University Research Symposium (URS)

Virtual - 2021

March 9, 2021

University of West Alabama

Livingston, AL, USA

Schedule

12:30 pm	Optional - Tech Time - Students can join their assigned session to make sure technical functions are working correctly.
1:00 pm	**Opening remarks (Zoom Link)** - Chair, opening comments and how it works
1:30 pm – 3:30 pm	**Poster presentations**
Session 1	Undergraduate Poster Session – All Fields - competitive
Session 2	Graduate Poster Session– All Fields - competitive
4:00 pm – 5:00 pm	**Graduate Oral Presentations – competitive 10 minutes talk and 2 minutes Q&A**
Session 1	Nutrition (1-4)
Session 2	Plant Biology (5-9)
Session 3	Nanotech (10-14)
Session 4	Engineering, Environmental (15-19)
Session 5	Education and STEM-related (20 -24)
5:00 pm – 6:00 pm	**Faculty Oral Presentations – none competitive - 10 minutes talk and 2 minutes Q&A**
Session 1	Talk (1-5)
Session 2	Talk (6-10)
6:00 pm – 7:30 pm	**Keynote speakers (Zoom Link)** • Crystal Icenhour • Esther Ngumbi • Lara Perez-Felkner
7:30 pm	Closing remarks
March 15th at 12:00 pm	Award announcement (by email to all)

Keynote titles:

- **Crystal Icenhour,** From West Texas to saving the World
- **Esther Ngumbi,** Never Alone: My Academic Journey from Kenya to Illinois!
- **Lara Perez-Felkner,** Sharpening the Focus on Student Basic Needs for STEM College Success

ORGANIZING COMMITTEE

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SPONSORS

The Tombigbee RC&D mission is to carry out activities that accelerate the development, conservation and wise use of human, financial and natural resources in order to improve the standard of living within the area.

RC&D is a local nonprofit organization led by local community leaders. To help you understand how RC&D works, the following information explains the RC&D program, the RC&D Area, the Council, and the relationships and responsibilities of each.

RC&D was initially started back in the 1960's to address rural poverty and help rural communities generate sustainable natural resource-based economies. Although today many RC&D Areas are not rural and are not poor, the need for the RC&D concept is just as strong as ever. RC&D is not the same-old, same-old – RC&D is collaborative, multi-leveled, action-oriented, and inclusive. And, sometimes, "RC&D" is difficult to explain and difficult to quantify. However, the effect of the RC&D approach to solving community problems involving local people involuntary, empowering ways can be felt by almost every RC&D project that happens across the country.

SPONSORS

In the summer of 1930, Elton B. Stephens began selling magazines door-to-door in Birmingham, AL. Fourteen years later, after putting himself through undergraduate and law school, Elton and his wife, Alys, began what would become one of the largest privately held companies in the United States—EBSCO. Today, we operate businesses in a wide range of industries, from information services to manufacturing, and we employ 5800 people in 26 countries around the world. While we have grown in many ways, we continue to operate with the same entrepreneurial spirit and drive that originated with our founder.

OTHER SPONSORS & SUPPORTERS

- UWA Office of Sponsored Programs and Research
- Sumter County Farmers Federation
- Mr. Jerry Hogan

MESSAGE FROM THE CHAIR

On behalf of the organizing committee, it is my great pleasure to welcome you to the 2021 Virtual University Research Symposium (URS). I am happy to extend a warm welcome to students, faculty, and visitors from 29 institutions from 13 countries, including Canada, China, Colombia, Egypt, India, Indonesia, Iran, Malaysia, Pakistan, Poland, Sri Lanka, Turkey, and the United States.

The COVID-19 pandemic has interrupted our everyday and professional lives. However, the silver lining of the COVID19 is making scientific meetings more accessible to everyone worldwide. Therefore, the URS became an international conference that attracted students (graduate and undergraduate) and faculty worldwide. In this year's conference, we hope that everyone can expand his/her professional network and learn from one another, and know that we have a lot in common regardless of where we reside!

This year's symposium features 69 talks from all scientific disciplines. The URS has played a vital role in advancing undergraduate research at the University of West Alabama. We anticipate that the URS will significantly contribute to the experiences of other students worldwide. I am thrilled that the URS now provides such opportunities for UWA students and others from all over the world.

For the first time, we have extended our talks to include faculty and professionals from various parts of the world. We are looking forward to establishing a strong and lasting relationship with these institutions through the URS and research and educational programs. Please reach out to us, and let's find how we can work together to better our student's educational experiences.

I would like to thanks our sponsors, including the Tombigbee RC&D, the Sumter County farmer Federation, EBSCO Industries, and the UWA Office of Sponsored Programs and Research. Through their support, we can make this opportunity available for all at no cost to presenters.

I want to thank our fantastic keynote speakers for making the time to talk with us. And Finally, I would also like to thank the UWA president and provost for their support.

Throughout the day, you will have the opportunity to meet colleagues and presenters, discuss various ideas, and expand your knowledge and network. We will conclude the day with a wonderful group of keynote speakers who can be role models and inspirations to many students.

Enjoy your day.

Mustafa Morsy

Chair and Co-founder

KEYNOTE SPEAKERS

Crystal Icenhour, CEO Aperiomics and infection disease expert

Dr. Icenhour is one of the rising stars of American biotechnology. After more than 25 years in medical research and biotech, she was named founding CEO of Aperiomics. This company harnesses the power of next-generation sequencing to identify any known pathogen (bacteria, virus, fungi, or parasite) in a single test. Aperiomics is the only company of its kind and scope in the world. Throughout Dr.Icenhour's career, she has demonstrated strong leadership in business and science and has dedicated herself to "bridging the translational gap between these two worlds."

Dr. Icenhour is an expert in infectious disease diagnostics and her mission is to change the entire thinking about pathogen diagnosis. Up to 75% of infections are never accurately diagnosed, leaving millions of people suffering from chronic infection. Aperiomics, under her leadership, has developed a technology that identifies all known pathogens – every bacteria, parasite, virus, and fungus – from clinical samples in one test.

Dr. Icenhour holds two patents, has authored and co-authored numerous research articles and theses, and has been a prolific speaker and presenter at scientific conferences. She has served on review panels for National Science Foundation and Environmental Protection Agency and National Institutes of Health Small Business Innovation Research (SBIR) grants. She is also an adjunct assistant professor at Duke University Medical Center's Division of Infectious Diseases in their Department of Medicine.

Before Aperiomics, Dr. Icenhour was president and chief science officer for Phthisis Diagnostics in Charlottesville, VA, a research and development company focused on development of easy-to-use molecular diagnostics for intestinal parasites. While a postdoctoral fellow at the Mayo Clinic College of Medicine, she was the first to identify and characterize *Pneumocystis* melanins.

Dr. Icenhour serves as Chairman of Virginia BIO and was chosen to participate in the Spring Board Enterprises 2016 class of women-led companies. She is a member of, Sigma Xi, Medical Mycology Society of the Americas, Association for Molecular Pathology, and the American Society for Microbiology. The Kauffman Foundation and Center recognized her as 2012 Entrepreneur of the Year.

Dr. Icenhour received her PhD in Pathobiology and Molecular Medicine from the University of Cincinnati Medical School of Graduate Studies in 2002. She conducted postdoctoral research in the Thoracic Diseases Research Unit at the Mayo Clinic College of Medicine from 2002-2005 and in the Department of Infectious Diseases at Duke University Medical Center from 2005-2006. She has been involved in local and national postdoctoral associations, including the Mayo Research Fellows Association Executive Committee (president), the Duke University Postdoctoral Association (chair of the membership committee), and the National Postdoctoral Association (2008 chair).

Dr. Esther Ngumbi, Assistant Professor at the University of Illinois at Urbana-Champaign

Dr. Esther Ngumbi was born in a rural farming community along the Kenyan Coast. Education for girls was considered unimportant and there were no societal role models to inspire girls to reach for the stars. Her parents were teachers, struggled, and sacrificed to raise enough money to pay for their children's school fees.

Her parents would collect their paychecks, but eat nothing before coming back in the evening, hungry and tired. She wondered at their ability to be in town, in the midst of all the best foods, with money to purchase that food, but choose not to spend it on themselves so that Esther and her siblings could go to school. This had a powerful effect on her and inspired her to pursue her academic career goals and persevere against challenges however daunting they seemed.

She studied hard so that one day she could rescue her family and community from poverty and be a role model to many young African girls in similar situations. She went through high school and eventually college and attained a Bachelor and Masters of Science at Kenyatta University. On a beautiful summer day of August 6, 2011, she attained what at times seemed to be an elusive dream: a doctorate degree in Entomology from Auburn University. She became the first woman in her community to obtain a Ph.D. degree.

She cried on her graduation day as she thought of her community in Kenya and the many girls in her community who had the potential to be a scientist too but simply lacked the opportunity. During that day, she told herself that she would do whatever was needed to give girls more opportunities to break the poverty barrier, obtain an education, and achieve greatness.

She has dedicated all of her passion, efforts, heart, and resources to bringing sustainable change to her community and she has become a role model for girls in her community.

Dr. Lara Perez-Felkner, Associate Professor of Higher Education and Sociology in the Higher Education Program within the College of Education at Florida State University

Dr. Perez-Felkner is an Affiliated Faculty member in the Department of Sociology, and Senior Research Associate with FSU's Center for Postsecondary Success. Additional affiliations: the HOPE Center for College, Community, and Justice; Pathways to Adulthood, and Network Gender and STEM.

Her research uses developmental and sociological perspectives to examine how young people's social contexts influence their college and career outcomes. She focuses on the mechanisms that shape entry into and persistence in institutions and fields in which they have traditionally been underrepresented. She also investigates racial-ethnic, gender, and socioeconomic disparities in post-secondary educational attainment and entry to scientific career fields. Dr. Perez-Felkner published a New Directions in Institutional Research volume on undergraduate women in STEM and is guest editing a special issue in the International Journal for Gender, Science, and Technology. Her published work appears in journals including Developmental Psychology, Frontiers in Psychology, Journal of Higher Education, Journal of Latinos and Education, and Teachers' College Record and several edited volumes. Her research has been covered in the U.S., Europe, and Asia in news outlets including ABC News and National Public Radio affiliates, Bustle, the Conversation, Salon, Science News for Students, and U.S. News and World Report.

Dr. Perez-Felkner has professional experience in Student Affairs as well. At the University of Chicago, she served as a Resident Head in the College from 2006-2012 and on an NSF AGEP-supported Social Sciences Division Taskforce on Diversity for the Professoriate. Prior to graduate school, she was a post-placement counselor for grade 7-10 students with Prep for Prep, helping underrepresented students transition to magnet schools and private day and boarding college preparatory schools. While earning her B.A. at Wesleyan University, she also worked in residence life, admissions, and student leadership.

Currently, she is Program Coordinator for FSU's Higher Education graduate program, Co-Chair of the Latinx Faculty and Staff Collective at Florida State, a member of the APLU iChange ASPIRE alliance team, a member of the President's Taskforce for Diversity and Inclusion.

Dr. Perez-Felkner teaches graduate courses in Sociology of Education, Sociology of Higher Education, Higher Education Outcomes Assessment, and Applied Education Policy Analysis. Impressed by the enthusiasm and caliber of FSU students, she has and continues to mentor and support students in collaborative research on higher education pathways to degrees and careers. Since joining the faculty, she received FSU's Transformation through Teaching Award in 2014, was a 2015 finalist for the FSU College of Education's Robert M. Gagne Research Award, won the 2016 Hardee Center Supervisor/Mentor Award, and received the 2018-19 FSU Graduate Faculty Mentor Award.

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UNDERGRADUATE ABSTRACTS

Undergraduate Poster Session – All Fields – Competitive (Poster 1 to 22) Zoom Link 1

Moderator: Dr. Jing Chen and Dr. King Tiong

1. Identification and Imaging of Potential Vaccine Targets for SARS-CoV-2 Spike Protein Using Machine Learning and Bioinformatics Tools

Srija Chakroborty[1,2], Thavisha Herath [3], Mohit Mazumder [2], Elia Brodsky [2], and Tharinda Karawita[3]
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Since the year 2020, we have been facing the onslaught of a new pandemic, the COVID-19 outbreak caused by a novel coronavirus, namely Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2). A significant population from all parts of the world have been infected accounting for over 2.5 million deaths. Similar to SARS-CoV and MERS-CoV, the recent SARS-CoV-2 also belongs to the *Betacoronavirus* genus. Just like other coronaviruses, it has a genome size of approximately 30 kilobases which encodes for multiple non-structural and structural proteins. Since SARS-CoV-2 has been discovered very recently, there is a current lack of immunological information about it, making it tough to fight. Hence, studying the SARS-CoV and MERS-CoV could be the milestone for the SARS-CoV-2 immunological study.
The aim in this project is to explore the idea for vaccine design against SARS-CoV-2 by studying the genetic similarities between SARS-CoV, MERS-CoV and SARS-CoV-2 using bioinformatics and machine learning tools. In this study, we have focused particularly on the epitopes in the Spike structural proteins due to their positive response reported against SARS-CoV previously. Our methodology consists of the alignment of experimentally-determined MERS-CoV and SARS-CoV derived T cell and B cell epitopes of the spike glycoprotein to the SARS-CoV-2 spike glycoprotein and further the imaging of the resulting epitopes on to the spike protein. These targeted antigen sites might have a potential benefit for protection against the novel virus. Further work on developing chemical compounds that can help recognize and bind to these target sites. The virus continues to mutate, and if these mutations ever affect the identified regions, epitopes will have to be further screened according to the filtering principle that we employed in this study, which will produce a more refined set of epitopes.
Keywords: SARS-COV-2, Bioinformatics, Machine Learning, Epitopes, immune response, Chemical compounds

2. Breaking the barriers of traditional service learning in a pandemic with E-Service-Learning: Impacts of a COVID-19 Module in a Non-Majors Biology Course

Ryleigh Fleming[1], Sarah Adkins-Jablonsky[1], Marco Esteban[2], Diana Bucio[1], J. Jeffrey Morris[1], and Samiksha Raut[1]

[1]Department of Biology, the University of Alabama at Birmingham, Birmingham, AL, USA

[2]California Dougherty Valley High School, San Ramon, CA, USA

In the wake of the COVID-19 pandemic, the general public has been subjected to an "information epidemic" or an "infodemic" leading to a plethora of invalid information. We decided to educate a non-majors biology class with an intent to help advance public health awareness related to COVID-19. This is particularly important for non-major's biology students who may only ever take one science class as a part of their core curriculum. In the light of an unanticipated transition to an online platform, an E-service-learning module was introduced for this course. In the four-week service-learning module, which included expert-led lectures and an E-service-learning assignment, students created digital infographics to inform their peers and community about COVID-19 safety precautions and completed a required post-reflection assignment summarizing their learning gains. Out of 112 enrolled students, 87 consented to have their reflections analyzed for this study and 8 students chose to participate in additional one-on-one online interviews. We categorized post-reflection and interview data into four broad categories: responses related to the service-learning, guest lectures, information on COVID-19 virus or pandemic, and those about the broader implications of COVID-19. Our post-reflection data and interview data together reveal that while some students were appreciative of an opportunity to be involved in the process of educating the community via infographics, a majority of the students reported a greater range of learning gains from expert led-lectures. Continued research on E-service-learning should explore the degree to which this pedagogical tool can maximize student learning in an online classroom environment

3. COVID-19-based Challenges and Countermeasures in Education, Research, and Management in Healthcare and STEM

Jessica Hallett, Stephanie Autore, Michelle Hoang, and Santanu De

Department of Biological Sciences, Halmos College of Arts and Sciences, Nova Southeastern University, Fort Lauderdale, FL.

