National Symposium on
Agriculture & Life Sciences

NSALS '25

"EMPOWERING SUSTAINABILITY THROUGH INNOVATIONS"

PROCEEDINGS

23rd Jan 2025

Faculty of Animal Science and Export Agriculture

Uva Wellassa University of Sri Lanka

Undergraduate Research Symposium – FASEA, UWU

NSALS ’25

National Symposium on Agriculture & Life Sciences - 2025

"Empowering Sustainability through Innovations"

January 23, 2025

Faculty of Animal Science and Export Agriculture
Uva Wellassa University of Sri Lanka
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Acknowledgments

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We are deeply grateful to our Chief Guest, Senior Professor Kolitha B. Wijesekara, Vice Chancellor of UWU, and our Keynote Speaker, Chair Professor Saman Seneweera of the University of Ruhuna and Chairman of the National Science Foundation Sri Lanka. Their insights and expertise greatly enriched the symposium. Special thanks are also extended to Prof. H.M.S.K. Herath, Dean of FASEA, for invaluable support throughout the organization of NSALS '25.

Our appreciation goes to Dr. A.G.A.W. Alakolanga for delivering an engaging scientific talk at the closing session. We also acknowledge the dedicated efforts of the symposium coordinator, secretary, organizing committee, track coordinators, panel chairs, panel members, and conveners for ensuring the event's smooth execution.

We commend the authors and presenters for sharing their innovative research findings, which form the heart of the symposium. Gratitude is also due to the Editor-in-Chief, Editorial Board members, and reviewers for maintaining the highest standards in finalizing the proceedings. The efficiency and dedication of the working committee leaders and members were pivotal to the event's success.

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Lastly, we express our sincere gratitude to the academic, administrative, and non-academic staff of UWU, as well as all others who played an active role in the success of NSALS '25. Your commitment and dedication have been integral to the realization of this symposium, and we are deeply appreciative of your efforts.

NSALS ’25

Uva Wellassa University of Sri Lanka (UWU) continues to lead as a trailblazer in Sri Lanka's higher education sector, exemplifying the spirit of an entrepreneurial and technopreneurial University. Upholding a visionary approach to education, UWU nurtures graduates who are not only knowledgeable but also equipped with indispensable skills and ethical values. These individuals are empowered to excel in technocratic roles, embark on entrepreneurial ventures, and contribute meaningfully to the nation’s progress and development.

Recognized as the "Center of Excellence for Value Addition" to Sri Lanka's national resource base, UWU remains unwavering in its pursuit of advancing research and innovation. The Faculty of Animal Science and Export Agriculture (FASEA), as part of this vibrant academic ecosystem, proudly hosts the second annual National Symposium on Agriculture and Life Sciences (NSALS ’25), the Undergraduate Research Symposium of FASEA-UWU. Building on the remarkable achievements of its first edition, NSALS ’25 seeks to create an engaging platform for dialogue and collaboration among students, academics, researchers, industry professionals, and scientific experts.

With the theme "Empowering Sustainability through Innovations", NSALS ’25 strives to ignite meaningful conversations, foster synergistic partnerships, and stimulate groundbreaking ideas that extend beyond the scope of the event. The symposium highlights UWU's enduring dedication to expanding knowledge boundaries, championing innovation, and steering progress toward a sustainable and prosperous future.

NSALS ’25 encompasses eight thematic tracks, each highlighting critical areas of agriculture and life sciences:

1. Agricultural Economics, Agribusiness Management, Extension, and Entrepreneurship
2. Agricultural Engineering and Process Technology
3. Agricultural Microbiology and Biotechnology
4. Animal Production and Technology
5. Aquatic Sciences
6. Crop Production Technology
7. Environmental Science and Climate Change
8. Food Science and Technology

This year, following a meticulous peer-review process, over 175 outstanding undergraduate research papers have been selected for oral presentation under these themes. These abstracts physically presented during NSALS ’25, are reflecting the symposium's dual commitment to academic rigor and innovation.

NSALS ’25 stands as a proud testament to UWU’s dedication to advancing research excellence and nurturing a culture of innovation in the fields of agriculture and life sciences. Together, we forge a path toward a brighter future, fueled by innovation and discovery.

