ALABAMA A&M UNIVERSITY

STEM DAY 2023

April 13th

STEM Day 2023

Collaboration and Innovation for the Future

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ALABAMA A&M UNIVERSITY

OFFICE OF THE PRESIDENT

April 13, 2023

Greetings, STEM Day Participants!

I am pleased to welcome each of you to Alabama A&M University's Annual STEM Day event. The 2023 theme is "Collaboration and Innovation for the Future." So many times, our creative energies are rekindled through collaboration. The excitement inherent in the STEM disciplines ensures a campus that is alive and conducive for intellectual discourse.

Previous STEM Day programs, even those impacted by the pandemic, have been remarkable displays of students' academic talents. Several AAMU students display their often enlightening research on posters and easels. They then enthusiastically share their methodologies and findings with attendees and knowledgeable judges. Members of the campus and surrounding community are invited to witness the embodiment of Science, Technology, Engineering and Mathematics, as well as to gain an appreciation for the young minds and budding futures behind the science.

As the preceding Black History Month and Women's History Month demonstrate each year, there have been numerous inventions and accomplishments fueled by minds from every walk of life. This exciting event is a logical continuation of those celebrations. Indeed, Alabama A&M University remains a leading producer of African-American computer scientists, engineers, mathematicians, agriculturalists and researchers.

Thus, today celebrates the contributions of our students, faculty and staff who continue each day to promote the importance and relevance of STEM disciplines. We know the presentations will maintain the fervor of past events and build excitement for years to come.

Sincerely,

Daniel K. Wims, Ph.D.
President

Alabama A&M UNIVERSITY

Academic Affairs
108 Patton Hall
Normal, Alabama 35762
(256) 372-5275 Office
(256) 372-5278 Fax
www.aamu.edu

March 31, 2023

Dear STEM Day Participants:

Welcome to Alabama Agricultural and Mechanical University! It is my genuine pleasure to extend my personal greetings and support to the 16th Annual Science, Technology, Engineering and Mathematics (STEM) Day. We are especially pleased to promote and foster the STEM disciplines of the university, while showcasing the achievements of our faculty, staff and students. In addition to showcasing achievements, STEM Day provides our students opportunities to partner and collaborate with faculty and professional mentors from local businesses and industry, presenting research projects in science and technology.

Our 2023 STEM Day theme, "***Collaboration and Innovation for the Future***" reflects an approach to discovery reliant on interdisciplinarity and ingenuity in the quest for new discoveries in STEM. Essential concepts and techniques learned in the classroom and applied through research provide our students with an excellent skill set required for future scientist and scholars.

It is our intent that STEM Day continues to cultivate initiatives, create alliances, and encourage student participation in the science, technology, engineering and mathematics disciplines. I wish each of you the best as you engage all that the program has to offer.

Again, welcome to STEM Day 2023 at Alabama Agricultural and Mechanical University, and best wishes in today's competitions.

Sincerely,

John D. Jones, PhD
Provost and Vice President of Academic Affairs

Alabama A&M UNIVERSITY

Office of the Vice President for
Research and Economic Development
4900 Meridian Street
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(256) 372-7010 Office
majed.eldweik@aamu.edu

March 29, 2023

Greetings, STEM Day Participants,

The Research and Economic Development Team, (R.E.D.), would like to welcome each and every participant to the Annual Science, Technology, Engineering and Mathematic (STEM) Day at Alabama Agricultural and Mechanical University. This event provides our participants with tremendous opportunities and knowledge to collaborate with industry and local businesses all over the United States.

Because of this event, students will definitely become familiar with research and up-to-date technological advancement in the STEM program. As an advocate of research and Economic Development it is indeed a pleasure to applaud, promote and support the STEM program.

This office will continue to support the STEM Day. I know that the presentations and exhibits that will be displayed will show the students the efforts and strong faculty members that are mentoring our students at AAMU.

The 2023, "**Collaboration and Innovation for the Future**" STEM event theme will show the student's that you can "**Start Here and you can go Anywhere**".

Sincerely,

Majed Dweik

Majed El-Dweik, PhD
Vice President of Research and Economic Development

Alabama A&M UNIVERSITY

School of Graduate Studies
Alabama A&M University
Patton Hall 300
Normal, Alabama 35762
(256) 372-5266 Office
(256) 372-5269 Fax

4/10/23

Greetings,

I want to take this opportunity to welcome you all to the 16th Annual ***Science, Technology, Engineering, and Mathematics*** (STEM) Day at Alabama Agricultural and Mechanical University (AAMU). I applaud the outstanding achievement of our student's hard work which is translated from their engagement in research activities in various STEM disciplines. In the ever-changing, increasingly complex world, it is more important than ever before our students be prepared to bring knowledge and skills to problem-solving, make sense of information, and know how to gather and evaluate evidence to make decisions. These are the kinds of skills that students develop in engaging in research. This occasion is a clear testament emanating from the hard work and the aspiration of our students and their respective faculty mentors in the various STEM discipline.

We are committed to the continued advancement of collaborative work and innovative thinking within our colleges and between our research labs and industry leaders, hence the theme of this year's STEM DAY is ***Collaboration and Innovation for the Future.*** The future is likely to be won by those who do not wait for the light bulb moment but rather develop a collaborative relationship to leverage the collective power of innovation. I believe you have adequate preparation based on your cross-disciplinary research as will be reflected by your respective presentations.

As we continue to provide advanced educational opportunities to meet your career aspirations, I encourage you to explore the possibility of advanced degrees in your preparation to enter the workforce, particularly the undergraduate graduating seniors. Finally, I am extending my best wishes to all of you who will participate in the STEM poster and oral competitions, and regardless of the outcome, I consider you all to be winners.

Sincerely,

Dr. Vann Newkirk

Van Newkirk, Ph.D.
Dean of Graduate Studies

Alabama A&M UNIVERSITY

College of Agricultural, Life and Natural Sciences
College of Engineering, Technology and Physical Sciences
College of Education, Humanities and Behavioral Sciences
College of Business & Public Affairs

Offices of the Deans

April 13, 2023

Dear Participants:

This year Alabama A&M University (AAMU) focuses on *"Collaboration and Innovation for the Future."*

As 2023 STEM Day participants, we again are pleased and excited to take in the depth of your research efforts and outcomes. This time continues to underscore the excellence that shows forth each year in the areas of our science, technology, engineering and mathematics programs.

In our efforts to prepare you to excel in and develop your spheres of influence, it is apparent that many of you have "understood the assignment" and have even now begun to blossom as young scientists, technologists, engineers, and mathematicians. For others, who are just beginning their academic journeys, we applaud you and hope that perhaps your appetites will be whetted by this experience and more to maintain this course of distinction.

Therefore, as Faculty, Researchers, Advisors, and Mentors, we continue to support STEM Day in word and deed through promoting these programs and funding STEM events. We extend our gratitude to the planners and organizations of this year's events and commend them for their efforts in making this a tremendous success. We look forward to an inspiring day and we thank you for your participation.

Sincerely,

Lloyd T. Walker, PhD
Dean/1890 Research Director
College of Agricultural, Life & Natural Sciences

Zhengtao Deng, PhD
Dean
College of Engineering, Technology & Physical Sciences

Lena Walton, PhD
Dean
College of Education, Humanities & Behavioral Sciences

Charles W. Richardson, Jr., PhD
Dean
College of Business & Public Affairs

Alabama A&M UNIVERSITY

Pyroelectric, Surface Properties
& Dielectric Materials Laboratory
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March 31, 2023

Theme: "*Collaboration and Innovation for the Future*"

Dear STEM Day Participants:

As the Founder of STEM Day at Alabama A&M University (AAMU), I am delighted to welcome you to STEM Day 2023. Through this correspondence, I wish to take a moment to address this year's theme, "*Collaboration and Innovation for the Future*." This theme suggests excellence and a commitment of research engagement in the STEM disciplines of unprecedented proportions by the faculty and students of the University with greater support of the same by administrators, staff, and stakeholders. This commitment points to the notion of having higher and higher STEM programs, at both the graduate and undergraduate levels, which provide students and faculty with a scholarly pathway to success that exemplifies the essence of STEM Day. As such, during the many activities of this day, STEM students with faculty mentors will showcase their research and scholarly investigations, demonstrating the best of what we do. Additionally, some faculty members, especially younger faculty members, will use this academic forum to achieve Faculty Development, through assuming leadership roles in organizing this multiple-disciplinary conference. Collectively, in this regard, STEM Day 2023 provides a reflective quality, which allows students and faculty members to expand their appreciation for the entire STEM enterprise—from the earlier educational component to later career application and employment.

Additionally, this year's theme is important and extremely timely as a mean to help galvanize our energies in a focused effort to tackle existing problems of science, mathematics, engineering and technology, including climate change, energy demands, food shortages, and healthcare needs. It invites the ascendancy to a new national normal for our country, where all individuals, regardless of their current location or place of origin, including persons from underrepresented groups—women, minorities, rural-dwelling Americans, the handicap, and immigrants—can participate in the scientific enterprise to the level of their individual abilities and talents. With this broader level of participation, we will encounter no problem that is beyond our ability to solve successfully when we serve with this personal commitment.

It is this level of participation and commitment that are available for you at STEM Day 2023. To that end, I wish you success in today's competition, continued enjoyment throughout the day, and a deepening appreciation for research engagement in the STEM disciplines and in the unending awareness that facts do matter!

Best regards,

Matthew E. Edwards

Matthew (Matt) Edwards, Ph.D.
Founder of AAMU STEM Day
Professor of Physics,
Fellow & Assoc. Director of the Alabama Academy of Science (AAS)
Former Dean, School of Arts and Sciences

Alabama A&M UNIVERSITY

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The Origination, Value, and Sustainability of STEM Day:

Before there was a STEM Day at Alabama A&M University (AAMU), I had attended numerous science and science education meetings, one of which was called Dynamic Days that considered chaos theory and differential equations. Moreover, I had worked previously at another institution, which at that time hosted an Annual Science Program. As an undergraduate student, I had worked at Argonne National Laboratory as a summer intern and later presented my first science talk at the Southeastern Section Meeting of the American Physical Society, while being a new graduate student. These experiences were all fulfilling, which further caused me to realize the significance of conducting research and sharing it with other individuals. In addition, I had previously organized science programs, and had taken students to government laboratories and to many science and engineering conferences. Although there can be no certainty of how or why it occurred, I believe that during the Fall Semester of 2006, somewhere between thinking about attending the Dynamic Days meetings, of presenting talks and posters at regional and national conferences, of taking students to meetings and government laboratories, of participating in previous Annual Science Programs, and of mentoring students at AAMU, the thought arose in my mind of the need for a yearly event at AAMU to be named "STEM Day."

Initially, not only did I contemplate the thought but also knew I had to tell someone about it. Therefore, I requested a meeting with then Provost Beverly Edmond. In a few days after my request, I arrived at the Provost's office and settled into a chair before the desk where she was seated. In order to buffer or assuage myself against a total rejection, I decided to offer two suggestions hoping that she would accept one, at least, and both if I were very lucky, and while not mentioning it earlier, I had been thinking also of how to deliver science content material better to students and how that process could be improved at AAMU. Thus, after exchanging pleasantries, I told Dr. Edmond that I had two ideas that I thought would benefit or be of value to the entire University. I stated that a need exists for a Center for Teaching and Learning to help early career and retooling faculty members to improve their teaching abilities, and secondly a need exists for an annual event called STEM Day to serve scholarly students and faculty members to illustrate the results of their research and individual studies. After a few other exchanges between us, and a brief moment in reflection, Dr. Edmond did not hesitate before replying that the two ideas were meritorious, so "let's make them happen." Thereby, with that simple statement, the goal was achieved, resulting in no rejection of my suggestions but in two positive outcomes all completed with one effort.

I departed from the Provost's office and returned to V. M. Chambers Hall knowing of her support to begin STEM Day and an educational center. The Center was established soon after my meeting with her, without my intervention, and near the end of Fall Semester 2006, I called the first STEM Day Organization Meeting; the meeting was held in the Physics Library with Dr. Edmond in attendance. Starting with that meeting, STEM Day had also begun, and all else about this organization since that time has been about its worth and sustainability.

STEM Day has now existed for many years! What a wonderful reality this is for the University to have some of its brightest students to conduct research and present their findings via posters to persons who have an interest in their work. Moreover, I am delighted to have participated in, have observed faculty members mentoring students in this manner, and have seen faculty and staff members taking leadership roles to make each STEM Day a success, all done with the support of the administration of the institution. Finally, it is each of you who will find the worth in STEM Day and help to sustain its existence at AAMU.

Very sincerely yours,

Matthew E. Edwards

Matthew E. Edwards, Ph.D., Professor of Physics
FRM. Dean, School of Arts and Sciences, and Founder of STEM Day

Biographical Sketch of Dr. Matthew E. Edwards, STEM DAY Founder at AAMU

Employment and Scholarly Activity: Since January 2002, Dr. Edwards has been a Professor of Physics at Alabama A&M University (AAMU) and served as the Dean of the School of Arts and Sciences from 2007 to 2011. Prior to 2002, academic positions he held included associate professorships at Spelman College and Fayetteville State University, and a visiting associate professorship and adjunct faculty position at the University of Pittsburgh, and an assistant professorship at the University of Arkansas at Pine Bluff. He has held summer-faculty-research positions at several Government Labs: the ROME Air Force Research Lab, NASA Langley Research Lab, and the Naval Research Lab. Dr. Edwards is a Condensed Matter physicist with expertise and interests in quantum physics/solitons wave theory, the materials of electrooptics, pyroelectricity, resistivity, and dielectric properties of crystals and nano-particles doped organic thin films, and in STEM Education. Dr. Edwards has more than 50-refereed papers and journal proceedings and has made greater than 55 professional and administrative presentations. He has guided seven students to advanced degrees: four to the Ph.D., and three to the Master's degree, has served on more than 20 dissertation and thesis committees, and has peer-reviewed greater than 25 research manuscripts. Currently, he is guiding two Ph.D.'s and one Master's degree student. Moreover, he sits on the Board of Directors of two science journals and one science education journal and serves on the executive committee of the Alabama Academy of Science.

Formal Training: Dr. Edwards graduated from Central High School in Goldsboro, North Carolina in 1965 and received the Master's and Ph.D. degrees in physics from Howard University, Washington, D.C, in 1975 and 1977, respectively, and received a B.S. degree in engineering physics from North Carolina A&T State University, in 1969. Additional studies included advanced physics courses at the University of North Carolina, Chapel Hill, North Carolina, in 1987, certificate studies at MIT, Boston, Massachusetts, in 2009, and Materials Science studies at the University of Alabama, Sumer 2000.

Honors and Awards: Dr. Edwards has received (1) the award of Fellow of Alabama Academy of Science, March 2022, (2) the award of Interdisciplinary Fellow of the International Institute of Informatics and Systemics (IIIS), July 2019 (3) The William Lesso Memorial Award for Excellence in Physics and Interdisciplinary Communications, July 2018 (4) Session Best Paper Awards, of the Proceedings of the International World Multi-Conference on Systemics, Cybernetics, and Informatics, in three years, July 2013, 2014, and 2016, (5) Top Faculty Award At Online Affordable HBCUs, 2013 & 2014, (6) Nuclear Research Commission (NRC) Faculty Research Participation Program Award, 2011 & 2012, (7) Madison Who's Who Recognition, 2011, (8) American Society for Engineering Education (ASEE) Fellowships, 1996, (9) Received the Noble Achievement Award from NAFEO, 2009, (10) The Special Recognition Award from Science Spectrum Magazine as a Top Minority in Research Science, September 2005, (11) Who's Who in American Colleges and Universities Recognition, 2004, (12) Presidential Award for Excellence in Teaching, from Spelman College, 2001, (13) Outstanding faculty of the year award from the Department of Natural Sciences, Fayetteville State University, 1994, (14) The Award from the National Institutes of Health (NIH)—National Institute of General Medical Sciences, 1991.

Achievements: Dr. Edwards was the Guest Editor of the special issue of the American Journal of Materials Science in 2015. He holds membership in several scientific and scholarly organizations. He has been the PI or Co-PI on more than 20 grants and contracts, totally more than 6.00 million dollars. He founded: (1) the Biomedical Research Program at Fayetteville State University, (2) the Interdisciplinary Center for Health Science and Health Disparities & Materials, at AAMU, and (3) STEM Day at AAMU,

Personal Information: Dr. Edwards's immediate family consists of wife, Glenda Robinson Edwards, a son, Matthew Edwards, Jr., with his significant other Rosalind Combs, two granddaughters, Megan and Misty Edwards, and their mother Shirley Haywood, a daughter, Natasha Hall with her husband Daniel, and two other granddaughters, Kaylie and Alexis Sellers, and Glenda's grandson, and great grandson, Courtland Cutler and Nicholas Cutler, respectively.

Welcome and Greetings!

It is an honor on behalf of the 2023 STEM-Day organizing committee to welcome you to Alabama A&M University's (AAMU) 16th Annual Science, Technology, Engineering, and Mathematics (STEM) Day. We are excited to provide our students the platform to exhibit the outcome of their hard work emanating from their collaborative research efforts with their respective faculty mentors. Hence, today is extraordinary for AAMU, as we have the opportunity to witness students, display their talents and innovative research while engaging the community by showcasing and disseminating their research professionally. The intellectual discourse befits this year's 2023 STEM-Day theme, "***Collaboration and Innovation for the Future***". As the theme is interwoven into the AAMU core values, the bottom line of today's research model is more dependent than ever on complex, multidisciplinary collaboration to bear innovation. Essentially, we are committed to the realization of embracing a cross-disciplinary approach for our students' academic and professional preparation in the STEM discipline. Despite being impacted by the COVID-19 pandemic for past three years, we are very proud of this year's STEM Day as we received an overwhelming number of abstracts for undergraduate students from sundry academic programs to participate in the poster presentations, likewise, graduate students for poster or oral presentations.

We cannot overemphasize the significance of the Annual AAMU STEM Day event when students come together in large numbers to present their scientific research findings. Through their research preparation, our students are developed to become problem solvers. Today's exhibition is a clear testimony of their readiness to tackle the challenges facing this great nation and world at large.

The 2023 STEM Day Committee expresses its deepest gratitude to the following sponsors: President's Office and Title III, Dean of the College of Agriculture, Life & Natural Sciences; Dean of the College of Engineering, Technology and Physical Sciences; Dean of the College of Education, Humanities and Behavioral Sciences; and Dean of the College of Business and Public Affairs, VP Research and Economic Development, VP Marketing, Communication & Advancement, Medtronic, Boeing, Honda, Ferguson, ServiceNow, Southern Co., Dairy Farmers of America, American Cast Iron Pipe Co., Whiting & Turner, etc. We would also like to acknowledge the support and backing of the AAMU Career Development Services Office. Also, we would like to convey a special thanks to our guest speaker and judges, who graciously devote time and efforts committed to our students. We would also like to thank our President, Provost, Deans, Upper university's administration, and the various department heads and faculty members in their roles in providing resources and mentoring our students.

The 2023 STEM Day Committee is grateful of your attendance, and we sincerely hope you will have a lively and conducive intellectual discourse as the students present the respective research projects on which they have been working.

Lamin S. Kassama, Ph.D.
Chair, 2023 STEM DAY
Department of Food and Animal Sciences, CALNS

Laricca Y. London, Ph.D.
Co-Chair, 2023 STEM DAY
Assistant Professor of Biology
Department of Biological and Environmental Sciences, CALNS

Pooja P. Preetha, Ph.D., Aff. M. ASCE
Co-Chair, 2023 STEM DAY
Assistant Professor,
Department of Civil & Mechanical Engineering and Construction Management, CETPS

ALABAMA A&M UNIVERSITY

Collaboration and Innovation for the Future

16th Annual STEM Day 2023 Program

Health and Wellness Center

April 13, 2023

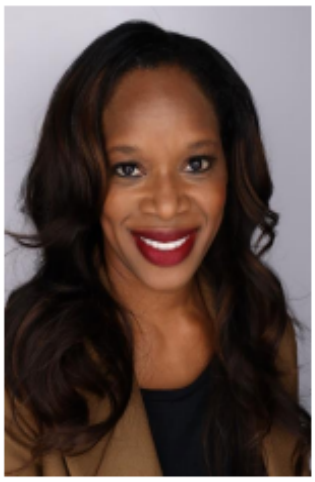
7:30 – 8:15 AM	**Breakfast & Registration**	
8:15 – 8:45 AM	**Welcome & Opening Remarks**	**Lamin S. Kassama, Ph.D.** Chair, STEM Day 2023
		Daniel K. Wims, Ph.D. President, Alabama A&M University
	Welcome Remarks: Provost	**John Jones, Ph.D.** Provost, Alabama A&M University
	Welcome Remarks: Founder	**Mathew Edwards, Ph.D.** Founder, STEM Day
8:45 – 9:15 AM	Introduction of the Speaker	**Lauryn E. Page** Senior, Mechanical Engineering President/Founder, Vex Robotics Club
	STEM Day 2023 Keynote Speaker	**Ms. Cynthia Reese, MBA, RN** Director External Partnerships & Community, Medtronic
9:15 – 9:25 AM	Special Presentations	**Lamin S. Kassama, Ph.D.**
9:30 – 12:15 PM	Student Poster Presentations	**Viewing and Judging**
9:35 – 12:30 PM	Graduate Oral Presentations	
	High School STEM Demonstrations	
12:15 PM	**Lunch**	
12:30 – 3:15 PM	**Interactive Programs** Employer Tables Graduate Information Sessions Research Collaborative Forum	
3:30 PM	**Awards Ceremony**	**Saguna Anasuri, Ph.D., CFLE**
4:00 PM	**Closing Remarks**	**Lamin S. Kassama, Ph.D.**
4:00 – 5:00 PM	**Poster Removal and Wrap-Up**	**Students/Volunteers**

Keynote Speaker

Medtronic

Cynthia Reese

Director External Partnerships and Community



CYNTHIA REESE is Director, External Partnerships and Community for Global Inclusion Diversity and Equity at Medtronic, a leading global healthcare technology company. In this role, Cynthia is responsible for strategic oversight and relationship management of enterprise partnerships that enable Medtronic's IDE strategy. Those include partnerships such as TMCF (Thurgood Marshall College Fund), SHPE (Society of Hispanic Engineers) and HRC (Human Rights Campaign), to name a few.

Cynthia has been with Medtronic over 16 years, serving in field and people and program manager roles while working collaboratively across functions to deliver solutions that positively impact our patients and customers. She has also held numerous leadership roles within the African Descent Network (ADN) employee resource group.

Prior to joining Medtronic, Cynthia worked at Novartis pharmaceuticals as a sales representative in Bentonville, AR and at Methodist LeBonheur Healthcare in Memphis, TN as a nurse educator.

Cynthia holds a BS in Nursing from Union University, an MBA from Webster University and a certificate for Diversity, Equity, and Inclusion from the University of South Florida. Cynthia enjoys travel, fitness and serving as an Uber driver and bank to her children, Madison 15, and Michael 12.

ALABAMA A&M UNIVERSITY

STEM DAY 2023

ABSTRACT CATEGORIES

POSTERS	
Undergraduate	**Graduate**
Biological and Environmental Sciences	Biological and Environmental Sciences
Community and Regional Planning	Community and Regional Planning
Family and Consumer Sciences	Family and Consumer Sciences
Food and Animal Sciences	Food and Animal Sciences
Accounting & Logistics	Leadership Education and Secondary Eduction
Marketing and Management	
Electrical Engineering and Computer Science	
Mechanical and Civil Engineering and Construction Mangement	Mechanical and Civil Engineering and Construction Mangement
Physics, Chemistry and Math	Physics, Chemistry and Math
ORAL PRESENTATIONS	
Biological and Environmental Sciences	
Community and Regional Planning	
Family and Consumer Sciences	
Food and Animal Sciences	
Electrical Engineering and Computer Science	
Mechanical and Civil Engineering and Construction Mangement	
Physics, Chemistry, and Mathematics	

ABSTRACTS

POSTERS

BIOLOGICAL AND ENVIRONMENTAL SCIENCES

Undergraduate

Abstract # 101

Determination of Antimicrobial effects of Ashwagandha, Moringa and Bitter Leaf Extracts

OluwaBukunmi Babalola; Babalola, O., & Okafor, F.