The Coronavirus Infectious Disease 2019 (COVID-19) has been one of most devastating contemporary issues of worldwide concern which affected all areas of functioning, individual to governmental. This comprehensive review encapsulates the global consequences of this pandemic on key socioeconomic sectors – healthcare management, and education and research in healthcare as well as science, technology, education, and mathematics (STEM). COVID-19 halted face-to-face classes and meetings in schools and colleges around the world, necessitating virtual instruction as academic institutions sought to continue education safely, yet effectively. This adversely impacted every field and level of learning, especially STEM and healthcare education since STEM degrees entail rigorous curricula integrating lectures and laboratory exercises whereas healthcare education involves hands-on, clinical lab activities and residencies that require working with patients. Research in high-needs STEM disciplines has been prioritized in the fight against COVID-19. Computational scientists, artificial intelligence experts, engineers, virologists, and mathematicians have been contributing with strategies to optimize patient care, enhance public understanding of the disease, track reported cases, and improve physical-distancing measures. Healthcare management facilities have implemented various operational changes geared towards reducing non-emergency patient visits and preventing infection transmission; these include shifting appointments to online modalities, altering procedures, and developing personal protective equipment (PPE). Multifaceted research endeavors have been undertaken to develop treatments or a potential cure for COVID-19; vaccines and antiviral drugs are being designed or undergoing clinical trials, with symptom-management approaches being employed upon evaluation of pre-existing conditions. The analysis will help identify and potentially overcome complex COVID-19-based barriers to global education, research, and management in healthcare and STEM.

4. *Drosophila melanogaster* as a Human Disease Model to study the Detrimental Effects of Commercially Formulated Spectracide® in the Development of Parkinsonian Symptoms and Altered Circadian Rhythm

Julia Mamana, Sabrina Rodriguez-Ortiz, Samuel Vielee, and Anathbandhu Chaudhuri

Department of Biological Sciences, University of Alabama, Tuscaloosa, Alabama, USA

A multitude of pesticides are readily available and conventionally used by the agricultural industry, despite the knowledge that such toxicants cause damage to the environment, human health, and non-target organisms. Commercially formulated, atrazine based Spectracide® is one of the most widely used herbicides. Recent studies reveal multiple ingredients in Spectracide® induce oxidative damage through competitive binding to the active site of a protective enzyme, impairing its ability to prevent damage to proteins, thereby leading to deficits in locomotor activity in Drosophila. This study focuses on age-dependent stress tolerance and circadian rhythms, reflected in sleep and activity patterns, upon exposure to varying doses of Spectracide®. Different doses (12.5%, 25% and 50%) of commercial Spectracide®, mixed with a 5% sucrose solution, were fed during early (7-10 days), middle (22-25 days), and late (42-45 days) ages of female flies. Control flies were fed a 5% sucrose solution. The stress tolerance, negative geotaxis, and daily activity patterns were recorded using Trikinetics Drosophila Activity Monitor (DAM2). Kaplan-Meier survival curves revealed that all the doses of Spectracide® are toxic, killing the flies in a dose-dependent manner. Fly mortality rates and earlier onset of Parkinsonian symptoms increased in a dose-dependent manner as well. Negative geotaxis assays revealed flies exposed to Spectracide® could not climb vertically after 24 hours, with exception of the flies treated with 12.5% herbicide. Trikinetics DAM2 analysis demonstrated that Spectracide® significantly alters sleep-wake patterns despite exposure to 12:12 LD cycles, disrupting the circadian rhythms. Since Spectracide® induced disruption in diurnal activity, fly rhythmicity, and movement behavior, we hypothesize that the dopaminergic system may be targeted by the active ingredients of this herbicide. Dopamine is considered to be a key regulator of movement behavior and circadian rhythm. Further, we plan to study the effects of Spectracide® on fly neuroanatomy and morphological changes of dopaminergic neurons.

Keywords: *Drosophila melanogaster*, Spectracide®, Circadian Rhythm, Stress tolerance, Parkinsonian symptoms, movement disorder

5. The Effect of Endophyte Treatment on Flavonoid Production in *Vigna radiate* Leaves"

Anna Morse, Phillip Speake, and Jeffery Merida

Biological and Environmental Sciences, The University of West Alabama, Livingston, Alabama, USA

Endophytes are fungal cells that live between the plant's cells. These organisms are usually mutualistic and provide the plant with needed nutrients, such as nitrogen and phosphorus. The plant, in return, gives some of its nutrients to the fungus. Flavonoids are a group of phytonutrients found in fruits and vegetables with antioxidant properties. Flavonoids also hold anti-inflammatory and anti-pathogenic properties. Endophytes may be a natural alternative for increasing flavonoid production in fruits and vegetables. Our aim was to investigate the amount of flavonoid production in mung beans (*Vigna radiata*) treated with endophyte solution. Mung beans were planted in individual containers and heavily watered on day of planting. After initial planting, the beans were watered until they reached the height of approximately three inches. Endophyte solution was applied to the experimental plant group after height checkpoint, and watering was continued until plants reached approximately six inches. Leaves were collected from the plants, weighed, and extracted via Soxhlet apparatus. Extracts were mixed in solution and transferred to a spectrophotometer, where concentrations were compared against a rutin standard curve at 510 nm. Preliminarily, the endophyte solution increased the concentration of flavonoid production in mung bean leaves five-fold.

Keywords: flavonoid, endophyte, *Vigna radiata*, antioxidant

6. Atrazine, an Active Ingredient of Commercial Spectracide®, Disrupts Circadian Rhythm in *Drosophila melanogaster*: Is Diurnal Activity Regulated by Dopamine Pathway?

Sabrina Rodriguez-Ortiz, Julia Mamana, Samuel Vielee, and Anathbandhu Chaudhuri

Department of Biological Sciences, University of Alabama, Tuscaloosa, Alabama, USA

Pesticides are widely used to combat the growth of weeds despite their negative effects on the environment and human health. Atrazine is one of the active ingredients in commercially formulated Spectracide® that works by disrupting photosynthetic pathways in target organisms, such as weeds. Recent research on atrazine reveals that atrazine plays a role in inducing oxidative stress and endocrine disruption in non-target organisms. Large scale use of such toxicants may cause health hazards, giving rise to similar symptoms in farmers who unknowingly ingest the chemical. This study focuses on the onset of movement disorders and disruption of circadian rhythms induced by atrazine, utilizing *Drosophila melanogaster, a* model organism to study human diseases. In the initial study, young adult (7-10 day old) female flies were exposed to different concentrations of atrazine (2% and 4%), testing for stress tolerance, negative geotaxis and sleep/activity patterns using Trikinetics Drosophila Activity Monitor (DAM2). Control flies were fed a 5% sucrose solution. It was observed that atrazine exposure alters negative geotaxis behavior in flies. Flies treated with lower doses of atrazine (2%) move faster compared to the control. The flies treated with higher doses (4%) climb slower, showing a biphasic effect from the active components of Spectracide®. A DAM2 Trikinetics assay was used to measure the activity pattern of the flies as well as analyze the circadian rhythm. Sleep-wake patterns reveal significant disruption in circadian rhythm causing atrazine treated flies to sleep more comparatively. Despite disruptions to the circadian rhythm of treated flies and induction of movement disorders, atrazine proves non-lethal to flies. In future studies, age-dependent stress tolerance will be assessed using a similar methodology to investigate atrazine's effect on middle and late age flies while concurrently studying the potential role of atrazine in disruption of the dopaminergic system in the Drosophila model.

Keywords: *Drosophila melanogaster*; atrazine; Circadian Rhythm; stress tolerance; movement disorder; Trikinetics Assay

7. Effects of Habitat Management on Gopher Tortoise Burrow Distribution

Cade Smelley[1], Joel Borden[1], Steven Schultze[2], and Adam Chupp[1]

[1]Department of Biology, [2]Department of Earth Sciences, University of South Alabama, Mobile, AL, USA

Gopher tortoises (*Gopherus polyphemus*) are a threatened, keystone species, endemic to longleaf pine forests of the southeastern United States. Their population has plummeted by 80% over the last century due to the destruction of these forests. Given current fragmentation along their range, the habitat management of longleaf pine forests is critical to the preservation of remnant tortoise populations. The focus of this study was to quantify the effects of land management on the density and distribution of gopher tortoise burrows. We conducted burrow surveys at Clearwater Tract (CW), a large, minimally maintained pine forest in 2005 and 2020 and Mobile Botanical Gardens (MBG), a small, well-maintained pine forest in 2013, 2017, and 2020. Data from these two sites were compared to that of Splinter Hill Bog (SH), a nature preserve with a long history of management. We found that active burrow abundance and density increased at both CW and MGB over time, however, the average distance between nearest neighboring burrows decreased only in MBG. These results suggest a greater area of potentially suitable habitat at CW versus the smaller MBG where burrow density may be saturated. Given continued and more intense management at CW, it is likely that burrow density will continue to increase while distance between nearest neighboring burrows will increase until a maximum density is reached. Our findings display the importance of concerted forestry management in areas where tortoises are known to occupy and that with even minimal management, active burrow numbers and density can increase.

8. Glyphosate Based Herbicide Roundup® Alters Circadian Rhythm and Stress Tolerance, Inducing Oxidative Stress in *Drosophila melanogaster*: A Mechanistic Insight Using *in vivo* and *in vitro* Models

Sam Vielee[1], Ankur Chaudhuri[2], Britton O'Shield[1], Kim Lackey[1], Julia Mamana[1], Sabrina Rodriguez-Ortiz[1], Maya Owens[1], Sibani Chakraborty[2] and Anathbandhu Chaudhuri[1]

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[2]Dept. of Microbiology, West Bengal State University, Barasat, Kol-126, India

Glyphosate Based Herbicides (GBH) have several negative effects on human health and non-target organisms, yet the mechanistic understanding remains very limited. This study tested the toxicological effects of the commercial herbicide Roundup® (RUP) and its key components, glyphosate and the surfactant polyoxyethyleneamine (POEA), on stress tolerance, movement behavior, circadian rhythms, oxidative stress, and cellular morphology using *in vivo* (*Drosophila melanogaster*) and *in vitro* (Drosophila Schneider 2 cells) models. Kaplan-Meier survival curves confirmed that exposure to RUP causes fly mortality in a dose-dependent manner ($P < 0.001$), while glyphosate and POEA are not lethal until day 7. Vertical movement of flies was significantly diminished, showing a remarkable decrease in negative geotaxis ($P < 0.05$) within 24 hours of acute exposure to RUP and its ingredients. Circadian rhythm was drastically effected when the flies were exposed to both RUP and its individual components. A Trikinetics assay, using Drosophila Activity Monitor (DAM2), showed significant alterations in flies sleep-wake patterns in all herbicide treated groups. RUP downregulates *sniffer* mRNA expression with a significant reduction in carbonyl reductase (CR) enzyme activity, trigging the formation of protein carbonyl in fly tissues. This indicates commercially formulated RUP is lethal, inducing severe oxidative stress in the fly model due to a synergistic effect of glyphosate and POEA. *In silico* modeling of glyphosate, POEA, and combined glyphosate and POEA (RUP) suggests that all the components have a differential binding affinity to CR protein. Glyphosate and POEA alone did not kill the flies, but significantly altered the daily activity pattern in Drosophila. *In vitro* cytological studies of S2 cells also revealed that RUP caused a significant change in tubulin protein architecture and morphology of the nucleus in S2 cells. Thus, we hypothesize that RUP causes movement disorders by triggering oxidative stress and altering cellular morphology.

Keywords: *Drosophila melanogaster,* herbicides, Roundup®, oxidative stress, Sniffer gene, carbonyl reductase, protein carbonyl, glyphosate, molecular docking, Schneider Cells (S2)

9. Reviewing the Nutritional Quality and Sensory Properties of Microgreens

Emily Ager, Yanqi Zhang, Libo Tan, and Lingyan Kong

Human Nutrition and Hospitality Management, The University of Alabama, Tuscaloosa, Alabama, USA

Microgreens are vegetable greens harvested prior to the fully matured stage. They are harvested once two cotyledons leaves are fully developed. At the microgreen stage, vegetables are seen to have intense flavors, dense nutrient content, and a fragile structure. Microgreens come in a variety of shapes, colors, and textures. This allows for a diverse nutrient content for each species of microgreens. This study was a literature review on the nutritional quality and sensory properties of microgreens. Antioxidant minerals commonly found in microgreens are zinc, copper, and selenium. For instance, rapini microgreens were found to have higher concentrations of zinc and copper when compared to the baby leaf stage. In addition, phytochemicals such as carotenoids, phenols, and flavonoids were found to be rich in a variety of microgreens. For example, carotenoids were found in higher concentrations in barley and wheat microgreens than in their seed phase. Microgreens with higher concentrations of nutrients with antioxidant capabilities can be beneficial when incorporated into human diet. Due to the variety of microgreen species the consumer has many options to fit their taste preferences. Sensory studies have been conducted to test consumer willingness to incorporate microgreens into their everyday diet. When determining if microgreens can be accepted by the general public, individual preference is a major factor. The flavor of microgreens is influenced by their nutrient content. For instance, brassicaceae microgreens tend to be bitter due to the presence of glucosinolates. Whereas, microgreens containing the chlorophylls tend to have a sweeter taste. In conclusion, microgreens are gaining popularity due to their antioxidant content and the variety of flavor profiles.