Chief Guest's Message

It is with profound pride and privilege that I extend my warmest greetings on the occasion of the inaugural National Symposium on Agriculture and Life Sciences (NSALS '25), hosted by the Faculty of Animal Science and Export Agriculture at Uva Wellassa University (UWU). This landmark event, centered on the theme "Empowering Sustainability through Innovations," exemplifies the University's commitment to advancing academic excellence and fostering transformative research in the domains of agriculture and life sciences.

NSALS '25 serves as a distinguished platform for the convergence of emerging scholars, researchers, and professionals. It provides a unique opportunity for undergraduate researchers to present their pioneering work, engage in scholarly dialogue, and share insights with a multidisciplinary audience. By fostering the exchange of ideas across diverse perspectives, the symposium creates an intellectually stimulating environment that inspires innovative solutions to contemporary challenges.

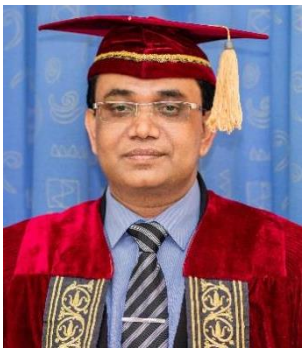
In addition to showcasing cutting-edge research, this symposium aspires to bridge the gap between academic inquiry and real-world application. It empowers participants to identify developmental opportunities, address pressing issues, and translate research into impactful, sustainable outcomes. Through this collaborative effort, NSALS '25 aims to contribute meaningfully to the advancement of knowledge and the cultivation of innovative practices in agriculture and life sciences.

I extend my heartfelt gratitude to the organizing committee and the Faculty of Animal Science and Export Agriculture for their unwavering dedication and meticulous efforts in realizing this visionary initiative. Their steadfast commitment has ensured the creation of a dynamic and enriching forum that will undoubtedly leave a lasting impact on all participants.

To the presenters and evaluation panelists, I offer my best wishes for an inspiring and rewarding symposium. May your contributions ignite fruitful academic discourse, stimulate innovative thinking, and pave the way for groundbreaking advancements that will shape the future of agriculture and life sciences.

Senior Professor Kolitha B. Wijesekara
Vice Chancellor
Uva Wellassa University of Sri Lanka

Dean's Message



It is with great pleasure and pride I am forwarding this message for the occasion of the second consecutive research symposium, "National Symposium on Agriculture and Life Sciences (NSALS '25)", which is held under the theme of 'Empowering sustainability through innovations', organized by the Faculty of Animal Science and Export Agriculture, Uva Wellassa University of Sri Lanka.

The faculty intends to conduct this symposium every year having commenced in year 2024 and accordingly, NSALS '25 provides a platform for the budding researchers to present their research findings and obtain experience prior to grooming as intellectuals. Not limiting to Uva Wellassa University, NSALS '25 has provided opportunities for the undergraduates of other universities. Therefore, we believe that we have made a national level platform for taking undergraduates of the country to share their recent scientific findings among each other. Representing Faculty of Animal Science and Export Agriculture, undergraduates of BScHons (Animal Production and Food Technology), BScHons (Export Agriculture), BScHons (Tea Technology and Value Addition), BScHons (Palm & Latex Technology and Value Addition) and BScHons (Aquatic Resources Technology) present their findings in this symposium. The symposium has focused on main eight tracks namely: Agricultural Economics, Agribusiness Management, Extension and Entrepreneurship, Agricultural Engineering and Process Technology, Agricultural Microbiology and Biotechnology, Animal Production and Technology, Aquatic Sciences, Crop Production Technology, Environmental Science and Climate Change and Food Science and Technology, covering main disciplines of the scope.

Since the inception, Uva Wellassa University takes the responsibility of producing graduates who could make a significant contribution to the national economy through value addition to national resource base. Thus, the University provides entrepreneurial education together with other core subjects for all undergraduates in their respective curricula. Also, an effort is made to deliver knowledge and skills requested by the employers of the industry in addition to providing an environment for developing attitudes. I believe that providing opportunities for undergraduates to communicate their research findings related to research and innovation in NSALS '25 will be a great investment for the future.

My concern is that the NSALS '25 will undoubtedly provide an opportunity to enhance research culture within the faculty and beyond. Hence, I take this opportunity to appreciate all organizers and the presenters of NSALS '25 for their commitment extended to succeed the event.