Mentor(s): Dr. Florence Okafor

Department of Biological and Environmental Sciences

Withania somnifera or Ashwagandha, Moringa oleifera, and Vernonia amygdalina or Bitter leaf are medicinal plants traditionally used for various health benefits and purposes. The objective of this study was to determine the antimicrobial effects of these plant extracts against various select bacteria including Staphylococcus, Escherichia coli, Clostridium sporogenesis, Lactobacillus, and Bacillus subtitles was determined. The antimicrobial activity of the extracts was tested on agar plates using the good diffusion method and measuring the zones of inhibition. The extracts were individually introduced into the agar wells and sterile distilled water was used as control. The plates were incubated at 37 degrees Celsius for 24 and 48 hours. Observed Zones of inhibition ranged between 15mm – 27mm. Preliminary studies show that Bitter leaf extracts' efficacy appears to be inhibitory and not bactericidal. The Moringa and Ashwagandha on other hand were bactericidal. Extracts of these medicinal plants could, therefore, be used as alternatives to antibiotics.

Abstract # 102

Evaluation of Environmental and Socioeconomic Indexes in North Huntsville, AL Using the EJScreen Tool

Jonae Cameron; Cameron, J., Moss, E., & Chappell, S.

Mentor(s): Dr. Elica Moss

Department of Biological and Environmental Sciences

Huntsville, AL, currently the largest city is Alabama, has a low cost of living and proximity to industry partners and customers which allows companies to tap into a rich history of innovation and a pool of local talent which makes it easy for manufacturing companies to recruit new workers. This continued

growth and change has led a the W.H. Councill Community Development Corporation (CDC) and the Huntsville Metro Area Black Chamber of Commerce to develop a rehabilitation plan of the Holy Cross/St. Christopher Church, located on Meridian Street in North Huntsville, a predominately African American area, into a Minority Business Collaborative Training Center. The overall goal is to increase procurement and contracting opportunities for businesses owned and operated by minorities and women. The Center will be a shared work environment where people meet, work, network, share ideas, and collaborate on projects. It will offer flexible and private office spaces and areas for networking, training, and business events. The Church was originally constructed to serve Black people displaced by Urban Renewal projects in downtown Huntsville. Due to age, the church and multi-purpose building are suspected of containing environmental hazards, such as lead based paint and asbestos. To assess the Church's proximity to a variety of environmental hazards, we used the Environmental Protection Agency's Environmental Justice Screening and Mapping Tool (EJScreen), which provides the public with a nationally consistent dataset and approach for combining environmental and demographic socioeconomic indicators. The data used is based on nationally consistent data and an approach that combines environmental and demographic indicators in maps and reports. The use of EJScreen is a useful first step in accessing the community-level vulnerability and potential environmental concerns, such as lead, diesel particulate matter, air toxins, underground storage tanks and wastewater discharge near the proposed Center compared to AL and the U.S.

Abstract # 103

Evaluation of Environmental and Socioeconomic Indexes in Africantown (Mobile, AL) Using the EJScreen Tool

Saiban Chappell; Chappell, S., Cameron, J., & Moss, E.

Mentor(s): Dr. Elica M. Moss

Department of Biological and Environmental Sciences

Communities of color are extremely victimized by environmental hazards and are far more likely to live in areas with heavy pollution and health disparities. People of color are more likely to die of environmental causes, and more than half of the people who live close to hazardous waste are people of color. Africatown is a prime example of this systematic letdown. Africatown is a historical community located three miles outside of North Mobile, which is also known as Plateau, Alabama. Africatown, also known as Plateau and Magazine Point, is a small predominantly African American community, home to the last slave ship, the Clotilda, to illegally enter the United States. Located on a major waterway, the area was developed in the early 20th century to host saw and steel mills, while other industries like Kimberly Clark (paper mill) and Hosea O. Weaver & Sons, an asphalt manufacturer, also flourished. Many of the larger employers, like International Paper have since left the area, but residents claim that they released dioxins, furans and related chemicals, as well as a cauldron of other hazardous and harmful chemicals and pollutants in the water and ground have caused high rates of air pollution and cancer. These issues have affected the people within the town and neighbors of the city for years. In

this study, we will look at several parameters of Africatown, with the EJScreen tool. EJScreen is EPA's Environmental Justice Mapping and Screening Tool that provides EPA with a nationally consistent dataset and approach for combining environmental and demographic socioeconomic indicators. Specifically, EJScreen, is a useful first step in accessing the community-level vulnerability and potential environmental information on Africatown such as the air toxins, particulate matter, lead paint, wastewater discharge, as well as the income and ages of the residents.

Abstract # 104

Fish Garden: An Exploratory Investigation of Aquaculture and Aquaponics at the Winfred R. Thomas Agricultural Research Station, Alabama A&M University

Anna Davenport; Davenport, A., Howell, H., Knight, P., & Stone, W.

Mentor(s): William Stone

Department of Biological and Environmental Sciences

Sustainability on this planet is one of the top issues that mankind is facing in modern times. To meet this challenge, ancient methods of farming fish and plants together are being explored and renewed in the new millennium. Aquaculture and aquaponics provide viable opportunities for humans to achieve a sustainable Earth. Aquaculture is essentially the entire lifecycle production of aquatic organisms in an environment where conditions are controlled. This food production method can be combined with hydroponics, which is the production of plants using water instead of soil, to create an inexpensive, eco-friendly system to cultivate both fresh vegetables and fish. At Alabama A&M University's Winfred R. Thomas Agricultural Research Station, a USDA-sponsored program presents an extraordinary research opportunity in fisheries to encourage undergraduate students in scientific disciplines to pursue research careers. Interns and research assistants are able to provide direct support to principal researchers as they study aquaculture and aquaponics, establishing successful systems to observe the symbiotic cycle between the fish and plant. Over the Fall 2022 and Spring 2023 semesters, aquaculture and aquaponics systems were built and upgraded, integrating the farming of large mouth bass, blue gill, and tilapia to provide nutrients to a variety of plant life, including wild rice, lettuce, tomatoes, Bok Choy, and herbs. Initially, four sets of four recirculating water tanks, each with floating trays of food plants above the tanks, were designed and constructed in a cool greenhouse to investigate methods to inexpensively feed the growing human population with native temperate species of flora and fauna. Later, larger recirculating tanks were established in a warmer greenhouse environment for tilapia, a tropical fish, to further explore options for lesser developed countries near the Equator to culture in a rapidly warming world. AAMU students will benefit from these learning opportunities.

Abstract # 105

Assessment of Lentinula Edodes Mycelial Culture Fluids on Bell Pepper Seed Germination And Plant Response to *Xanthomonas Campestris* Pv Vesicatoria

McKenzie Davis; Davis, M., & Nyochembeng, L.

Mentor(s): Leopold M. Nyochembeng

Department of Biological and Environmental Sciences

Bacterial leaf spot (BLS) caused by Xanthomonas campestris pv vesicatoria is a devastating seed borne pathogen of pepper and tomato which occurs worldwide wherever susceptible crops are grown. The disease causes leaf and fruit spots, leading to defoliation, sun-scalded fruit, and yield loss. Submerged culture filtrates of eight shiitake (L. edodes) strains known for their antibacterial activity against Erwinia amylovora (Ea) and Xanthomonas campestris pv vesicatoria (Xcv) were collected after prolonged fermentation in either sucrose or glucose medium and used for soaking bell pepper seeds at different durations viz 0, 2, 4, and 6 hours prior to germination. The soaked seeds were then placed on moist Whatman # 1 filter paper in Petri dishes and incubated at 25°C for germination. The objective of the experiment was to determine the effects of the culture fluids on bell pepper seed germination and subsequent plant response to inoculation with Xcv. The experimental design will be a completely randomized design with four replications. Data collection will include germination %, seedling height, root length, plant biomass and activity of plant defense-related enzymes. This research will validate the antibacterial activity of shiitake mycelial metabolites and their role in induced plant resistance which can be harnessed for managing seed borne bacterial infection in pepper and tomato.

Abstract # 106

The Possible Role of Genetic Variations Of Triadin And Calsequestrin 2 in The Occurrence of Catecholaminergic Polymorphic Ventricular Tachycardia

JoAnna Dennis; Dennis, J., & Yuan, Q.

Mentor(s): Dr. Qunying Yuan

Department of Biological and Environmental Sciences

Catecholaminergic polymorphic ventricular tachycardia (CPVT) is a disease that results in cardiac arrhythmias and can lead to death in those that have this disease. In this study the gene variants that cause CPVT, specifically the genes that are involved in calcium cycling within the heart, were examined using bioinformatics tools. Preliminary data shows that there are twenty-two genes with 2,794 variants that are known to be associated with CPVT. Further analysis using simple clinvar shows three genes, calsequestrin 2 (CASQ2), triadin (TRDN), and ryanodine receptors (RYR2) are the genes with the most variants causing CPVT and all three are involved in calcium cycling with the heart. Now we will further

identify whether the specific mutations of the CASQ2 and TRND genes are harmful or non-harmful, whether they cause structural changes of the proteins and are associated with the occurrence of CPVT.

Abstract # 107

The Role of JAK2 Genetic Variants in the Development of Acute Lymphoblastic Leukemia

Yazmin Douglas; Douglas, Y., & Yuan, Q.

Mentor(s): Dr. Qunying Yuan

Department of Biological and Environmental Sciences

Acute Lymphoblastic Leukemia (ALL) is cancer that starts in the bone marrow and affects the production of white blood cells, causing an excess of immature lymphocytes in the blood. This disease can be life-threatening if untreated, and it has been suggested that genetic variations are associated with the development of ALL. The goal of this research project is to investigate the impact of genetic variations on the JAK2's structure and function in the context of ALL. Using bioinformatics techniques, mutations that may contribute to the development of this disease will be identified. The ClinVar database is used to find the correlation between the JAK2 pathway, its variation, and the development of ALL. The YASARA software will be utilized to further evaluate the structural and functional consequences of these variants. We obtained pathogenic assessments and relevant information about variants of genes that may be involved in ALL and the JAK2 pathway from CliniVar. To date, we have found that the JAK2 gene is located on 9 chromosomes and has 57 variants, which may result in 15 phenotypes.14 of these variants may contribute to the development of ALL. We will continue to research and understand the pathological consequence of JAK2's variants using the software technology. The results of this study will provide a better understanding of the role of genetic variations in the JAK2 pathway in the development of ALL, which may lead to new treatments for this disease.

Abstract # 108

The Identification and Characterization of Environmental Bacteria

Jaela Hill; Hill, J., Johnson, A., & London, L.

Mentor(s): Dr. Laricca London

Department of Biological and Environmental Sciences

Isolating and identifying environmental bacteria is a crucial process in microbiology, as it enables researchers to understand microbial diversity and their role in various ecosystems. The process involves several steps, including sampling the environment, culturing the bacteria, and identifying the bacterial

species using different methods such as microscopy, biochemical tests, and molecular techniques. For this project, surfaces were sampled for the presence of bacteria in the Carter Science Hall on the campus of Alabama A&M University and several bacteria were harvested. Bacteria isolates were characterized via culturing using selective and differential media, Gram Staining, biochemical tests, and DNA analysis for identification. We report our findings here. Despite the complexity of the process, isolating and identifying environmental bacteria adds valuable knowledge to understanding the microbial world and its impact on our environment.

Abstract # 109

The Identification and Characterization of Environmental Bacteria

Arian Johnson; Jonson, A., Hill, J., & London, L.

Mentor(s): Dr. Larrica London

Department of Biological and Environmental Sciences

Isolating and identifying environmental bacteria is a crucial process in microbiology, as it enables researchers to understand microbial diversity and their role in various ecosystems. The process involves several steps, including sampling the environment, culturing the bacteria, and identifying the bacterial species using different methods such as microscopy, biochemical tests, and molecular techniques. For this project, surfaces were sampled for the presence of bacteria in the Carter Science Hall on the campus of Alabama A&M University and several bacteria were harvested. Bacteria isolates were characterized via culturing using selective and differential media, Gram Staining, biochemical tests, and DNA analysis for identification. We report our findings here. Despite the complexity of the process, isolating and identifying environmental bacteria adds valuable knowledge to understanding the microbial world and its impact on our environment.

Abstract # 110

Assessment of Stream Health of Brierfork Stream on AAMU Winfred Thomas Agricultural Research Station, Meridianville, Alabama

Austen Johnson; Johnson, A., Knight, P., Howell, H., & Stone, W.

Mentor(s): Dr. William Stone

Department of Biological and Environmental Sciences

Concerns around our natural resources will continue to grow as urbanization spreads to rural areas and human development expands. One of the many problems we will have to address is the health of our

freshwater ecosystems such as rivers and streams. Rural areas in North Alabama are experiencing a period of rapid development of single-family housing construction. As fields and forests are removed, the mineral soil is exposed and erodes from rain and wind to settle as sediment on streambeds. Agricultural runoff is also a concern as it can kill native aquatic species when sediment is deposited in streambeds and E. coli bacteria and algae can accumulate with increased organic and commercial fertilizer nutrient enrichment (eutrophication). Sediment settling into streambeds can prevent certain aquatic species from breeding or simply destroy their habitats. With assistance from previous research in the Brierfork stream on the AAMU Winfred Thomas Agricultural Research Station, my advisor and I collected and compiled data on water quality, stream channel morphology, macroinvertebrate bio-indicators, and fish communities over a period from 2010-2022. We investigated whether the health of the stream has been affected by increased urban development during this period, and if so, in what ways has the quality of the stream declined. We discovered that the stream has been impacted detrimentally over the last decade primarily by increased sediment deposition in the streambed that has affected aquatic communities. Increasing the forested buffer might protect the stream in the future, but additional silt fencing around construction projects upstream would also benefit the stream's health by lowering the input of sediment and nutrient enrichment.

Abstract # 111

Impact of Nitrogen on Genetic Variation in Grain Sorghum (Sorghum Bicolor) Under Field Conditions

Blake Long; Long, B., Kuang, X., Xiao, X., & Cebert, E.

Mentor(s): Dr. Xianyan Kuang

Department of Biological and Environmental Sciences

Nitrogen plays a vital role in growing sufficient food to feed the world. Its use, along with other fertilizers, has revolutionized agriculture but has come at a great cost to the environment. Sorghum is a gluten-free cereal crop that is grown throughout Africa, India, and the United States that thrives on marginal lands and shows greater nitrogen use efficiency compared to other cereal crops. Research in the past has studied the effect of nitrogen deficit stress on the yield of sorghum, but these studies have focused on single genotype entries grown under greenhouse conditions. With significant variations occurring among sorghum varieties, further research is required to explore and exploit these genetic variations and their impact on nitrogen response. Our work used the Sorghum Association Panel, which consists of 416 sorghum genotypes representing a global sorghum genetic and phenotypic diversity. In this study, we planted the 416 genotypes in a random block design with six blocks totaling 2,496 plots. Three blocks received supplemental nitrogen of 80 lbs. of nitrogen/acre, while the remaining three blocks received no amendment. Throughout the summer, we recorded plant height, date of panicle emergence, and anthesis (period of opening of flowers) within each given plot. The results indicate significant variations among the 416 varieties for all the variables of interest based on nitrogen amendment. As an example, average plot plant height ranged from 51.6 cm to 395.2 cm. We will use

this data to acquire a map of nitrogen-related signals of interest among the lines in this association panel. Our results will allow the development of possible gene candidates to investigate seed yield among sorghum varieties based on soil nitrogen. In the upcoming year, we plan to apply the use of UAV technology to further assist in data collection for phenotyping.

Abstract # 112

Amphibian Diversity in Wetlands in Northern Alabama

Kylan McKee; McKee, K., Howell, H., Czech, H., & Stone, W.

Mentor(s): Dr. William Stone

Department of Biological and Environmental Sciences

Amphibians (eg., toads, frogs, salamanders) are wild animals that are useful as bioindicators of environmental pollution because their semipermeable skin makes them sensitive to what they encounter in the environment. Wetlands are a breeding ground for amphibians and a habitat for their juvenile offspring (tadpoles, efts). As areas in the country develop, there is more pollution and habitat degradation from soil erosion, livestock feces, and agricultural chemicals. Each species has its tolerance level to and environmental needs. Wetlands around Madison County, Alabama, were scouted for any amphibians living there. To survey the local area for amphibian diversity, minnow traps, and hoop nets were used to capture and release as the species and stage of life were observed and the number of individuals was recorded. Also, checking beneath coverboards, rocks, and logs were used as observation tools. Five species in total were found between four sites. The sites were divided into suburban, urban, and agricultural categories. The site categories with the most amphibians are suburban and urban. At the agricultural site, adult frogs were present, but they could not be examined closely to be identified. There were no same species found across different wetland sites; each had its own species. These findings could help monitor species diversity in Madison County as the environment changes.

Abstract # 113

Biofilms in Oral Health: A Review of Current Research

Kehinde Olawepo; Olawepo, K., & Okafor, F.

Mentor(s): Dr. Florence Okafor

Department of Biological and Environmental Sciences

Biofilms are complex microbial communities that play important roles in health and disease. In the field of oral health, biofilms are known to be responsible for the development of dental caries, periodontal

disease, and other oral infections. This research paper aims to investigate the impact of biofilms on health, especially oral health, and to explore potential interventions that can be used to prevent and treat biofilm-related diseases. The experimental design includes in vitro and in vivo studies. The observed results by various researchers show that biofilms can have significant negative effects on health, including increased antibiotic resistance and decreased immune response. Various interventions have been tested, including antimicrobial agents, mechanical removal of biofilms, and the use of probiotics. The discussion and conclusion highlight the need for further research to fully understand the complex nature of biofilms and their impact on health.

Abstract # 114

Bacterial Monitoring of Open and Closed Looped Cooling Water Systems at Alabama A&M University

Alexis-Marie Parrish; Parrish, A-M., Moss, E., & Brooks, A.

Mentor(s): Dr. Elica Moss

Department of Biological and Environmental Sciences

The water in cooling or heating systems in highly serviced offices, commercial buildings, and other workspaces dramatically affects performance. Regularly monitoring and treating water in the cooling mechanism will reduce problems from water deposits. Open systems can have numerous issues, with contaminants like Legionella entering the cooling tower's water. A closed-circuit system keeps the water completely enclosed inside pipes, preserving water volume and quality, and reducing the chance of contamination. Management and control procedures exist for effectively dealing with microbial contamination in such open circuit systems; however, the issues associated with the growth and proliferation of bacteria in closed heating and chilled water systems are still less understood. Bacteria are omnipresent and inhabit almost every conceivable environment. They play essential roles in ecological cycles and can be helpful for biotechnological applications. However, some bacteria can cause human diseases, and their presence in buildings can pose a health risk to humans. Therefore, monitoring the bacterial community in buildings is essential to maintain safe and healthy environments for people. Additionally, lowered pH could indicate bacterial growth or a system leak, affecting the water levels and chemistry. Analysis was conducted using the IDEXX method to test the pH and presence/absence (P/A) of Total coliforms, Escherichia coli, Enterococci, Pseudomonas aeruginosa, and Legionella pneumophila found in the water of open and closed-loop systems at several buildings on the campus of Alabama A&M University, i.e., the Wellness Center, Hopkins Hall, and the New School of Business. Regular testing and monitoring of the systems can help ensure building occupants' safety and prevent the spread of harmful bacteria. Additionally, results from this study will allow for proper management to avoid the many problems caused by bacterial contamination.

Abstract # 115

Depression and Stress in College: The Effects Of DNA Methylation

Alexis Powell; Powell, A., & Kennedy, K.

Mentor(s): Dr. Karen Kennedy

Department of Biological and Environmental Sciences

Despite burnout's severe impact on current college campuses and the many counseling and tutoring services, there are no diagnostic criteria. In addition, depression is difficult to differentiate from other mental illnesses, and many college students learn to live with it. Therefore, a burnout biomarker must be disposed of. Several studies suggest that DNA methylation could play a role in linking stress-related psychopathology to mental disorders and could be considered a potential biomarker. The purpose of this review is to provide a general overview of how DNA methylation contributes to stress and depression in college. This review also aims to provide a scientific basis for burnout biomarker research by providing a state-of-the-art overview. Based on a systematic literature search, we identified 25 relevant articles. Fifteen studies dealt with depression, seven with chronic stress, and only three with burnout and work stress. The majority of these studies used the candidate-gene approach, assessing 12 different genes across three epigenome-wide studies. Depression and chronic stress display different methylation patterns of the glucocorticoid receptor gene (NR3C1). Similar methylation patterns were observed in depression and stress genes (SLC6A4). The methylation patterns of the brain-derived neurotrophic factor gene (BDNF) in the same human sample were associated with stress and depression related to college. There was a correlation between college stress and tyrosine hydroxylase (TH) methylation in a single study. There is a need for additional longitudinal studies to uncover the cause-effect relationship between stress, epigenetics, and burnout, including its overlap with depression.

Abstract # 116

The Effects of E-Cigarette Vapor on Bacterial Growth

Adrian Rhoden; Rhoden, A., & Okafor, F.

Mentor(s): Dr. Florence Okafor

Department of Biological and Environmental Sciences

The use of E-cigarettes has experienced a dramatic surge especially among the youth and it is fast becoming a public health hazard. The purpose of this research is to determine the effects of e-cigarette vapor on bacterial growth. This research focuses on the effect of e-cigarettes on the body’s internal microbiome. The study was carried out by incubating select species of bacteria on microbiological media, exposing one set of 105 concentration of bacteria to concentrated e-cigarette vapor in a custom-

built vapor chamber, and comparing the bacterial growth of the vapor exposed group to the control group after a twenty-four-hour period and after a forty-eight-hour period at 37 degrees Celsius. After 24 hours, the bacterium Bacillus subtilis exposed to e-cigarette vapor showed no growth, bacterial growth was only present in the agar plate that was not exposed to the vapor (the control). However, after 48 hours, the non-exposed bacteria had continued to grow to uncountable levels, while the exposed group had an average of 34 cfu visible colonies. Based on our results, we tentatively conclude that e-cigarette vapor inhibits bacterial growth, the vapor is not bactericidal. It is possible that inhibition may eventually lead to increased virulence of the bacteria. However, more research needs to be done on different species of bacteria as well as different brands of e-cigarettes.

Abstract # 117

Growth-Drought Relationships of Two Southern Pine Species in Northern Alabama

McKenzie Smith; Smith, M., Johnson, A., Woodall, M., Jackson, J., Hossain, S., & Naka, K.

Mentor(s): Dr. Shaik Hossain

Department of Biological and Environmental Sciences

Climate change projections for the southern USA predict increased frequency and severity of droughts, which are expected to impact tree growth profoundly. As such, growth-drought relationships can help predict species' response to climate change which is considered an integral part of adaptive forest management. In this study, tree radial growth in relation to historical drought events will be estimated for two southern pine species, shortleaf (Pinus echinata Mill.) and loblolly (P. taeda L.) pines. Due to their occurrences in a large geographic range, these two pines are suitable candidate species to explore growth-drought relationships. In the summer of 2022, three study sites were located in two northern Alabama counties, where several drought events have occurred recently. Using increment borers, Alabama A&M University undergraduate students collected cores from naturally regenerated and mature (>15 cm DBH) pine trees, resulting in 10-15 core samples from each species per site for a total of 70 cores from three sites. Tree cores were processed using dendrochronological techniques to measure radial extension as a function of tree ring widths. Radial extensions pre- and post-drought (5-year) events will be compared to examine if droughts negatively affect tree growth. This research will inform forest managers about the impacts of droughts on tree growth and the potential for selecting species that are more tolerant to droughts. This work also exposes HBCU students to scientific research and helps improve their technical and communication skills.

Abstract # 118

Neighborhood Disparities: Improving Health and Reducing Obesity in Minority Women

Ti'Yanna Watson; Watson, T., Clarke, E., Olawepo, K., & Weems, E.