10. Inhibitory Effect of Lipid Guest Compounds on the *in vitro* Digestion of Starch

Alegna Contreras [1], Jiayue Guo [2], and Lingyan Kong[1]

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Obesity is a major public health issues that has reached an epidemic level. Since starch is the major energy source of the human diet, retarding starch digestion is an efficient approach for the prevention and treatment of obesity related chronic diseases. Starch can be classified into different categories based on their digestibility rate. Such categories are rapidly digestible starch (RDS), slowly digestible starch (SDS), and resistant starch (RS). The starch of interest in this experiment is RS. It is not digested in the small intestine and is fermented in the large intestine which results in minimum release of glucose with other beneficial effects. For this study type 5 RS (RS5) was used for the *in vitro* starch digestion. RS5 samples were obtained by forming starch inclusion complexes with ascorbyl palmitate (AP) and palmitic acid (PA) using the DMSO method. Contents of starch was determined at 20 (RDS), 120 (SDS), 240 (total digestible starch, TDS), and after 240 (RS) min. Annealing and mild acid hydrolysis were performed on the RS5 samples, and the structural characteristics were determined using XRD and DSC. Digestibility profile of using starch inclusion complexes for AP and PA increased the SDS and RS contents as compared to cooked starches. Using the treatments of annealing and mild acid hydrolysis increased the crystallinity of RS5 inclusion complexes. This led to an increase SDS and RS contents lowering digestion rate. In conclusion, the results suggest that using starch inclusion complexes with AP and PA lower digestion rate by increasing the SDS and RS content.

Keywords: Starch; Digestion; RS; Ascorbyl Palmitate, Palmitic Acid

11. Complexation Ability and Physicochemical Properties of Starch Inclusion Complexes with C18 Fatty Acids

Isabella Gladden [1], Jingyi Zhou [2], Alegna Reyes [3], and Lingyan Kong [2]

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The ability of starch, specifically amylose, to form starch inclusion complexes with fatty acids has been well known and influences many quality attributes of starch-containing foods. Depending on the structure and chemistry of guest molecules, the properties of the inclusion complex can vary. Previous research has shown a correlation between a longer chain length and increased thermal stability of starch-fatty acid inclusion complexes. In this study, the effect that fatty acid saturation has on the ability to form inclusion complexes and the effect on thermal stability and digestion were investigated. The fatty acids used as the guests were all C18 fatty acids and included stearic acid, oleic acid, elaidic acid, linoleic acid, alpha-linolenic acid, and conjugated linoleic acids. Evidenced by complementary techniques, including differential scanning calorimetry, X-ray diffraction, and Fourier transform infrared spectroscopy, all C18 fatty acids formed inclusion complex with high amylose maize starch. Thermal stability of the inclusion complex decreased with the degree of unsaturation of the fatty acids. The digestibility profiles were then obtained through simulated *in vitro* digestion. All inclusion complexes exhibited relatively rapid digestion within 4 h, leaving minimum amount of resistant starch. Future research is required to examine the structural feature that limit the resistance of the inclusion complex against enzymatic digestion.

12. Inhibition of Carbohydrate Digesting and Metabolic Enzymes by Food Antioxidants

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Food antioxidants are natural compounds that can inhibit oxidation and prevent damage to cells caused by free radicals. In this study, we report another functional property of certain food antioxidants in inhibiting some digesting and metabolic enzymes of carbohydrates. First, we examined the inhibitory effect of ascorbic acid (AA), commonly known as vitamin C, on the simulated *in vitro* digestion of starch using three types of starches, including high amylose maize starch (HAMS), a resistant starch control (RSC), and potato starch (PS). A major implication of such inhibition is a decreased rate of starch digestion into glucose, thereby reducing postprandial hyperglycemia. Accordingly, the resistant starch (RS) content, defined as the starch remaining after 4 h of simulated *in vitro* enzymatic digestion, was measured for both raw and cooked starch samples. For all three starches, the inhibitory effect of AA on the digestion of raw starch increased with its concentration until reaching a plateau at 12.5 mg/mL. At this concentration, the RS content increased to 80.92% compared to 52.81% without AA for HAMS, 80.39% compared to 49.74% for RSC, and 74.23% compared to 70.83% for PS. Cooked starch contained significantly less RS than raw starch, and the addition of AA resulted in significantly increased RS content. Secondly, we examined the inhibitory ability of several antioxidants on glucose oxidase and peroxidase, which are metabolic enzymes frequently used in glucose measurement methods. At a concentration of 2.84 mM, AA, ferulic acid, and catechin mM caused underestimations of 40.03%, 59.11%, and 59.77% compared to the true glucose contents. Ultimately, the inhibitory effect of AA on starch digestive enzymes may function as a glycemic modulator, while the inhibition of metabolic enzymes by these antioxidants may cause inaccurate results in applications such as blood glucose monitoring and starch digestion assays.
Keywords: antioxidants; starch; digestion; ascorbic acid; resistant starch; phenolics

13. Phase Behavior and Complex Coacervation of Chitosan and Gum Arabic

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Complex coacervation is an associative, liquid–liquid phase separation that can occur between polyelectrolytes of opposite charge. The oppositely charged polymers form a soluble complex that is stable and capable of encapsulating active guests of interest, for instance, drugs, nutrients, and other bioactive compounds. In this study, the phase behavior and coacervate formation between low molecular weight chitosan (CHI) and gum Arabic (GA) were investigated. First, various stock solutions of CHI (0.5% - 1.5%, w/v) and GA (10% - 20%, w/v) were mixed at volume ratios of 2:8, 5:5, and 8:2 to determine the concentration range for observable coacervation. It was found that the mixture containing 1.5% CHI and 20% GA was the only group that showed phase separation at those mixing ratios. Then, the 1.5% CHI and 20% GA were mixed at ratios from 1:9 to 9:1. Among all the ratios that have been tested, the most segregated layer separation has appeared on the ratio of 7:3. The phase volume of each phase was measured by reading the marks on the microcentrifuge tubes. The total solid content in each phase was determined by the weight difference after an oven drying method (105 °C, 20 min).

Keywords: Complex coacervation; chitosan; gum-Arabic; electrospraying; electrospinning

14. Comparison of Antimicrobial Activities of Fermented Beverage for Determination of Synergistic Antimicrobial Compounds

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Synergistic benefits of probiotics, including improved food nutrition and digestibility, are known to be induced by fermentation specific food. These FDA-declared GRAS probiotics, including bacteria and/or yeast, are able to produce various antimicrobial compounds during fermentation. The potential synergistic antimicrobial effect of combined fermentation food substrate and probiotic, on foodborne pathogens has been minimally explored. In this study, we explored beverage probiotic microbiology with focus on the antimicrobial property of fermented beverages. Collected samples, Kombucha and home-made wine, were serially diluted, using buffered peptone water (BPW), to achieve countable plates (colony forming unit, CFU) of indigenous bacteria on deMan, Rogosa and Sharpe (MRS) (10-90; detects Lactobacillus) agar and Plate Count Agar (PCA) (30-300; detects most bacteria). An agar overlay method was applied for determining antagonistic colonies against indicator microorganisms, such as *Escherichia coli* and *Listeria monocytogenes*. The antimicrobial properties of these beverages were evaluated using agar diffusion test and inoculated viability test. Other potential microbial inhibitors found in fermented beverages, such as H_2O_2, organic acid, and bacteriocin, were determined by neutralizing agents. Differential total plate counts were found to be higher in PCA plating than MRSA; however, wine exhibited no detectable CFU (at 10^{-1} dilution) on PCA ($P < 0.05$). Subsequent deferred antagonism assay revealed no antimicrobial producing strains. Inhibitor neutralization assay revealed a group of antimicrobial compounds differentially found in the fermented beverages, suggesting that synergistic antimicrobial activity may be induced by select combination of fermentation specific food and strains of bacteria. Probiotic-based healthy nutrition is increasingly gaining public interest worldwide, attributed to the palatability and gut health benefits of probiotic fermented foods. These results suggest an improved antimicrobial effect, produced by two types of fermented product which used different fermentation food substrate and probiotics, on a group of foodborne pathogens that may contribute to an effective antimicrobial formulation.

Keywords: *Listeria monocytogenes,* anti-microbial, foodborne pathogen, probiotics, wine, kombucha

15. Phase Separation and Electrospinning of Complex Coacervates

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Abstract: Complex coacervation refers to the liquid-liquid phase separation between two macromolecules of opposite charge placed in an aqueous medium. These oppositely charged macromolecules will spontaneously associate into dilute polymer-poor and dense polymer-rich phases, the latter termed a coacervate. The coacervate is of particular interest, as the intermolecular association and entanglement could facilitate its electrospinning into nanofibers. In the current study, the phase behavior of medium molecular weight chitosan (CHI) and gum Arabic (GA) as a function of individual polymer concentration and mixing ratio was investigated. Acetic acid (1%, w/v) dispersions of CHI of 0.5 to 1.5% (w/v) and GA of 10% to 20% (w/v) were mixed vigorously at ratios of 1:9, 2:8, 3:7, 4:6, 5:5, 6:4, 7:3, 8:2, and 9:1 graduated microcentrifuge tubes, and left at the ambient temperature (22 °C) for 48 h. Phase separation and coacervation were evaluated by visual observation and images were recorded. Phase volume was measured, and total polymer concentration was determined for each phase using an oven drying method (105 °C, 20 min). Coacervates formed were apparent in high polymer concentrations, particularly by mixing 1.5% CHI with 20% GA. Select coacervates are to be collected and tried for electrospinning. Nanofibers fabricated from complex coacervates are particularly advantageous in nutrient encapsulation, drug delivery, and other biomedical applications.

16. Recovery of the Emerging Infectious Agent *Vagococcus lutrae* from Seafoods

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Vagococcus lutrae is a member of pathogenic Gram-positive cocci presumptively transmitted by contaminated seafood. Ineffective conventional identification methods are the reason it has been rarely isolated worldwide. Recent studies have shown the offshoot of the bacteria via the human body. This microorganism's transmitting host is a source of marine life, but its association with shellfish seafoods has not been experimentally explored to date. Our aim was to investigate fresh seafood shellfish organisms for potential transmission of *V. lutrae*. Collected environmental seafood shellfish species were transported to lab and stored at refrigeration temperature prior to testing. Samples were processed by washing and homogenizing in 5 % sterile buffered peptone water. This was followed by 1-step enrichment incubation. Enriched samples were partially processed by plating on thiosulfate-citrate-bile salts-sucrose (TCBS) agar containing various concentrations of salt and prolonged heating at hyper-thermophilic temperature followed by the TCBS plating. Bacterial identity was confirmed using 16S rDNA bacterial identification. Subsequent growth nutritional requirement and virulence assays were performed. Of 8 samples collected from seafood wet market (3), lagoon (3) and estuarine (2) environments, two (i.e., crab and shrimp) out of three seafood types were tested positive (25 %). Both enrichment alone and enrichment supplemented with heating conditions exhibited colony forming bacteria on TCBS agar with various colors depending upon the agar salinity. Confirmed strains of *V. lutrae* by 16S rDNA bacterial identification were found to be sensitive to various antibiotics ($P < 0.05$) as documented in the literature and hemolytic negative. In addition, they were able to grow confluently in glucose supplemented media. The bacterium *V. lutrae* cannot be detected with the identification methods in place today. These results suggest rapid presumptive identification of *V. lutrae* using TCBS supplemented with salt for testing contaminated seafood samples and improving seafood safety from this emerging human bacterial pathogen.

Keywords: *Vagococcus lutrae*; pathogen; seafood; enrichment; shellfish; hyper-thermophilic

17. DNA barcoding of pink bollworm (*Pectinophora gossypiella*) and expression analysis of *PgCadh* gene against Cry1Ac in Bt cotton

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Pink bollworm is destructive pest cotton. Over time, it has developed resistance against insecticides and cry toxins. DNA barcoding based partial sequences of the COI gene (710 bp) were obtained from species collected from different geographic areas. The expression level of PgCadh gene was compared in laboratory susceptible and field resistant population. RT-PCR of the PgCadh gene expression indicated that the susceptible population of *P. gossypiella* has less PgCadh gene expression as compared to the field population.

18. Identification and Characterization of Macrofungi in Lentang Forest Reserve, Pahang, Malaysia

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Macrofungi are diverse and play important roles in the ecosystem. However, the study and information about the macrofungi diversity is not well documented in Malaysia. Therefore, this study focused on characterization and diversity of macrofungi in Lentang Forest Reserve, Bentong, Pahang, Malaysia. A total of 55 fungal samples were obtained and identified into genus level based on morphological characterization which includes 17 genera. The identified genera are *Agaricus, Amouroderma, Auricularia, Annulohypoxylon, Cantharellus, Entoloma, Geastrum, Hymenopellis, Lactarius, Laetiporus, Lepiota, Mycena, Oligosporus, Phellinus, Polysporus, Trametes* and *Xylaria* species. Only eleven samples of selected macrofungi were successfully identified until species level by using internal transcribed spacer (ITS) sequence analysis. The species are *Cyathus striatus, Cookeina tricholoma, Favolus acervatus, Ganoderma williamsianum, Hexagonia tenuis, Hygrophorus agathomus, Marasmiellus candidus, Microporus xanthopus, Russula leucocarpa, Trichaptum cf durum* and *Trichaptum fuscoviolaceum*. Comparison of ITS sequences showed that the isolates were 86–100% similar to respective fungal species from GeneBank database, thus confirming the fungal identity. Findings from this study can be used as a checklist for future studies related to fungi distribution in tropical lands and will be beneficial for the purposes of biodiversity conservation.

Keywords: Macrofungi, fruiting body, fungal biodiversity, internal transcribed spacer (ITS)

19. Identifying Symbiotic Endophytes From The Biodiverse Regions of Ecuador

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As the world's population increases, the need for more sustainable resources also increases. Many resources that humans rely upon are produced from plants; food, clothing, fuel, furniture, homes, etc. Because of the many resources that plants provide, the need to improve agricultural systems has also increased. Currently, the main problem agricultural systems face is the need for more sustainable practices. One solution is the use of symbiotic microorganisms (symbionts). Symbionts occupy plant hosts and provide benefits, including increased productivety, abiotic stress tolerances, and nutrients restoration to depleted soils. Though there are many benefits to using symbiotic microorganisms, one of the drawbacks is the varied results between host species. The purpose of this research is to identify more symbionts that can be applied to agricultural systems and improve the plant host's abiotic stress tolerance or increase crop production. Seventy-two isolated fungal endophytes obtained from Ecuador's coastal regions and farmlands were sent to the lab and sub-cultured for further study. Nine samples was tested in strawberries, tomato species, and grass species. DNA was extracted from all the cultured samples, and PCR was used to amplify the ITS sequences; then, the PCR solution was sent for DNA sequencing. From the DNA sequencing results, most of the endophytes were positively identified. The results from the initial plant experiments have yielded, that sample #36, identified as [redacted]., supports an increase in production to its host and possibly imparts drought tolerance. Due to the positive results of #36 treatments, an experiment focusing on #36 has already begun to determine if it can impart drought tolerance to the staple crops: corn, wheat, soybean, and cotton. By continuing this research, more beneficial endophyte species will be recorded, as will their benefits on the host plant.

Keywords: abiotic stress tolerance, [redacted] *sp.*, agricultural systems, Ecuador.