Professor H.M.S.K. Herath
Dean, Faculty of Animal Science and Export Agriculture
Uva Wellassa University of Sri Lanka

NSALS '25 Coordinator's Message

It is with great enthusiasm that I welcome you to the National Symposium on Agriculture and Life Sciences (NSALS '25) at Uva Wellassa University of Sri Lanka (UWU), an event reflecting our shared vision of creating a sustainable future through innovation and collaboration. NSALS '25, the second undergraduate symposium organized by the Faculty of Animal Science and Export Agriculture, UWU, embraces the theme "Empowering Sustainability through Innovations," underscoring the urgent need to rethink how we address today's challenges.

As we confront the realities of climate change, dwindling resources, and a growing global population, the call for sustainable practices is louder than ever. Sustainability, however, is not solely about preservation—it demands bold, innovative solutions to thrive in harmony with our planet. This symposium offers a dynamic platform to bridge the gap between ideas and action.

On 23rd January 2025, we will explore topics ranging from sustainable agriculture and biotechnology advancements to resource efficiency and policies supporting environmental stewardship. Our esteemed speakers, leaders in their fields, will share cutting-edge research, transformative insights, and groundbreaking technologies with the potential to reshape industries and communities.

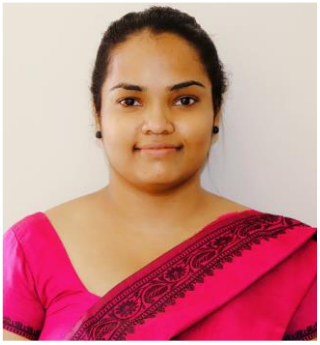
Beyond knowledge sharing, this on-ground event fosters connection. As a participant, you join a diverse network of researchers, practitioners, policymakers, and students, each contributing unique perspectives and expertise. Together, we can forge impactful partnerships and create solutions that are innovative, scalable, and inclusive.

Empowering sustainability is a collective effort. The insights gained here must ripple outward, influencing institutions, industries, and communities. Let us use this opportunity to think boldly, challenge assumptions, and embrace innovation as the key to a sustainable future. My hope is that you leave this symposium enriched with knowledge and inspired to lead meaningful contributions to the critical work ahead.

I extend heartfelt thanks to our Vice Chancellor, Dean, organizing committee, volunteers, and sponsors whose tireless efforts have made this event possible. Special gratitude goes to our esteemed speakers and panelists for their invaluable contributions, which will undoubtedly inspire and enlighten us.Thank you for joining us in this vital endeavor. Together, we can empower a future where sustainability and innovation go hand in hand.

Dr. Duminda Senevirathna
Coordinator/NSALS '25
Faculty of Animal Science and Export Agriculture
Uva Wellassa University of Sri Lanka

NSALS' 25 Secretary's Message



It is my honour to convey this message for the 2nd National Symposium on Agriculture and Life Sciences 2025 (NSALS '25) of the Faculty of Animal Science and Export Agriculture, Uva Wellassa University of Sri Lanka.

The theme of our undergraduate research symposium is "Empowering Sustainability through Innovation". The mindset of undergraduates holds the potential to shape the future of Agriculture and Life Sciences, driving meaningful advancements and inspiring further exploration in the pursuit of a more resilient and sustainable world. Therefore, NSALS '25 serves as a premier scientific communication platform that recognizes the dedication and perseverance of Sri Lankan undergraduates in the face of adversity. It emphasizes their commitment to advancing knowledge, fostering exquisite research, and promoting the spirit of collaboration and innovation among stakeholders.

Similarly, NSALS '25 aims to highlight the interactive threads of research and bridging the gap between science and industry. It embodies Uva Wellassa University's vision of being the centre of excellence for value addition to the national resource base by promoting innovations, advancing knowledge, and making meaningful contributions to society through impactful research.

As the secretary to the NSALS '25, I would like to express my profound gratitude to the Vice Chancellor of Uva Wellassa University, the Dean of the faculty, all staff members in the faculty, sponsors and well-wishers for their steadfast support, encouragement and dedication given to this event. Moreover, I am truly grateful for the cooperation extended by the organizing committee and supportive staff members of NSALS '25 in accomplishing this event.