Mentor(s): Dr. Ebony Weems

Department of Biological and Environmental Sciences

Over the last ten years, there has been a surge in studies conducted on the causes and downstream effects of socioeconomic inequality and health disparities. Many studies shed light on inequalities found in societal variables such as educational opportunities, health care access and outcomes, mass incarceration, social networks, and food security within minority communities. The latter has proved to be the catalyst in the incidence of poor health outcomes in those with metabolic diseases such as diabetes and obesity. The prevalence of obesity in the United States continues to rise on an upward trend and is directly associated with food security. Two-thirds of the American population is either overweight or obese. Adults with obesity are at a greater risk for heart disease, stroke, type 2 diabetes, and multiple cancers. Minority women and girls are disproportionately affected by the obesity epidemic. Almost 60 percent or two-thirds of Black women are obese [1] based on increased body mass index. This project aims to understand the neighborhood disparities associated with higher BMI in minority women. We hypothesize that neighborhood disparities among minority women positively correlate with the incidence and severity of obesity. Using both data from U.S. Census (2017-2021) and National Health and Nutrition Examination Survey (NAHNES) 2017-2018, we will utilize multivariate logistic regression and machine learning to develop a prediction model to study the relationship between BMI and neighborhood disparities. Geospatial information systems will also be used to map incidences in various locations. Understanding the causes of obesity is essential to managing and preventing the disease. Results obtained from this study will be used in future in vitro cell models.

Abstract # 119

Modeling NASA's Biosentinel Satellite Mission Using Non-Ionizing UV to Induce DNA Damage in *Saccharomyces Cerevisiae*

Ambreal Renea White; White, A. R., Rainge, T., & Farmer, T.

Mentor(s): Dr. Tyesha Farmer

Department of Biological & Environmental Sciences

The NASA Ames Research Center BioSentinel satellite mission seeks to understand how prolonged exposure to space radiation affects strains of Saccharomyces cerevisiae. The yeasts are being developed as biosensors to assess risks to human health in deep space. In the current study, the BioSentinel experiments are modeled using strains of S. cerevisiae treated with non-ionizing UV and other DNA

damaging agents to observe effects on cell growth over time, with an added focus on sensitivity to curcuminoid agents. Overnight cultures of BY4741, fet3-delete, rad6-delete, and rad51-delete strains were diluted to an OD 595 of 0.2 and 10-fold serially diluted in 96-well plates. The 10 -1 to 10 -4 dilution series were then spotted and dried in duplicate onto YPD media plates. Plates were exposed to UV light for 10 seconds, 30 seconds, 1 minute, 2 minutes, 5 minutes, 15 minutes or no exposure (control) and then transferred to a 30ºC incubator for 3-5 days for growth assessment. The rad6-delete and rad51-delete strains exhibited pronounced cell kill at the 10 second time point, consistent with disruption of UV induced DNA damage response pathways in these strains. In addition, these strains displayed greater sensitivity to 50ug/mL curcuminoids when grown on YPD (compared to control), but not when grown on synthetic media. Future experiments include quantitative viability assays and evaluating the amount of DNA damage induced. The rad51-delete strain is currently being evaluated on the BioSentinel satellite mission. Development and study of yeast biosensors will inform and safely enable long-term human missions in deep space.

Abstract # 120

Morphometric Evaluation of Novel Hemp (Cannabis Sativa) Genetic Resources in Northern Alabama

Jarius R Whitehead; Whitehead, J. R., & Cebert, E.

Mentor(s): Dr. Ernest Cebert

Department of Biological and Environmental Sciences

Hemp (Cannabis sativa L., < 0.3% THC) has become an important emerging crop in the U.S. due to its many diverse applications and environmental benefits. However, there is limited access to hemp genetic resources and lack of genetic knowledge on priority traits, and few adapted cultivars have been developed. To this end, U.S. Department of Agriculture Plant Genetic Resources Unit (USDA PGRU; Geneva, NY) has initiated to collect, conserve, evaluate, and distribute diverse hemp genetic resources and apply these efforts to breed adapted/improved cultivars suitable for agriculture. For newly collected hemp genetic resources, extensive evaluation in various climate zones and soil types is required. As part of the collaborative efforts, Alabama A&M University commits to conduct morphometric phenotyping for novel hemp genetic resources in northern Alabama. As a pilot study, in 2022, we evaluated nine hemp entries with diverse genetic background at Winfred-Thomas Agricultural Research Station (Hazel Green, AL). For each entry, a limited number of seeds (~120) were obtained and were directly seeded. Plant stand, sex ratio (male:female), plant architecture, biomass and grain yield, and post-harvest terminal sampling data were collected; stress in weed pressure, insect, and disease were also monitored. The field and post-harvest measurements showed that these entries exhibited significant variations in most traits. Specifically for the biomass trait, there exist significant variations in the canopy architecture, stem diameter, and stem length; additionally, dry biomass is positively correlated with basal stem diameter, stem height and canopy architecture parameters. The collected seeds will be sent back to PGRU for further processing and distribution, and the information associated with these entries

will be deposited into the Germplasm Resources Information Network (GRIN-Global) and made publicly available. This pilot research provided a proof-of-concept test to evaluate hundreds of entries in coming years, which will also strengthen our hemp educational and research capacity.

Abstract # 121

Groundwater Contamination Near Coal Ash Impoundments

Lydia Joy Williams; Williams, L. J., Wendt, A., & Moss, E.

Mentor(s): Dr. Elica Moss

Department of Biological and Environmental Sciences

Understanding the Beginning: Critical minerals (CM) are found in almost all forms of everyday life. These minerals can be traced back to phones, computers, and electric vehicles. Figure 1 shows all the ways in which critical minerals are utilized. When thinking of the advancement of cleaner energy, CM plays a role in the manufacturing of solar panels and wind turbines. As the name suggests, critical minerals are critical. They can be used as a substitute for raw materials for the United States. Relying on old sources of coal through import or mining can become an economic issue. Therefore, the transition away from coal-centered sources is important. If we want to broaden the amount of renewable energy sources and form greener technologies in order for the US to not be susceptible to disruptions in supply due to COVID and war, the use and application of CM's are needed. The utilization of CM is the most environmentally friendly option. It allows the U.S. to tap into its own resources by pulling from already existent ash ponds, it cleans up waste and potentially helps decrease contamination, it creates more jobs, and it prevents the potential for health threats and financial backlash due to coal ash runoff.

Graduate

Abstract # 122

Integrating Grafting and Plant Growth Promoting Rhizobacteria (PGPR) To Alleviate Drought And Soilborne Disease Effect On Tomato

Njideka O. Adeniyi; Adeniyi, N. O., & Nyochembeng, L. M.

Mentor(s): Dr. Leopold M. Nyochembeng

Department of Biological and Environmental Sciences

Organic crop production has become popular due to the global concern for healthy food consumption and ecofriendly farming methods for environmental safety. Organic vegetable production in the southeastern US (Alabama) is challenging due to biotic and abiotic stresses caused by soilborne plant pathogens and drought, respectively. These stresses can have significant deleterious effects on the vegetable production system. In this research, grafting techniques and the plant growth promoting rhizobacterium (PGPR) Bacillus amyloliquefaciens were applied to alleviate the effects of these stresses on tomatoes. The popular but susceptible heirloom tomato variety 'Roma' (scion) was grafted onto the resistant rootstock 'Maxifort' in the greenhouse. Furthermore, B. amyloliquefasciens was applied to both grafted and non-grafted plants prior to inoculation of plants with the soilborne fungal pathogen Verticillium dahliae and application of the drought stress treatment. The experimental design was a split plot with grafting and PGPR as main plot and pathogen and drought as subplot treatments with four replications. The controls were non-grafted 'Roma' plants and distilled water treatment. Data collection will include plant height, biomass, time to flowering, disease incidence, disease severity and fruit yield. The results and impact of the research on alleviating biotic and abiotic stress and enhancing the overall performance of the organic tomato crop in Alabama will be discussed.

Abstract # 123

Rhizobium Tropici Derived Biopolymer Effects on Saturated Hydraulic of Two Soils

Jhanelle Davy; Davy, J., & Davis, D.

Mentor(s): Dr. Dedrick Davis

Department of Biological and Environmental Sciences

A Rhizobium tropici derived biopolymer was recently developed for use as a soil stabilizer. The biopolymer has shown potential to enhance the geotechnical properties of soils. However, there are limited studies on the effects of the rhizobium tropic derived biopolymer on soil water flow. The objective of this study was to determine the effects of Rhizobium tropici derived biopolymer on the saturated hydraulic conductivity of two soils. The two soils used were Compass sand and Decatur silt loam. Each soil was mixed with the biopolymer at rates of 0.1%, 0.25%, 0.5% and 1% (mass of biopolymer/mass soil) to create a moist soil-biopolymer mixture. A non-amended counterpart served as the control for each soil. Each treatment had three replications. The falling head method was used to measure the saturated hydraulic conductivity of the soil. The effect of the Rhizobium tropici derived biopolymer on saturated hydraulic conductivity will be reported.

Abstract # 124

Introduction and Evaluation of Dry Beans as a Next-generation Summer Crop in Northern Alabama

Andrion B Erves; Erves, A. B., & Kuang, X.

Mentor(s): Dr. Xianyan Kuang

Department of Biological and Environmental Sciences

Dry beans are a predominant source of food in many parts of the world, and they are considered nutritional powerhouses due to their high content of plant-based protein, fiber, and antioxidants. In Alabama, the number of thriving crops and their genetic diversity available for farmers are limited, with dry beans not or little grown by Alabama farmers. To develop a next-generation crop for a diverse Alabama agricultural economy, this study aims to introduce and evaluate dry bean as a summer crop in Alabama. We acquired diverse dry bean germplasm (including two major types of black bean and pinto bean) from North Dakota State University, a leading institute in dry bean research. In year 1 (2021), we started field trials of 45 black bean cultivars and 96 pinto bean cultivars in Winfred Thomas Agricultural Research Station, including a field trial of randomized complete block design (RCBD, 4 replicates). The traits of interest include lodging, maturity, and grain yield as well as pest and disease monitoring; post-harvest yield components include plant height, dry weight, number of branches, stem diameter, number of pods, and seed weight. With a comprehensive evaluation, the best 24 cultivars of each dry bean type exhibited high yield and non-lodging were selected for further evaluation in Year 2 (2022). In Year 2, a replicated RCBD field trial for the selected cultivars was conducted and evaluated with a similar strategy. The results showed that black beans generally outperformed pinto beans in our site and that yield performance, lodging and maturity were generally consistent across the two years. We have identified the best 10 cultivars for each dry bean type for a scale-up production and grain quality test in Year 3 (2023). This study can serve as an example for developing networks to test, breed, and cultivate supporting crops new to Alabama.

Abstract # 125

Bacterial and chemical characterization of water from open and closed cooling towers at Alabama A&M university

Abbas Gubara; Gubara, A., & Moss, E.

Mentor(s): Dr. Elica Moss

Department of Biological and Environmental Sciences

With the increasing complexity of building installations in modern, highly serviced offices and commercial buildings, the need for open and closed-looped cooling tower water systems is becoming more important. For public and environmental health and the working efficiency of these systems,

proper management is needed to avoid problems caused by microbial contaminations. A closed circuit system keeps the water completely enclosed inside pipes, preserving water volume and quality, and therefore has a reduced chance of contamination; however, open systems can have numerous problems with contaminants such as Legionella. In this study, water samples were collected from open and closed cooling water systems in the Foster Living and Learning Center, School of Business, and Wellness Center on the Alabama A&M University (AAMU) campus. Non-culture-dependent bacterial analysis using the IDEXX water test and full-length 16S gene amplicon sequencing by Zymo Research Laboratories was conducted to identify, classify, and quantify bacterial contamination in the water. Chemical analysis was also conducted to determine the pH, dissolved oxygen, turbidity, conductivity, copper, aluminum, and lead in the open and closed water systems. The results showed the effects of chemical characterizations of bacterial contamination, which can lead to hazardous risks such as stagnant water, nutrient growth, poor water quality, deficiency, and corrosion of the cooling water systems. Positive total coliforms and E. coli were detected, and microbial composition at different taxonomies from phylum to species was identified. Opportunistic human pathogens Legionella pneumophila and Pseudomonas stutzeri were also discovered in the open and closed-loop water cooling systems analyzed at AAMU. Additionally, the water samples showed high turbidity and low dissolved oxygen levels. Frequent and accurate tests are recommended to determine the correct treatments needed to avoid damage to the water-cooling systems and subsequent harmful consequences of bacterial contamination on human and environmental health.

Abstract # 126

Germination Response of Microbe-Polymer Coated Bell Pepper Seeds

Kezia Gyasi-Darko; Gyasi-Darko, K., & Nyochembeng, L. M.

Mentor(s): Dr. Leopold M. Nyochembeng

Department of Biological and Environmental Sciences

Seed treatment directly affects crop improvement and yield in agricultural systems. Seed coating has been used over the years as a treatment method to enhance seeds in the crop production system. Generally, seeds can be coated with beneficial microbes, micronutrients, and protectants that serve various growth purposes. However, for these inoculants coated on the organic seeds to be held in place and available to protect the seedling, there is a need for effective organic polymer coating. This study aims to study the germination response of microbe containing polymer-coated bell pepper seeds. The research will be conducted in a germination chamber in the plant pathology laboratory of the Biological and Environmental Science Department. A 25-seed weight of Bell Pepper ('California Wonder') seeds will be coated using a factorial combination of a biocontrol organism at different concentrations with four polymers to be replicated five times with a control of no polymer. Data collected on measured growth parameters, including emergence rate index, germination percent, shoot length, and vigor index, will be subjected to the SAS Analysis of Variance (ANOVA) procedure. Significant treatment means will be

separated using the LSD test (P=0.05). The research results will benefit organic bell pepper growers and seed companies by enhancing organic seed health for commercial organic production systems.

Abstract # 127

Evaluation of Xanthan Gum on Soil Strength, Soil Health Properties and Plant Growth (Green Beans)

Erneste Havugimana; Havugimana, E., Metuge, J., Senwo, Z., & Rugandirababisha, J.

Mentor(s): Dr. Zachary Senwo

Department of Biological and Environmental Sciences

The use of bio-based materials impresses chemical soil bidders in soil stabilization and soil strengthening and has been taught to be cheaper and environmentally friendly [1]. Biopolymers are large molecules that are produced by or derived from living organisms [2] (ex: xanthan gum, cellulose, lignin….) Xanthan gum is a Biopolymer produced by different Xanthomonas species especially Xanthomonas campestris [3]. XG has been shown to improve soil engineering properties but its effect on soil health and the growth of plants has not been extensively evaluated. Our research aims to evaluate the effect of XG on some soil health indicators and the growth of green bean crops in amended soil. It was found that soil respiration on both Cahaba sandy loam and Sumter clay soil increases with increase with xanthan gum concentration 0.25%, 0.5% and 1% compared to the control . Control means of non-amended and amended soil both (Cahaba sandy loam and Sumter clay) are significantly different at 95% CI.

Abstract # 128

Genome-Wide Identification and Characterization of Select Fiber Genes in Four Gossypium Species

Sowndarya Karapareddy; Karapareddy, S., Anche, V., Bandarupalli, A., & Sripathi, V.

Mentor(s): Dr. Venkateswara Sripathi

Department of Biological and Environmental Sciences

Cotton is valued as the world's leading natural textile fiber and a major oilseed crop. The cotton fiber quality is directly correlated with the cotton textile quality. Therefore, identifying and characterizing understudied fiber genes will contribute to the growing catalog of cotton fiber transcriptome. The genus Gossypium consists of 45 diploid and five tetraploid species. However, only four species produce spinnable fiber, of which two are diploids (2n=26), and two are tetraploids (2n=52). Upland Cotton, *Gossypium hirsutum* (AADD), is the most widely cultivated cotton species. It is likely evolved from two wild ancestral genomes, the A-genome donor being *G. herbaceum* (A1) or *G. arboreum* (A2), and the D-genome contributor being *G. raimondii* (D5). This study included four Gossypium species (*G. hirsutum*

cultivar, Texas Marker, TM-1; *G. herbaceum*, A1-141; *G. arboreum*, A2-44 and *G. raimondii*, D5-2), and two tissues (seed and seedling) for identification and characterization of select fiber (>100) genes using specific primers. First, RNA-Seq data generated was filtered, trimmed, mapped, annotated, and their functions were assigned using standard RNA-Seq pipeline (HISAT2, StringTie2, DESeq2, Panther, DAVID, Gene Ontology Enrichment, and KEGG pathways). From the annotated list of genes, 12 candidate genes (PP2A, TMN5, UBQP, TBL6, UDPG, AAP2, G8HY, 18srR-1, 18SrR-2, UBQN, END4, and β-Actin), were screened to identify β-Actin as a common reference gene for quantifying (2-ΔΔCt) the gene expression among Gossypium species. Further, differential gene expression of ~100 select fiber genes was confirmed using quantitative real-time PCR (qPCR), and the 13 most widely studied fiber genes (PEPC, GA20, XTHY, βTUB, EXPN, LTP1, LTP3, E6Pr, LTP7, SUSY, SPSY, A12G0616, and A12G2259) were characterized. Interestingly, GA20, SPSY, SUSY, βTUB and LTP7 genes in D-genome species and XTHY, E6Pr and LTP1 genes in A-genome species were highly expressed. This study will aid in utilizing understudied fiber genes in cotton crop improvement programs.

Abstract # 129

Soil Moisture and Temperature Distributions in a Biopolymer Amended Soil

Emmanuel Oko; Oko, E., & Davis, D.

Mentor(s): Dr Dedrick Davis

Department of Biological and Environmental Sciences

Soil strengthening and treatment is a common practice performed in the field of geotechnical engineering. Methods utilizing traditional and non-traditional material have been used to increase soil strength and stability. However, the demand for environmentally friendly materials is currently increasing because the use of traditional methods of soil strengthening and stabilization has an increasingly negative public perception due to limited biodegradability and their tendency to leach toxic substances into the soil and the environment. Due to the demand for biopolymers which are biodegradable and environmentally friendly, the interaction between the soil type, biopolymer, and soil conditions must be understood to understand their potential effects on soil strengthening. Specifically, the effects of the biopolymer on soil moisture and temperature dynamics need to be investigated. The purpose of this research is to investigate the effects of biopolymers on soil temperature and soil moisture under controlled laboratory conditions. The findings from this study will help us to understand the effects of biopolymers on soil moisture, and soil temperature and how they interact to influence soil strengthening and stabilization.

Abstract # 130

Evaluation of the Effect of CMC Cellulose on Soil Strength, Soil Health, and the Growth of Soybean (Chiba Green) Plant on Some Alabama Soils

Jean Rugandirababisha; Rugandirababisha, J., Metuge, A. J., & Senwo, Z.

Mentor(s): Zachary Senwo

Department of Biological and Environmental Sciences

This study aims to evaluate the effect of Carboxymethyl cellulose (CMC) on soil strength, soil health and the growth of soybean (Chiba green) plant on some selected Alabama soils such as Marvyn Sandy Loam and Houston Clay. The soil amendment was done by using 0% as control, 0.5% and 1% of Carboxymethyl cellulose (CMC) content. This study is still ongoing, and the preliminary results on soil respiration and seeds germination in petri-dishes show that, cellulose increases soil respiration for both Marvyn Sandy Loam and Houston Clay soils, soil respiration is higher on Houston clay than on Marvyn Sandy Loam, but the amendment effect is higher for Marvyn Sandy Loam than for Houston Clay. For soybean seeds germination in petri-dishes the results show that 0.5% of CMC content facilitated the higher number of germinated seeds with 100% than other treatments with 97%, and 87% of germination for 0% and 1% of CMC contents, respectively.

COMMUNITY AND REGIONAL PLANNING

Undergraduate

Abstract # 131

Housing Insecurity During the COVID-19 Pandemic in the State of Alabama

Aneisha Ingram; Ingram, A., & Rukmana, D.

Mentor(s): Dr. Deden Rukmana

Department of Community and Regional Planning

The United States is no stranger to the prevalence of housing insecurity as this issue dates back to the 1800s. Despite decades of efforts to eradicate the problem, the recent global coronavirus pandemic exposed gaps in federal and local government efforts. The purpose of this research is to assess how the COVID-19 pandemic may have influenced housing insecurity across Alabama counties. ArcGIS Pro was used to produce maps to show the geographical distribution of housing insecurity (cost burdened households), COVID-19 cases and deaths, and Black populations. A correlation matrix will be used to assess the strength and direction of the four previously mentioned variables. The matrix results will be

specific to July 2020, January 2021, September 2021, and January 2022 as new variants of the virus started spreading during these periods and resulted in surges of new cases and deaths. The results will show a decrease in cost burdened households from 2015 leading up to 2020 during the pandemic. For all the periods in which new variants emerged, the expected results are that there was a negative and weak correlation between Black populations and cost burdened households and a positive but weak correlation between cost burdened households and covid cases. As for cases and deaths, and Black populations and deaths due to COVID-19, the results will show there was a positive correlation. Further research can be done using similar methods for different races to highlight the possibility of race playing a bigger role in housing insecurity. The results obtained from this study can be used to tackle racial discrimination in the implementation of social and economic policies. In this way, minority groups will not be subjected to housing insecurity due to a lack of affordable housing and housing assistance on the basis of their race, income, or ethnicity.

Graduate

Abstract # 132

Population Growth Demand for Producing Urban and Affordable Environments that Reduce Poverty and Increase Quality of Life in the City of Huntsville, AL

Nigeria Jones; Jones, N., & Yin, J.

Mentor(s): Dr. Jordan Yin

Department of Community and Regional Planning

Over the decade, the population of Huntsville, AL has reached new heights. According to the 2020 census, the city had a population of 215,006, making it the most populated city in Alabama. The five-county Huntsville-Decatur-Albertville, AL Combined Statistical Area includes Huntsville as its largest city. You would think population growth is solely a positive factor, but with population growth comes population growth issues. This study investigates and analyzes the growth issues that Huntsville is facing due to the rapid population growth. It is important when addressing these issues, we must also address the goals we want to reach as a community, reducing poverty and increasing the quality of life. Not only do we need to create more homes for all but specifically for families that cannot obtain adequate affordable housing. In this study, we will also discuss multiple factors about creating new housing. Such questions will be asked and answered, how should we build the “new” homes? Can we update existing dwellings? Where will we build these new homes? This study addresses all of these topics and includes recommendations that mention the “Smart Growth” approach as well for the city of Huntsville.

FAMILY AND CONSUMER SCIENCES

Undergraduate

Abstract # 133

Intimate Partner Violence on the Hill: A Cross-Sectional Study of Student Awareness

Nia Freeman; Freeman, N., & Anasuri, S.

Mentor(s): Dr. Sadguna Anasuri

Department of Family and Consumer Sciences

Individuals aged 18-24 are the most at risk for experiencing intimate partner violence (IPV). Many are enrolling in college and entering new or first-time relationships at this age. Past research has found that college students do not report abuse because they may not realize it at the time of its happening. The 2019 Campus Climate Survey found that one in ten students surveyed who had been in a relationship since entering college experienced intimate partner violence. Statistics also show that about one-third (32%) of college students, and about 20-25% overall during their college career, will have experienced sexual assault, dating violence, or stalking. This ongoing problem has necessitated and inspired the researcher(s) to assess students' awareness of IPV on The Hill (AAMU campus). It was found that students often may not understand or realize the related circumstances until it's too late. The current investigation sheds light on the topic with special reference to the context of college campuses – ways in which IPV unfolds, its possible precursors, its impact on both partners, and recommendations for reducing and preventing such instances. A cross-sectional study was designed to examine the awareness and knowledge of IPV on campus. A short survey with 27 questions that consisted of a Likert-type scale, multiple choice, and open-ended questions was used for this exploratory study. The survey will be distributed to students enrolled in 2023. A sample size of 100 males and females will be studied, and their responses will be coded and analyzed using SPSS. The study results will be used to develop prevention and intervention strategies. Knowing the students' perception of IPV will help the institutions address the issue, destigmatize the matter, and recommend appropriate prevention practices to ensure the safety of individuals.

Abstract # 134

Technology-driven Fashion Retail: The Future of Shopping

Anijah Webster; Webster, A., & Bobwealth-Omontese, C.

Mentor(s): Ms. Carmi Bobwealth-Omontese

Department of Family and Consumer Sciences

The retail landscape is constantly evolving, and the fashion industry is no exception. In recent years, technology has played a significant role in transforming the fashion retail experience. Brands are now leveraging a range of technological solutions, from augmented reality and virtual reality to mobile apps and social media, to create innovative and engaging shopping experiences for consumers. This study examines the role of technology in fashion retail experience. A review of previous studies and current retail practices is conducted to provide an overview of the use of technology in fashion retail. It investigates the impact of technology on consumer behavior and consumer preferences in fashion retail. Findings suggest that technology has the potential to transform the fashion retail experience, increase collaboration among fields, create new opportunities for brands to engage with consumers and enhance the overall shopping experience.