20. Electrospinning Iron (III) Oxide Nanoparticles-Loaded Cellulose Acetate Nanofibers

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Solar energy represent the richest energy on Earth. Utilizing solar energy to produce thermal energy and heat the water promises a renewable and sustainable approach to reduce the carbon footprint to fight climate change. Iron oxide nanoparticles as a nontoxic and low-cost light absorber can be used to convert solar energy into thermal energy with desired light absorption coefficient. However, during the solar vapor generation, the surface photocorrosion will degrade the solar vapor generation. To address this drawback, cellulose acetate (CA) fibers with nontoxic, lab-produced iron oxide (Fe_2O_3) nanoparticles were investigated to trade off the light absorption and degradation. To accomplish this, CA fibers were doped with iron(III) nitrate nonahydrate and subsequently annealed to obtain the required Fe_2O_3 particles. These particles were then loaded into new CA fibers in varying ratios. The samples were then analyzed via scanning electron microscopy (SEM) and energy-dispersive X-ray spectroscopy (EDS) to observe the resulting fiber morphology and to confirm the successful uptake of the Fe_2O_3 particles. After confirming this uptake, ultraviolet-visible (UV-vis) spectroscopy was conducted from 300 to 1100 nm to determine the absorptivity of the fibers. A compact infrared (IR) camera was also used to test the heat generation of the Fe_2O_3-loaded fibers under 1 sun (1000 W/m^2). Lastly, the fibers were submerged into water under 1 sun to test their solar vapor generation capabilities. Potential applications for this technology include the direct conversion of solar energy to thermal energy for water sanitation purposes. This technology is promising as it relies on sustainable energy and is easily applicable regardless of societal development.

Keywords: cellulose acetate; iron oxide; electrospinning; photosensitive; photothermal conversion; nontoxic

21. NiN/GO Anode Catalyst for Direct Alkaline Glucose Fuel Cell

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Direct glucose alkaline fuel cells (DGAFCs) are a new type of energy equipment that can directly use glucose as fuel. However, the performance of DGAFCs is controlled by anode catalysts that are considered the backbone of a fuel cell. Here, we synthesized NiN/GO composite material through a facile process and utilized it in a high-performance glucose fuel cell. The catalytic characteristics of as-prepared material were checked as an anode in half glucose fuel cell through LSV and EIS techniques. A full DGAFC was assembled, NiN/GO was used as an anode, and Cu_2O as a cathode. The NiN/GO anode catalyst exhibited excellent 31.78 W/m^2 power density at room temperature, which is higher than that of GO, Ni, NiN catalysts. The nickel oxidized the glucose molecules while graphene doping along with nitride facilitates the rapid electron transfer between active-sites to the current collector. This research provides a potential direction for the design of low-cost monometallic doped catalysts for wide application in glucose fuel cells.

Keywords: Glucose, electrocatalyst, NiN/GO, power density

22. Automated Lung Histology Analysis

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In this study, we aim to develop image analysis tools to automatically study the structural information from lung histology images under multiple respiratory disease. Particularly, we are developing image processing tools to analyze pathological lung images and extract key metrics to describe the difference among diseases.

The dataset contains histology images from patients diagnosed with tuberculosis, pneumonia, and hypertension. We focus on the regions that are air-filled and exclude large airways and vessels. The total alveolar regions analyzed are tuberculosis (n = 9), pneumonia (n = 15), and hypertension (n = 9).

We hypothesize that the difference between subregions can be quantified by a processed image using the metric of air-filled alveolar space ratio, namely aeration. To test this hypothesis, we first imported histology images and split them into its RGB channels. Otsu's algorithm was then applied to highlight the non-air tissues including the alveolar walls, blood vessels, and cells, etc. Through this, we acquired binary images in which black regions are blood vessels/alveolar walls and white regions are air-filled regions. Morphological operations such as dilation and erosion were also applied for noise reduction and image enhancement. Finally, we extract the evaluation metric by calculating the ratio of the white regions compared to the whole area to collect the statistics.

In the experiment, we found that the tuberculosis patients have the highest percentage (83±3%) of white regions in comparison with the other two patterns that do not differ from each other (72±7% and 72±6% respectively). From the data presented, we demonstrate that it is feasible to use our image processing tool to automatically quantify the air-filled alveolar space across differently diseased lungs. Future work will be towards the development of computational methods to distinguish other colored regions in lung histology.

Graduate Poster Session – All Fields – Competitive (Poster 1 to 11)
Zoom Link 2

Moderator: Dr. Mustafa Morsy and Mrs. Hoda Hassan

1. Screening of Different Natural Plants for Treatment of Type II Diabetes Mellitus

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Diabetes mellitus is chronic metabolic disorder that leads to several complications. Herbal treatments for diabetes were always of great value and nowadays it has become more preferred due to its safety and efficacy. The aim of this study was to enhance the effect of conventional diabetes treatments by adding natural herbs as adjunctive therapy. *In vitro* screening of 15 plants from family Lamiaceae on β-glucosidase enzyme inhibition was performed as a preliminary step. According to the *in vitro* results both *Ocimum citriodorum* and *Origanum majorana* possessed the lowest IC50 values on β –glucosidase, thus, they were selected as candidates for further *in vivo* studies to assess anti-diabetic activities on streptozotocin-induced diabetic rats. The male rats were separated into 7 groups: control, injured without treatment, injured receiving Daonil® and four other injured groups receiving oral doses (100 and 200mg/kgbwt) of both studied plants along with Daonil®. This adjunctive therapy showed promising antidiabetic results. The metabolic profiles of both plants were studied using HPLC/MS analyses in an attempt to identify the metabolites that are responsible for the anti-diabetic effect.

2. The Composition and Wound Healing Activity of Some Ocimum and Origanum Species

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Wound healing is a normal, complex and programmed cell process, tend to repair and replace the damaged cells and tissues. Natural essential oils have been used for many years and they have showed promising wound healing activities. The aim of the present study is to investigate the chemical composition and evaluate the wound healing activity of *Ocimum minimum*, *Origanum majorana*, *Ocimum basilicum* and *Ocimum americanum* essential oils. The essential oils were separately obtained by hydro-distillation using fresh aerial parts then the analysis was carried out using gas chromatography-mass spectrometry GC/MS technique. The wound healing activity was evaluated *In vitro* in terms of wound width, migration rate and wound closure percentage. The results showed that estragole (10.10%), linalool (8.84%) and τ-cadinol (6.07%) were the major constituents of *O.minimum* essential oil while 4-terpineol (17.71%), γ-terpinene (10.04) and limonene (7.03) were the major constituents of *O.majorana* essential oil and it was found that methyl cinnamate (17.05%), linalool (12.35%) and 1,8 Cineole (6.53%) were the major constituents of *O.basilicum* essential oil and the major constituents of *O.americanum* essential oil were methyl cinnamate (43.50%), τ-cadinol (12.27%) and camphor (5.42%). *O.majorana* oil exhibited the best wound healing activity with wound width of 0.2 ± 0.28, 0.034 inch/hour migration rate and a 88.921 % wound closure percentage at 72 hours treatment interval. The results reported herein supports the employment of *O.majorana* oil as a natural wound healer.

Keywords: Gas chromatography/mass spectrometry; Ocimum americanum; Ocimum basilicum; Ocimum minimum; Origanum majorana

3. Bioprocessing soybean seedcoats for omega-3 fatty acid production using *Pythium* isolates

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Industrial processing of soybeans to produce soy oil and soy meal results in soybean seed-coats as a low value product. *Pythium* are rapidly growing plant pathogens that secrete a large number of carbohydrate-digesting enzymes that possess the ability to breakdown the fibrous carbohydrates in soybean seedcoats to release the required carbon for their growth. We tap into this potential of oomycetes and apply the use of soybean seed-coats as a source of carbon for the growth of *Pythium* under both aerobic and hypoxic conditions to produce the important omega three and omega six fatty acids that can be included in fish feed as an alternative source of fish oil. Biomass produced by growing cultures on this carbohydrate source and inorganic N has a protein content exceeding 20% with a very favorable amino acid profile. Microaerobic culture conditions produce an unsaturated and saturated fatty acid mixture that mimics that of salmon and sardine oil. Production of omega three and omega six fatty acids from soybean seed coats has the potential to be a major source of essential fatty acids for aquaculture.

4. Dietary Lutein/Zeaxanthin Intake is Associated with Lower Prevalence of Metabolic Syndrome in U.S. Females: An Analysis of National Health and Examination Survey 2015-2018

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U.S. female has greater prevalence of metabolic syndrome (MetS) than males, mainly due to the higher prevalence of dyslipidemia. Lutein (L) and its isomer zeaxanthin (Z) are carotenoids that alter the composition of lipoprotein, which affect components of MetS. Dietary intake of L and Z is inversely associated with MetS in U.S. males, however, this association is unclear in females. This study aimed to investigate the relationship between dietary and supplemental intake of L/Z and MetS prevalence among U.S. females. A sample of premenopausal women aged 20-50 years was drawn from NHANES 2015-2018. The diagnostic criteria of MetS was based on the National Cholesterol Education Program Adult Treatment Panel. Dietary and supplementation L/Z intake were calculated from two 24-hour recalls and dietary supplements use files, respectively. The association between MetS and quartile of L/Z intake was assessed using logistic regression analyses adjusting for covariates. A separate model was run with the addition of supplemental L/Z. Among the 630 U.S. females included in these analyses, the prevalence of MetS was 22.84%. Mean dietary L/Z intakes by quartiles 1, 2, 3, and 4, respectively, were 0.30, 0.64, 1.16, and 4.60 mg/d. When comparing the highest intake quartile to the lowest, women in the highest quartile had significantly lower risk of MetS (OR: 0.38, 95% CI 0.15-0.97). The means of dietary plus supplemental L/Z intake by quartiles 1, 2, 3, and 4, respectively, were 0.33 mg/d, 0.64 mg/d, 1.21 mg/d, and 4.73 mg/d. No relationship was noted between the sum of dietary and supplemental L/Z intake and the presence of MetS. In conclusion, participants in the highest quartile of dietary L/Z had significantly reduced presence of MetS than those in lowest intake. This relationship was not dose dependent suggesting intakes of greater than 1.7 mg/d were related to a reduced risk.

Keywords: lutein, metabolic syndrome; U.S. female; secondary data analysis

5. Sustaining Biological Soil Health Indicators Through Seed Bio-priming in Sunflower

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In modern agriculture, adoption of agrochemicals adversely affects growth of soil micro biota and its activities that deteriorates soil health. Keeping the soil health in view, the current research was undertaken with an objective to investigate the shift in soil biological properties through seed bio-priming. In this study the preferred microorganism for seed bio-priming was *Trichoderma asperellum* along with varying dosage of chemical fertilization (70, 80 and 90% RDF). Results demonstrated the significant improvement in soil microbial biomass carbon, soil cellulase enzyme activity and fungal population in bio-primed treatment along with 70% fertilization. Soil enzyme activities such as urease and alkaline phosphatase were higher in seed bio-priming treatment along with 90% and 80% RDF respectively, whereas dehydrogenase activity was higher in 70% RDF + bio-priming and 80 RDF + bio-priming. Soil bacteria and actinomycetes population was superior in bio-priming along with 80% and 90% RDF respectively.

Keywords: Bio-priming, microorganisms, soil enzymes, soil population

6. Removal of Cr (VI) from industrial effluents using activated carbon from worn rubber

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The present work reports the rate of adsorption of chromium (VI) from aqueous solutions on activated carbon prepared from worn rubber. Worn rubber metal wires were regenerated and pulverized in a micro-mill. The resulting powder was activated with H3PO4 and carbonized in an inert atmosphere for 2 h at 800°C. The morphology of the activated carbon surface was analyzed using SEM analysis. Batch adsorption experiments were performed to evaluate the effect of chromium (VI) concentration, carbon dose, pH, stirring rate, time and temperature. The maximum adsorption capacity was found at a concentration of 100 mg/l at 0.5 g/100mL adsorbent dosage, pH 2 and 25°C temperature. The Langmuir adsorption isotherm shows the best equilibrium data, and a quasi-second-order relationship represents the adsorption kinetics.

Keywords: Activated carbon; Waste tires; Chromium Cr (VI); Wastewater treatment

7. Analysis of optoelectronic characteristics of GaN-based light-emitting diodes

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Gallium Nitride (GaN) has rapidly revolutionized the area of solid-state lighting due to their tunable broad wavelength emission spectrum. But the major hindrance in the progress of solid-state lighting is the degradation of quantum efficiency (QE) at high current density. We proposed a mathematical model for the approximation of internal quantum efficiency (IQE) and light output power (LOP) by including the role of polarization field, which has been absent in previous published models. Due to the polarization field the probability of radiative recombination is reduced in active region. Our mathematical model shows excellent approximation with experimental results of IQE and LOP. Furthermore, for the enhancement of efficiency of green GaN-based LEDs, we proposed an engineered active region structure and compared its optoelectronic characteristics with the reference structure. The proposed structure shows superior optoelectronic characteristics as compared to the reference structure both at low and high current densities. The excellent behavior of proposed structure is attributed to better injection of carriers as well as their distribution across engineered active region.

Keywords: Solid-state lighting (SSL), Green InGaN-based light-emitting diodes (LEDs), Modified ABC model, Optoelectronic characteristics, Internal quantum efficiency (IQE)

8. Intelligent spatial decision support system for foods crops agricultural system sustainability measurement, analysis and improvement

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The main objective of this study was to develop a hybrid spatial model for measuring, analysing, and improvement the sustainability level of a sustainable food crops agricultural system using Intelligent Spatial Decision Support Systems (ISDSS). The proposed model integrated the greenhouse gasses (GHG) inventory effect, Life Cycle Management (LCM), and geoprocessing analysis with the Internet of Things (IoT) by a spatial perspective using Android OS. We considered the advanced non-numeric Multi-Expert Multi-Criteria Decision Making (ME-MCDM) and modified Dijkstra algorithm to determine the GHG effect. The spatial perspective was integrated into economic, social, and environmental aspects. The environmental aspect, i.e., Methane (CH_4), Nitrous oxide (N_2O), Carbon dioxide (CO_2), and Chlorofluorocarbons (CFCs) emissions were measured using the Raspberry Pi sensor. The GHG inventory effects indicators were added into the environmental quality index measurement model. The spatial perspective indicators considered were land cover area, temperature, rainfall, multi-hazard zone indexes, and spatial-temporal congestion. We used SHT15 and Rain Gauge sensor. Furthermore, we classified the sustainability level into 4 classes. The proposed model was implemented in the potato farming system at 4 sub-districts (D_1, D_2, D_3, and D_4) in X district, and 3 sub-districts (D_5, D_6, and D_7) in Y district, Central Java, Indonesia. The sustainability measurement without considering the spatial perspectives shows that samples D_1, D_2, D_4, and D_7 have an average sustainability index greater than the sustainability threshold value (0.1). Meanwhile, the sustainability level index measurement uses a spatial perspective, it was found that sample D_1 and D_7 have values >0.1, while samples D_2 and D_4 have new values <0.1. This means that D_1 and D_7 sub-districts were suitable for potato farming areas, while D_2 and D_4 were not suitable. This proposed model can be used to measure, analyse, and improvement the sustainability level of the potato farming system more accurately.