I believe NSALS '25 creates a space where ideas thrive, collaborations emerge to inspire groundbreaking research, fostering innovation to build a resilient and sustainable future for generations to come. I wish all participants a rewarding and inspiring experience at NSALS'25 and look forward to the sustainable innovations and collaborations this symposium will empower in the field of Agriculture and Life Sciences.

Ms. K. Prathibha M. Kahandage
Secretary NSALS '25
Faculty of Animal Science and Export Agriculture
Uva Wellassa University of Sri Lanka

Keynote Speech

"Plant Responses to Elevated CO_2 Concentrations: Implications for Global Food and Nutrient Security"

Climate change in a global context

Climate change, driven primarily by anthropogenic greenhouse gas emissions, poses significant challenges to global food systems. Elevated atmospheric CO_2 concentrations, currently at 420 µL L^{-1} and projected to reach 550 µL L^{-1} by mid-century, are a critical factor influencing plant physiology, food production, and nutrient security. While CO_2 acts as a substrate for photosynthesis, enhancing growth and yield in C_3 crops such as wheat and rice, the broader implications on food quality, ecosystem resilience, and human health are complex and multifaceted. This abstract highlights the key physiological responses of plants to increased CO_2 levels, the subsequent changes in crop yield and nutrient composition, and the strategies needed to ensure food security in future climate scenarios.

The Evolution of Agriculture and Challenges of Climate Change

Since its inception 10,000 years ago, agriculture has undergone transformative advancements, including the Green Revolution, which significantly increased food production through the development of high-yielding crop varieties and intensive farming practices. However, global agricultural productivity is now constrained by climate change. Rising temperatures, erratic precipitation patterns, and recurrent extreme weather events threaten crop yields, particularly in tropical and subtropical regions. Studies indicate that climate change may reduce yields of staple crops by 10–15%, exacerbating the challenge of feeding a projected global population of 10 billion by 2100. Therefore, understanding how plants respond to climate change, especially increased CO_2 levels, is crucial for creating resilient agricultural systems systems.

Physiological Responses of Plants to Elevated CO_2

Elevated CO_2 enhances photosynthesis, particularly in C_3 crops, through the "CO_2 fertilization effect," increasing grain yield by 20–30% under controlled conditions. This effect arises from increased carboxylation efficiency, reduced photorespiration, and improved water use efficiency due to reduced stomatal conductance. However, the long-term sustainability of these benefits is uncertain, as photosynthetic acclimation and nutrient limitations may offset yield gains. Research using Free-Air CO_2 Enrichment (FACE) systems has uncovered vital interactions among elevated CO_2, temperature, and nutrient availability, highlighting the need for integrated methods to investigate plant responses in realistic environmental conditions.

Impact on Grain Yield and Quality

While elevated CO_2 increases biomass and yield, it adversely affects grain quality. Notably, protein, zinc (Zn), and iron (Fe) concentrations in grains decline, posing significant risks to global nutrition, particularly in regions heavily reliant on cereal-based diets. Studies using FACE experiments demonstrate reductions in protein and micronutrient content in rice and wheat, with implications for human health, particularly for populations already vulnerable to

nutrient deficiencies. Furthermore, changes in grain composition, such as altered gluten protein profiles, compromise the baking quality of wheat, underscoring the need for targeted breeding and management strategies to mitigate these effects.

Adaptation Strategies in Agriculture

Adapting agriculture to climate change requires a multi-faceted approach integrating genetic, agronomic, and technological innovations. Key strategies include:

1. Breeding for Resilience: Developing cultivars with enhanced nutrient use efficiency, heat tolerance, and resilience to abiotic stresses. For example, gene-editing technologies like CRISPR-Cas9 offer potential for precise trait improvements.
2. Optimizing Nutrient Management: Addressing nutrient limitations through site-specific fertilizer applications and biofortification strategies to enhance micronutrient content in crops.
3. Leveraging Technology: Employing precision agriculture tools, including drones, satellite imagery, and automated irrigation systems, to optimize resource use and improve crop monitoring.
4. Improving Crop Modeling: Integrating advanced crop models with climate projections to predict yield responses under future scenarios and guide policy decisions.

