J. Morton*, Department of Agricultural Sciences, Southern University and A and M College, Baton Rouge, LA 70813.

This project demonstrates an interdisciplinary approach to experiential learning that integrates Agricultural and Human Sciences through whole-class research engagement. Using the Wool Study Model, a collaborative experiment focused on cleaning raw wool and analyzing absorbency properties, faculty developed a scalable framework that allows students to experience every phase of the research process. Students participate from hypothesis formation and data collection to analysis and dissemination through abstracts, posters, and presentations. This approach cultivates scientific literacy, collaboration, and problem-solving skills while enhancing engagement in applied Agriculture and Human Sciences fields. The model bridges the gap between classroom theory and professional practice by transforming traditional lectures into project-based learning experiences that support undergraduate research skill development. To date, more than 40 students across both disciplines have participated in variations of this activity, applying findings to textile science, sustainability, and agricultural production contexts. The model has also been implemented as a professional development module during the Southern University Faculty Institute, where it was shared with faculty across all disciplines as an example of active, research-based learning integration. Outcomes include increased student interest in research, improved comprehension of scientific methods, and greater confidence in presenting findings. The project demonstrates how interdisciplinary research and experiential teaching can advance student learning outcomes, promote cross-departmental collaboration, and strengthen institutional capacity for hands-on education.

1271

New Technics of Greenhouse Management and Innovative Ideals. A. Roberson*, and B Biswas, Fort Valley State University, Fort Valley, GA 31030.

In the face of global change, traditional agricultural practices, which currently supply approximately 95% of our food, are proving unsustainable. While fertilizers have temporarily boosted yields, their long-term effects including human and animal health issues, soil erosion, and degradation are significant drawbacks. These issues, coupled with growing public demand for nutritious, low-cost produce, especially as more consumers shift to plant-based diets, necessitate a departure from conventional soil-based farming. This work explores the adoption of Controlled Environment Agriculture (CEA), specifically focusing on innovative greenhouse management and soilless farming systems like hydroponics. These techniques offer compelling solutions to critical resource challenges: climate variability, water scarcity, and limited space. Our research and development efforts at Fort Valley State University are centered on creating more efficient, accessible systems. This includes the design and construction of a self-contained CEA room with precise control over temperature, humidity, lighting, and video monitoring, with future plans for UV sterilization and automated exhaust. Crucially, we are innovating low-cost, small-footprint soilless systems that are accessible to a wider audience, from commercial farmers to individual households. These designs utilize readily available materials and are engineered to maximize output, allowing up to 36 plants to grow in under 2 square feet of space. This research aims to present practical, improved designs and techniques that contribute to sustainable food production, enhancing food security and nutritional access for the community and beyond.

1272

Study of Soilless Technology for Food Security and Food Safety Research is New Hope for the Future Ag Research. B. Biswas*, C. Harris, J. Mimbs, A. Roberson & S. Sarkar, Specialty Crop Research, College of Agriculture, Family Sciences and Technology, Fort Valley State University, Fort Valley, GA 31030

A cutting-edge training center designed to address critical gaps in modern agricultural education by focusing on high-producing, sustainable soilless farming techniques and the creation of value- added products. The initiative responds to the growing demand for skilled Agri-professionals capable of navigating climate change challenges, limited arable land, and the need for enhanced food security and food safety research. To train future generations to study the effectiveness of new technology we have been investigating soilless technology. In this study we studied lead (Pb) and microplastics. Pb contamination poses significant environmental threats to agriculture and human health, particularly in crops cultivated in traditional farming using potentially contaminated water sources. This study investigates the physiological impacts of environmentally relevant lead exposure on romaine lettuce (Lactuca sativa var. longifolia). Twenty-four romaine lettuce plants were evenly divided between two identical hydroponic systems: one dosed with a 10 ppm Pb solution using lead nitrate ($Pb(NO_3)_2$) and one untreated as a control. Per day the average plant in Control 'A' grew 0.5g per day but lead infilter plants have not shown signs of growth. In our observation the control plants take 12.5 milliliters of water a day while the lead contaminated plants take 2.07 milliliters/day. Physiological growth parameters—including biomass, leaf number, plant height, and root development rates were measured regularly over 4 weeks. The study aims to clarify the effects of lead toxicity on growth in romaine lettuce, providing valuable insights into plant tolerance, contamination risks, and management strategies for safer vegetable production.

1273

Effect of Carbon Nanotubes on the Germination and Growth in Lettuce and Chili Plants. V. N. Degala* and H. P. Singh, Nanotechnology Laboratory, Department of Agricultural Sciences, College of Agriculture, Family Sciences and Technology, Fort Valley, GA 31030.