Keywords: Hybrid spatial model, Intelligent Spatial Decision Support Systems, Potato crops, Sustainable food agricultural systems, Sustainability level measurement.

9. Are Jet Fuel and Diesel Prices Vulnerable to Crude Oil Markets? Implications for Emerging Energy Sources

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New biojet and biodiesel technologies are trying to substitute biomass for crude oil as refining inputs. Potentials for emerging biojet and biodiesel industries will be influenced by current price relationships between crude oil and jet fuel/diesel. To investigate these price relationships, we estimate long-run relationships and short-run adjustments. We find that jet fuel and diesel prices are vulnerable to oil markets in both the long and short runs, but in substantially different ways, depending on whether oil prices are relatively increasing or decreasing. Jet fuel prices respond to oil price decreases, while diesel prices respond to oil price increases. Emerging biojet and biodiesel with biomass inputs could improve risk management within jet fuel and diesel industries by diversifying input supply. Biojet may be especially attractive to jet fuel producers because they are unable to pass increased oil costs through to consumers.

10. Do you have what I expect? – Understanding the gap between local government's plans to mitigate coastal hazards and public perceptions

Evan Cass

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The New Orleans region of Louisiana has been at the front of coastal hazard and climate change research in recent years because of its high social vulnerability, influenced by its location on the Gulf of Mexico, socioeconomic profile, and general location below sea level. It is vital that municipal hazard mitigation is sufficient not only in its coverage of the hazards that pose a threat to the region, but also of the hazards that residents of this region are most concerned about. Resident perception of risk is a vital component of social vulnerability, as a knowledgeable and motivated population is more prepared to handle a major event, such as a hurricane. Because climate change is expected to intensify these threats, it becomes important to ensure that resident perceptions of risk are considered when developing municipal plans to maximize regional resiliency against major events. This research aims to identify a gap in the hazard mitigation process that can be closed to better prepare the community to handle coastal hazards. To achieve this, an online survey is distributed to the New Orleans metropolitan area to determine risk perceptions and expectation of the local government's action in response to coastal hazards and climate change. In addition, policy analysis is conducted to identify the priorities held by municipal planners in these issues. Through research, it is found that, although there is no gap in the mitigation of current hazards, there is a substantial gap between the municipal approach to climate change mitigation and the worry and expectation of action the residents hold in regard to the future effects of climate change. It is recommended that the approach to climate change be reconsidered on a municipal level in order to maximize resiliency toward coastal hazards in the future for New Orleans.

Keywords: risk perception, coastal hazards, climate change, hurricane, planning, New Orleans

11. The Quality of Life of Older Adults on the Autism Spectrum

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Autism spectrum disorder is a spectrum of neuro-developmental conditions that often is studied with young children, from a clinical, cure-focused perspective. There is a dearth of knowledge focused on the self-expressed experiences of quality of life of those that identify as autistic. Similarly, studies focused on older adults are scarce. This presentation focuses on preliminary information for this study. This study seeks to explore the quality-of-life experiences of older adults who identify as autistic, asking, "What are your social, emotional, mental, and physical quality of life experiences?". This study utilizes a self-report demographics survey, a self-report quality-of-life survey developed for autistic folks, and an interview to illustrate any quality-of-life experiences participants wish to express. Descriptive data for demographic survey will be calculated to provide a description of sample. Means data for participant responses to the quality-of-life survey will be calculated to find significant differences in reported quality-of-life if any. Survey results will also be analyzed to find if any possible correlational and/or regression conclusions can be made. The narratives from the interviews will be explored using qualitative data analysis methods.

12. Antimicrobial cotton fabric treated by DBD and subsequently ultrasonically coated by silver nanoparticles and durability effect of plasma

M Saleem[1], M. Y. Naz[1*], S. Shukrullah[1]

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Dielectric barrier discharge (DBD) is the configuration for the generation of plasma by introducing a dielectric medium between the metallic electrodes. It has versatile applications such as in textile, electronics, water treatment, automotive, packing and environment zone generation for water treatment and air disinfection. Present research work is to focus on the effect of atmospheric DBD plasma on wettability and the preparation of antimicrobial cotton fabric. The fabric was exposed by DBD for various exposure times at constant discharging power. The wettability of treated and untreated samples was found by vertical wicking test and consequently enhanced sorption properties. Plasma aging effect was determined after 25 days of plasma treatment, which revealed better durability of plasma. The plasma treated fabrics were ultrasonically coated with silver nanoparticles in order to enhance their antimicrobial properties. The coated samples were tested against E.coli and S. aureus by using agar diffusion test. The results revealed that application of DBD, prior the coating of Ag nanoparticles improved the antimicrobial property of samples.

Keywords: antimicrobial; DBD; wettability; nanoparticles

Session 1 Nutrition (1-4) Zoom link

Moderator: Mr. Robby Johnson

1. Inhibition of *in vitro* Starch Digestion by Bioactive Guest Compounds

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Retardation of starch digestion is an effective way of optimizing glycemic response. Certain bioactive food components inhibit starch digestion by binding with starch digestive enzymes or starch molecules in the digestive tract. Inclusion complexation between starch and guest compounds is a specific non-covalent binding mode and may contribute to a lower digestibility of starch. The aim of this study was to examine the inhibitory effects of ascorbyl palmitate (AP) and palmitic acid (PA) on *in vitro* starch digestion both as potential enzyme inhibitors and as inclusion complex guest compounds. Raw, cooked, and retrograded high amylose maize starch (HAMS) and potato starch (PS) were tested for *in vitro* enzymatic digestion. AP and PA were either added during digestion as potential inhibitors or processed to form inclusion complexes with starch prior to digestion as guest compounds. Starch digestibility profiles, represented by rapidly digestible starch (RDS), slowly digestible starch (SDS), total digestible starch (TDS), and resistant starch (RS) contents, were determined. Cooking significantly increased the digestibility of both HAMS and PS, while retrogradation reduced the digestion rate by increasing the SDS and RS contents. The addition of AP significantly inhibited the *in vitro* digestion of raw, cooked, and retrograded HAMS and PS by increasing the RS content. Formation of starch inclusion complexes with AP and PA contributed to a significant increase in the SDS content as compared to non-complexed and cooked starches. This study suggested that adding certain bioactive food components could compensate for RS loss, which could serve as a practical way of modulating glycemic response. As retarding starch digestion and glucose absorption has served as an effective way for the prevention and treatment of obesity-related chronic diseases, the findings of this study could provide insights for future research and functional food product development.

Keywords: Starch; digestion; inclusion complex; ascorbyl palmitate; palmitic acid.

2. Improved Performance of Cementitious Materials by Tree Nut Extracts

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Tree nut is a major agricultural crop in the south-east region of the U.S and good source of nutrition in human diets, as well as contributes to agricultural waste. A potential opportunity to capture value is by redirecting byproducts of this waste stream, such as the discarded shells, to sustainable construction materials. The objectives of the pilot study were to measure the antioxidant capacity in extracts of collected tree nuts, and to test performance parameters of cementitious materials reinforced with the extracts. Both the kernels and shells of two types of tree nut cultivars were evaluated. First, milled kernels or shells were brewed into tea-like samples. Then the crude extracts were centrifuged and the supernatant was concentrated using a rotary evaporator. Afterwards, the total solid content and total phenolic content in the extracts were measured. The extracts were then used to mix with regular concrete compounds at the same water-cement ratio for compressive strength test which judges concrete's primary mechanical property. Results showed that kernel extracts of both nut types contained higher total solid and total phenolic content than shell extracts. From the results, both nut kernel extracts significantly improved mortar compressive strength for all of the tests. In conclusion, the study provides significant evidence of promising improvements to compressive performance of cementitious materials when integrating tree nut extract.

Keywords: tree nuts; extract; phenolic content; cementitious materials; compressive strength

3. Lipophilization and Amylose Inclusion Complexation Enhance the Photostability and Thermal Stability of Catechin

Yuzhuo Wang [a, b], Yanqi Zhang [c], Lei Guan [a, b], Siqi Wang [a, b], Jing Zhang [a, b], Libo Tan [c], Lingyan Kong [c], and Hao Zhang [a, b, d]

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Catechin is a natural phenolic compound with various bioactivities and has potential in preventing chronic diseases. However, catechin is unstable under adverse environments, such as high temperature and light illumination, which limit its application in functional foods. Amylose can form a single helical hydrophobic cavity, which is often used to protect bioactive compounds. With traditional methods, however, CA is unable to form IC with amylose due to its bulky size and shape. In this work, we applied amylose inclusion complexes (IC) to encapsulate a lipophilized catechin, i.e., hexadecyl catechin (HC), to improve its photo-stability and thermal stability. The formation of amylose-HC IC was characterized using differential scanning calorimetry, X-ray diffraction, and Fourier transform infrared spectroscopy. To evaluate the photo-stability and thermal stability, amylose-HC IC samples were placed under LED irradiation and 60 °C for 48 hours, respectively, using raw HC, amylose-HC physical mixture as the control. The release profiles of IC were tested using simulated gastric fluid (SGF) and stimulated intestinal fluid (SIF). Photo-stability study showed that the retention of guest in IC was 86.1% ± 5.1%, which was significantly higher than the other groups, after 48 h of direct UV irradiation. After 48 h of storage at 60 °C, the retention in IC was significantly higher, i.e., 87.4% ± 0.6% compared with 57.5% ± 2.8% for pure catechin. Moreover, the *in vitro* release profile of IC demonstrated that the release of catechin was in a steady manner and the guest was completely released during digestion in SGF and SIF. The findings show that the lipophilization and amylose encapsulation of catechin is a promising technique to preserve bioactive compounds in functional foods.

Keywords: catechin, encapsulation, amylose, stability

4. Effects of Fatty Acid Chemical Structure on the Complexation Ability and Physicochemical Properties of Starch-C18 Fatty Acid Inclusion Complexes

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Starch, especially its amylose component, is well-known to form inclusion complexes with various small molecules. Starch-lipid inclusion complex has attracted much attention as a type of novel resistant starch. The structure of the lipid guest affects its complexation and properties, and thus its resistance to enzymatic digestion. In the current study, we aim to investigate the complexation ability and physicochemical properties of high amylose maize starch (HAMS) inclusion complexes with six different C18 fatty acids with different degree of unsaturation, including octadecanoic (stearic, SA), (*Z*)-octadec-9-enoic (oleic, OA), (*E*)-octadec-9-enoic (elaidic, EA), (9*Z*,12*Z*)-octadeca-9,12-dienoic (linoleic, LA), (9*Z*,12*Z*,15*Z*)-octadeca-9,12,15-trienoic (α-linolenic, ALA), and conjugated linoleic acids (CLA). Two methods were employed to form HAMS-C18 fatty acid inclusion complexes, which were further characterized by complementary techniques, including X-ray diffraction (XRD), differential scanning calorimetry (DSC), and Fourier transform infrared (FTIR) spectroscopy. The results showed that all C18 fatty acids were capable of forming inclusion complex with HAMS. The low and broad endotherms observed between 85 and 100 °C in HAMS-OA, EA, LA, CLA, and ALA samples could be resulted from retrogradated amylopectin component in HAMS. Among the formed complexes, the peak temperatures decreased as the fatty acid is more unsaturated, with ALA had the lowest peak temperature. Although OA and EA both contain one double bond, EA's *trans* structure delayed its endotherm onset compared to the *cis* structure of OA. By comparing LA with CLA, the endotherm onset was delayed when the structure became conjugated. These results suggested that fatty acid structures could greatly affect the formation of inclusion complex. The formation and thermal stability of starch-lipid inclusion complex are expect to influence its digestibility and thus nutritional quality.

Keywords: Starch; amylose; inclusion complex; fatty acids; differential scanning calorimetry

Session 2 Plant Biology (5-9) Zoom Link
Moderator: Dr. Tiong King

5. Silicon can stabilize photosynthetic apparatus in barley (*Hordeum Vulgare* L.) plants subjected to salinity stress

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Salinity is known to damage the delicate parts of photosynthetic apparatus through excessive production of reactive oxygen species (ROS; $^1O_2$, O^{2-}), while silicon (Si) application is considered as remedy to reduce the damages done by salinity to photosynthetic apparatus. To investigate the protective effect of rooting application of 200 ppm Si on photosynthetic apparatus two barley genotypes (B-10008 and B-14011) were grown under salinity stress (200 mM NaCl). The results revealed that salinity stress (200 mM NaCl) the accumulation of Na^+ in photosynthetic leaves resulted in chlorophyll degradation and disturbed the thylakoid membrane due to over-production of ROS. A significant enhancement in dissipation fluxes (NPQ) in order to protect PSII from photo-oxidative damage under salinity stress was observed. The rise in the value of F_O/Fm under salt stress indicates that the rate of reduction of Q_A was much higher than the rate of oxidation of Q_B due to accumulation of inactive reaction centers in PSII thus lowering electron accepting capacity of PSII from water-splitting complex. The most sensitive component of photosynthetic apparatus is the size and number of active reaction centers (Fv/Fo) which is significant reduced under salinity stress especially in salt-sensitive genotype (B-14011) as compared to tolerant genotype (B-10008). The reduction in Fv/Fo indicated that efficiency of electron donation from OEC to donor side of PSII was reduced under salinity stress. Si application lowered F_O/Fm value in order to stabilize the oxidation-reduction reaction Q_A and Q_B. The decrease in F_O/Fv after rooting application of Si under salinity stress might be due to the fact that the Si application had already initiated steps to protect the OEC under stress through mitigation of ROS and by enhancing NPQ to protect PSII from photo-oxidative damage. The results of this study showed that the adverse effect of salinity stress on photosynthetic apparatus was reversed by the rooting application of Si.

6. Surface Imaging and Cytology Analysis of *Fusarium proliferatum* Causing Fruit Rot of Banana Treated with Plant Extracts.

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Banana is one of the most important and famous tropical fruits planted in Malaysia. Fruit rot is a major disease which affects the quality and quantity of marketable banana fruit. The disease is mainly caused by *Fusarium* species, which are severely infected by *Fusarium proliferatum*. The regular and unselective use of synthetic chemical fungicides to control the pathogen are getting a great attention over the public concerns on toxic remaining in the yield and environment, hence risking public health and trigger the pathogen's resistance development, consequently, other safer alternatives have been investigated including using plant extracts to control the pathogen development. Therefore, ethanolic extracts of *Averrhoa bilimbi* fruit and *Garcinia mangostana* pericarp have been examined for their efficacy in affecting the development process of the pathogen. The pathogen was cultured on growth media containing both extracts individually and carbendazim as positive control, while, the growth media alone served as negative control. All samples were processed for observations under scanning electron microscope (SEM) and transmission electron microscope (TEM). SEM imaging revealed significant morphological abnormalities and plasmolysis in *F. proliferatum* hyphae treated with the plant extracts. Calcium carbonate crystals were also observed abundantly in control compared to treatment plates. This indicated that the plant extracts have ability to inhibit some metabolic production in the pathogen, as in this study, they can inhibit biomineralization process in the pathogen. Furthermore, TEM observation indicated cytological alterations such as development of cell empty cavity and degeneration of cytoplasmic organelles of the pathogen cell. These findings indicate that ethanolic extracts of *Averrhoa bilimbi* fruit and *Garcinia mangostana* pericarp could be a potential alternative antifungal to control the disease. Further phytochemical profiling of the extracts should be conducted. Applications and commercialization of plant-based antifungal compounds as a safer and lower cost against fruit rot pathogens should be explored.