The Sri Lankan Context: Opportunities and Challenges

Sri Lanka, with its diverse agro-climatic zones and fertile soils, possesses substantial potential for agricultural innovation. Nonetheless, the agricultural sector in the country faces hardships due to climate change, such as declining yields, water scarcity, and heightened pest pressures. Modernising agriculture through the adoption of precision farming, enhanced irrigation systems, and advanced breeding techniques is crucial for boosting productivity and farmer income. For instance, increasing average rice yields from the current 4 MT per hectare to 5 MT per hectare could boost farmer income by 20%. Additionally, Sri Lanka must prioritize local research on climate adaptation, focusing on staple crops like rice and pulses. Collaborations between research institutions, policymakers, and farmers are crucial for implementing sustainable practices. Biofortification programs targeting Zn and Fe deficiencies, coupled with public awareness campaigns, can address malnutrition while improving food security.

Global Implications and Future Directions

The effects of elevated CO_2 on food and nutrient security extend beyond individual regions, with global implications for biodiversity, ecosystem services, and human health. Addressing these challenges requires coordinated international efforts to mitigate greenhouse gas emissions, enhance crop resilience, and ensure equitable access to nutritious food. Policies supporting sustainable agricultural practices, investment in research, and capacity-building initiatives are critical for achieving these goals. In summary, elevated atmospheric CO_2 concentrations present both opportunities and challenges for global agriculture. While potential yield gains offer hope for meeting future food demand, the adverse effects on nutrient quality and environmental sustainability underscore the need for comprehensive adaptation strategies. By integrating advanced research, innovative technologies, and inclusive policies, we can pave the way for a resilient and sustainable agricultural future.

Professor Saman Seneweera

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Paper ID: NSALS '25-020 (Oral)

Analyzing the tea buyers' perception of the current constraints and future potential for electronic auction system in the Sri Lankan tea industry

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The Colombo Tea Auction (CTA), established in 1883, is the world's largest tea auction, traditionally using the English auction system. However, the manual nature of the auction has posed challenges, prompting the shift to an e-auction system. While the e-auction offers benefits like higher transparency, timesaving, reduced costs, and real-time updates, it has introduced issues such as reduced interaction between buyers and sellers, partial automation, and difficulties for users with low IT literacy. As buyers are key stakeholders in the tea industry, this study aims to analyze tea buyers' perceptions of the current constraints and future potential of the e-auction system. Data was collected from 30 active e-auction tea buyers using purposive sampling. Thematic analysis reached data saturation with the selected sample size, ensuring comprehensive identification of key themes. The main objective was to investigate the challenges buyers face with the current system, evaluate their satisfaction levels, and explore opportunities for improvement. An exploratory sequential design was used, starting with qualitative data collection through semi-structured interviews, followed by quantitative data collection. Thematic analysis identified 8 key challenges: loss of negotiation, communication barriers, unsold lot manipulation, online auction fraud, error lots, simultaneous bidding, immediate action challenges, and limitations of sequential bidding. A scoring system and 5-point Likert scales were used to measure satisfaction. Descriptive and correlation analyses were applied to assess variables and their relationships with buyer satisfaction. Results revealed a negative correlation between these challenges and satisfaction levels, indicating that more issues on the platform lead to a significant decline in satisfaction. Despite moderate overall satisfaction among buyers, the findings suggest that while certain aspects of the e-auction system are well received, others require substantial improvement. In conclusion, while e-auctions have modernized the tea industry, addressing challenges such as unsold lots, communication gaps, lack of negotiation, and fraud is crucial for creating a more efficient, fair, and interactive marketplace for stakeholders.

Keywords: Buyer perception; challenges; electronic tea auction system; satisfaction; tea auction

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Paper ID: NSALS '25-030 (Oral)

Consumer awareness and willingness to buy egg and egg-based products in the urban areas of the Western province of Sri Lanka