Graduate

Abstract # 135

Effects of Volunteering on Perceptions Toward Older Adults Among Career Tech High School Students

Kristina Kimbrell; Kimbrell, K., & Anasuri S.

Mentor(s): Dr. Sadguna Anasuri

Department of Family and Consumer Sciences

With the rising elderly population in the United States as Baby Boomers age, the younger generations may not be aware of the possible careers that will be in demand when it is time for them to enter the workforce. This study aims to explore the perceptions and attitudes of high school students, grades 10th-12th about older adults and any differences before and after their volunteering experience at an assisted living facility. On average, the residents at the retirement home belong to middle and working classes, while majority of the students come from low-income households. Students in the Career Technical Student Organizations (CTSO'S): Future Business Leaders of America (FBLA), Family Career and Community Leaders of America (FCCLA), Skills USA, and Distributive Education Clubs of America (DECA) will participate in the study. The Kogan Attitudes Toward Old People Scale will be administered to students to measure any changes in their scores. Students will be creating care-packages for the residents. In addition, they will be providing services such as manicures, assistance with technology, reading or writing letters, and assist in any other basic task that they may not be able to complete themselves. Proximate interactions such as these are expected to foster a better understanding of old age. Previous studies have shown that the students who had similar first-hand experiences showed neutral and more positive perceptions. In some cases, students who had training on older adults scored higher on positive scores. Current and future studies as this can inculcate and promote more positive outlook and an interest in careers with aging Americans.

FOOD AND ANIMAL SCIENCES

Undergraduate

Abstract # 136

Evaluation of the Bioactive Properties of Macerated Northern Alabama Grown Hemp

Gabriel Barker; Barker, G., Dudley, A., Kassama, L., Jackson-Davis, A., Kuang, X., Cebert, E.

Mentor(s): Dr. Armitra-Jackson Davis

Department of Food and Animal Sciences

Hemp has phytochemical components (flavonoids, phenolic acids, and cannabinoids) that give antibacterial and antioxidant activity. These bioactive properties can be used in food quality and safety applications. The extraction of phytochemicals is an important step in unlocking bioactivity. It can be manipulated by controlling key parameters, i.e., extraction solvent, time, and temperature. This study will use macerated hemp extracts using different aqueous and organic solvents. The objectives of this study will be to determine the extraction yield and antioxidant activity (DPPH radical scavenging activity, total phenolic and flavonoid contents), of hemp variety Rogue, after macerating in different solvents. In this study, Hemp inflorescences were grown at the Alabama A&M University, Winfred Thomas Research Station (Hazel Green, AL; N 34.9025-W 86.5596). Hemp samples were macerated in ethyl acetate, deionized water, ethanol, and petroleum ether solvents for 24 hours at 25°C. All treatments were analyzed in triplicate, and all statistical significance was tested at 5%. Our expected results are that the ethyl acetate and ethanol solvents, due to amphiphilicity, will extract more phytochemicals and yield the best extraction yield and highest antioxidant activity.

Abstract # 137

Physiochemical Analysis of Bread

Korbin Fears; Fears, K., & Herring, J.

Mentor(s): Dr. Josh Herring

Department of Food and Animal Sciences

This project is on the physiochemical analysis of bread. The purpose of this project was to investigate selected flours and protein concentration on texture, color, and taste. Four treatments were baked: whole wheat bread as the control, whole wheat with 10% hemp protein, whole wheat with 10% coconut flour, and whole wheat with 10% hemp protein and 10% coconut flour. The four treatments were baked in different pans: steel, aluminum, and stainless steel. The treatments did not have notable differences in color nor air cell formation.

Abstract # 138

Product Development of Chocolate Cake Using Functional Ingredients: Comparison of Stevia, Splenda, and Hemp Protein Interactions

Nyeima King; King, N., Montgomery II, N., & Verghese, M.

Mentor(s): Dr. Nedra Montgomery

Department of Food and Animal Sciences

In a growing world with people looking for more alternatives and replacements within their diets, it may not be surprising that the first thing people replace is sugar. There are many alternative sugars that are on the rise within the market. Take for example, stevia, Splenda, equal and even monk fruit. Alternative sugars are often extensively sweeter than regular cane sugar. However, when using an artificial sweetener as a replacement, artificial sweeteners may affect the quality of a product such as mouthfeel, color, and shelf life. Understanding the use of different ingredients within a baked good can help determine the expected qualities of a product. The addition of hemp is also a trend on social media and is a versatile ingredient. In this experiment, hemp protein has been added in order to add structure, while satisfying trends within the food industry. In a scientific study, between cane sugar and the two artificial sweeteners, stevia, and Splenda, it was found that when used in a chocolate cake the moisture content was higher with the use of cane sugar. This is expected due to the composition of sugar; the sugar crystals are not as finely grounded compared to both Splenda and stevia for baked goods. It should be noted that cane sugar has the second highest pH with stevia having the highest pH of all three. Further analysis will be conducted to determine more desirable attributes such as shelf life including color, water activity, and texture.

Abstract # 139

Development of GO-GO Smoothies: A functional Meal Replacement

Imani Smith; Smith, I., Shipman, T., Wills, J., & Verghese, M.

Mentor(s): Dr. Martha Verghese

Department of Food and Animal Sciences

Smoothies containing fruit and no added sugars can have great nutritional health benefits (Ribeiro et al., 2018). The advantages of developing fruit-based beverages include less waste of out-of-season fruit and increased bioavailability of fruit nutrients (Murakonda, S., & Dwivedi, M 2021). Many college students share the same struggle of not getting enough nutrients to increase their overall health through food. Studies show 5-83% of students have said they skipped at least one meal throughout the day (Pendergast et al., 2017). One main reason for the lack of consumption of healthier options is their need

for more familiarity with healthier options. Failure to meet nutritional recommendations results in diets lacking essential nutrients. Nearly 35% of college students may be overweight or obese due to common nutritional-related behaviors (Huang et al., 2004). Smoothies are a great way to meet your nutritional needs and improve your health. You can receive antioxidants when incorporating fruits such as blueberries, strawberries, bananas, and pineapples. Fruits can also prevent high blood pressure, high blood sugar levels, digestive health, heart disease, and cancers. Including a base such as yogurt in your smoothies allows you to get high amounts of protein, calcium, vitamins, and probiotics, enhancing the gut's overall health. In this study, an aesthetically pleasing and flavorful smoothie was developed using real fruit, yogurt, and milk alternatives. The average pH for blueberry banana, strawberry banana, and pineapple banana is 6.76,4.71, and 6.84, respectively. Just as expected, the blueberry banana smoothie was darkest with an average L* value of 17.38, while the strawberry banana was more yellow with an average b* value of 14.41, and the pineapple banana was closest to green with an average a* value of 2.73. Further analysis will be conducted to determine sensory attributes and if reformulation is needed.

Abstract # 140

Maceration and Blend Electrospinning of Northern Alabama Grown Hemp Loaded Nanofibers

Emille White; White, E., Dudley, A., Jackson-Davis, A., Kuang, X., Cebert, E., & Kassama, L.

Mentor(s): Dr. Lamin Kassama

Department of Food and Animal Sciences

Hemp has phytochemical components (flavonoids, phenolic acids, and cannabinoids among others) that give antibacterial and antioxidant activity. These bioactive properties can be used in applications for food quality and safety. Extraction of phytochemicals is an important step in unlocking bioactivity and can be manipulated through control of key parameters i.e., extraction solvent, time, and temperature conditions. This study will use electrospinning technique to nanoencapsulate hemp extract. The objectives of this study will be to identify optimum extraction conditions of hemp by determining extraction yield and to fabricate an active nanofibrous film and evaluate its mechanical and viscoelastic properties. In this study, Hemp inflorescences grown at the Alabama A&M University, Winfred Thomas Research Station (Hazel Green, AL; N 34.9025-W 86.5596) were used. Hemp samples were macerated in ethyl acetate and petroleum ether solvents at various temperatures and times with extraction yield determined for each parameter. Polyvinyl alcohol solutions containing various concentrations of Hemp extract were electrospun. All treatments were analyzed in triplicate and all statistical significance were tested at 5%. Our expected results are that the ethyl acetate due to amphiphilicity will yield the best extraction yield and will be used in fabrication of the nanofiber material.

Graduate

Abstract # 141

An Integrative Multi-Omics Approach to Understand the Contribution of ATP-Citrate Lyase Subunits in Lipid Accumulation in the Oleaginous Yeast, *Yarrowia lipolytica*

Varsha Anche; Anche, V., & Fakas, S.

Mentor(s): Dr. Stylianos Fakas

Department of Food and Animal Sciences

ATP citrate lyase (ACL) catalyzes the ATP-dependent conversion of cytosolic citrate to the fatty acid precursor, acetyl-CoA. ACL presence in yeasts has been associated with their ability to accumulate lipids (i.e., oleaginous phenotype), but little is known about the regulation of this enzyme in oleaginous yeasts. In the model oleaginous yeast *Yarrowia lipolytica*, ACL is a heterodimer composed of a catalytic and a regulatory subunit encoded by the ACL1 and ACL2 genes, respectively. To better understand the contribution of ACL subunits in lipid accumulation, we constructed strains that lack (i.e., acl1Δ; acl2Δ; acl1Δacl2Δ) or overexpress (OE) (i.e., ACL1OE; ACL2OE; ACL1/2OE) Acl1 and Acl2, either alone or in combination. The effects of ACL mutations were examined by analyzing the growth, expression profiles, triacylglycerol (TAG), phospholipids (PL), and fatty acid profiles. The results showed that loss of Acl1/2 resulted in slower growth compared to the wild type (WT), while ACL OE did not significantly affect growth. The expression profiles of Acl1 and Acl2 showed that both subunits were expressed at 24h and 48h, but their expression declined 72h and 96h. Overexpression of Acl1 increased the protein levels of Acl2. In addition, Acl2 was more expressed than Acl1 in the strain overexpressing Acl1 and Acl2. Lipid analysis showed that TAGs decreased by 74% in the acl1Δ mutant and increased by 35% in the ACL1/2 OE strains compared to the WT. The PL levels decreased by 19% in the acl1Δ mutant and 28% in the ACL1/2 OE strains. The ACL mutations also affected the fatty acid profiles of the TAGs and PLs. These effects are further examined using an integrated multi-omics approach that combines transcriptomics, lipidomics, and metabolomics data. This is the first study to provide insights into the multi-omic analysis of ACL mutants in *Y.lipolytica*.

Abstract # 142

In-vitro Study to Determine the Anti-Oxidative Potential of Lavender Flowers

Trevor Berkemeyer; Berkemeyer, T., Kaur, R., & Verghese, M.

Mentor(s): Dr. Martha Verghese

Department of Food and Animal Sciences

Genus Lavandula occurs naturally in the Mediterranean basin and its species are a rich source of phytochemicals that can be used to reduce oxidative stress. Changes in redox status with increased oxidative stress in adipose tissue have been linked with obesity-related disorders. The objective was to determine the total phenolic content (TPC), total flavonoid content (TFC) and antioxidant activity of extracts of whole Lavender flower (LF). All samples were freeze-dried, followed by preparation of ethanol (EE) and aqueous (AE) extracts. Antioxidant activity was measured using 2,2-diphenyl-1-picrylhydrazyl radical solution (DPPH), ferric reducing antioxidant power (FRAP), Trolox equivalence antioxidant capacity assay (TEAC), and nitric oxide radical scavenging activity (NORS). TPC was higher in EE (7498.27 mg G.A.E./ 100g DW, respectively) than AE (161.43 mg G.A.E./ 100g DW, respectively). Similarly, EE showed higher TFC (147.45 mg C.E./ 100 g DW of Lavender) than AE (59.83 mg C.E./ 100 g DW of Lavender). TEAC of LF extracts were not significantly different (EE- 80.11 % inhibition of ABTS radical and AE- 82.34 % inhibition of ABTS radical). FRAP assay showed AE (94.07%) having a higher % Ferrous Chelating Capacity of Lavender extracts compared to EE (70.91%). Results suggest that Lavender Flower exhibits antioxidant potential. Future research will involve detailed investigation to delineate the mechanism of action of Lavender to develop it as therapeutic target for obesity. Data from this study will be used to determine the health benefits of Lavender sp. whole flowers with implications for developing functional food products.

Abstract # 143

Effect of Selected Thermal Processing Techniques on Phytochemical Content and Antioxidant Activity of *Beta Vulgaris* (Red Beetroot)

Terica Curtis; Curtis, T., Kaur, R., & Verghese, M.

Mentor(s): Dr. Martha Verghese

Department of Food and Animal Sciences

Red beetroot possesses health-promoting properties due to its high antioxidant power. High water content contributes to its short shelf-life. Thermal processing may be employed to reduce food waste and to potentially enhance phytochemicals. Objective of this research was to determine the effects of selected processing methods on red beetroot bulbs (Bl) and foliage (Fo). Effects were determined through chemical and antioxidant analysis including Total Phenolic Content (TPC), Total Flavonoid

Content (TFC), Trolox Equivalent Antioxidant Capacity (TEAC), Nitric Oxide Radical Scavenging (NORS), and Ferric Reducing Antioxidant Power (FRAP) assays. Bl and Fo samples were subjected to selected processing methods [oven-drying- 40ºC (OD) and low-saline (5%) osmotic dehydration (OSD) + oven-drying (40ºC)]. Untreated (F) samples served as control. Extracts were prepared using deionized water (AqE) and 5% acetic acid (AcE). For Bl, TPC was significantly higher in OD samples (AqE – 491.44 and AcE – 1129.86 mg G.A.E./100g d.w.) compared to OSD (AqE – 488.43 and AcE – 407.83 mg G.A.E./100g d.w.) and F (AqE – 357.73 and AcE – 328.35 mg G.A.E./100g d.w.). TFC for OSD (AqE – 279.45 mg C.E./100g d.w.) was 0.6 times higher than OD. There were no significant differences in TFC for AcE OD and OSD samples. NORS for AqE and AcE ranged from 2361.41 – 83418.75 mg A.A.E./100g d.w. For Fo, FRAP ranged from 6.53 – 15.03 mM F.E. (II)/100g d.w., and NORS ranged from 1848.86 – 33761.05 mg A.A.E./100g d.w.. TEAC decreased by 0.71-0.85 in AqE OD and OSD samples compared to F (71.73 mM T.E./100g d.w.). Similarly, in AcE, TEAC of the OSD (70.57 mM F.E. (II)/100g d.w.) was lower than F (72.86 mM F.E. (II)/100g d.w.). Higher antioxidant potential found in OD and OSD samples suggests release of bioactive compounds during thermal processing. This may result in increasing shelf-life and utilization in functional food product development.

Abstract # 144

Inactivation of Listeria Monocytogenes on Cold-Smoked Salmon (RTE) by Cold Atmospheric Plasma and Pulse Light

Manikanta Sri Sai Kunisetty; Kunisetty, M. S., Jackson-Davis, A., Mentreddy, S. R., Kassama, S., Xu, G., Ghimire, B., Dudley, A., & Madala, S.

Mentor(s): Dr. Lamin Kassama

Department of Food and Animal Sciences

Listeria monocytogenes are ubiquitous pathogen and a leading risk factor for cold-smoked salmon (RTE) food. Hence, there is a need to evaluate the potential use of non-thermal processing technologies, such as Cold atmospheric plasma (CAP) and Pulse light (PL), to inactivate foodborne pathogens in food systems. However, extensive research is needed to optimize CAP parameters and PL processing effects on CSS. This study aimed to determine the antibacterial efficacy of CAP and PL treatment against L. monocytogenes on CSS. The CSS samples were purchased from a local store. The whole sample was processed into fillets. Each fillet was inoculated with an L. monocytogenes cocktail. The inoculated CSS fillets were treated with two different nonthermal treatments. Cold plasma at 10 kV for 0, 3, 6, 9, and 12 min and pulse light using three voltages (0, 2, and 3 kV) at 300 J/Pulse PL energy levels for 120 and 160 pulses. All the samples were analyzed in triplicates, and statistical analysis was conducted at a 5 % significance level. The samples showed the most significant ($P < 0.05$) log reduction of LM with CAP at 10 kV for 12 min by 1.13 (± 0.15) CFU/g and with PL at 3 kV and 160 Pulses by 1.15 (± 0.07) CFU/g was observed. Results showed that the microbial load was significantly ($P < 0.05$) lower in the treated samples compared to the control samples in both treatments. Depending on the fluence, reductions of

LM on CSS were 1.15 – 0.53 log. Hence, the L .monocytogenes reduction efficiency depended on the voltage, pulses, and treatment times ($P < 0.05$). The results show that ACP and PL effectively inactivate LM in cold-smoked salmon. Therefore, CAP and PL technology are promising non-thermal technologies with great potential for application in the CSS industry.

Abstract # 145

Effect of Cold Plasma on Antinutrients and Antioxidants in Shelled Hemp Seeds (*Cannabis sativa L.*)

Manikanta Sri Sai Kunisetty; Kunisetty, M. S., Tasie, O., Boateng, J., Kassama, L., Jackson-Davis, A., Mentreddy, S., Xu, G., Ghimire, B.

Mentor(s): Dr. Lamin Kassama

Department of Food and Animal Sciences

Non-thermal processing is an emerging technology used to develop foods with minimal damage to sensory and nutritional properties. Hemp contains numerous nutrients and phytochemicals and is an excellent source of protein that can provide physiological benefits. However, the presence of anti-nutritional factors (ANFs) limits the bioavailability of nutrients in conferring health benefits. This work's objective was to evaluate the effect of cold plasma as a pre-treatment method on the antinutrients and antioxidants of shelled hemp seeds. The shelled hemp seeds (wet and dry) were pre-treated with Jet plasma at two exposure times of 30 and 60 seconds. The total phenolic content (TPC), total flavonoid content (TFC), saponins, tannins, and antioxidant activities using ferric reducing antioxidant potential (FRAP) and 1, 1-diphenyl-2-picrylhydrazyl (DPPH) were determined. Samples were analyzed using the SAS Software and Tukey's mean separation test. The results showed the highest tannin (14.928 mg CE/100 g DW) content in control (untreated) and the lowest in wet samples pretreated at 30 seconds at 7.06 mg CE/100 g DW. The highest saponin was observed in 60 seconds at 113.98 mg DE/100 g DW while the lowest saponins were observed at 74.99 mg DE/100 g DW at 30 seconds of plasma treatment. The highest TPC of 72 mg GAE 100 g-1 DW was observed at 60 seconds, and the highest TFC (29.49 mg CE 100 g-1 DM) was observed at 30 seconds. The highest antioxidant capacity (FRAP µmol Fe (II) SO4 100 g-1DW) was observed at 205.07. µmol Fe (II) SO4 100 g-1DW at 60 seconds, and the lowest FRAP was observed at 171.02 µmol Fe (II) SO4 100 g-1DW at 30 seconds. Overall, antioxidant content and ANFs significantly differed in the shelled hemp seeds treated with plasma. This research can lead to the development of novel methods for reducing antinutrients in hemp seeds.

Abstract # 146

Influence of Organic Acids and Pasteurization Methods on the Physical Properties of Sweet Indian Cheese

Sai Vinay Madala; Madala, S., & Kassama, L.

Mentor(s): Dr. Lamin Kassama

Department of Food and Animal Sciences

The Indian spongy sweet cheese dessert is typically made with lactic acid in conventionally pasteurized milk. Thus, the use of other organic acids and inherent heating could presumably improve the physicochemical properties while also reducing the coagulation time with better quality. As a result, this will provide an opportunity to discover an improved Indian sweet cheese dessert. The aim of this study was to determine the effect of organic acids and pasteurization methods on the physical properties of sweet Indian cheese. Citric and tartaric acids (1, 2 and 3% concentrations) were used as coagulants in the manufacturing of sweet cheese. Conventional and microwave pasteurizations were carried out at temperatures of 60 and 70°C for 30 and 2 minutes, respectively. The apparent coagulating viscosity was determined using a Brookfield viscometer, and the texture was measured using a Texture Analyzer. Total soluble solids, diameter, and color were determined using a refractometer, caliper, and colorimeter, respectively. The data was analyzed with SPSS software, and an analysis of variance (ANOVA) was performed with a statistical significance of 5%. Shear rates ranging from 30 to 250 s-1 were used to measure the apparent coagulation viscosity, indicating that the viscosity was shear thinning. Pasteurization had no effect on the color and appearance of the sweet cheese ($p > 0.05$). The total soluble solids content decreased slightly as the concentration of organic acids increased. Microwave pasteurization results in a slight decrease in color when compared to conventional pasteurized samples. Pasteurization and acid treatments have a significant ($p < 0.05$) effect on sweet cheese hardness, whereas organic acid concentration has no effect ($p > 0.05$). This study shows that combining organic acids (Citric and Tartaric) with heat treatment (Conventional and Microwave) could help improve the quality of sweet Indian cheese.

Abstract # 147

Effect of Selected Drying Methods on the Antioxidant Potential of Curry Leaves

Karthik Medabalimi; Medabalimi, K., Kaur, R., & Veghese, M.

Mentor(s): Dr. Martha Verghese

Department of Food and Animal Sciences

Curry leaves (*Murraya Koneigii* a leafy spice) with a pungent aroma, are used in Indian cuisine and are highly valued in traditional medicine used to manage many illnesses. Numerous bioactive functional

compounds have been identified such as carbazole alkaloids which have drawn significant interest. Objective was to determine anti-oxidative potential of curry leave using selected (oven-dried, air-dried, and fresh) drying methods. Pilot research was conducted to examine the effects of three selected temperatures on total phenolic content (TPC), total flavonoid content (TFC), and anti-oxidative potential as evaluated by 2,2' diphenyl picryl hydrazyl (DPPH), and Trolox equivalent antioxidant capacity (TEAC) nitric oxide radical scavenging activity (NORS) Ferric reducing antioxidant potential (FRAP). Fresh curry leaves were crushed, and air-dried samples were prepared by drying at 25°C. The curry leaves were dried in an oven at 50°C, 60°C, and 70°C, and extracts were prepared using Ethanol (E) and water extracts. Ethanol extracts of curry leaves showed higher NORS (238.82 mM NO/100g DW) at OD60°C compared to other antioxidant assays DPPH 63.23g/ml, FRAP 185.39 µM FESO4/100g and TEAC 192.81 µmol TE/100g. In curry leaf, aqueous extract of NORS was almost 50% lower (127.35mM NO/100g DW) similarly FRAP was one-fold decrease (91.38 µmFESO4/100g) compared to ethanol extract. However, DPPH 50.59g/ml, and TEAC 162.33 µmol TE/100g, were similar to Ethanol extract. TPC and TFC of Ethanol extract and aqueous extract of curry leave OD 60°C were similar (191.90g/ml , 872.04 mg/ml) and (129.04g/ml ,869.83mg/ml). Data from this study will be used to determine the optimum temperature conditions for drying process of curry leaves to enhance shelf life and used in functional food product development.

Abstract # 148

Determination of the Presence for PAH1, DGK1, and CHO1 proteins by Western Blotting

Kevon J. Seay; Seay, K. J., Anche, V., & Fakas, S.

Mentor(s): Dr. Stylianos Fakas

Department of Food and Animal Sciences

Electrophoresis is a technique that uses separation by using charged molecules in an electric field. The most commonly used form of electrophoresis is gel electrophoresis, mainly used for separating proteins and DNA that differ in size, charge, etc. SDS-PAGE (sodium dodecyl sulfate-polyacrylamide gel electrophoresis) is a technique that is used to separate and identify individual proteins of different sizes from a mixture. In this type of gel electrophoresis, prior denaturation, and use of SDS eliminate the influences of the structure and charge of the molecules, respectively, allowing the proteins to separate based on their molecular weights. After SDS-PAGE takes place to analyze the sizes of the proteins, the proteins are then separated through western blotting. Western blotting is a technique used to identify specific proteins. Separated proteins from the SDS-PAGE are transferred to a membrane producing a band for each protein using the iBlot. The membrane is then incubated with antibodies specific to the protein of interest (i.e., PAH1, DGK1, and CHO1). The unbound antibody is washed off, leaving only the bound antibody to the protein of interest. After that, the membrane is scanned using an illumination scanner called the GE Typhoon FLA 9500 Scanner. The main objective of this study is to determine and confirm the identity of a protein of interest that can be used for future research using the appropriate

antibodies. In this study, three gels will be used to identify the presence of proteins PAH1, DGK1, and CHO1 by using protein samples from Yarrowia lipolytica cells. Results from a previous study showed the presence of DGK1 and CHO1 using the anti-rabbit antibody.