Carbon nanotubes (CNTs) are considered a promising nanomaterial for diverse applications, including agricultural and horticultural practices. Carbon nanotubes can be a potential source to accelerate seed germination and improved plant growth, thus increasing production to meet the global demand of agricultural produce. The physio-chemical characteristics of carbon nanotubes, play a major role in the rate of transportation of water and minerals that in turn enhance seed germination and plant growth. This study evaluated the effect of carbon nanotubes on the germination and growth in lettuce and chili plants. Single walled carbon nanotubes (SWCNTs) and multi walled carbon nanotubes (MWCNTs) in two different concentrations each of 10 and 30 µg/mL were added to Murashige and Skoog (MS) medium with gellan gum in magenta boxes. The carbon nanotubes were subjected to sonication with 45 amplitude for 10 min followed by 42 amplitude for 60 min to avoid clumping and obtain uniform distribution in MS media. The morphology of carbon nanotubes and their distribution in MS media were analyzed using advanced microscopy. Sterilized lettuce and chili seeds were placed on MS medium with and without SWCNTs, MWCNTs and placed in a plant growth chamber for up to 12 days. Percentage germination, stem length, root length, chlorophyll content, wet and dry biomass of lettuce and chili were recorded. SWCNTs, MWCNTs media showed a higher percentage of germination, stem length, root length, chlorophyll content, wet and dry biomass compared to control in lettuce and chili plants.

1274

Assessing Improved Livestock Grazing Feed in a Solar Corridor Cropping System through HighThroughput Aerial Phenotyping. S. Tesfaye*, T. Hurisso, B. Alsunuse, College of Agriculture, Environmental and Human Sciences (CAEHS), Lincoln University of Missouri, Jefferson City, MO 65101; and T. M. Reinbott, R. J. Kremer, University of Missouri, Columbia, MO 65201.

High-throughput aerial phenotyping is being utilized to assess the viability of livestock grazing feed planted in a solar corridor cropping system for all year-round grazing. Producing winter forage, harvesting and storing it requires significant financial investment and is a challenge to Missouri's beginning and underserved community ranchers with limited resources. It is postulated that an all-yearround grazing system comprised of grain sorghum together with a high-protein summer and fall/winter cover crops planted in a solar corridor cropping system would tackle the issue. It is anticipated this approach affords livestock producers to develop a high energy and protein-rich grazing system during the fall and winter, thereby minimizing the cost of animal feed. To test the validity of this approach experimental field plots are planted with grain sorghum at wider row spacing and protein-rich forage crops in the corridors between grain sorghum rows at Lincoln University-MO's Alan T. Busby Research Farm. The plots are mapped with Micasense RedEdge-MX/P multispectral cameras and DJI's L2 LiDAR sensor mounted on a Matrice 350 small unmanned aerial

vehicle (drone). Flights were conducted at an altitude of 30m above ground on weekly basis. High-throughput aerial phenotyping data collection began in summer 2025 and will be processed to determine various plant morphological and physiological parameters including height, chlorophyll content, leaf area index, etc. and analyzed to estimate biomass, forage yield and quality. Ultimately, the high-throughput aerial phenotyping results will be calibrated using conventional field data results to generate predictive models for biomass, forage yield and quality.

1275

Grain Sorghum Production in the Solar Corridor Cropping System for Livestock Winter Feeding. T. Hurisso*, College of Agriculture, Environmental and Human Sciences (CAEHS), Lincoln University of Missouri, Jefferson City, MO 65101; T. Reinbott, William Lee; University of Missouri, Columbia, MO 65201.

Feed costs represent the largest expense in a livestock operation. Of feed costs, winter feed costs are the highest. A production method that aims to further utilize the available light energy from the sun is the Solar Corridor Cropping System (SCCS), in which a high-energy crop is grown on 60-inch-wide rows to create a “solar corridor”. Subsequently, a protein-rich floor crop or intercrop can be planted in the corridor for grazing in late fall and winter to meet livestock energy and protein needs. In this 2-year study, grain sorghum was utilized as a high-energy primary crop and forage soybean or cowpea as an intercrop, with grain sorghum in 30-inch-wide rows (solid seeded) as a control. Biomass of grain sorghum was highest in solid seeded than that of solar corridor-based treatments in both years. Overall, our preliminary results indicate that crude protein and total digestible nutrient levels were greatest in heads and leaves of grain sorghum suggesting that grain sorghum grown in the solar corridor can provide sufficient protein and energy for grazing animals in the fall and winter.