Keywords: Fruit rot disease, plant extract, morphology, SEM, TEM, antifungal

7. Foliar Growth Regulator Applications Improved Rice Tolerance to Combined Heat Stress

Alvaro Daniel Pantoja-Benavides[1], Gabriel Garces-Varon[2], and Hermann Restrepo-Díaz[1]

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Rice yield production has been decreased between 6% to 7% in different regions around the world because of the climate variability and the increase of temperatures from 1-2°C that has been causing heat stress in those plants. The use of growth regulators works as a strategy to mitigate heat stress in different crops enhancing physiological and biochemical mechanisms. Therefore, the aim of the study was to evaluate the effect of foliar application of four growth regulators on physiological and biochemical variables in rice plants during the vegetative stage subjected to heat stress. Rice plants of cultivars Fedearroz 67 and Fedearroz 2000 were set in a factorial arrangement where the main factor was the cultivar, the second one was the six treatments: Absolute control (without heat stress (daytime temperature 30°C and night 25°C)), heat stress control (daytime temperature 40°C and night 30°C), stress+auxins, stress+gibberellins, stress+cytokinins, and stress+brassinosteroids. Plants treated with growth regulators showed an increase in measures of different variables such as chlorophyll content, chlorophyll fluorescence parameters, water relative content, stomatal conductance, DQE (decrease in the maximum quantum efficiency) with significant differences between stress control, and rating similar values to absolute control, the stress control plants were lower because of heat stress effects, variables such as leaf temperature and CSI (Crop stress index) were higher in stress plants, the rest of treatments showed similar values to absolute control. In conclusion, the cultivars Fedearroz 67 and Fedearroz 2000 suffered affectations on their physiological and biochemical variables when they were exposed to heat stress. The growth regulators evaluated in this research demonstrate an increase in tolerance of rice plants during the time they were being stressed. There were differences between cultivars in the physiological and biochemical variables evaluated in this research.

Keywords: growth regulators, heat stress, auxins, gibberellins, cytokinins, brassinosteroids.

8. Kinetic Study of the Biodegradation of Monocrotophos by Indigenous Soil Bacterial Isolates in Presence of Humic Acid, Fe(III), and Cu(II) Ions

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The present study was executed to investigate the kinetics of the biodegradation of monocrotophos (MCP) in an aqueous medium. Three bacterial strains (Streptomyces sp., Bacillus subtilis, and Rhizobium leguminosarum), with excellent MCP degrading capabilities, were isolated from the agricultural soils and characterized on the basis of 16S ribosomal RNA (rRNA) gene sequencing methods. Biodegradation of MCP was performed with and without applications of metal ions (Fe(III) and Cu(II)) and humic acid (HA). In fourteen days experiment, three strains have utilized 92-97% (with half-life periods from 7.92 to 8.85 days) of MCP. The results indicated that all the three bacterial isolates were able to degrade MCP with an order MCP2 (Bacillus subtilis) > MCP1 (Streptomyces sp.) > MCP3 (Rhizobium leguminosarum). Applications of Cu(II), the biodegradation of MCP was from 83 to 92% with half life periods from 9.71 to 10.38 days. The biodegradation of MCP under the applications of Fe(III) was from 78 to 87% with half life periods from 10.75 to 11.14 days. In the presence of HA, MCP biodegradation was inhibited significantly, the observed degradation was from 75 to 82% with half life periods from 12.04 to 12.54 days. Overall, MCP's biodegradation inhibition order under different conditions was as HA > Fe(III) > Cu(II). Hence, these strains could be used as potential biological agents in the effective biodegradation campaign for other pesticide-contaminated sites.

9. Effect of Applied Inoculant Bacterial Strains on Growth, Oxidative Stress and Antioxidant System Regulation of Maize (*Zea mays L.*) Under Hydrocarbon Contaminated Soil

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Environmental contamination by hydrocarbons creates a major problem and its accumulation in soil may pose hazardous effects in ecosystems. Toxic hydrocarbons including petroleum products can neither be eradicated nor demolished from environment; however, they can be transformed from lethal to harmless forms. The purpose of this investigation was to assess whether inoculation affects plant growth, oxidative stress (H_2O_2, MDA), enzymatic (SOD, POD, APX, CAT, GR) and non-enzymatic (AsA, GSH, Pro, α-Toco) antioxidant defensive system under hydrocarbon stress. Corn was planted in diesel-contaminated soil (0, 1.5, 2.5, 3.5 g kg^{-1}) and inoculated with *B. phytofirmans* PsJN by two methods: seed inoculation and soil inoculation. *B. phytofirmans* PsJN inoculation generally improved plant biomass production and hydrocarbon degradation. Inoculants cause significant fluctuations in enzyme and non-activities in both leaves and root as compare to without inoculum treatment, however they significantly reduced oxidative stress in polluted soils exhibiting an enhancement in plant resistance to diesel.

Session 3 Nanotech (10-14) Zoom Link
Moderator: Dr. Mustafa Morsy

10. Synthesis and Characterization of Ni-Cu-Zn Based Nanofluids

Noor ul ain, Muhammad Yasin Naz, Shazia Shukrullah, and Abdul Ghaffar

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The nanofluids were prepared by dispersing the copper-nickel-zinc nanoparticles in transformer oil and kerosene via two-step method. The nanoparticles were synthesized by sol gel auto-combustion method and characterized by Scanning electron microscope, Photo luminescence spectroscopy and X-ray diffraction. The SEM images predict that the morphology of the prepared Ni-Cu-Zn nanoparticles is irregular. The surfaces of some particles are amorphous in nature. The measured crystallite size is varying in between 45-48nm. The results of photoluminescence give the band gap and emission lines of the nanoparticles. Transient hot wire method was used to measure the thermal conductivity of base fluids and nanofluids. It is observed that the addition of nanoparticles enhances the heat transfer rate. It has witnessed that the thermal conductivity of Ni-Cu-Zn/Kerosene based nanofluids has higher value than Ni-Cu-Zn/transformer oil based nanofluids. The physical method of tracking falling ball automatically depending on image processing was used to measure viscosity of transformer oil and kerosene based nanofluids. The viscosity of transformer oil based nanofluids at room temperature is 12.53mm2s-1 and decreases to 12.49mm2s-1 at temperature of 40oC. The viscosity of kerosene based nanofluids is 1.49mm2s-1 at room temperature and 1.18mm2s-1 at 40oC, respectively. Sedimentation method revealed that the Ni-Cu-Zn/transformer oil based nanofluids have greater stability than Ni-Cu-Zn/Kerosene based nanofluids. The observed values of stability and viscosity are in agreement with the reported values in the literature.

11. Simulation of Effect of Distributor Blade Angle on a Particle Dynamics in a Swirling Fluidized Bed

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The Fluidized beds are broadly utilized in many processes because of their property of excellent heat transfer and the ability to move solid particles like a fluid. The fundamental part of any fluidized bed is air distributor and its design and efficiency effect the mixing of air particles and bed materials. As the Swirling fluidized beds enhance the fluidization process through radial mixing, they have become an interested topic of research. Swirling fluidized bed is an annular bed in which air is injected through the blades of distributor. In this current research, the effect of blade length, blade inclinations, blade overlap angles, and air inlet velocities on the velocity of particles and pressure at distributor outlet were examined. The fluidization of a bed of round particles was done using an annular distributor covered with mesh. In the distributor, angles of rectangular blades were set at 30^{o}, 45^{o}, 60^{o}, and 75^{o}, and mesh cover cell size was 5x 5 mm^{2}. Furthermore, Computational fluid dynamics simulation was performed by using turbulent (k-Ɛ) model, to investigate the air distributor. Fluidized bed geometry was built using solid work software and was then imported to ANSYS software for further analysis such as Reynolds number, particle velocity, pressure contour, velocity vector, velocity contour, pressure drop, stream lines, animation of the movement of the particles and air velocity at the bed column. The initial velocity of 1.5 m/s was applied at the inlet. While striking with the air distributor blades, the streamlines had to cover extra distance as a result of blade length. Consequently, swirling motion was achieved as a result of blade inclination. The constant and laminar flow for 1.5 m/s velocity was achieved at 0.3, 0.4 and 0.6 m/s In 0.7, 0.8 and 0.5 Seconds respectively.

Keywords: swirling fluidized bed; annular blade distributor; ANSYS software; SOLIDWORKS software.

12. Effect of DC Voltage on Morphology and Size Distribution of Silver Nanorods Synthesized Through Plasma-liquid Interaction Method

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A plasma-liquid interaction method was used to produce silver nanorods from silver nitrate and sucrose solution at different DC voltages. Sucrose was used as stabilizing and reducing agent in this reduction reaction. A fixed molar ratio of silver nitrate was used to elaborate the effect of DC plasma voltage on shape size and elemental composition of nanorods. The formation of silver nanorods was confirmed from SEM images. Some copper nanoparticles were also formed due to degradation of anode during plasma reduction process, which were uniformly distributed over the surface of nanorods. The nanorods had well-defined shape and alignment at an applied voltage of 4 kV. The elemental analysis provided EDX peaks at 3 keV, 1.8 keV, 0.5 keV and 0.3 keV, which correspond to Ag, Si, O and Cu, respectively. The applied voltage only effected the shape and size of the nanorods. The size of nanorods varied from 662 nm to 964 nm, 483 nm to 703 nm and 572 nm to 841 nm for 2 kV, 4 kV and 6 kV, respectively. The size distribution histograms reveal narrowest size distribution of nanorods at 4 kV voltage followed 6 kV and 2 kV.

Keywords: Ag nanorods; Plasma reduction method; Plasma- liquid Interaction;

13. Microwave Plasma Assisted Sol-gel Technique for Synthesis of TiO_2 Nanoparticles

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Synthesis of metal oxide nanoparticles through microwave plasma assisted sol-gel (MPAS) method is a most recent research development. MPAS is a low-cost electrochemical method whereby the nanomaterials can be synthesized in relatively shorter periods of time by having good control over particle size, shape and distribution. The plasma treatment is a promising technique for oxidation of nanomaterials. Titanium dioxide (TiO_2) is a material of great interest due to its excellent set of physio-chemical, optical, and electronic properties that make it supportive to be used in several technological applications including self-cleaning surfaces, water treatment and electronic devices. In this study, TiO_2 nanoparticles were synthesized by combining sol-gel method with MW plasma treatment. The obtained nanoparticles were placed in partially vacuumized chamber for MW plasma treatment. MW plasma calcination took barely 15-20 s, which means a low calcination time providing a low cost, time saving and energy efficient synthesis of TiO_2. The crystallite sizes, crystal phases, band gap and surface morphology of both pure and MPAS synthesized samples was evaluated by XRD, SEM, FT-IR and UV-Visible spectroscopy techniques. The mixed anatase-rutile phased TiO_2 nanoparticles were obtained under the set synthesis conditions having particle size range of 0.2-14 nm. The average particle size decreased while band gap energy increased by 40 % after MW plasma treatment. The particles were of aggregated and trigonal shapes. FTIR analysis confirmed the absorption of O-Ti-O band stretching near 415-420 cm^{-1}. The hydroxyl bands (OH) were observed to be less stretched after MW plasma calcination. The MPAS method improved the photocatalytic performance of TiO_2 nanoparticles by raising their band gap energy and reducing the grain size.

Keywords: TiO_2 nanoparticles; sol-gel; MPAS method; MW plasma treatment

14. Particle Image Velocimetry and Statistical Analysis of a Swirling Fluidized Bed

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Swirling fluidized bed (SFB) is a recent type of famous bubbling bed. All industrial fluidized beds contain an air distributor, which has a significant impact on the quality of fluidization. Swirling fluidized beds are being used for efficient industrial processing. The effectiveness of SFBs depends on the deliberately designed air distributor, which is the key component in the setup for improving the process efficiency. In this study, high speed imaging followed by the particle image velocimetry (PIV) of a swirling fluidized bed was performed to the evaluation of bed performance. PIV analysis was conducted by varying the blade angle, superficial velocity and bed weight. The obtained results were compared with a suitable statistical model for optimization of the bed parameters. The GNU R (version 4.0.3) programming language was used to measure the velocity of the FB. Response surface regression model was used to analyze the data statistically. The confidence interval of the velocity of the obtain from statistical method was ranged from 0.49485-0.49998. The experimental and statistical values of the velocities were 0.49741 and 0.538 m/s. The similar weights of the bed and the SAV were obtained through statistical and experimentally analyses.

Keywords: swirling fluidized bed, particle image velocimetry, statistical analysis, GNU R programming language.

Session 4 Engineering & Environmental Science (15-19) Zoom Link
Moderator: Dr. John McCall and Mrs. Hoda Hassan

15. Accessibility of Movement Challenged Persons to Evacuation Routes to Dhaka City

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To develop a sustainable, resilient, and inclusive city persons with disability (PWDs), a highly vulnerable minority group, should be able to reach a safe shelter through an accessible evacuation route in the advent of a disaster. To ensure better accessibility of PWDs to evacuation routes, it is necessary to first evaluate the accessibility of PWDs to evacuation routes. Proper measures can be taken to improve their accessibility and overall resilience as a result. Despite its importance, little research has been dedicated to determine the accessibility of PWDs using a defined framework previously. This study thus aims to close the gap by assessing the accessibility to earthquake evacuation routes for movement challenged persons (MCPs). This comprehensive accessibility index is composed of four components pertaining to accessibility from home to the shelter: perceived accessibility of internal circular space and entrance gate of the residential building, accessibility of evacuation route, accessibility of entrance gate of the shelter. Considering the importance of having alternative links to reach a shelter if one link gets blocked by damaged buildings, Link to node ratio (LNR) has been selected to evaluate the accessibility of evacuation routes as it considers the multiplicity of the network. Perceived physical impedance faced by MCPs has been integrated with LNR to determine the accessibility to evacuation routes. 455 MCPs from Dhaka, Bangladesh, a city highly vulnerable to earthquake, has been surveyed through a questionnaire. Considered accessibility components have been standardized to represent the overall accessibility situation of MCPs during an earthquake. The examination of the relation of various accessibility components with socio-economic factors reveals that people with more disabilities and older MCPs perceive lower accessibilities of evacuation routes, circulation space, and entrance gate of residence, while male and more educated MCPs perceive circular space and entrance gate of residence to be more accessible.