Abstract # 149

Effect of Hemp (Cannabis sativa) Supplementation on Vital and Behavioral Responses of Weaned Beef Cattle

Monya Simpson; Simpson, M., Abdelrahim, G. E., Herring, J., Verghese, M., Samuel, F., Ogunkunle, N., Cebert, E., & Kuang, X.

Mentor(s): Dr. Gamal Eden Abdelrahim

Department of Food and Animal Sciences

Weaning induces stress to both cows and calves and hence, reduces growth performance and behavioral characteristics. The objective of this study is to evaluate the effect of industrial hemp supplementation on the vital and behavioral parameters on calves. Twelve (12) apparently healthy calves, with an average body weight of 600 lb. and ages 6 months were used for these studies. These calves were randomly divided into four (4) groups of three calves each and hemp was supplemented. Group 1 (20/200mg normal concentrate for 4 weeks, CC), group 2 (14 days feeding normal concentrate pre-weaning and 14 days of feeding 20/200mg industrial hemp CH), group 3 (14 days of industrial hemp supplementation pre-weaning and 14 days of normal concentrate HC) and group 4 (4 weeks of hemp supplemented feed). Vital and behavioral parameters were measured once a week, for two weeks pre-weaning and two weeks post-weaning. Temperature was measured using thermometer, pulse rate was measured using stethoscope and respiratory rate by costo-abdominal movement. The chute score, exit score and vocalization were observed scored and recorded. The rectal temperature significantly decreased from week 1 to week 2 and thereafter increased significantly but where higher in the hemp supplemented groups. The respiratory rate significantly decreased in all the groups from week 1 to week two and there after increased significantly in all the groups but lowest in the (HH and HC) hemp supplemented groups. The heart rate also increased steadily across the hemp supplemented group with the normal range. The chute score elaborated a higher percentage of calmness, higher percentage of walking proportion and higher percentage of non-vocalizers in the hemp supplemented groups compared to the non-hemp supplemented group. It was concluded that hemp supplementation at pre and post weaning could improve the thermoregulation, respiratory efficiency and cardiac function as well as improving the behavior of the calves at weaning.

Abstract # 150

Neuroprotective Effects of Selected Phytochemicals from Various Fruits on tert-Butyl-Induced/Hydrogen Peroxide Toxicity and Oxidative Stress in Non- malignant Neuronal Cells (HCN)

Harpreet Singh; Singh, H., Boateng, J., & Verghese, M.

Mentor(s): Dr. Martha Verghese

Department of Food and Animal Sciences

Research has suggested that phenolic compounds from fruits have anti-oxidative properties that may be beneficial in preventing oxidation-induced diseases. Hydrogen peroxide and tBHP are known to be major contributors of oxidative damage. The study aimed to determine anti-oxidative and neuroprotective effects of selected fruits utilizing HCN-2 cells. Assays performed to evaluate oxidative stress biomarkers included Lactate Dehydrogenase (LDH), Glutathione S- transferase (GST), Glutathione peroxidase (GPx) activity, and Glutathione (GSH) activity, indicators of detoxification & antioxidant mechanism. Media served as negative control, tert-butyl hydroperoxide tBHP (300µM) and H2O2 (500µM) as positive controls. Cells were pre-treated with various concentrations (50-400µg/ml) of fruits (black plum [BP], cranberry [CB], Gala apple [GA], green grape [GG], McIntosh apple [MA], red grape [RG], red plum [RP]) and phytochemicals (cyanidin [CY], ellagic acid [EA], pelargonidin [PEL] and quercetin [QUE]) extracts. LDH (%) release in HCN-2 cells pretreated with fruit extracts was significantly ($p<0.05$) lower compared to cells treated with tBHP alone. Compared to cells exposed to tBHP alone, GST activity was 9 – 80% higher in phytochemical-treated cells. When cells were exposed to H2O2 after pretreatment with selected phytochemicals, LDH release was 73 – 90% lower than cells exposed to H2O2 alone. GST activity was significantly ($p<0.05$) higher in cells exposed to H2O2 after pretreatment with fruit extracts than in cells exposed to H2O2 alone. In cells pretreated with selected phytochemicals, GST activity was significantly ($p<0.05$) higher (41-83%) compared to cells exposed to H2O2 alone. GSH levels ranged from 2.82 µM/mg protein in cells treated with CY at 2.5µg/ml to 3.24µM/mg protein in PEL at 10µg/ml. Pre-incubation of cells with fruit and phytochemical extracts protected neuronal cells. Hence, results provide impetus to further elucidate mechanisms of action of protective properties of whole fruits against ROS-associated neurodegenerative diseases.

Abstract # 151

Development of a Vegan Cheesecake Dessert Utilizing Sustainable Functional Ingredients of Tropical Fruits: Pineapple, Kiwi, and Mango

Khalid Smith; Smith, K., & Montgomery II, N.

Mentor(s): Dr. Martha Verghese

Department of Food and Animal Sciences

The processing of fruits' edible portions occurs in such abundance. Processing leads to much of fruits' by-products often being discarded as waste. Seeds, peels, and even pomace from the processing of fruit juices maintain many nutrients such as polyphenols, flavonoids, and dietary fiber (Yeo & Thed, 2022). The trends of utilizing by-products are increasingly on the rise as sustainability becomes the approach of many industries, specifically fruit, due to the inedible portions having an even more concentrated version of the bioactive compounds (Nadar et al., 2022). Tropical fruit's bioactivity has been linked to minimizing chronic diseases, diabetes, and heart disease. Although snacking in America is associated with increased calorie intake, therefore being linked to obesity, snacking can be made healthier. Many of the snacks associated with the daily consumption of excess energy are typically desserts and sweets (Dunford & Popkin 2017). Whole fruits, including the by-products or waste, can yield a higher nutritional value in combination; therefore, tropical fruits and their waste were selected to develop a snack product. Development of a vegan cheesecake utilizing powdered and pureed portions of pineapple, kiwi, and mango was used to create the crust and filling. The vegan cheesecake crust was developed using powdered peels of the selected fruits mixed with almond flour and coconut butter for the crust and cashews, coconut milk, maple syrup, and natural flavors for the cheesecake filling. Overall, the vegan cheesecake was developed with like texture of a current market cheesecake. Further analysis will be conducted to determine its functional and sensory properties to determine if reformulation is required.

Abstract # 152

Quantification of Polyphenols and Antioxidant Capacities of Black and Pinto Beans

Mariam Yakubu; Yakubu, M., Cebert, E., Kuang, X., & Boateng, J.

Mentor(s): Dr. Judith Boateng

Department of Food and Animal Sciences

Bound polyphenols are overlooked and underestimated. Unbound and bound polyphenol content of black and pinto beans demonstrate relevant contribution to antioxidant potential. Common bean (Phaseolus vulgaris L.) is a widely cultivated pulse with varieties including black and pinto beans. These pulses are a renowned source of proteins and antioxidants which infer health benefits. Results of this study revealed that, total phenolic content (TPC) of unbound polyphenols of black beans was 6.51% higher than pinto beans while bound TPC was 31.56% higher than that of pinto beans. However, the total flavonoid content (TFC) of unbound and bound polyphenols of pinto beans was 79.98% and 36.69% higher than black beans, respectively. This implies that black bean samples contained more phenolic content while pinto beans contained higher levels of flavonoids. The ferric reducing antioxidant potential (FRAP) of unbound polyphenols of black beans was 18.42% higher than that of pinto beans, while bound polyphenols of black beans showed 74.2% higher ($P<0.05$) FRAP activity than pinto beans. Unbound polyphenols contributed significantly to FRAP activity compared to bound polyphenols in both varieties of beans. DPPH results revealed that IC50 values of unbound polyphenols were significantly

lower than bound polyphenols in both bean varieties. This study would inform bean breeders to identify and focus on suitable breeding strategies to improve antioxidant-rich varieties of pinto and black beans.

ACCOUNTING AND LOGISTICS

Undergraduate

Abstract # 153

Benefits of Smart Warehouse Adopting Industry 4.0 Technologies for Inventory Optimization and Cost Reduction

Bayyan Israahmadewi; Israahmadewi, B., & Rana, K.

Mentor(s): Dr. Krishan Rana

Department of Accounting & Logistics

Industries nowadays are demanded to perform business operations with high reliability, at the lowest possible cost while maximizing supply chain surplus. Global logistic supply chain, however, faces challenges as it grows increasingly complex. The growing population around the world causes an increase of demand for a large variety of product types and dimensions. Distribution centers and warehouses have to be ready to cope with high demand, growing port congestion, manufacturing delays, extreme weather events, and several other disruptions that affect supply chain activities. Warehousing is one of logistic supply chain operations that plays a significant role as a vital hub in the flow of goods. It facilitates and offers a way to reduce dwell time of materials, provides agile flow of goods, avoids any shortage like situations, and allows business players to fulfill orders on time in response to ever-changing customer demand, therefore provides a better customer service. Warehousing activity has shifted from provisioning a passive traditional storage to strategic assortment by maximizing and leveraging the warehouse space. The implementation of integrated information and technology for automation and digitization in supply chain helps companies to optimize inventory level in warehouse. It reduces material wastage which leads to cost reduction. The use of automation technology in smart warehouses also reduces menial labor and cuts back on the chance for human errors. The objective of this study is to present rationale through data collection why Industry 4.0 capable smart warehouse is the best solution in the foreseeable future for demand driven optimization. For the purpose of validation, we will perform comparison between traditional warehouse and smart warehouse in terms of functionalities, efficiency, and performance.

Abstract # 154

Risk In Air Transportation Systems and Its Management

Linden Thomas; Thomas, L., & Rana, K.

Mentor(s): Dr. Krishan Rana

Department of Accounting & Logistics

Air transportation is one of the most important and essential logistics modes in the global supply chain. It is an important enabler to achieving economic growth and development, facilitates flow of goods, investment integration into the global economy, and provides vital connectivity on a national, regional, and international scale. It helps generate trade, promote tourism, and create employment opportunities. Countless industries utilize air transport to reduce delivery times, especially in emergency needs. IATA estimates airfreight has been used to transport about $6 trillion worth of goods annually and constitutes about 35% of global trade by value, utilizing over 100,000 airplanes. In view of the enormous usage of air transport and its economic impact, the safety of transportation systems is of utmost importance. Global supply chains have been interrupted during the last three years and this phenomenon has increased the cost of essential commodities and inflation to a high level. We would like to suggest using various management techniques to maximize throughput in the global supply chain network and to manage delays caused by natural phenomena and other variations.

Marketing and Management

Undergraduate

Abstract # 155

Supply Chain Management of Beauty Products

Jasmine Laury; Laury, J., & Rana, K.

Mentor(s): Dr. Krishan Rana

Department of Management & Marketing

The business of manufacturing beauty products, distribution, and sales is in billions of dollars. All countries of the globe make beauty products in one form or the other. In older days, natural products like herbs, fruits, and vegetables or their extracts were utilized for enhancing beauty. There has been emphasis on enhancing beauty or skin toning from time immemorial. These days, scientific methods and technology is widely used for making and distributing beauty products. In modern times, it has become a global business, and several famous corporations and entrepreneurs have invested a large amount of funds in this kind of business. We look at the business from the supply chain management point of view.

To manufacture beauty products, several ingredients are needed, and they generally come from different parts of the globe. The manufacturing plants are located at places away from the supply source or its market. In our presentation, we investigate various kinds of supplies, their locations, and logistics of transporting them to the manufacturing plants, distribution of such products, and retailing. We provide statistics, markets for this billion-dollar business, and the process of retailing so that various products are available to end-users. We further explore future trends, various kinds of issues and challenges, and strategies to realize full market potential the business can achieve. Additionally, we would suggest utilizing various kinds of management techniques in processing, transportation, warehousing, and marketing. This paper would benefit all supply chain partners, students who desire to know about various kinds of beauty aids, and future entrepreneurs.

Leadership Education and Secondary Education

Graduate

Abstract # 156

Worldwide Teacher Burnout

Charminque Marcus

Mentor(s): Charminque Marcus

Department of Educational Leadership and Secondary Education

Burnout in the teaching profession is growing worldwide. The current presentation exposes national statistics of the noticeable decline in the number of prepared teachers entering the teaching field for a period of three years and longer, to draw comparison to the Greenhouse as an effect of the Carbon Cycle. The greenhouse effect is a natural process in which atmospheric gases trap the sun's heat and warm the Earth's surface and lower atmosphere; this makes Earth hospitable for life (Environmental and Energy Study Institute). The Pyramid of Biomass is exploited to emphasize the hierarchy within the teaching profession in regard to burnout, as well as recommendations drawn to retain those teachers as to contrast those efforts to recommendations of saving the ozone layer. In light of research, the presentation will discuss environmental and adaptive factors which support the efforts of those who teach us best and the efforts toward maintaining an eco-friendly carbon footprint. Potential areas of desired statistics are presented as well as references, comparisons, and contrasts to biological elements.

ELECTRICAL ENGINEERING AND COMPUTER SCIENCE

Undergraduate

Abstract # 157

Wireless Shifting Mounts for Handcycles and Trikes

Lillian Belford; Belford, L., Landon F., & Tiger C.

Mentor(s): Dr. Raziq Yaqub

Department of Electrical Engineering and Computer Science

Disabilities in the hands such as missing digits or weakness in hands, make it difficult to steer, brake, and shift gears when operating vehicles such as bikes or trikes. To combat this issue, we implemented a voice recognition based, wireless gear shifter. It will allow the individuals with disabilities to shift gears up or down using voice command. The project designed a system using hardware (gadgets such as electronic gear shifter, microphone, Bluetooth transceiver) and software (speech recognition code, and an app) that will capture the voice input from the vehicle operator in terms of speech, select the correct driving parameters, receive confirmation from the vehicle's operator and proceeds to the target destination. Our project is funded by the BAE Systems and Adaptive Adventures to develop voice recognition based wireless electronic shifting mounts for handcycles and trikes to increase the efficiency and ease of use for individuals with physical disabilities.

Abstract # 158

Airline Reservation

Yana Dhamija; Dhamija, Y., & Fu, Y.

Mentor(s): Dr. Yujian Fu

Department of Electrical Engineering and Computer Science

Currently, the mobile airline reservation system is being embraced by many people and businesses. For decades, reservation systems have been put into place all over the world, switching from manual to computerized systems at first. Automated reservation systems, airline, bus, and mobile ticketing are all growing in popularity. Organizations in the aviation industry are working to develop systems that will enhance their client services as a result of the industry's intense competition. As a result, research into an automated seat reservation system is still ongoing. The goal of this study is to create a mobile airline seat reservation system that will help the general public reserve seats more easily and quickly and

provide them additional options for booking real-time tickets. The HyperText Markup Language (HTML) front end, and Python back end were all used in the system's development. The created system will help airline users and operators by offering a system that is affordable and will enable real-time seat reservations using a mobile phone, regardless of the user's location.

Abstract # 159

Design and Simulation of Microwave Subsystems

Kobe Green; Green, K., & Coleman, J., Yang, S.

Mentor(s): Dr. Shujun Yang

Department of Electrical Engineering and Computer Science

The goal of our senior design project is to design and simulate several microwave subsystems. Microwave (RF) works differently from low frequency AC. Since signal wavelength is much larger than circuit conductor size, a single wire is enough to carry the signal at low frequencies. Voltage and current do not change along the wire. At microwave frequencies (being above 1 GHz), signal wavelength is comparable to, or even smaller than conductor size. In such cases, signals must be treated as traveling waves and must be transmitted with transmission lines (coaxial cable and microstrips). Microwave (RF) circuits have different working mechanisms and structures compared with low frequency AC circuits. In this project, microwave subsystems including microstrip, coplanar waveguide, and microstrip bandstop filters are designed and simulated.

Abstract # 160

Likelihood Predictions of Diabetes at Early Stage Using Data Mining Techniques

Chasity Harris; Harris, C., & Zhao, X.

Mentor(s): Dr. Xiang (Susie) Zhao

Department of Electrical Engineering and Computer Science

Diabetes Mellitus is a chronic metabolic disorder, one of the fastest growing life-threatening diseases that have already affected more than 400 million people worldwide according to the report of World Health Organization (WHO). It creates health crises of this era despite racial, geographic or ethic context. Due to the presence of a relatively long asymptomatic phase, early detection of diabetes is always desired for a clinically meaningful outcome. Around 50% of all people suffering from diabetes are undiagnosed because of its long-term asymptomatic phase. Then the diabetic complication might become severe and hard to treat after the patients get diagnosed eventually. Therefore, early prediction

and diagnosis are highly desired. In this project, data mining techniques are used to generate a solution to early likelihood prediction of diabetes. In this study, both a Decision Tree and a Support Vector Machine (SVM) classifiers have been implemented in Python. A decision tree is when a dataset is broken down into smaller and smaller subsets while at the same time an associated decision tree is incrementally developed during the classification. And then the SVM is a data mining algorithm that learns by assigning labels to the objects in the subsets using support vectors near the decision boundaries. The classifiers have been trained and tested using real-world diabetes patient datasets that include 16 features (attributes). This dataset has been created from a direct questionnaire to people who have recently become diabetic, or who are still nondiabetic but having few or more symptoms. The experiment results indicate that both classifiers demonstrated high accuracy in predicting the diabetes with carefully selected attribute sets. Future research will investigate the accuracy of ensemble classifiers, such as Random Forest on larger data sets.

Abstract # 161

Fabrication and Characterization of CZTS Semiconductor Nuclear Detectors

Komlan Havah; Havah, K., Calhoun, C., Horton, L., & Egarievwe, S.

Mentor(s): Dr. Stephen Egarievwe

Department of Electrical Engineering and Computer Science

The goal of this project is to fabricate and characterize cadmium zinc telluride selenide (CZTS) nuclear radiation detectors. The CZTS based semiconductors have the capability to detect X-rays and gamma-rays at room temperature without cryogenic cooling. The major material properties for room-temperature semiconductor detectors include high electrical resistivity, high charge-carrier transport, and good energy resolution. The planar CZTS detectors will be fabricated with pixelated gold electrical contacts. This will be followed with the measurement of surface current and bulk current that will be used to calculate surface resistivity and bulk resistivity, respectively. The CZTS material high resistivity will be tested for nuclear radiation detection using 241Am 137Cs sealed sources. Experiments will be designed to measure the electrical and radiation-detection properties of CZTS.

Abstract # 162

PTSD Detection Device

Kevin Hughes; Hughes, K., Rios, J., Cole, J., Miles, K., & Yaqub, R.

Mentor(s): Dr. Raziq Yaqub

Department of Electrical Engineering and Computer Science

America's VetDogs strives to enhance mobility and renewed independence to veterans, active-duty service members, and first responders with disabilities, allowing them to once again live with pride and self-reliance. While service dogs are trained to support their owners when they exhibit PTSD symptoms visibly or audibly, the ideal situation is to stop the episode before it happens. America's VetDogs in partnership with BAE Systems is seeking to develop a device that monitors a spike in an individual's heart rate and blood pressure before a PTSD episode begins. The device should alert the service dog so it can in-turn provide the veteran with comfort (attention demanding activities, such as licking, jumping, shaking hand gestures, tail vegging while sitting in the lap etc.) This project plans to use an approach to receive the veteran's stimuli and convey them to the trained dog so that it may proactively comfort his owner to avoid or minimize the impact of PTSD episodes. The goal of the project is to create a system that continuously monitors the veteran's PTSD-related vital signs, such as heart rate, convert this data into signals that the system can understand, and transmits those signals to the service animal collar via Bluetooth so that the service dog can actively support his owner and prevent or lessen the effects of PTSD episodes.

Abstract # 163

Surveying the Need for Cybersecurity Best Practices Training for College Students

Jamal Irby; Irby, J., & Pearson, E.

Mentor(s): Dr. Ed Pearson

Department of Electrical Engineering and Computer Science

Cybersecurity sounds like a futuristic term that is only used in a top-secret mission that is only assigned from the president. Well, the sad reality is that cybersecurity has been a real thing since the 1970's. The first project dealing with cyber security was The Advanced Research Projects Agency Network (ARPANET). This was the connectivity network developed prior to the internet itself.[3] In my opinion I think that is very cool. Now, Cybersecurity is important because it protects all categories of data from theft and damage. This includes sensitive data, personally identifiable information (PII), protected health information (PHI), personal information, intellectual property, data, and governmental and industry information systems. This research paper explains what cybersecurity is, gets real world answers from

college students facing cyber-attacks, and informs students about how they can better protect themselves by providing classes about cybersecurity.[4]

Abstract # 164

Motion Planning and Control with Reinforcement Learning and Temporal Logic

Carlan Jackson; Jackson, C., & Fu, Y.

Mentor(s): Dr. Yujian Fu

Department of Electrical Engineering and Computer Science

This project is ongoing research in the focus of Reinforcement Learning (RL) is to utilize various Machine Learning concepts to establish a system of intelligently trained models for safety-critical autonomous systems. The program design will be directed towards developing a platform for quadcopter collaboration using the formal methods and control theory. Control theory will provide policies to maximize rewards, based on model algorithms fueled by concepts such as Markov Processes and Buchi Automata. The factors will provide data for collision avoidance and object detection in a Path Generation model. Along with that we will develop a Temporal Logic model designed to guide and control the system of automatic quadcopter drones. Temporal Logic is used to specify safety properties to provide to the Path Planning model. Our program is running on a high-performance computer with 2.4 GHz core i7, 16 GB DDR4 RAM, and graphics coprocessor, NVIDIA GeForce RTX3070. The simulation platform, Microsoft AirSim, fully supports the RL framework with Python API. The primary Tasks of Collision Avoidance, Object Detection, and Path Generation in a static real-world environment will synthesize a fully trained Path Generation Model capable of optimal decision making and traversal in a 3D environment.

Abstract # 165

Effects of Different Thickness of Anodes on the Thin Film Batteries

Amanuel Dessalegn; Dessalegn, A., Dishman, H., Malagon, V., Dishman, H., & Budak, S.

Mentor(s): Dr. Satilmis Budak

Department of Electrical Engineering and Computer Science

The senior design project is to fabricate thin film solid state Li-ion batteries using DC/RF Magnetron Sputtering system. Thermal annealing will be introduced to improve the efficiency of the fabricated thin film solid state batteries. Lithium-ion batteries are devices that can convert chemical energy to electrical energy and vice versa reversibly. Lithium-ion batteries consist of a positive cathode and a negative

anode separated by an electrolyte that is ionically conducting lithium ions but insulating to electrons. Thin film solid state rechargeable lithium batteries are ideal micro power sources for many applications requiring high energy and power densities, good capacity retention for thousands of discharge/charge cycles, and an extremely low self-discharge rate. For many thin film batteries, the cathode is usually made of a lithium-oxide complex such as LiCoO2, LiMn2O4 and LiFePO4. The anode material is commonly made of a carbon-based material such as graphite, although lithium and other metals can be used. Thin film batteries are commercially available and can be used for many applications, including in renewable energy storage devices, smart cards, and radio frequency identification (RFID) tags, portable electronics, defibrillators, neural stimulators, pacemakers, and wireless sensors. Senior Design Project Students used SiO2 as a substrate, LiCoO2 as a cathode, Li3PO4 (LIPON) as buffer layer, multilayer thin films as anodes, and Cu+Al as current collectors for cathode and anode metals. Experimental characterizing techniques are Seebeck coefficient, van der Pauw four probe resistivity, mobility, charge carrier concentration, charge density, Hall Effect, type of carrier concentration, thermal conductivity, open and loaded circuit measurement, I-V measurements. Final deliverables are fabricated and characterized by thin film solid state batteries.

Abstract # 166

Precision Agriculture

Adefemi Olateru; Olateru, A., Phiri, M., Harris, H., & Yaqub, R.