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Egg-based products, namely egg powder, liquid egg and frozen egg are receiving an enormous popularity all over the world for their convenience, nutritional benefits and versatility. However, egg-based products are not available in general consumer market of Sri Lanka. The objectives of this study are to determine consumer awareness and willingness to buy egg-based products in the urban areas of Western province of Sri Lanka and to identify the factors which influence consumer preferences and decisions regarding egg-based products. A survey was conducted through a structured questionnaire from seven municipal council areas namely Colombo, Sri Jayawardenapura Kotte, Kaduwela, Dehiwala-Mount Lavinia, Moratuwa, Negombo and Gampaha. Interviews were taken from 200 respondents using the stratified random sampling technique according to the population density of each stratum. Both the descriptive and correlation analysis were carried out to evaluate the results. According to the results, only 40% of consumers are aware of egg-based products while 60% are not, but if they were made available, 53% of consumers would express a willingness to buy. Higher awareness was observed in younger (73% out of the people who are aware), unmarried (83% out of the people who are aware), and more educated respondents (58% of graduates and 26% of post-graduates out of the respondents who are aware) with males having a higher awareness (86% of the total). Higher willingness to buy was observed in the similar groups such as 63% in 18-35 age group, 78% in males, 70% in unmarried people, 53% and 19% in graduates and postgraduates respectively, indicating a potential market for egg-based products. Consumer choices are positively correlated (P<0.05) and largely influenced by convenience and nutrition, with liquid eggs being the most popular product because of their perceived health benefits and convenience in use. Awareness, product packaging concern, trust in brands, promotional methods especially the shopkeepers and internet, trade through supermarkets, and willingness to test new products have been identified as crucial factors which influence the purchasing decisions since their correlation with willingness to buy (P<0.05). According to the study's findings, there is a potential for egg-based products in the Sri Lankan market, particularly if campaigns to raise awareness along with targeted marketing techniques are implemented.

Keywords: Egg based products; egg powder; frozen egg; liquid egg; willingness to buy egg-based products

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Paper ID: NSALS '25-040 (Oral)

Technical efficiency of potato farmers in Welimada, Sri Lanka

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Agriculture Sector Modernization Project (ASMP) implemented by Ministry of Agriculture, Sri Lanka, introduced various new technologies to farmers in 12 districts in cultivating high valued crops. Potato farmers at Welimada in Badulla district also received a technology package to boost potato production. However, the adoption of technology varies across farmers. Therefore, this study is an attempt to find the impact of technologies provided on Technical Efficiency (TE) of beneficiaries of ASMP estimating Stochastic Production Frontier. The study also estimated the TE of non-project beneficiaries to investigate the improvement in TE of project beneficiaries. Results showed that project beneficiaries demonstrated higher TE with a mean value of 0.300, in comparison to non-project beneficiaries who had a mean value of 0.227. Enhanced efficiency of project beneficiaries can be attributed to the technologies provided, use of high-quality seeds and continuous training. Although the ASMP has provided new technologies, potato farmers still have to improve their production efficiencies, as the mean TE is extremely low. By adopting the given technology properly and following all the guidelines related to production, the farmers can further enhance their production.

Keywords: ASMP; potato farmers; stochastic production frontier, technical efficiency

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Paper ID: NSALS '25-068 (Oral)

Factors affecting consumer awareness of fairtrade tea products: A study on Colombo and Badulla Districts

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Tea is one of the world's most popular beverages, and Sri Lanka plays a crucial role in global tea production, particularly known for its high-quality Ceylon tea. As the demand for ethically sourced products rises, fairtrade certification has become vital in the tea industry, promoting sustainable agricultural practices, fair wages, and better working conditions for farmers. However, despite the growing availability of fairtrade products worldwide, consumer awareness of fairtrade tea in Sri Lanka remains inconsistent. This study explores the factors affecting consumer awareness of fairtrade tea in two significant districts: Colombo and Badulla. A quantitative approach was employed, surveying 100 respondents from urban and semi-urban areas. Data were gathered through structured questionnaires administered in selected supermarkets, focusing on aspects such as demographic factors, social values, beliefs, attitudes, sustainability, social responsibility, and consumer experiences. The findings indicate that beliefs, sustainability, and social responsibility are the strongest predictors of consumer awareness of fairtrade tea products, showing strong positive correlations. Consumers who are more familiar to ethical and sustainable practices tend to have a higher awareness of fairtrade tea. Conversely, demographic factors like age, income, and education level exhibited weak or non-significant correlations with awareness, suggesting that ethical beliefs are more influential than traditional consumer characteristics. Furthermore, 92% of respondents recognized social media as the most accessible platform for learning about fairtrade products, underscoring the potential for targeted digital campaigns to enhance consumer engagement and promote fairtrade tea. This study adds to the growing literature on ethical consumption and provides practical recommendations for marketers, policymakers, and fairtrade organizations. By understanding the drivers of consumer awareness, stakeholders can develop more effective marketing strategies, encourage ethical consumer behavior, and support sustainable development within Sri Lanka's tea industry. Insights into digital marketing trends also offer guidance for leveraging online platforms to improve the visibility and impact of fairtrade products.