16. Efficacy of Botanical Encapsulated Zinc Nano-Particles for the Management of Bird Cherry Oat Aphid, *Rhopalosiphum pedi* L. (Hemiptera: Aphididae)

Muhammad Jafir[1], Jam Nazeer Ahmad[1,2], Aqsa Khan[2], Sonia Jamil[2], Amanullah[1], Fayyaz Ahmed[2], Muhammad Azhar Saeed[1], Ayesha Ghaffar[2] and Samina Jam Nazeer Ahmad[2]

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Rhopalosiphum pedi L is an important pest, damaging the cereal crops globally. Due to the attack of this major pest, wheat cultivars could not meet the yield potential in many countries including Pakistan. It sucks the cell sap through its stylet, inject the toxic saliva and also transmits the pathogens in the host plant. Short life cycle and frequent development of biotype is the main problem for the management of this pest. The main objective of this study was to check the effectiveness of *Azadirecta indica* synthesized zinc nano-particles against *R. pedi* L. The trial was conducted in the semi-field condition with four levels of zinc nanoparticles and water as control treatment. Nano-particles were sprayed in three doses 50, 100, 150 and 200 ppm of 50 ml. Results revealed that zinc nano-particles significantly suppress the aphid populations. Variable suppression of *R. pedi* L. was observed at different concentration. But no significant difference was observed between two highest concentrations i.e. 150 and 200 ppm (89.87% and 92.25% mortality). Moreover, LD_{50} of nano-particles was found to be 95.028 ppm with the slop 2.670. It can be thought that this study could be the first report which demonstrated that zinc nanoparticles could be used in *R. pedi* L. control. Additionally, this study could be highly helpful for the researcher to develop the effective IPM strategies.

17. Production of Silver Nanoparticles through Bicontinuous Microemulsions approach for antibacterial activity

M. Manzoor, M. Y. Naz, S. Shukrullah, and A. Ghaffar

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Silver nano-particles are very attractive for the applications of biomedical because of their biocide properties and great biocompatibility. It is also very helpful for microanalysis. In this study precipitate of Ag nanoparticles was stabilized with mixture of surfactants sodium tetraborate decahydrate (Na2[B4O5(OH4)]. 8H2O) and sodium dodecyl sulfate (NaC12H25SO4) (2/1, w/w) at 70 ◦ C containing the solution of silver nitrate 0.5M) while toluene used as organic phase. In this method, sodium borohydride (NaBH4) was used as precipitating agent. In case of micro-emulsions, different concentrations of silver nitrate, surfactants and dosage time was studied. The antibacterial movement of cathodes covered with silver nanostructures is exceptionally improved inside seeing an electric field. Silver used as a successful disinfectant, is combined by microorganisms it executes. As such, dead organisms may be the source of silver that may kill additional microorganisms. The structure of microemulsions and size of particle have been characterized through SEM (Scanning Electron Microscope), XRD (X-Ray Diffraction), UV-Visible (Ultraviolet-Visible Spectroscopy) and FTIR (Fourier Transform Infrared Spectroscopy). It was showed that the diameters of particle smaller than 10 nm and distributions of particle size in narrow range. XRD analysis showed the particle size is slightly effected all concentrations and also observed that the size of particle increasing by changing the concentration of surfactant. FTIR showed the chemical composition and physical state of the sample

Keywords: Silver Nanoparticles, Bicontinous Microemulsions, Surfactant, Nanosize.

18. Finishing of Green Synthesized ZnO Nanoparticles Over DBD Plasma Treated Cotton Fabrics to Improve Antimicrobial and UV Protective Properties

Malik Tanawush, Muhammad Yasin Naz, Shazia Shukrullah, and Abdul Ghaffar.

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Treatment of natural fibers, like cotton, using nanoparticles and plasma technique is in limelight these days. As plasma treatment is a dry, environment-friendly, chemical free method and it can improve wettability, hydrophobicity, adhesion, self-cleaning, dye ability, printability and product quality without alteration of bulk properties of the fabric. An awareness of health, sanitation and hygiene has led to the production of antimicrobial and UV protective textile to protect wearer from harmful microorganism. This study was aimed to prepare ZnO nanoparticles via green synthesis method mediated by *Psidium Guajava Linn.* leaf extract. The leaf extract improved the antimicrobial and UV resistive properties when coated on fabric. Dielectric barrier discharge plasma, using air gas, was used for pretreatment of cotton fabric to functionalize the surface, enhance wettability and adhesion properties. The characterization of ZnO nanoparticles, before and after coating, were carried out using X-ray diffraction, scanning electron microscopy and UV-Visible spectroscopy techniques. The presence of functional groups on cotton fabric were confirmed through FTIR. For antimicrobial effect, agar disc diffusion test was used. The antimicrobial activity and UV resistive properties of plasma treated and untreated fabric were compared to study the effect of plasma treatment onto finished cotton fabric. The results indicated that plasma treated cotton fabric showed significant antimicrobial activity, against E. coli and S. aureus, as compared to plasma untreated cotton fabric.

19. Microencapsulation of Copper Rods with Silver Nanoparticles Through Liquid-plasma Interaction Method

Anum Zulfiqar, M. Y. Naz , and S. Shukrullah

Department of Physics, University of Agriculture Faisalabad, Pakistan

For a wide variety of innovation, nanotechnology is an umbrella term. Nanotechnology and Nanoscience is an exceptional multidisciplinary field of technology and applied science proposed to understand, use and create molecular and atomic-scale structures. Plasma Nanoscience is an extremely fascinating and fertile field where many exciting discoveries and feasible applications can be anticipated in the years ahead. Plasma nanoscience research bridges the nano-technology and nano-science, physics of plasma and gas discharges. The most widely recognized types of plasma reactors and plasma utilized in the nanoscale plasma processing and synthesis is low and high pressure, thermal plasma, liquid-plasma interaction and etc. In the field of plasma science and technology, microencapsulation through liquid-plasma interaction methods is turning into an undeniably significant topic. In numerous applications extending from material science, health treatment and ecological remediation the interaction of non-equilibrium plasma with fluid state is significant. Silver coated copper nanorods have been one of the intriguing materials in microelectronic engineering because of their extraordinary thermal and electrical properties. Copper rods show dominant mechanical and optical properties and held great promise for low-cost fabrication. The oxidation of the copper nanowires and strong thermal stability can be well suppressed by the encapsulation of copper rods with silver nanoparticles. Microencapsulation of copper nanowires with silver nanoparticles is done through liquid-plasma interaction method. The samples were prepared through the different stabilizer agent. During the synthesis process, samples dried at 90°C temperature in an oven and annealed at 300°C for one hour. The samples were prepared for further characterization such as XRD, SEM, FTIR, TGA, UV-Vis spectroscopy.

Keywords: Liquid-plasma interaction; Ag/Cu encapsulation; copper rods; silver NPs; anti-oxidation.

Session 5 Education and STEM-related (20 -24) Zoom Link

Moderator: Dr. Jing Chen

20. The Physicological Effect of Interior Plants for University Students

Sevin Bayram and Hilmi Ekin Okray

Yüzüncü Yıl University, Turkey

Space features affect the users both socially, physically and mentally in creating healthy environments in the places we live in. For this reason, the interior features of the buildings are very important. People need a natural interior landscape to meet their social needs and the interiors, where most of the time is spent, appears closed and monotonous. This situation drives people away from nature. But people's instinct is to be in touch with nature. This situation can be solved by bringing plants to indoors.
It is stated by many users who grow plants that dealing with and taking care of plants provides peace and comfort. In addition to the physical effects of plants, they also have functions such as emotion regulation, body and mind development. Indoor planscape (planting designs) help people to feel in nature, to protect mental health and to relax the body and mind. It is known that the integration of the interior with a green space has a significant effect on the recovery of people's psychology.
In this case, it can be said that natural environments have healing properties. These properties are described as restorative in environmental psychology. The restorative environment is the field that deals with the benefits of nature to human health or psychology. Restorative environments enhance people's well-being and health. It reduces mental fatigue, improves productivity and helps relieve stress. In this study, the effects of restorative indoor environments on university students were investigated. Based on this, the benefits of transforming the interior spaces of the university into restorative environments have been investigated. For achieving this aim a questionnaire has been done with university students and a factor analysis yield five factor based on the result of the questionnaires.

Keywords: Restorative spaces, factor analysis, indoor plants, planting design

21. Qualifying the Driving Environment Dynamics from the View of Autonomous Vehicles (AVs): Inspiration for Qualitatively Defining Operational Design Domains (ODDs)

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Until the Level 5 autonomous vehicle (AV) becomes a reality, automated driving systems (ADS) are expected to operate only under special environments without safety driver. A taxonomy - Operational Design Domain (ODD) has been defined to describe the conditions under which a given ADS is designed to function. The ODDs are currently described in a qualitative way, such as freeway, light rain, minimal traffic, etc. However, the ADS may prefer quantitative information feeds to determine whether a vehicle is within its ADS's ODD. Using the data from Lyft, this study is to provide a quantitative method to depict the dynamic driving environments from the view of an AV, and to offer implications for qualitatively defining ODDs for ADS. From the camera and LIDAR data, objects and their relationships with the host vehicle or ego car were identified and the relationships were measured by metrics proposed in this study. This study built a logit model to relate the ego car's instantaneous maneuvers to the metrics that are proposed to quantitatively measure driving environments. The model revealed that the metrics are significantly related to vehicle maneuvers. It implies that these metrics may be suitable for quantifying ODDs for ADS. The quantified driving environments based on historical sensor data could be integrated into a sematic map for ADS to use as a reference to determine whether a driving environment meets its ODD. The public agencies may also use the semantic map to improve their environment to meet the ODD requirements by ADS.

22. The Impact of Differentiated Instruction on the Reading Performance Growth of Rural School Elementary Students

Tatshum Nichelle Johnson

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Rural school administrators, teachers, and stakeholders seek to understand instructional differences and student achievement performance. Many rural school educators are exploring teaching strategies and researched-based instructional approaches to help close academic achievement gaps among diverse student populations. Differentiated instruction (DI) is an instructional approach well-known for assisting teachers in designing and implementing instruction to meet learners' needs. This comparative correlational study aimed to determine the impact of rural school-teachers' implementation practices of distinct components of (DI) on closing the reading achievement gap between rural and non-rural schools. Specifically, the researcher (1) investigated the differences in Grade 3-5 students' reading performance growth (RPG) of teachers implementing (DI) as a result of pre- and post-test (RPG) scores and (2) examined the relationship between Grade 3-5 teachers' implementation of (DI) and students' (RPG) scores. This quantitative study is significant because it addressed the impact of (DI) on students' (RPG) to support school reform efforts. To investigate the research questions, the researcher utilized teacher data gathered from an online 7-point Likert survey based on Tomlinson's (DI) model and students' (RPG) data from Edmentum Assessments. The findings revealed that (1) Grade 3-5 teachers' (DI) practices showed no significant differences in students' (RPG) based on grade level, and (2) a mild to moderate correlation between teachers' (DI) implementation and Grade 3-5 student (RPG). Implications from this study suggest that rural school educators could benefit from professional development to review, discuss, and align instructional practices to dive deeper into the use of multiple instructional strategies designed for varied learners to maximize student growth and success (Tomlinson and Allan, 2000). This study will contribute to the body of literature related to (DI's) impact on students' (RPG) for Grade 3-5 students in rural schools. Future studies will include examining differences that exist among teachers' (DI) implementation based on identified beliefs about (DI).

Keywords: differentiation, rural, professional development, education, achievement

23. Exploring The Relationships Between Peer Observation And Collective Teacher Efficacy Among Rural School Teachers

Domonique Morgan

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Rural school leaders are challenged to recruit and retain quality teachers with limited financial resources. Generally, rural schools employ a significant percentage of the local population, and change is not always received well in the rural environment. Educators prefer to work in environments where they feel as if they are contributing to a common goal. The purpose of this study was to determine the differences between rural teachers' perception of collective teacher efficacy in Grades 3-5 and 6-8, and the relationship between the implementation of a peer observation protocol and rural teachers' perception of collective teacher efficacy. This comparative correlational study aimed to provide a link between peer observations and collective teacher efficacy in rural schools. Study results provide definitive evidence that a statistically significant difference existed between the grade level clusters' perception of collective teacher efficacy. In addition, the study showed a moderate association between the implementation of a peer observation protocol and rural teachers' perception of collective teacher efficacy. Implementing peer observations in an effort to improve collective teacher efficacy among rural school teachers appears to be a worthwhile endeavor. Rural leaders can engage their teachers in a cost-effective, job-embedded professional development model to improve their perception of collective teacher efficacy and instructional practices.

Keywords: peer observation, collective teacher efficacy, rural

24. Effect of Advertisement on Buying Habits of College Students of Jorhat District of Assam

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The aim of advertising is to have impact on buying behaviour; however, this impact is strengthened frequently through people's memories. Memories about the product are formed by associations that are related to brand name in consumer mind. These brands continuously influence consideration, evaluation and finally purchases, Consumers buying behaviour has always been given so much importance and space in the literature study of impact of advertising regarding its effectiveness. Most of the time consumers buying behaviour depends on liking or disliking of consumer towards the advertisement of the product advertised (Smith et al., 2006). A good quality advertisement is likely to influence consumers into buying that product while a poor quality advertisement will do the opposite. Keeping it in mind the present study was taken up "Effect of advertisement on buying habits of college students of Jorhat Assam"with the following objectives 1) to study the type of advertisement that influences the buying habit. 2) to find the Role and effect of advertisement of cosmetic products on college students.For this study a total of 120 samples were selected from four different college of jorhat Assam by simple random sampling.It was observed that most of the respondents i.e (48.33%) admitted that advertisement influence them to purchase the cosmetic product. Mostly (80.33%) reported that there is a medium effect of advertisement on the respondents.