Mentor(s): Dr. Raziq Yaqub

Department of Electrical Engineering and Computer Science

Smart Agriculture, also known as Precision Agriculture (PA), is a modern farming approach that employs information technology (IT) to provide crops and soil with precisely what they require for optimal growth. This novel concept aims to increase production, decrease labor time, and ensure efficient management of irrigation and fertilizer processes. The primary challenge with Smart Agriculture is the acquisition of vast amounts of data on farmland and its surroundings and utilizing this data to make smart decisions that ensure crops and soil receive the exact amounts of water, oxygen, fertilizer, etc. for their growth. To address this issue, the project proposes a solution that employs sensors, wireless communication, and IT to collect and transmit large volumes of data to a computer server. An algorithm running on the server will utilize this data to make intelligent decisions that ensure optimal crop growth. The project is a hands-on undertaking that involves creating sensors using electronic components and enabling them to transmit data to the computer server via Bluetooth or other wireless communication technologies. By employing this methodology, the project will create a Smart Agriculture system that ensures that crops and soil receive precisely what they require for optimal growth.

Abstract # 167

Autonomous Wind Turbine Blades Cleaning System

Mphande Phiri; Phiri, M., Yaqub, R., & Heidary, K.

Mentor(s): Dr. Raziq Yaqub

Department of Electrical Engineering and Computer Science

Cleaning wind turbine blades is necessary to remove contaminant buildup that would otherwise distort the airfoil's shape and lower power output by 20% to 30%. The dirt buildup, filth, bat carcasses, and dead bug deposits on turbine blades are the leading causes of contamination. The blades cannot be cleaned practically or automatically. This study describes an Autonomous Wind Turbine Blades Cleaning System (ABC) created to automate the problem-solving process fully. The designed methodology is independent and "intelligent" because it can: self-schedule the cleaning schedule considering, particularly the local atmospheric standards as well as the utility's system demand complexities; start the cleaning procedure autonomously, with no human interaction at all; execute the post-cleaning record and inform the hub routinely; and alert the corner in case urgent attention is required. The suggested system is physically mounted on the turbine tower and is programmed to function by the industry's current best practices.

Abstract # 168

Design and Fabrication of a CMOS-based Application Specific Integrated Circuit (ASIC)

Meek Denson Simbule, Simbule, M. D., Bibb, A., & Zhigang, X.

Mentor(s): Dr. Zhigang Xiao

Department of Electrical Engineering and Computer Science

A CMOS-based application-specific integrated circuit (ASIC) will be designed, layout, and simulated for the application of a sensor interface circuit in this project. The ASIC consists of a voltage follower, low-pass filter, and 12-bit dual-slope analog-to-digital converter (ADC). The ADC contains an integrator, a comparator, a counter, a latch, and digital control logic. Tanner software (L-Edit and T-Spice) will be used for the layout and simulation of the ASIC. The ASIC will be implemented on a 2.5 mm × 2 mm silicon chip die and fabricated using the TSMC service. The performance of the fabricated ASIC chip will be tested.

MECHANICAL AND CIVIL ENGINEERING AND CONSTRUCTION MANAGEMENT

Undergraduate

Abstract # 169

Photovoltaic Solar System with Tracking

Jada Bonner; Bonner, J., Thomas, T., & Chowdhury, S.

Mentor(s): Dr. Showkat Chowdhury

Department of Mechanical and Civil Engineering

The primary sources of energy of the world are fossil fuels, such as petroleum, coal, and natural gas. But fossil fuels are formed over million years from decaying plants and animal products, and hence will soon deplete. In addition, combustion of fossil fuels produces carbon dioxide, a greenhouse gas which causes global warming. Alternatively, energy can be produced from renewable sources like solar energy, wind energy, etc. These energies are continuously produced, infinite source, environment-friendly, and are known as clean energy. But they have to be made economically competitive with fossil fuels. Solar energy is the energy that the earth receives from the sun as radiation, and is harnessed using technologies, such as solar heating and photovoltaic. Photovoltaic (PV) cells convert the radiation energy received from the sun directly into electrical energy. The photovoltaic cells are put together to form PV panels. The objective of this project is to design, construct and test a solar power system using PV panels with tracking mechanism. The system consists of PV panel, charge controller, storage batteries, inverter, and tracking mechanism. The purpose of tracking is to move the solar collector and minimize the angle of incidence of beam radiation and thus maximize the performance of the solar collector. The characteristic parameters of the PV panels, relation between generated power and solar radiation, solar panel's efficiency, and influence of single or double axis tracking on the solar panel's performance are evaluated. Finally, the performances of the system with or without the storage battery are analyzed and results presented. The designed solar energy system will provide 140 Watt of clean power for household appliances, battery chargers, etc. The project is built on a movable cart for demonstration and to generate awareness among the engineering and technology students. Acknowledgements:MSEIP Award # P120A210012, U.S. Department of Education.

Abstract # 170

Design of a Pipeline Water Distribution System

Faith Coggins; Coggins, F., Hasan, M., & Kassu, A.

Mentor(s): Dr. Mahbub Hasan

Department of Civil, Mechanical Engineering & Construction Management

Efforts have been made to design an alternate pipeline water conveyance system that will transfer clean drinking water from the George W. Carver Complex-South Wing to the Arthur J. Bond Engineering and Technology building at Alabama A&M University. The length of the pipeline is approximately 80 meters. Applying knowledge and research from two construction management courses: Construction Surveying and Advanced Construction Cost Estimating and one engineering course: Hydraulics and Fluid Mechanics, two designs are created. Design one is a pipeline supported by a concrete pad and will cost approximately $180,000 to construct. Design two is a pipeline supported by a compacted subgrade and will cost approximately $160,000. Design one is the most suitable for the longevity and sustainability of the installment of an alternate pipeline water conveyance system. Although design one is initially expensive, there should be no extra spending cost due to minimum maintenance required overtime. Thereby, design one is accepted.

Abstract # 171

Dehydration Study Of Building Gypsum

Joe Figueroa; Figuerora, J., Nieto, J., & Kassu, A.

Mentor(s): Dr. Aschalew Kassu

Department of Mechanical and Civil Engineering

Gypsum is one of the most widely used natural and recycled gypsum-based waste materials used in constructing new and renovating buildings. The common forms of natural gypsum are the calcium sulfate dihydrate (CaSO4.2H2O), and its dehydration products, calcium sulfate hemihydrate (CaSO4. 1/2H2O), and calcium sulfate anhydrite (CaSO4). Thermal dehydration of gypsum results in hemihydrate, and conversely, hemihydrate hydration produces crystallization of gypsum. In the construction industry, building gypsum is used for several purposes, including cement admixture, gypsum-based dry walls, gypsum-based plasters, sustainable binder, thermal insulation, and renovation of buildings. Conventional and standoff Raman spectroscopy has been a widely explored technique for materials characterization. This study demonstrates the application of these techniques to characterize and monitor the dehydration of building gypsum. The Raman spectra of the samples are captured periodically, and the intensity ratios of the selected characteristic Raman bands are used for the analysis.

Abstract # 172

Design of an Electronic Gear Shifting Assembly using Paddle Shifters

Jibrail Muhammad Jr; Muhammad Jr, J., Johnson II, D., & Chan, W.

Mentor(s): Dr. Wing Chan

Department of Mechanical and Civil Engineering

Traditional manual transmission shifting systems have been proven to decrease Formula SAE drivers' controllability and acceleration time during cornering and braking. The deficiency yields grounds for a limited driver reaction time which can produce unwanted engine revs that require increased fuel consumption and potentially damage the transmission. Once a shift is needed, the driver is limited to completing this task with one hand on the steering wheel. The research examined how an electronic gear-shifting system can improve the response time required to initiate and complete a gear change in the vehicle transmission system. An observed elapsed time to complete a horizontal manual gear shift occurred between 1- 2 seconds; however, an ideal gear shift time to maximize engine efficiency is completed in less than 625 milliseconds. A modified Honda Acura paddle shifter is implemented onto the Formula SAE steering wheel to decrease the shift response time. Implementing the electronic gear shifter proved to be 33 times more efficient by decreasing the response time from 1 second to 30 milliseconds. Decreasing gear-shifting response timing yielded better engine revs that created ideal RPM levels. Achieving efficient and quick gear shifts maximizes the ability to maintain the vehicle's momentum and decrease damaging engine components.

Abstract # 173

Accelerated Degradation Study of Polystyrene-Based Building Thermal Insulator

Jordy Nieto; Nieto, J., Figueroa, J., & Kassu, A.

Mentor: Dr. Aschalew Kassu

Department of Mechanical, Civil Engineering & Construction Management

Polystyrene is a synthetic polymer widely used as a thermal insulation material in buildings. The purpose of this study is to demonstrate the viability of the Raman spectroscopy technique for monitoring the thermal degradation of polystyrene films. The system is integrated with an excitation wavelength 785. nm from a diode laser source giving 100mW power at the laser output port. The Raman spectra of the samples annealed at selected temperatures are captured, and the characteristic Raman bands are analyzed. The preliminary results of the study suggest that the analysis of the spectroscopically observable variations in the Raman band intensities of the samples annealed at different temperatures for a period of time is feasible for monitoring and qualitatively evaluating the rate of thermal degradation of polystyrene-based building thermal insulators. Acknowledgments: Joe Figueroa and

Ordy Nieto would like to acknowledge the funding from INSPIRE (Introducing STEM to Provide Incentives for Research and Education) project supported by NSF Award #2106583.

Abstract # 174

Attitude Control System Thruster Anomaly

Lauryn Page; Page, L., & Adams, A.

Mentor(s): Dr. Aaron Adams

Department of Mechanical, Civil Engineering & Construction Management

This abstract discusses an anomaly that occurs in a spacecraft equipped with six ACS thrusters that provide 3-axis control. The thrusters are arranged in two triads, each located at the back of the spacecraft, with Triad 1 containing thrusters 1, 2, and 3, and Triad 2 containing thrusters 4, 5, and 6. Under vacuum conditions, activating thrusters 3 and 4 causes a negative yaw instead of positive roll. The cause of this anomaly could be due to various factors, including a malfunction in the thruster control system, a failure in the thrusters' hardware, or an error in the spacecraft's software. This issue affects the control dynamics of the spacecraft, making it more challenging to maintain its position and orientation in space. To mitigate the problem, the spacecraft's engineers need to perform diagnostic checks and conduct corrective actions to rectify the issue. Overall, this anomaly highlights the importance of ensuring the reliability and effectiveness of spacecraft control systems, especially in complex missions.

Abstract # 175

Shielding Radiation Leak within T.R.E.A.T Reactors

Kailyn Pope; Pope, K., White, T., Admas, T., Hill, D., Hubbard, C., & Cates, T.

Mentor(s): Dr. Aaron Adams

Department of Mechanical, Civil Engineering & Construction Management

Built in the 1950s, The Transient Reactor Test (TREAT) Facility is a thermal spectrum, air-cooled, graphite-moderated nuclear test reactor. It is used to test reactor fuel and supporting materials. The highly enriched uranium fuel in the air-cooled reactor design has a carbon-to-uranium atom ratio of 10,000:1 and is disseminated in graphite to provide a fast-acting, negative temperature coefficient of reactivity. Extreme testing is done on materials and fuels for nuclear reactors by TREAT. On a smaller scale and very regulated manner, it can generate rapid bursts of energy that cause powers to fail. This allows researchers to evaluate fuel efficiency in accident-like simulations. Subsequently, in a spill-like accident, shielding is required in case of a radiation leak from the reactor. Scientists will need materials

that can endure radiation and are strong enough not to break over time before they can create a shield. Scientists can conclude that Borated Polyethylene is the finest choice after conducting supported research and locating material. Last but not least, scientists have begun to create shields that not only withstand radiation but also seal radiation leaks. The calculations after the shield are installed should reduce radiation by 3000%. After completing a study on the materials most suited for shielding, scientists have successfully sealed the leak.

Abstract # 176

Applied Mechanical Properties to Quadcopter Design and Functionality

Jordan Reynolds; Reynolds, J., Fu, Y., & Drabo, M.

Mentor(s): Dr. Yujian Fu

Department of Mechanical, Civil Engineering & Construction Management

In this project, a detailed study will be focused on the specific detailed design of quadcopter kinematics and dynamics. The study will examine how changes in the parameters of the given environment and the resulting changes in influencing forces affect known drone properties. Furthermore, this study will investigate flight conditions and the reactions specific to our model. The expected outcome will be a validated analytical model that predicts relevant acting forces such as thrust, friction, and angular velocity with respect to power. Data will be presented in terms of power (W), time (s), and angular velocity (rad/s) as a function of projected parameters. The results of this project will provide insight into the understanding of basic control systems relevant to six-degree of freedom motion systems.

Abstract # 177

Determination of Evapotranspiration for Cotton in Alabama

Samuel Sparks; Sparkes, S., & Kassu, A.

Mentor(s): Dr. Mahbub Hasan

Department of Mechanical, Civil Engineering & Construction Management

Cotton irrigation is increasingly becoming a challenge in Alabama because of climate change effects such as the variations in rainfall, temperature, and recent peculiar weather pattern during the growing season of cotton. Cotton crop characteristics, as well as the prevailing weather conditions, are critical in determining cotton water requirement. An efficient method of scheduling irrigation to any crop is important for optimizing time and amount of water requirement. In this presentation, a reliable approach to determine crop water requirement for cotton cultivation has been proposed using the Penman method for Gadsden, Alabama, located in the southern part of the USA. Local weather data

collected from different reliable sources were applied in the Penman's Equation to determine the evapotranspiration for cotton. The highest and lowest water requirements were 9mm/day July 2021 and 0.3 mm/day on March 1, 2021.

Graduate

Abstract # 178

Analyzing The Groundwater Quality From 2010 To 2020 in A Watershed in South Alabama

Kayla Maclin; Maclin, K., & Preetha, P.

Mentor(s): Dr. Pooja P. Preetha

Department of Mechanical, Civil Engineering & Construction Management

Groundwater is an important resource of the environment for daily human activities. According to recent studies, groundwater provides over 97% of accessible fresh water on the planet. Hence, it is important to keep track of the amount of groundwater storage and groundwater retrieval. The amount of groundwater retrieved should not exceed the amount of groundwater stored because that will dry out the soil and cause cracks that can spread into the deeper layers of the earth. The balance of groundwater storage and retrieval is evaluated through a parameter, groundwater recharge that is essential to replenish the water needed in the soil. The purpose of this study is to analyze the ground water flow and surface runoff to be able to examine the groundwater quality of the Wolf Bay Watershed located in South Alabama. In this study, ArcGIS is used to analyze, manage, and share spatial data of the Wolf Bay Watershed and run a calibration for the model to retrieve the output data for the sub basins. Soil and Water Assessment Tool (SWAT) is a modeling tool used in the study to simulate the hydrology and groundwater quality of the Wolf Bay Watershed and develop the layering system of the watershed. The surface runoff and groundwater recharge collected from the Wolf Bay Watershed model developed in ArcGIS and SWAT will be compared with the values of the surface runoff and groundwater recharge retrieved from the United States Geological Survey (USGS) for the years of 2010 to 2020.

PHYSICS, CHEMISTRY AND MATHEMATICS

Undergraduate

Abstract # 179

Synthesis, Spectral and Antimicrobial Studies of Bis (Cyclopentadienyl) Hafnium (IV) Bis (O,O'-Dialkyl dithiophosphate) Complexes

Ta'Najala Anderson; Anderson, T., Reese, R., & Elkhaldy, A.

Mentor(s): Dr. Adnan Elkhaldy

Department of Physics, Chemistry and Math

A new complex of Cp2Hf[S2P(OR)2]2 (where R = Et, Pr-n and Pr-i, Bu-i) were prepared by the dropwise addition of the appropriate O, O'-dialkyl to bis cyclopentadienyl Hafnium dichloride in 1:2 molar ratio and refluxed in benzene solution. These novels com[1]plexes will be characterized by elemental analyses, molecular weight measurements, and spectroscopic techniques (IR., NMR 1H, 13C, and 31P NMR). This Hafnium (IV) dithio complexes will be screened for their antibacterial activities.

Abstract # 180

Statistical analysis of homelessness in the United States among different races

Albert Ball; Ball, A., & Khan, S.

Mentor(s): Dr. Salam Khan

Department of Physics, Chemistry and Math

In this study, we analyzed the state of homelessness in the United States overall and in different states from 2013-2021. Descriptive statistical analysis and regressional analysis is used to analyze homelessness data and predict homelessness in 2030. We also conducted a comparison analysis of homelessness between races.

Abstract # 181

Thermodynamic Analysis Of The Growth Of Cesium Hexachlorohafnate (CHC) from Melt

Jordan Drake; Drake, J., Adedeji, E., Reeder, A., & Babalola, S.

Mentor(s): Dr. Stephen Babalola

Department of Physics, Chemistry and Math

Cesium hexachlorohafnate (CHC) is a non-hygroscopic, high light yield (54,000 photons/MeV), scintillator crystal with high effective atomic number. Unlike many other scintillator crystals, it requires no doping to achieve the high light yield and high energy resolution. This poster reports on the thermodynamic properties of the growth of CHC. CHC is a cubic (BCC) crystal with a perovskite structure consisting of cesium cations and hexachlorohafnate anions. The formation of the hexachlorohafnate anion is of particular interest for this poster, as its formation may facilitate a reduction in the vapor pressure of hafnium over the crystal melt during CHC growth, which may result in more precise stoichiometry. Theoretical predictions about the thermodynamic properties will be made using the existing literature and will be used to predict a temperature profile during the growth process. These predictions will be compared to using the temperature profile of the melt during the crystallization process.

Abstract # 182

Transmission Probability and Lifetime for Emission of Diprotons by Radioactive Heavy Nuclei

Cornelius Salonis; Salonis, C., & Zhang, T.

Mentor(s): Tianxi Zhang

Department of Physics, Chemistry and Math

According to quantum theory, we have modeled the emissions of diprotons from radioactive heavy nuclei, including those proton-rich or neutron-rare isotopes of neon, iron, and krypton. A diproton is a neutron-lacking isotope of helium, 2He, consisting of only two protons. It can be formed in nature and labs by (1) combining two separate protons and (2) decaying of radioactive nuclei. A star in its core forms a huge amount of diprotons every second during the first step of the proton-proton chain nuclear fusion reaction via kinematic collisions and Coulomb barrier quantum tunneling. The slow and stable fusion rate in the core of a star indicates that diprotons are unbounded and most of the formed diprotons rapidly separate back into two separate protons. Only an extremely rare part of diprotons fuse into deuterium via beta decay. Experimentally, scientists have found that proton-rich or neutron-rare heavy nuclei can also emit diprotons, such as 15Ne → 13O + 2He, 45Fe → 43Cr + 2He, and 67Kr → 65Se

+ 2He. Quantum modeling of the diproton decay of heavy nuclei shows that the transmission probability is very small but increases with the energy of diprotons, while the lifetime is extremely short and decreases with the energy. The result obtained from this study is consistent with measurements. This poster shows the details of scientific background or entries on the topic, model analyses conducted, results obtained, and consistency with measurements. This quantum science study is supported by the IBM Quantum Center and NSF HBCU-UP awarded projects.

Abstract # 183

Incidence of Pharmaceutical and Personal Care Product (PPCP) Contamination in Alabama Waters

Destinee Simmons; Simmons, D., Garner, K., Robinson, R., & Shabel, A.

Mentor(s): Dr. Paul Okweye

Department of Physics, Chemistry and Math

Highly soluble pharmaceuticals and personal care products (PPCPs) released into surface waters contaminate aquatic ecosystems and have been shown to have adverse effects on fish and animal populations. In 2015, a total of 60 samples were collected from watersheds across Alabama. PPCP concentrations were determined by US EPA Method 1694 for multi-residue analysis, using solid-phase extraction and ultra-performance liquid chromatography-electrospray tandem mass spectrometry (LC/MS/MS). The detection ranges for acetaminophen (26-45 ppb), bisphenol-A (150-220 ppb), caffeine (991-220 ppb), N, N-Diethyl-meta-toluamide (41-280 ppb), salicylic acid (62-84 ppb), sulfamethoxazole (22-120 ppb), and trimethoprim (13-16 ppb) revealed concerning levels. Water quality measurements were also taken for pH, temperature, and water conductivity. Water conductivity varied across the state, ranging from 263.9-411.6 mS/cm. Temperature and pH did not show significant spatial variation. A greater frequency of PPCP detection was shown to occur in south Alabama. The present study investigates current PPCP contamination at the same locations as the 2015 study. Data were analyzed in R using a two-way analysis of variance (ANOVA) with Tukey HSD for mean separation. The detection ranges of these contaminants were compared to the previous data to access temporal and spatial trends and significant observations were made. Our findings further highlight the need for improvements in pharmaceutical use and management and the development of evidence-based water quality guidelines.

Abstract # 184

Statistical Analysis of Graduation Rates and Data in The United States

Brandon Watts; Watts, B., Coleman, N., & Khan, S.

Mentor(s): Dr. Salam Khan

Department of Physics, Chemistry and Math

This study analyzed the United States' graduation rates and data from 1990-2020. Statistical descriptive analysis and regression analysis are used to analyze the graduation rates with the data and predict future graduation rates. We have also compared and analyzed men's and women's graduation rates and data.

Abstract # 185

A Piezoelectric-Pyroelectric-Photovoltaic Based Power Harvesting Flag via Smart Materials

Amari Williams; Williams, A., Sampson, J., Batra, A. K., & Aggarwal, M.

Mentor(s): Dr. Ashok Batra

Department of Physics, Chemistry and Math

A hybrid piezoelectric-pyroelectric-photovoltaic-based flag was developed and tested as a potential power harvester. The common conception of flags is that they are simply used to display patriotism. However, flags can also be used to generate electric energy from wind, light, and heat from the Sun. Efforts have been made to develop a prototype flag to generate electricity using piezoelectricity, pyroelectricity, and photovoltaic principles via smart materials. The novel prototype was developed as part of a research effort to create green and sustainable energy-harvesting solutions that can passively generate electric energy with little or no maintenance. The Flag utilizes an array of 17 flexible piezoelectric and pyroelectric strips as well as a photovoltaic cell panel. The piezo-pyro- component of the prototype simultaneously generates power through movement and heat, respectively, while the photovoltaic cells harvest solar energy to produce electric power. The beauty of this Flag is to develop power day and night depending on the energy sources available. The basic concept is presented and validated by laboratory experiments with controlled airflow, light, and infrared heat. The maximum voltage generated was 60 mV when the Flag was simultaneously exposed to low-level wind, thermal and light energies.

Graduate

Abstract # 186

Investigating Optimal Polyvinylidene Fluoride (PVDF) Concentrations For Its Applications As Efficient Smart Material

Angela Davis; Davis, A., Batra, A. K., Guggilla, P., & Edwards, M.

Mentor(s): Dr. Padmaja Guggilla & Dr. Matthew Edwards

Department of Physics, Chemistry and Math

Demand for thin films of various functional materials is increasing due to the miniaturization of electronic devices to nanometer scales. Nano sized thin films can be defined as a thin layer of material, where the thickness is less than 109 nm in at least one dimension and based on the specific characteristics it exhibits naturally they are categorized as SMART materials. As the material gets to the size of a nanometer, the characteristics will behave completely different from bulk size for example, color, electrical and optical properties etc. Partially fluorinated polymers such as Poly (vinylidene fluoride (PVDF) have the flexibility and some are classified as smart materials. The study being conducted will help to shine light on what concentration of PVDF is required to exhibit higher polarity and consequently improved mechanical properties. Under the current investigation, PVDF thin films are fabricated with various concentrations of PVDF and characterized for their electrical, optical properties for their use as smart materials.

Abstract # 187

Low Temperature PL Spectroscopy for Evaluating Metal-Semiconductor Interfaces of CdZnTeSe Crystals for Nuclear Radiation Detection

Alexander Egarievwe; Egarievwe, A., Adam, J., Rondinone, Han Htoon, H., Guggilla, P., Trinh, T. C., Wu, Y., Edwards, M., Roy, U. N., & James, R. B.