Keywords*:* Consumer awareness; digital marketing; ethical consumption; fairtrade tea; social responsibility; tea industry

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Paper ID: NSALS '25-073 (Oral)

Exploring the determinants of consumer preference for organic herbal tea products in the Colombo metropolitan area

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The increasing global trend towards healthier and more sustainable consumption has significantly influenced consumer behavior in Sri Lanka particularly in the organic food and beverage sector. This study investigates the factors driving consumer preference for organic herbal tea products in the Colombo metropolitan area, aiming to identify key determinants shaping purchasing decisions. Specifically, the research examines demographic characteristics, health consciousness, environmental awareness, and product attributes such as taste, price, and promotional strategies and avoiding redundancy in explanations. To achieve these objectives, a structured survey targeting 165 respondents from diverse demographic backgrounds in the Colombo metropolitan area was conducted. The sampling procedure involved random sampling, ensuring a representative sample of the population. Data analysis employed binary logistic regression to establish relationships between consumer preferences and the influencing factors, with descriptive statistics used to provide a detailed profile of demographic characteristics and purchasing behaviors. The findings reveal that product quality and health consciousness are the most significant determinants of consumer preference. While younger consumers and those with higher incomes favor organic herbal tea due to its perceived health benefits and eco-friendly attributes, price sensitivity was found to play a moderate role. Promotional strategies, although considered, showed a minimal impact on consumer decisions. These insights suggest that businesses should focus on improving product quality and leveraging health and environmental benefits in their marketing campaigns. Furthermore, understanding price elasticity and crafting targeted promotions can enhance consumer engagement and market competitiveness in the organic tea sector.

Keywords: Binary logistic regression; consumer preference; environmental awareness; health consciousness; organic herbal tea

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Paper ID: NSALS '25-077 (Oral)

Determinants of food price inflation in Sri Lanka-an application of ARDL model

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In recent time, Sri Lanka experienced an escalating food price, and this has led to many concerns among the consumers and food security issues in the country. Hence, this study aims to examine the major factors influencing food price inflation in Sri Lanka. The secondary data for the study has been collected from the Department of Statistics of Sri Lanka and Central Bank reports in Sri Lanka for the period of 2007 to 2022. Based on the unit root test results, the study employed the Autoregressive Distributed Lag model to test the long-run and short-run relationships between food price inflation and selected macroeconomic variables. In the short run, the findings reveal that exchange rate volatility leads to higher food prices, while an increase in the money supply helps to lower food price inflation. The Error Correction Model (ECM) shows that any short-term changes in food prices will adjust back to normal overtime, with exchange rate changes pushing prices higher and money supply helping to keep prices lower. The results identified that the exchange rate volatility and food import values have significant impact on food price inflation, while money supply and food export values are also critical. The study findings underscore the need for the elimination of erratic movements in the exchange rates and the right monetary policy to control food price inflation in the long run while paying attention to controlling the money supply in the short run. A key policy suggestion is to keep the exchange rate stable to reduce its impact on food prices in Sri Lanka.

Keywords: ARDL model; food price inflation; inflation determinants; macroeconomic indicators; unit root test

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Paper ID: NSALS '25-093 (Oral)

Tea smallholders' perceived effectiveness of Public-Private Producer and Society Partnership (4PS) model in Ratnapura district

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The Sri Lankan tea industry greatly depends on the tea smallholding sector, where public and private sector organizations operate collaboratively through the public-private, producer, and society-oriented partnership (4PS) model to address social challenges and drive economic growth. This study aims to assess the perceived effectiveness of the public-private, producer and society-oriented partnership (4PS) model for the sustainability of tea smallholders in Ratnapura district, determining key challenges and success factors. The study was conducted in five villages in Ratnapura District, using a cluster sampling technique to select 100 tea smallholding farmers. Primary data were collected through pre-tested questionnaires, focus group discussions, and in-depth interviews. The reliability of the questionnaire was validated by measuring Cronbach's Alpha value. The dependent variable, the perceived effectiveness of the 4PS model was measured using a 5-point Likert scale and categorized into effectiveness levels. Quantitative analysis, including descriptive statistics and ordinal logistic regression, revealed that 57% of farmers rated the model as moderately effective, 32% rated as highly effective, and 11% rated it as very highly effective. According to the ordinal logistic regression results, the overall model was significant (P<0.05), and the results exhibited that the effectiveness of the model is 63.5% and positively correlated with smallholders' access to resources, participation in training programs, access to extension services, degree of satisfaction with the model and adoption of sustainable farming practices. Focus group discussions and in-depth interviews were used to contextualize and validate the survey findings, offering deeper insights into farmer perceptions, challenges, and success factors. According to the study findings, it could be proposed that policymakers should prioritize the enhancement of access to resources, training programs, and extension services. Such improvements are essential for increasing land productivity and income, ultimately fostering better outcomes for the smallholder farmers within the framework of the 4PS model.