Session 1 (talks 1-5) Zoom Link

Moderator: Dr. Tiong King

1. Effectiveness of Entomopathogenic Fungi against Cotton Jassid and Whitefly

Muhammad Jafir[1*], Jam Nazeer Ahmad[1], Muhammad Azhar Saeed[1], Faisal Hafeez[3], Amanullah[1], Fayyaz Ahmad[2], Ayesha Ghaffar[2], Mohsin Razzaq[1], Muhammad Shoaib[1], Muhammad Ayoub[1], and Samina Jam Nazeer Ahmad[2]

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Amrasca biguttula biguttula and *Bamisia tabacii* are polyphagous sucking insect pests causing almost 40% damage to important agricultural crops including cotton. Management of pest through microbes is an important part IPM. It also favours managing climate change. Present experiment was conducted to check the effectiveness of entomopathogenic fungi, *Beauveria bassiana* and *Metarhizium anisopliae* against cotton jassid and whitefly. Two different formulations of both fungi were used. Statistical outcomes of the data indicated that *B. bassiana* caused higher mortality as compared to *M. anisopliae*. Formulation in the form of filtrates yielded significantly higher mortality with respect to the conidial formulation of both fungi. *B. bassiana* caused significantly higher mortality in whitefly than that of *M. anisopliae*. While higher mortality with filtrates of *M. anisopliae* was observed in jassid than that of *B. bassiana.* As for entomopathogen treatments for the whitefly concerned, was observed on *B. bassiana* filtrates followed by conidia of the *B. bassiana* while conidia of the *M. anisopliae* showed lowest mortality. Mortality data of jassid for all the treatments indicated that *M. anisopliae* was slightly more effective than that of *B.bassiana* but statistically non-significant result was yielded. All the significant results were noted after two days of application time. At six days of interval all the treatment gave non-significant results. From this study, it was concluded that filtrates of *B. bassiana* is the best control of cotton whitefly and *M. anisopliae* is recommended for the management of cotton jassid. Moreover this study will be lead the scientist for the sustainable management of sucking pest of agricultural crops.

Key words: Entomopathogen, IPM, Climate change, *Beauvaria bassiana*, *Metarhizium anisopliae*

2. Toxicity Evaluation of Different Insecticides and Nanomaterials Against Pink Bollworm, Pectinophora gossypiella Saunders (Lepidoptera; Gelechiidae)

Muhammad Jafir[1*], Muhammad Umar[1], Amanullah[1], Samina Jam Nazeer[2], Mohsin Razzaq[1], Ayesha Ghaffar[2], Fayyaz Ahmad[2] and Jam Nazeer Ahmad[1*]

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Cotton is one of the cash crops and backbone of textile industry in Pakistan. Many insect pests especially bollworms cause decline in cotton's yield. Pink bollworm (*Pectinophora gossypiella*) is one of the major lepidopterous pests of cotton. Its larva resides inside the cotton bolls and reduces the fiber length and destroys the lint quality. It is mandatory to control this notorious pest. Therefore, the laboratory experiment was conducted to assess the toxicity of various insecticides and nanoparticles against *P. gossypiella*. For this purpose, three insecticides (Talstar, Coragen and Emamectin-benzoate) and *Ficus religiosa* encapsulated silver nanoparticles (Ag-NPs) were tested against 2nd, 3rd and 4th instar of *P. gossypiella*. The tested chemicals were formulated in three different levels (Low, Medium and High). The stock solutions were prepared in ppm concentrations from which further serial dilution were made. Treatments were applied uniformly on artificial diet and larvae were starved for two hours before releasing on treated diet. Data was recorded with twelve hours interval. The obtained results showed that Emamectin-benzoate was most toxic among the tested insecticides. The LC_{50} values were calculated as 35.92, 109.86, 242.32 and 266.62 ppm, when 2nd instar of *P. gossypiella* was treated with Emamectin-benzoate, Coragen, Talstar and silver nanoparticles, respectively. The efficacy of tested chemicals was also observed in same order for 3rd and 4th instars, respectively. It was observed that percentage mean larval mortality increased as increase in dose rate. While, percentage mean mortality decreased with an increase in larval instars. It showed positive relation of insecticides on mortality rate but negative effect on insect age ($P \leq 0.05$). Thus, it is concluded that tested chemicals are effective against 2nd instar of *P. gossypiella* and silver nanoparticles can be used as an alternate to conventional insecticides due to their eco-friendly nature. This study will boost up the competition among the scientists to analyze the effect of nanoparticles on physiological as well as biochemical parameters of plants as well as insects.

3. Bio-priming in Combination with Mineral Fertilizer Plays an Important Role in Modulating Soil Biochemical Environment, Nutritional Quality, and Yield of Red Cabbage Under Middle Gangetic Plains, India

Deepranjan Sarkar and Amitava Rakshit

Department of Soil Science and Agricultural Chemistry, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi-221005, Uttar Pradesh, India

Field assays (2016-17 and 2017-18) were conducted in Varanasi (Middle Gangetic Plains), India during *rabi* season to determine the combined impact of seedling bio-priming and mineral fertilizers on biochemical properties, microbiological properties, and fertility of soil and nutrient concentration, bioactive compounds, and yield of exotic crop (red cabbage) at harvest. The recommended dose of fertilizers (RDF, N:P2O5:K2O) was applied @ 120:60:60 kg ha-1. Three compatible primers (*Trichoderma harzianum*, *Pseudomonas fluorescens*, and *Bacillus subtilis*) were applied singly and in combination with 75% of recommended NPK fertilizer dose. Further, the effect of treatment combinations was also analyzed for carbon mineralization by conducting an incubation experiment over a period of 90 days. Application of 75% DF + *T*. *harzianum* + *P*. *fluorescens* resulted highest urease and cellulase activities, soil organic carbon, and head N content, Cu, and protein content along with marketable head yield. Inclusion of dual bacterial inoculations (*P*. *fluorescens* and *B*. *subtilis*) in the integrated system resulted highest dehydrogenase activity, available P, and head P, K, Fe, Zn, and total carbohydrate content. These priming agents also exhibited significantly higher carbon dioxide fluxes and carbon mineralization throughout the study period. Microbial consortium of *T*. *harzianum* and *B*. *subtilis* increased the microbial biomass carbon, available K, head Mn, and vitamin C content. Treatments had no significant effect on alkaline phosphatase activity in soil and β-carotene and anthocyanin concentration in the crop. The performance of dual consortium was better than the triple consortium. Although, triple consortium priming improved C mineralization in laboratory conditions, but the positive effects lowered down in field conditions. Therefore, the current study highlights the significance of dual inoculations in comparison to individual and triple inoculations in substituting the mineral fertilizer requirements and promoting the ecofriendly red cabbage production in Middle Gangetic Plains by improving soil quality and produce quality.

4. Effect of Sulphur Fertilization and Seed Bio-priming on Yield and Yield Attributes of Mustard [*Brassica juncea* (L.) Czern.] in an Inceptisol

Sonam Singh and Amitava Rakshit

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Among the secondary nutrients, sulphur (S) is one of the most critical nutrients required for the growth and development of plants especially oilseeds. This study was conducted to optimize the S fertilization dose by including seed bio-priming interventions with the recommended schedule for improving the yield and yield attributes of mustard (*Brassica juncea* (L.) Czern). Mustard seeds (cv. Giriraj) were primed with varied bio-inoculants and grouped into three categories, the first one kept unprimed (control), second was primed with *Bacillus subtilis* and third was primed with Pseudomonas fluorescens and sown in field with four levels of S dose (0, 20, 30 and 40 kg S ha^{-1}) through bentonite S. The results showed that seed bio-priming with both the bacterial strains improved the plant height, siliqua per plant, seed per siliqua, test weight, grain yield of mustard crop. Further S dose of 40 kg ha^{-1} and seed bio-priming with *Bacillus subtilis* emerged as promising package in the integrated plant nutrition system which exhibited through increased grain yield by 17.7% than other inoculant and non-primed treatments.

Keywords; Sulphur; oilseed; seed bio-priming; bentonite S; yield and yield attributes

5. Biochemical Mechanism of Toxin Production by Microbes during Plant Disease Development

Seweta Srivastava and Raghavendra Reddy Manda

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Present day concept of toxins in pathogenesis has acquired an important place in the arena of plant pathology. Because once the toxic metabolite of the pathogen is identified and characterized, it opens up many ways for combating against pathogen. Plant pathogenic bacteria and fungi damage their host by producing diffusible toxins. These toxins induce several symptoms such as chlorosis, necrosis, water soaking and wilting which leads to the death of the plants. These toxins (secondary metabolites) are dangerous to the plants even in minute concentrations and many of the toxins reproduce at least few symptoms of relevant fungal or bacterial diseases. Toxins are used as weapons by plant pathogens to induce disease condition in susceptible hosts. Several Pathogens produce toxins both *in vitro* and *in vivo* and are involved in pathogenesis. There has been a substantial progress about the nature, structure and mode of action of these microbial toxins. This is reviewed briefly in this article.

Key words: Host Selective Toxin, Non-specific Toxin, Pathotoxin, Phytotoxin, Vivotoxin

Session 2 (talks 6-10) Zoom Link

Moderator: Dr. Mustafa Morsy

6. Turning the Page: A Design Thinking Approach to Increasing Literacy Advocacy in West Alabama

Caleb Walters

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The Literacy Council of West Alabama is a nonprofit organization whose goal is to increase literacy throughout its nine-county service area. For illiterate populations, helpful information and resources may be difficult to comprehend and therefore not as effective at increasing literacy as intended. Through a design thinking-focused case study of LCWA's website and promotional materials, including a content inventory and comprehensive web heuristic evaluation, this research offers proposed solutions of how to better optimize marketing and communication efforts for both fully literate and functionally illiterate populations, including print and digital materials that make better use of semiotics and visual communication practices.

Keywords: design thinking; UX design; semiotics; literacy; nonprofit; digital media

7. Creating Accessible Video Content for the Classroom

Brandon Walker

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With the onset of the COVID 19 pandemic, many instructors from K-12 to higher ed were tasked with creating video-based content for their classrooms for the first time. While many tools have emerged that focus on creating content, fewer resources have surfaced about making that content accessible. This presentation focuses on taking created video-based content and making it meet accessibility standards by way of closed captioning and descriptions.
Using free resources and guides, this presentation provides a framework and pathway to incorporate an accessibility plan into your existing production pipeline.

8. Non-thermal Plasma Jet: An Effective Tool for Treatment of Industrial Effluents

Muhammad Yasin Naz, Shazia Shukrullah, and Abdul Ghaffar

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Non-thermal plasma jet is one of the best oxidation methods available for the treatment of industrial effluents. An atmospheric pressure DC plasma jet consists of positive ions, electrons, negative ions, free radicals, electrically neutral gas atoms and or molecules and electromagnetic radiations. Being strong oxidizers, the plasma species interact with the contaminated media and decompose the pollutants in the media. These plasma species also kill the bacterial endospores and vegetative cells. In this study an argon plasma jet was sustained in open air and characterized for its chemical composition. The optically characterized plasma jet was used to treat industrial wastewaters containing mixed textile dyes and heavy metals. Since plasma jet produces UV-radiations, the photocatalytic TiO_2 was used to enhance plasma treatment efficiency especially for degradation of dyes. The emission spectrum confirmed the presence of Ar, NO, O_3, OH^-, N_2, N_2^+, O, O_2^+ and O^+ species at 695-740 nm, 254.3 nm, 307.9 nm, 302-310 nm, 330-380 nm, 390-415 nm, 715.6 nm, 500-600 nm and 400-500 nm. These reactive species decomposed the organic pollutants and separated the heavy metals from the water samples. The conductivity of plasma exposed water samples increased while pH and hardness decreased. The effect of plasma treatment on Staphylococcus aureus strains was more pronounced than Escherichia Coli strains.

Keywords: Wastewater; plasma jet; optical emission spectroscopy; TiO_2 catalyst; dye degradation.

9. Impact of Climate Change in Vegetable Cultivation and Coping Strategies to Enhance Their Production and Productivity in Tamil Nadu, India

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Climate change is the primary cause of low production of most of the vegetables worldwide. Under changing climatic situations crop failures, shortage of yields, reduction in quality & increasing pest and disease problems are common and they render the vegetable production unprofitable. Drought and salinity are the two important consequences of increase in temperature, reduced irrigation-water availability and flooding worsening average yields. Keeping this in view the study was conducted with 90 vegetable growers to assess the impact of increasing climate change and factors responsible. Physiological disorders and increasing intensity of pest and diseases are the major impact. The effects are fruit borer (70.00%), blossom dropping and less fruit setting percentage (68.33%), fruit cracking or split problem (65.00%), sunscald due to high temperature (61.66%), deformation of fruit and lower quality (51.66%), yellow or green fruit shoulders (46.66%) and Bhendi curling/Small size of fruit/discoloration and Hardness of fruit (40.00%). The major technological gaps are non adoption of IPM Packages (63.33%), foliar spray (60.00%), lack of knowledge on growth regulators, seed treatment practices (56.66%), use of HYV (50.00%) & application of recommended fertilizers and top dressing (46.66%) and mulching (33.33). Unless proper measures are undertaken to adapt to the effects of climate change, vegetable production will be under threat. Development of high yielding varieties tolerant to high temperature, moisture stress, salinity and climate proofing through biotechnology, improved nutrient-use efficiency, organic manures, bio-fertilizers, bio-agents, mulching with crop residues, plastic mulches to reduce evaporation and conserving soil moisture, vegetable value addition, awareness, capacity building and education are the mitigating ways.

10. Synthesis and Functionalization of Carbon Nanotubes for CO2 Adsorption Application

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Carbon dioxide is one of the major greenhouse gases and a leading source of global warming. Several adsorbent materials are being tested for removal of CO_2 from the atmosphere. The use of multiwalled carbon nanotubes (MWCNTs) as a CO_2 adsorbent material is a relatively new research avenue. In this study, Fe_2O_3/Al_2O_3 composite catalyst was used to synthesize MWCNTs by cracking ethylene gas molecules in a fluidized bed chemical vapor deposition (CVD) chamber. These nanotubes were treated with H_2SO_4/HNO_3 solution and functionalized with 3-aminopropyl-triethoxysilane (APTS). Chemical modification of nanotubes removed the endcaps and introduced some functional groups along the sidewalls at defected sites. The functionalization of nanotubes with amine introduced carboxylic groups on the tube surface. These functional groups significantly enhance the surface wettability, hydrophilicity and CO_2 adsorption capacity of MWCNTs. The CO2 adsorption capacity of as-grown and amine-functionalized CNTs was computed by generating their breakthrough curves. BELSORP-mini equipment was used to generate CO_2 breakthrough curves. The oxidation and functionalization of MWCNTs revealed significant improvement in their adsorption capacity. The highest CO_2 adsorption of 129 cm^3/g was achieved
with amine functionalized MWCNTs among all the tested samples

Keywords: Fluidized bed; CVD; MWCNTs; CO_2 adsorption capacity

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- EBSCO Industries Inc.
- Sumter County Farmers Federation
- UWA Office of Sponsored Programs and Research

Judges

Pushpinder Litt	Hygiena
Pei Jia Ng	Oklahoma State University
Yinlin Dong	University of Central Arkansas
James Cook	University of West Alabama
Frank Rogers	University of West Alabama
Kenya Goodson	Stillman College
Jason Cassity	US Army Corps of Engineers
JJ Wedgworth	University Charter School
Carmen Giles	Mississippi State University
Chunhui Yu	Farmingdale State College
Dhiraj Gautam	Department of Agricultural Commissioner in Los Angeles County
Kean Lee	Rieke Packaging
Brian Mast	University of West Alabama
Santanu De	Nova Southeastern University

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