Mentor(s): Dr. Padmaja Guggilla and Dr. Matthew Edward

Department of Physics, Chemistry, and Math

Semiconductor-based radiation detectors can measure ionizing radiation, such as X-rays and Gamma-rays, by recording the number of free carriers (charges) created upon interaction with each incident photon. In the photoluminescence process, a photon at an energy above the band-gap of the semiconductor is used to stimulate excitation of free carriers with ionizing radiation. How strongly the material emits light near the band-edge (photoluminescence) reflects on the efficiency for collecting-

carriers as radiation detector materials. By analyzing the intensity of photoluminescence as the function of energy, we were able to determine whether the composition of the material is uniform and investigate the presence of defects. We will investigate whether the deposition of a gold layer on top of the crystal surface for charge collection causes any defects beneath the gold layer. We first deposit the gold layer on top of the crystal, chemically etch the gold away, and then perform low-temperature photoluminescence spectroscopy and mapping as the function of the chemical etching time. When the chemical etching time is short enough to remove only the gold layer, we expect the photoluminescence spectra to be modified by the presence of defects created near the metal-CZTS interface. However, photoluminescence spectra are expected to be restored when the chemical etching is enough to remove the damage, interfacial chemistry, and potential diffusion layer induced by the metal deposition.

Abstract # 188

Lattice-Effects on the structure and Mechanical properties of Additively Manufactured 316L Austenitic Stainless Steel: A Review

Ajibike Joan Farounbi; Farounbi, A. J., Schneider, J., & Guggilla, P.

Mentor(s): Dr. Padmaja Guggilla

Department of Physics, Chemistry and Math

The use of powder bed fusion process with high-intensity lasers as an energy source to melt and fuse selective regions of powder, layer by layer in Additive Manufacturing process is able to produce metal components products from metallic powders. Therefore, the relationship between process, microstructure and property in materials made through additive manufacturing tends to be different from the conventional manufacturing process depending on the metal and its alloys. The scanning pattern effects on the microstructure and mechanical properties of steel and its alloy produced by the powder bed based additive manufacturing will be explored. Currently, Laser Powder Bed Fusion (L-PBF) is used to produce stainless steel components for engineering applications, but the technology's ability to spread is being constrained by a fundamental lack of standardization and accurate metrology definition. Furthermore, laser power induces residual stresses during their manufacture and formation despite the unique qualities of austenitic stainless steels. For this reason, this review focuses on the L-PBF process and some of the peculiar phenomena associated with it such as; The applications of austenite SS 316-L materials and more unique and aesthetic designs can be created. Also, the quality, strength, material properties, surface quality and amount of support structures has direct relationship to print orientation.

Abstract # 189

Smart Membranes for Energy Harvesting & Biomedical Sensing Applications

James A. C. Sampson; Sampson, J. A. C., & Batra, A. K.

Mentor(s): Dr. Ashok K. Batra

Department of Physics, Chemistry and Math

Polyvinylidene fluoride (PVDF) is a noncentrosymmetric and electroactive fluoropolymer that is utilized in many thin-film nanocomposites due to its impressive piezoelectric coefficient, cost-effectiveness, mechanical strength, flexibility, chemical and thermal resistivity, and ferroelectric responses. PVDF serves as an excellent polymer matrix for the doping of other various electro-active elements in nanocomposite fabrication. Lead lanthanum zirconate titanate (PLZT)/polyvinylidene fluoride (PVDF) nanocomposite-based membranes were fabricated using a traditional electrospinning process that is seldom performed utilizing electro-active polymer solutions. The fabricated films were sandwiched between electrodes and then Kapton film to produce a capacitor and sensing device. Experimental values for capacitance and dissipation factors were recorded via an LCR measurement system. Dielectric parameters of the fabricated membranes, such as permittivity, electric modulus, impedance, and ac conductivity are calculated. The experimental results obtained provide insight into the electrical behaviors of electro-spun smart materials and their potential use in energy harvesting and biomedical applications.

ORAL PRESENTATIONS

BIOLOGICAL AND ENVIRONMENTAL SCIENCES

Abstract # 501

Investigating the Antimicrobial and Antioxidant Activity of Selenium Nanoparticles and Their Potential Application to Increase Food Safety and Protect Food Quality

Mojetoluwa Afolabi; Afolabi, M., Xiao. Z., & Yuan, Q.

Mentor(s): Dr. Qunying Yuan

Department of Biological and Environmental Sciences

Selenium is a trace element and an essential micronutrient of human, animal, and microorganism benefits. This nanoparticle, in recent times, has attracted the interest of many researchers due to its bioavailability, biocompatibility, and low toxicity. This study aims to test the antimicrobial activity of

selenium nanoparticles (SeNPs) as food against foodborne bacterial pathogens and explore the potential application of SeNPs as a food preservative. SeNPs were synthesized by ascorbic acid reduction of Na2SeO3. SeNPs at a concentration ranging from 0.5 to 30µg/mL were used to treat 11 different foodborne bacteria. The inhibition of SeNPs on the bacterial growth was analyzed using colony forming unit assay. SeNPs exhibited strong inhibition on the growth of Listeria Moncytogens but only a modest inhibition on the growth of Staphylococcus aureus, Staphylococcus epidermidis, and Vibrio alginolyticus. SEM examination of the SeNPs treated bacterial cells suggested SeNPs may inhibit bacterial growth by causing damages such as dented cell membrane, cell shrinking, and cell disruption. Our preliminary data suggested that SeNPs are able to slow down the growth of some foodborne bacteria; however, they may not be potent inhibitors. In addition, the safety of SeNPs needs to be tested at the cellular and animal level.

Abstract # 502

Effects of Direct Low-Temperature Plasma on Bell Pepper Seed Germination and Suppression of *Xanthomonas campestris* pv. vesicatoria

Sophia Madison; Madison, S., & Nyochembeng, L.

Mentor(s): Dr. Leopold Nyochembeng

Department of Biological and Environmental Sciences

Low-temperature plasma (LTP) is gaining more attention as an alternative to chemical disinfectants due to its demonstrated applications in agriculture. The objective of this research was to assess the effectiveness of LTP directly in suppressing Xanthomonas campestris pv. vesicatoria, a seed-borne bacterial plant pathogen infecting Bell pepper seeds and plants. California Wonder bell pepper seeds will be inoculated with Xanthomonas cultures. The inoculated seeds will then be treated with three different low-temperature plasma voltages 0 kV(control; no voltage applied), 6 kV, and 8 kV. Each of these trials will be treated in time increments of 0(control; no time applied), 4,6, and 8 min. Treatments will then be cultured on a nutrient agar plate to be further observed and assessed for their optical density and concentration of cells.

Abstract # 503

Effects of cork particles on unconfined compression in compressed earth blocks

Karman Morgan; Morgan, K., Davis, D., & Sharma, G.

Mentor(s): Dr. Dedrick Davis

Department of Biological and Environmental Sciences

The unconfined compression strengths of three native Alabama soils were studied under different cork and straw applications for compressed earth blocks (CEBs). High clay soil, moderate clay and high silt soil, and low clay and high sand soil with cork and straw additives were utilized in molds that simulated unfired CEBs. Replicated Standard Proctor Test, Specific Gravity, Atterberg Limits, and Unconfined Compression Strength (UCS) were examined. The influence of straw and/or cork on UCS depended on soil type. Cork significantly increased UCS up to 37% and decreased weight by 19% in high clay soil. The addition of cork and straw to moderate clay and high silt soil significantly increased UCS by 28% and decreased weight by 25%. Soil with very low clay and high sand content had the lowest UCS values, and the addition of cork or straw did not significantly affect the UCS. To our knowledge, this is the first study that utilizes cork particles in CEBs.

Abstract # 504

Effects of Low-Temperature Plasma on Seed Germination and Plant Growth of Leafy Mustard Greens

Sravan Kumar Sanathanam; Sanathanam, S. K., Pham, T., Kumar, S., Boateng, J., Sowe, S. F., Kunisetty, M., Ghimire, B., Xu, K. G., & Mentreddy, S. R.,

Mentor(s): Dr. Srinivasa Rao Mentreddy

Department of Biological and Environmental Sciences

Low-temperature plasma (LTP) is a weakly ionized noble gas comprising free electrons and positively charged ions. It is increasingly used in agriculture for microbial disinfection, enzymatic inactivation, seed germination, and plant growth. Leafy mustard greens (MG) are emerging as a healthy food in the USA. However, their production is associated with poor germination rate, uneven stands, and seedling diseases. This study aims to determine the effects of LTP on seed germination, germination rate, and plant growth in the MG variety 'Amara.' MG seeds were exposed to T0=0s–Control, T1=30s, T2=60s, and T3=90s, He or Ar LTP at 7 kV, one µs pulse width, 5 kHz. The treated seeds were grown in pots containing potting mix in a greenhouse. Seed germination, germination rate, and plant height were recorded daily. The seeds exposed to Ar or He LTP germinated earlier than the Control. The percentage difference between Control and treated seeds was higher by 20% in the He than in the Ar treatment. He and Ar LTP enhanced seed germination by 18.75% and 10.4%, respectively. Compared with the Control, the germination rate increased by 18.75% and 8.33% by He and Ar LTP, respectively. Exposure to He LTP for 30s enabled higher germination (81.25%) and growth rate. Seeds treated with He for 90s (HeT3) exhibited a 31.25% higher growth rate. Exposure of seeds to Ar LTP for 60s (ArT2) gave a greater germination rate than other Ar treatments. LTP-treated plants were taller (>5% in Ar, > 8% in He), produced longer roots (16% in ArT1 & ArT2, 22% in HeT3), and produced greater biomass (5% in Ar, 14% in He). The study showed that LTP increases the percentage and the rate of seed germination and promotes plant growth of leafy mustard greens. This research was supported by NSF-EPSCoR OIA-2148653 and NASA-EPSCoR 80NCCS21M0139.

Abstract # 505

Impact of Food Deserts on Health Outcomes in Individuals with Metabolic Disorders

Jah-Nice Washington; Washington, J., & Weems, E.

Mentor(s): Dr. Ebony Weems

Department of Biological and Environmental Sciences

Since the early 1960s, obesity has been considered a growing epidemic within the United States, along with Type II Diabetes (T2D) and other metabolic disorders primarily impacting individuals living within a food desert, especially within Alabama. Alabama is ranked as one of the top twelve states that has a higher rate of obesity within a food desert, 39%, with an 8.03% increase in comparison to the remainder of the nation. A food desert can be considered as an area where there is an insufficiency of adequate foods that contribute to maintaining a healthy and active lifestyle per household, smaller populations, higher poverty percentages, or where there is a higher percentage of individuals with lower levels of education. Within this study, we sought to determine the association of social determinants such as transportation methods, global health crisis, and built environments in correspondence with metabolic disorders such as obesity, diabetes, and mental health. It is hypothesized that increased body mass index (BMI) is adversely impacted by the social determinant factors associated with food desert areas. Geospatial data analysis was used to identify significant areas within Alabama with increased incidences of obesity and T2D. A total sample of 665 participants was interviewed at local grocery stores, gym facilities, weight loss clinics, convenience stores, and through social media, asking a series of questions. Sample analysis identified 58.4% of the total sample who are considered low income, indicating that there was a financial barrier formed which limited approximately 28.3% of individuals to not having any form of personal transportation to access healthier foods. This barrier indicates that where there is a food desert with an abundance of social determinants, there is a decrease in the quality of life.

Abstract # 506

Field evaluation of Eleven Triploid Miscanthus X Giganteus Advanced-Breeding Genotypes in Northern Alabama

Friday Zakari; Zakari, F., Kuang, X., & Cebert, E.

Mentor(s): Dr. Xianyan Kuang

Department of Biological and Environmental Sciences

Miscanthus × giganteus (Mxg), a perennial C4 grass derived from tetraploid M. sacchariflorus and diploid M. sinensis, is an important bioenergy feedstock crop that has the potential to meet a substantial proportion of current and future U.S. cellulosic bioenergy needs due to its high biomass yield and low input requirements. The only commercial biomass Mxg cultivar (Mxg 'Illinois') available to farmers in the

southern US is plagued by early-flowering for the crop's potential to be fully realized. To select higher-yielding and better-adapted Mxg genotypes, in this study, we evaluated eleven elite Mxg advanced-breeding genotypes developed from extensive germplasm collection (by Sacks at the University of Illinois). The eleven elite genotypes and two check cultivars (Mxg 'Illinois' and 'Nagara') were tested in a field trial at Winfred Thomas Agricultural Research Station (Hazel Green, AL). A randomized complete block design with four blocks/replications was included. Planting was done in 2019 Fall; each plot has four rows of 12 plants. For each of the past three growing seasons, we collected and will collect data on flowering time, lodging, biomass yield, and yield components. Preliminary data analysis indicates that great variations exist among the 13 genotypes in yield. For example, in the 2021 growing season, the average biomass ranged from 1.89 kg/plant to 0.80 kg/plant among these genotypes. In addition, different degrees of non-desired lodging (plants falling toward/on the ground) were observed in 2021 and 2022, ranging from mild, moderate, to severe levels. This highlights the need to consider lodging as an important breeding indicator in future breeding schemes. Biomass harvest for the 2022 growing season and yield components are to be done. Comprehensive evaluation based on flowering time, yield, and non-lodging plant architecture through this three-year trial will provide guidance for the future breeding of elite Mxg genotypes for cultivation.

COMMUNITY AND REGIONAL PLANNING

Abstract # 507

The Analysis of Residential Pricing Using Big Data

Zainab Adedo; Adedo, Z., Oluwoye J., Rukmana, D., Florina D., & Salam K.

Mentor(s): Dr. Deden Rukmana

Department of Community and Regional Planning

For many real estate firms and practitioners, understanding property pricing and its relationship to data analysis is of utmost importance. However, a lot of research on residential property prices uses manual survey data and statistical data to perform quantitative analyses. The distribution of residential housing prices in urban areas cannot be explained by conventional housing price models, which are primarily linear models. Numerous academics have investigated and calculated housing prices using spatial statistics, exploratory spatial data analysis, and other techniques in order to model the relationship between housing prices and the influencing factors. However, the need for a more sophisticated yet comprehensive method has now become more imperative. For real estate experts, figuring out the prices of residential properties can be difficult. Even though there are various ways to determine a property's price, the accuracy of these assessments and prices has come under intense scrutiny. Therefore, this is what big data analytics wants to solve in the determination of property prices. The goal of this study is to determine whether and how big data analysis may be utilized to evaluate residential

properties and determine a fair price. The research design used in this study is quantitative, and in order to get a relevant result, both the descriptive statistical approach and the ordinary list square regression (OLS) was used. The results of the study demonstrate that the three influencing factors—use, age, and land square feet—have a considerable impact on residential property prices. Use is favorably correlated, while age and land square feet are inversely correlated. Additionally, the study discovered that the pricing of residential property might be influenced by the months in which the property is sold. Due to reduced residential property prices in February and March, these months had a negative impact on pricing.

Abstract # 508

The Adoption of the use of Unit Packaged Sewage Treatment System as an Alternative Means to Septic Tanks

Oluwadamilare Akomolafe Daniel; Daniel, O. A., & Yin, J., Pressley, J..

Mentor(s): Dr. Joyce Pressley

Department of Community and Regional Planning

The population density of the suburbs, especially small towns, is fast growing and developing into cities. This growth and development calls for expansion and changes in certain physical features and basic amenities. As the suburbs increase in population density, specific amenities may pose a danger on such a geographical site. The region's residents are naturally beginning to see further development as a threat to the unique charm that has made their way of life so attractive.

Natural water is a vital source of human existence and must be protected from contaminants. One of the significant sources of supply of natural water is the underground aquifer. The underground aquifer needs to be carefully protected from any contaminants, and this source of water supply for livelihood will only retain the quality of its content when prevented from any possible contamination source. Although, the city planning council commission designed and put policies in place to serve as installation guides to septic tanks. However, the use of septic tanks is an idea that is based on a temporary solution. It can be highly susceptible to collapse or overflow, thereby leading to the contamination of the underground water source, thus posing a health hazard to the natural environment and human health. This paper argues the threat that the heavy use of septic tanks may pose in the fast-growing small towns of the United States of America. The objectives of this study thus propose the use of unit-packaged and cost-effective sewage treatment plants for residential developments in small towns in the United States of America and what the sewage treatment system will do differently, especially with respect to protecting the underground aquifer. And to establish the efficiency and effectiveness of its use to prevent the underground water from being contaminated. This study focused on the small towns in Huntsville. The paper adopts the use of bibliography reviews as the research method, and the following variables are considered: population size; area coverage; proposed sewage treatment system

specification; climatic conditions; successes and/or failures of the proposed system in certain geographical territories; and the cost implications. It, however, is pertinent to know that the proposition is not targeted at replacing what has been in existence and in use over the decades in the sample study areas in the United States of America but may be presented to serve as a support or an additional solution to the existing sewage treatment solution.

Abstract # 509

Households Energy Use a Study Investigating Role Towards Energy Efficiency In The Electricity Sector: A Case Study Of O Forikrom And A P Iadu Community In Ashanti Region Of Ghana

Marvin Lotsah; Lotsah, M., & Oluwoye, J.

Mentor(s): Dr. Jacob Oluwoye

Department of Community and Regional Planning

Electricity is an important indicator of a country's economic prosperity because it provides the fundamentals for growth. It is critical for key activities such as quality healthcare delivery, transportation, education, mineral extraction, effective communication, and many others. A nation's development and progress can be significantly hampered in the absence of a reliable and sustainable electricity supply. To better understand the energy efficiency gap, this research paper identified and investigated household role toward energy and stated preference towards energy efficiency. The research was carried out through simple random sampling for household participants and purposive sampling for four specific institutions (Energy Commission Ghana, Electricity Company of Ghana, Brew Hammond Energy Centre, KNUST, and Centre for the Development of People). The results revealed that the participants lacked knowledge of electrical appliance ratings as well as environmental awareness.

The research findings suggest a link between green space availability and electricity consumption. Family structure was identified as a minor factor influencing electricity consumption in the studied areas, with economic and situational considerations taking precedence. While the experiment also revealed the lack of communication and educational opportunities between service providers and households about their electricity consumption patterns. The paper concludes that the household sector is a large electricity consumption worldwide, and as a result, it has become the focus of numerous energy efficiency measures.

FAMILY AND CONSUMER SCIENCES

Abstract # 510

Exploring Lifestyle Behaviors of College Students

Ashley Knight; Knight, A., & Sistani, N.

Mentor(s): Dr. Nahid Sistani

Department of Family and Consumer Sciences

This study aimed to explore the lifestyle behaviors of college students. This research study explored college students' diet, physical activity, sedentary behaviors, tobacco use, and sleep behaviors. A modified version of the 2019 State and Local Youth Risk Behavior Survey was administered to 314 college students to assess their lifestyle behaviors. The data was gathered, and the researcher determined how lifestyle behaviors influenced students' health by examining their demographics, body mass index, dietary intake, physical activity, and sleep.

FOOD AND ANIMAL SCIENCES

Abstract # 511

Hepatoprotective Effect of Mixed Fruits and Berries on Cafeteria Style (Western) Diet-Induced Obesity in Rats

Rawan Al Hazaimeh; Al Hazaimeh, R., & Boateng J.

Mentor(s): Dr. Judith Boateng

Department of Food and Animal Sciences

Non-alcoholic fatty liver disease (NAFLD) is considered a major cause of several liver-related morbidity and mortality. Studies found the prevalence of NAFLD is twenty-six times higher in adolescents when overweight or obese. This study evaluated the effect of mixed fruits and berries (MFB) in alleviating obesity related NAFLD in a preclinical model of adolescent obesity. Adolescents Sprague Dawley male rats at 39 days old were randomly assigned (n=6) one of six treatments diets: PC (positive control; CAF +chow diet (CD)), NC (negative control; chow diet only), T1 (treatment one; 3%MFB diet), T2 (treatment two; 6% MFB diet), P1 (prevention one; 3%MFB diet + CAF), and P2 (prevention two; 6%MFB diet + CAF). Weekly body weights, daily feed, and caloric intake were measured. On day 42, post-treatment, animals were euthanized. Livers were collected, weighed, and used for histopathological analysis and determination of enzyme activity. Blood was collected via cardiac puncture and used for serum and plasma biochemical analysis. The body weight of the PC was 20% higher than the P2 group and 11% higher than P1. The group administered MFB maintained a weight comparable to NC. Notably, liver

weight was significantly higher in the PC group (16.4±0.35g) compared with P1 (12.03 ±0.27g) and P2 (12.00±0.42g). Moreover, alanine aminotransferase (ALT) and aspartate aminotransferase (AST) were significantly higher in the PC group, and the MFB groups were comparable with the NC. Histopathological analysis of the liver showed lipid accumulation and significant presentation of microvascular steatosis in the PC, while P1 and P2 were comparable to the control groups (NC, T1, and T2). Consumption of polyphenol-rich MFB mitigated CAF/junk food-induced obesity. Results suggest that consumption of MFB may help prevent and treat obesity related NAFLD due to their antioxidant and anti-inflammatory actions.

Abstract # 512

Hemp By-Product (Hemp Flakes) Showed Potential for Application as a Functional Food Ingredient

Elvis Baidoo; Baidoo, E., Cebert, E., Mankolo, R., Verghese, M., & Herring, J.

Mentor(s): Dr. Joshua Herring

Department of Food and Animal Sciences

Cannabidiol (CBD) oil production from hemp buds generates by-product biomass (hemp flakes), often posing waste management challenges. This work is based on the hypothesis that the by-product possesses residual compounds with nutritional and health value that could be used to improve utilization. The chemical composition, antioxidant properties (total phenolic compounds (TPC), total flavonoids (TFC), ferric reducing antioxidant potential (FRAP), 1,1–diphenyl-1-picrylhydrazyl (DPPH), trolox equivalent antioxidant capacity (TEAC)), heavy metals (Al, Cu, As, Pb, Co, Cd), and selected cannabinoids (CBD, cannabiodiolic acid–CBDA, cannabichromene–CBC, cannabigerol–CBG, and cannabinol–CBN) contents were compared. Hemp flakes' chemical composition was generally similar in value to commercial products, showing intermediate amounts. Protein was significantly different ($p \leq 0.05$) among samples, with the hemp flakes exhibiting intermediate levels among commercial products. Heavy metal levels of all tested products were within the permissible limits according to the US FDA standards; however, while more hazardous metals such as arsenic and lead were absent, aluminum and copper were present in all hemp samples. Negative correlations ($r = –0.832$, $p = 0.001$ and $r = –0.773$, $p = 0.003$) were found between protein and copper and aluminum, respectively. All tested cannabinoids were present in the hemp by-product, while some cannabinoids were not detected in some commercial products. Considering the high contents of nutrients, antioxidants, cannabinoids, and safe heavy metals in hemp flakes, we suggest its application as a food ingredient to complement other ingredients for consumer functional benefits.

Abstract # 513

Anti-oxidative Potential of Spirulina Microalgae and Bilberry

Katelyn Boyle; Boyle, K., Kaur, R., & Verghese, M.

Mentor(s): Dr. Martha Verghese

Department of Food and Animal Sciences

Spirulina is a photosynthetic cyanobacterium. Bilberry is a dark berry known for its medicinal purposes. Overall, the aim was to identify potential anti-oxidative properties of Spirulina and Bilberry. Objectives were to determine total phenolics and total flavonoids in Spirulina and Bilberry extracts, pure and combination samples [100% Spirulina (100S), 100% Bilberry (100B), 50% Spirulina + 50% Bilberry (50S/50B), 75% Spirulina + 25% Bilberry (75S/25B), & 25% Spirulina + 75% Bilberry (25S/75B)], and their antioxidant potential. Aqueous (AE) and 80% ethanol (EE) extracts of Spirulina and Bilberry were prepared using standard protocol. Antioxidant potential was determined using Total Phenolic Content (TPC), Total Flavonoid Content (TFC), 2,2-diphenyl-1-picrylhydrazyl (DPPH), Ferric Reducing Antioxidant Potential (FRAP), Trolox Equivalent Antioxidant Capacity (TEAC), and Nitric Oxide Radical Scavenging Ability (NORS) assays. DPPH % inhibition (□g/mL) of EE extracts ranged from 36% - 92%, and AE ranged from 20% - 61% with highest seen in 100B. TEAC (mM T.E./100g DW) in 100S EE (147.03) was 1.07 to 2.55 times higher than other EE extracts, and 75S/25B AE (142.35) was 1.04 to 1.73 times higher than its counterparts. Highest NORS (mg A.A.E./100g DW) was seen in 100B EE (31129.03) and 50S/50B AE (20677.42). Highest FRAP (mM F.E. (II)/100g DW) was seen in 100B EE (229.48) and AE (113.51). TPC (1946.89 mg G.A.E./100g DW) and TFC (45.06 mg C.E./100g DW) were highest in 100B EE. However, in AE, TPC (2128.82) was highest in 25S/75B, and TFC (15.97) was highest in 50S/50B. EE extracts had higher TFC, and antioxidant potential than AE, suggesting more lipophilic bioactive components in Spirulina and Bilberry extracts. Spirulina and Bilberry are underexplored and underutilized in the food industry. Therefore, the significance of this research is to further use Spirulina and Bilberry in functional food product development due to their health-promoting properties.

Abstract # 514

The Control of Salmonella in Salmon Through the Use of Pulsed Light Technology

Kira Christian; Christian, K., Jackson-Davis, A., & Kassama, L.

Mentor(s): Dr. Armitra Jackson-Davis

Department of Food and Animal Sciences

Salmonella enteritidis is a Gram-negative bacterial pathogen that if consumed, can be very dangerous. Food products like fish are largely at risk for harboring Salmonella. In an effort to control the bacterial load on these products, pulsed light technology has been explored as a treatment method in

maintaining the microbial safety of the treated samples. Pulsed light is a cost-effective technology and safe for the environment. This treatment combines intense pulses of white light and short durations of time to inactivate pathogens in food systems. The objective of this study was to determine the effectiveness of pulsed light in controlling the natural microbial load on salmon. After salmon was purchased from a local retailer, the microorganisms native to the product were harvested. The samples were then treated with pulsed light at various treatment settings that varied in voltage, energy, and number of pulses (1-2kV, 100-300J/P, and 5 & 10 pulses). After treatment, 0.1 mL of the samples were plated on non-selective media in duplicate. The plates were incubated at 37°C for 24 h and then evaluated for survival of organisms. The results showed that using intense pulses of light at short periods of time successfully reduced the amount of Salmonella that existed in the sample. The samples treated with pulse light at 2kV showed to be more controlled than the samples treated at 1 kV. The microbial load in this set of samples was less than samples that were treated with a lower voltage. The treatment levels were successful in maintaining the quality of the product by preventing lipid oxidation and maintaining the appropriate texture of the salmon.

Abstract # 515

Northern Alabama Grown Hemp (Cannabis sativa sp L) loaded Electrospun Nanofibers for Active Food Packaging Application

Aaron Dudley; Dudley, A., Jackson-Davis, A., Quang, X., & Cebert, E.

Mentor(s): Dr. Lamin Kassama

Department of Food and Animal Sciences

Hemp (Cannabis sativa sp) is a medicinal plant that contains bioactive compounds with antimicrobial properties. The incorporation of Hemp extracts into a nanofibrous film as an active food packaging solution has yet to be widely examined. This study used electrospinning technique to prepare Polyvinyl alcohol/hemp extract nanofibrous films. The objectives of the present study were to fabricate an active nanofibrous film and evaluate its antibacterial effect on the selected foodborne pathogens. In this study, Hemp inflorescences grown at the Alabama A&M University, Winfred Thomas Research Station (Hazel Green, AL; N 34.9025-W 86.5596) were used. Polyvinyl alcohol solutions containing various concentrations of Hemp extract were electrospun with a Fluidnatek Electrospinner. The physicochemical properties of the electrospun nanofibers were characterized with FTIR, and the in vitro and situ antimicrobial activity were evaluated. Antibacterial activity against cocktails of enteric pathogens Listeria monocytogenese (LM) and Salmonella enterica (SE) was evaluated. All treatments were analyzed in triplicate, and all statistical significance was tested at 5%. FTIR results confirmed the successful incorporation of hemp extract into the nanofiber matrix, the existence of cannabinoid, phenolic acid, and flavonoid chemical compounds indicated with characteristic absorption bands ranging from 3358-3125cm-1, 1533-1429cm-1 , and 1264-1042cm-1 respectively. The number of LM in the control group was 10.72 Log CFU/mL at 37°C, while the number of LM in Hemp nanofibers decreased by

8.87 Log CFU/mL after 48 h. In situ evaluation of nanofibers after four-day observations stored at four °C and 25°C showed that the Hemp nanofibers were bacteriostatic against SE. The results suggest that packaging raw poultry in Hemp nanofibers could help improve the raw storage shelf-life of poultry meat. Therefore, Hemp-loaded nanofiber will be a good candidate for food supply chain safety.

Abstract # 516

Impact of Probiotic and Natural Fermentations on the Techno-Functionality Properties Of Red Ripper Cowpea and Lemon-Yellow Sorghum: A Two-Climate Resistant Crops

Ama Adadzewa Eshun; Eshun, A. A., Jackson-Davis, A., & Boateng, J.

Mentor(s): Dr. Judith Boateng

Department of Food and Animal Sciences

Sorghum and cowpea are drought-resistant crops and have complementary nutritional compositions. Thus, these crops have the potential to improve food security in a world challenged by the climate crisis. This study aimed to investigate the effect of natural and lactic acid bacteria (LAB) fermentation to improve the techno-functional properties of sorghum and cowpea flours. Natural fermentation of the sorghum and cowpea flours was conducted at 34^{o}C for 24, 36, and 48 hours. The probiotic (lactobacillus paracasei) fermentation was also carried out on the flours for the same time period, and the pH and titratable acidity were monitored. Samples were taken after each fermentation period for analysis. Techno-functionality in terms of water/oil absorption capacity (WAC/OAC), bulk density (BD), emulsifying capacity/stability (EC), foaming capacity/stability (FC/FS), and color parameters of the flours were determined. The introduction of lactobacillus paracasei to the flours reduced pH and increased acidity. In terms of techno-functional properties, both fermentation types improved the lightness (L*), redness (a*), and yellowness (b*) of the flours. BD significantly ($p < 0.05$) decreased from 4.24±0.16 g/ml to 1.50±0.01 g/ml for cowpeas and from 2.94±0.05 g/ml to 1.95±0.01 g/ml for sorghum. LAB and natural fermentation significantly impacted ($p < 0.05$) OAC for cowpea and sorghum with an increase. Furthermore, EC ranged between 42.50% - 60.27% for cowpeas and 46.62% - 56.91% for sorghum after LAB fermentation. In addition, LAB and natural fermentations resulted in significant increases ($p < 0.05$) in WAC for both cowpeas and sorghum. FC significantly decreased for both samples after fermentation. Overall, LAB-fermented flour demonstrated better functional properties. Results showed that natural and probiotic fermentations improved the techno-functional properties of sorghum and cowpea flours. This will be useful to enhance the properties of pulse-derived functional formulations.

Abstract # 517

Development of Educational Materials For Underrepresented Farmers

Melody Jackson; Jackson, M., Jackson-Davis, A.

Mentor(s): Dr. Armitra Jackson-Davis

Department of Food and Animal Sciences

The Food Safety Modernization Act (FSMA) was signed into law in 2011; and two rules have directly impacted small-and medium-sized growers, packers, and processors in the US and abroad. As a result, those seeking employment in the food industry must have knowledge of these regulations. The Produce Safety Rule impacts growers, those who grow and pack on their farms, and those who sell products at roadside stands and farmers markets. Although it is well documented that over 35,000 individuals have successfully completed the Grower Training, underserved minority groups are often hard to reach for participation in such training. The overall objective of this work was to develop customized food safety education and outreach programs for underserved communities (including minority, tribal, and otherwise socially disadvantaged growers) that expands upon existing food safety education and addresses the needs of specialized audiences whose education needs have not been previously or adequately addressed. To address this objective, a learning module on the topic of sanitation was developed. To accomplish this, an outline related to sanitation was first developed. This outline lists the content that would be addressed in the learning module. After approval of the outline, a script for the recording session was developed. This outline and script were then approved by an advisory board. After this, the PowerPoint slides were developed. The developed learning module address the USDA Food Safety Outreach Program by "…... expand upon existing food safety education and outreach programs that address the needs of small, specialized audiences".

Abstract # 518

Health Benefits and Antioxidants Mechanisms of Polyphenols from a Reborn Native American Tea: Yaupon

Jayla Lane; Lane, J., Laur, K., & Verghese, M.

Mentor(s): Dr. Martha Verghese

Department of Food and Animal Sciences

Yaupon tea is an herbal made from the leaves of the Yaupon plant, which is a type of holly native to North America. It is a natural source of caffeine and contains theobromine, which is present in coca. These compounds have the ability to support brain function and increase energy and alertness. It is also

known to have active compounds that can act as antioxidants to reduce inflammation and oxidative stress in the body. The objective of the study is to determine the differences in the selected, processed Yaupon teas (Green, medium roast, dark roast), which will be evaluated by measuring the Total phenolic content (TPC), Total flavonoid content (TFC), and the antioxidant potential. The Yaupon tea: medium roast (MR), dark roast (DR), and green tea (GT) were extracted using two solvents: 80% Ethanol (EE) and boiling water (AQ). Antioxidant capacity will be determined by the following assays: 2,2-Diphenyl-picryl-hydrazyl (DPPH), Total Antioxidant Capacity (TEAC), Nitric oxide radical scavenging (NORS), Ferric reducing antioxidant potential (FRAP). Yaupon tea is anticipated to exhibit antioxidant potential. Based on previous studies of tea products, high levels of phenolic compounds, specifically catechins, are expected to be present in green tea over dark teas. There is limited research on the antioxidative potential of Yaupon tea. This study will help determine the antioxidants of Yaupon tea and how they may have potential health benefits to prevent certain chronic diseases such as cancer, diabetes, etc.

Abstract # 519

Effects of Industrial Hemp on Rumination Behavior of Angus Cattle

Nathaniel Ogunkunle; Ogunkunle, N., Samuel, F., Simpson, M., Kuang, X., Cebert, X., & Boateng, J.

Mentor(s): Dr. Judith Boateng

Department of Food and Animal Sciences

Rumination is an important behavior in cattle, which helps in the digestion of roughages. Maintenance of an optimum rumen environment is critical to the performance and well-being of ruminant animals. The objective of this study was to determine the effects of industrial hemp supplementation on the rumination behavior of Angus cattle. Twenty Black Angus heifers were completely randomized into either CON (receiving commercial concentrates) or HEMP (receiving 30g of hemp) in a trial that lasted for six weeks. Hay and water were offered ad libitum. Rumination, rumin al pH, temperature, and water intake were recorded with smaxtec bolus x2.0. Data were analyzed using GLIMMIX procedure for repeated measure in SAS 9.4. There was a significant ($p<0.05$) difference in water intake within the experimental period. Water intake ranged from 41.24-72.96 and 44.03-64.29 in CON and HEMP group, respectively. No significant difference was observed in the pH and rumination of the animals. Rumination behavior ranged from 289.30 to 316.20 in CON and 200 to 318 in HEMP group. Conclusively, industrial hemp can improve rumination behavior in cattle while conserving water and maintaining optimum rumen pH thereby improving the performance of Angus cattle.

Abstract # 520

Regulation of the Saccharomyces cerevisiae PAH1-encoded phosphatidate Phosphatase By Citric Acid Cycle Metabolites

Sagar Pasham; Pasham, S., & Fakas, S.

Mentor(s): Dr. Stylianos Fakas

Department of Food and Animal Sciences

Phosphatidate phosphatase (PAP) catalyzes the conversion of phosphatidate to diacylglycerol in a reaction that depends on $Mg2^{+}$. PAP enzymes are evolutionarily conserved from yeast to mammals. In the model yeast Saccharomyces cerevisiae, the PAH1-encoded PAP regulates lipid biosynthesis by controlling the levels of phosphatidate and diacylglycerol, which act both as lipid precursors and signaling molecules. The enzyme activity of the Pah1 PAP is regulated by phospholipids, sphingoid bases, and nucleotides. In this work, we examined the regulation of the PAP activity of Pah1 by citric acid cycle metabolites (e.g., citrate, isocitrate, and α-ketoglutarate). A unit of PAP activity was measured following the release of 32P-phosphate from the radiolabeled substrate 32P-phosphatidic acid. The results showed that the PAP activity of Pah1 increased by 2-fold, 1.8-fold, and 1.6-fold in the presence of citrate (1mM), isocitrate (1mM), and α-ketoglutarate (2.5mM), respectively. Next, we examined the effects of citrate and isocitrate on the kinetics of Pah1 PAP activity with respect to the concentration of $Mg^{+}2$ ions. The results showed that the highest activity was obtained in the presence of 1mM of Mg+2 ions and 1mM organic acids. Currently, we are examining the effects of citrate and isocitrate on the kinetics of Pah1 activity with respect to the surface concentration of PA. These results corroborate our previous findings with the PAP activity from the yeast Yarrowia lipolytica, which is regulated by citrate metabolites. These findings indicate that the effect of citrate metabolites on PAP enzymes could be widespread among yeasts and, perhaps, mammalian enzymes.

Abstract # 521

Evaluation of the Effect of Industrial Hemp Supplementation on The Hemogram and Biochemical Characteristic in Angus heifers

Felix Uchenna Samuel; Samuel, F. U., Nathaniel, O., Monya, S., Kendra, J., Josh, H., Gamal, E. A., Martha, V., Ernst, C., Xuang, K.

Mentor(s): Dr. Josh Herring

Department of Food and Animal Sciences

The nutritional and physiological status of animals are indicated by changes in their hemogram and biochemical properties. The use of industrial hemp in animal nutrition is gaining importance. This study evaluated the effect of industrial hemp supplementation on the hemogram and biochemical

characteristics of Angus cattle. Twenty (20) healthy Angus heifers, aged 19 months with an average body weight of 800 lb and body condition score of 6.5 were randomly divided into two groups of ten (10) heifers each in a completely randomized design. Group 1 (n=10) was supplemented with grounded industrial hemp at 20/200mg of the concentrate and group 2 (n=10) had no industrial hemp supplementation. Hay and water were provided ad-libitum to all the groups for a period of 10 days. Three (3) ml of blood samples were collected from all the heifers on day 0 and day 10 of the experiment and used to analyze for hemogram and serum biochemistry using an auto haemo analyzer and auto chemistry analyzer, respectively. The total leucocyte counts, granulocyte, and agranulocyte of the hemp group were significantly ($P<0.05$) lower than those of the control except for neutrophil and eosinophil. On the other hand, the erythrogram and erythrocytic indices were significantly ($P<0.05$) higher in hemp group than the control except for mean corpuscular volume. The platelet counts, platelet indices and albumin/globulin were significantly higher ($P<0.05$) while the blood urea nitrogen/creatinine, alkaline phosphatase, and alanine aminotransferase were significantly ($P<0.05$) lower in the hemp group compared to control. However, all the haemogram and biochemical parameters were within the normal ranges for cattle. It was concluded that dietary hemp supplementation improves the erythrogram, immune status, hepatic and renal function, and reduces clotting time in Angus cattle.

ELECTRICAL ENGINEERING AND COMPUTER SCIENCE

Abstract # 522

Modular Robotics

J'Ambre Chalmers; Chalmers, J., & Fu, Y.

Mentor(s): Dr. Yujian Fu

Department of Electrical Engineering and Computer Science

Modular Robots are designed to be autonomous kinematic machines with variable morphology. Beyond conventional actuation, sensing and control typically found in fixed-morphology robots, self-reconfiguring robots are also able to deliberately change their own shape by rearranging the connectivity of their parts, in order to adapt to new surroundings. The current research with Cubelets will help confirm this. Equipped with sensors that can tell depth perceptions, tell distance using light sensors, cameras and motion sensors. These self-reconfiguring autonomous machines will help shape the future of autonomous robots. Continuing research about the internal and external systems, it was found that autonomous robots can be used in all aspects of life like heavy lifting, education, and even automobiles (as we see with Tesla). The current research has involved testing the robots in various settings (in daylight and dim light, on inside and outside terrains, with objects designed to deter direction) and so forth. The future goal of this study is to create a bridge between modular robots and integrate it with AI technology and research. It was expected to control most of the pieces in order for the robots to function. The results showed otherwise. After completing the assembly, it was found that the robots communicated as one. There was no need for human intervention. Once snapped together (depending on which function cubelets the user chooses), the robot will automatically move and

proceed to evaluate the environment. It was discovered that the purpose of cubelet research is to help the user gain practical skill and knowledge about coding and programming through visual and tactical processes.

MECHANICAL AND CIVIL ENGINEERING AND CONSTRUCTION MANAGEMENT

Abstract # 523

Assessing Water Quality of Nitrate-Nitrogen For Improving Groundwater Management

Madison Johns; Johns, M., & Preetha, P.

Mentor(s): Dr. Pooja Preetha

Department of Mechanical, Civil Engineering, & Construction Management

This study aims to identify the source of the decline of nitrate concentrations in the year 2020 in the Huntsville, Alabama, region. These findings could aid in the identification of causes of water pollution in the area, such as industrial operations, wastewater treatment, or human activity since there was a decrease due to COVID in 2020. This data was gathered over five different landcovers, such as forests, water bodies, hays, open spaces, and agricultural lands from 2015 to 2020 in the city of Huntsville, Alabama, United States. This study employed hydrogeological data using four methods: field sampling of data from monitoring stations of the United States Geological Survey (USGS), Soil and Water Assessment Tool (SWAT), Soil and Water Assessment Tool – Calibration Uncertainty Program (SWAT CUP), and statistical data analysis to determine the nitrate concentrations in the Huntsville region. After analyzing data that was gathered from 2020, the highest average nitrate concentration was estimated as 0.2 kg/ha, while the year of 2019 showed an estimate of 0.4 kg/ha. Also, in 2020 the highest nitrate concentration stemmed from forest lands averaging about 0.228kg/ha, rather than agricultural lands, with an average of 0.220 kg/ha. Based on usage and activities occurring on various land covers, nitrate levels can fluctuate, identifying environmental impacts. Data gathered can be utilized to develop nitrate-based hydrological models to enhance the sustainability of ecosystems and safe groundwater systems throughout the United States.

PHYSICS, CHEMISTRY AND MATHEMATICS

Abstract # 524

A modified Czochralski Method for the Growth of Cesium Hexachlorohafnate Scintillator Crystals

Elijah Adedeji; Adedeji, E., Drake, J., & Reeder, A.

Mentor(s): Dr. Stephen Babalola

Department of Physics, Chemistry, and Math

Cesium hexachlorohafnate (CHC) is a non-hygroscopic, high light yield (54,000 photons/MeV) scintillator crystal with a highly effective atomic number. Unlike many other scintillator crystals, it requires no doping to achieve a high light yield and high energy resolution. This paper reports on an attempt at growing CHC using a modified Czochralski technique and novel ampoule design to contain the starting materials. The ampoule uses a rotatable borosilicate stir rod to lower and introduces the seed crystal to the crystal-melt. An O-ring maintains a controlled atmosphere for the hygroscopic starter materials and the melt, producing hafnium vapor within the ampoule. A distinct ampoule design with gas lines to feed inert gas into the top of the ampoule was also tested. The grown crystals will be characterized for defects using infrared transmission spectroscopy and for scintillation performance by its response to gamma radiation.

Abstract # 525

A comparative study of europium doped materials for white light generation

Yannik Palmer-Tesema; Palmer-Tesema, Y., & Bommareddi, R.

Mentor(s): Dr. Rami Bommareddi

Department of Physics, Chemistry, and Math

Nowadays, there is a great demand for LED bulbs which are replacing incandescent light bulbs. LED bulbs are compact, rugged, and free from pollution. Diodes emit a single wavelength. However, phosphor-coated diodes generate white light on exposure to blue or violet light. Global research is ongoing to design phosphor coatings that emit high intensity in a broad spectral wavelength region. We are also investigating different phosphor materials to address this issue. We are investigating the suitability of europium doped crystals and glasses for this purpose. Crystals used for this study were procured from commercial sources, and the glasses were made in our laboratory. Appropriate quantities of the chemicals were measured, ground, and mixed for an hour. The chemicals were poured into an aluminum crucible and heated in a box furnace above the melting point for an hour. The resulting melt was poured into a mold and allowed to cool to room temperature naturally. The glass samples were polished with sandpapers of different grades. Detailed spectroscopy measurements were performed to

characterize the materials. Absorption spectral measurements of the materials were performed using a Cary 3E spectrophotometer. Emission was stimulated from the samples by exposing them to blue diode lasers. The sample glow was white for blue laser excitation along the beam path. A compact spectrometer was used for fluorescence spectral measurements. Emission spectral data and lifetime measurements were used for unambiguous spectroscopic assignments. From the emission spectral measurements, color coordinates and color temperature were derived. All these results will be presented in detail.

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Dr. Matthew E. Edwards, Professor of Physics

Fall Semester 2006

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STEM DAY 2023

ALABAMA A&M UNIVERSITY

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STEM Day showcases our students' pioneering research under the guidance of our illustrious faculty. The STEM Day event epitomizes this year's theme: *Collaboration and Innovation for the Future.*

Thank you to the 2023 STEM Day Committee, the faculty, students, and staff for your hard work to make this another successful event. To the employers who serve as judges and provide sponsorship support, we appreciate you.

Daniel K. Wims, Ph.D.
President
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Programs like this lead to the preparation of the next generation of successful innovators, scientists, entrepreneurs, and business leaders. Thanks to the STEM Day 2023 committee, and everyone whose efforts made this event possible.

MAJED EL-DWEIK, PH.D.

Vice President
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COLLABORATION AND INNOVATION FOR THE FUTURE

STEM DAY 2023
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Collaboration and Innovation for the Future

STEM Day gives our students an opportunity to showcase the knowledge and skills they are gaining in our rigorous academic programs. Congratulations to every student who was selected to participate; thanks to their faculty advisors for preparing them for this day.

Thank you to Dr. Lamin S. Kassama and the 2023 STEM Day committee members for bringing this event back to campus after two years of virtual programming during COVID.

Last, but not least, thanks to Career Development Services for inviting employers from industry and government to participate in this event. To the employers that are serving as sponsors, judges, and hosting tables, thank you for your partnership.

Braque (Brock) Talley, Ph.D.
Vice President, Student Affairs

Congratulations!

Congratulations

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Career Development Services is honored to support the STEM Day 2023 committee as they host an event that highlights our students' exceptional research and communication skills.

Thanks to Ms. Cynthia Reese, Director of External Partnerships & Community at Medtronic, for serving as the keynote speaker. We also thank every employer that volunteered to serve as a judge and those who have provided sponsorship support for this event.

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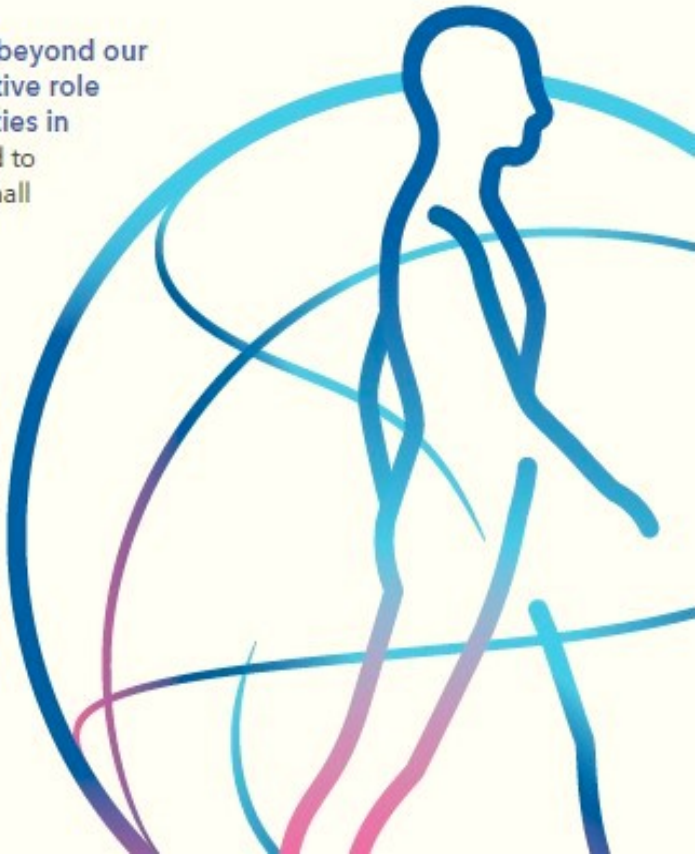


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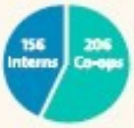

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