Keywords: Extension services; public-private producer and society partnership; sustainable farming; tea smallholding sector

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Assessing the factors affecting tourists' satisfaction with the hands-on experience of tea tours in Halpewatte tea factory in Uva region, Sri Lanka

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The tea plantation industry is essential to Sri Lanka's economy, making a significant contribution to its GDP and foreign exchange earnings. As the fourth-largest tea producer in the world, Sri Lanka's tea sector supports millions of livelihoods. Tea tourism, a growing niche, allows visitors to engage deeply with the country's rich tea culture, showcasing the cultivation, production, and cultural aspects of tea, which enhances the tourism sector. This research investigates the factors influencing tourist satisfaction during hands-on tea tours at the Uva Halpewatte Tea Factory, a key destination for tea tourism in the Ella region. The factory offers a variety of tours, including plantation, factory, and handmade tea experiences, where visitors can participate in activities such as tea plucking, rolling, and tasting. The study explores how experiential learning, the expertise of tour guides, and the alignment between tourists' expectations and their actual experiences impact overall satisfaction. A pilot survey was conducted with 180 local and international tourists who participated in three types of tea tours at the Halpewatte Tea Factory. Data was collected through structured questionnaires to evaluate overall satisfaction and the likelihood of recommending the experience. Multiple linear regression analysis was employed to assess the influence of factors such as tour content, guide knowledge, and hands-on activities on tourist satisfaction. The model produced an R^2 value of 0.61, indicating that 61.1% of the variation in tourist satisfaction could be attributed to these factors. The research highlights the importance of interactive experiences, knowledgeable guides, and well-structured tours in enhancing tourist satisfaction within Sri Lanka's tea tourism industry.

Keywords: Foreign exchange earnings; GDP; hands-on tea tours; tea tourism; tourists' satisfaction; Uva Halpewatte tea factory

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Assessing feasibility of launching organic certified fruity tea into local market: Case in Colombo district

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The growing global interest in organic products and heightened environmental awareness have prompted a shift towards organic agriculture, crucial for preserving the environment for both current and future generations. This study examines the feasibility of launching certified organic fruity tea in the Sri Lankan local market, focusing on consumer behavior, market dynamics, and factors influencing purchasing willingness (WP). Conducted at the Good Market in Colombo, an organic product outlet, the research employed a quantitative approach, gathering data from 180 local customers through structured questionnaires. The questionnaire was validated through a pilot survey and evaluated for reliability using Cronbach's alpha, with results confirming acceptable overall internal consistency (α=0.861). Data were analyzed using descriptive statistics, correlation analysis, and regression techniques. Significant correlations (P<0.05) were identified between WP and demographic variables such as age, education, and income. Personal factors, including knowledge, health consciousness, and environmental awareness, alongside external influences like social and group dynamics, were also found to significantly impact WP. Key findings revealed that product quality, promotional strategies, and distribution channels were the main drivers of WP, while price had a relatively lower influence. These findings suggest a strong market potential for organic fruity tea in Sri Lanka, provided businesses enhance product quality, optimize promotional efforts, and streamline distribution. Limitations include the use of convenience sampling and a localized study scope. Future research should explore price sensitivity and long-term customer trends to refine marketing strategies further and ensure the product's successful launch.

Keywords: Consumer behavior; fruity tea; organic; Sri Lanka; Willingness to Purchase

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Paper ID: NSALS '25-122 (Oral)

Factors influencing the consumer preference on iced tea products in an urban area

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The Sri Lankan tea industry is experiencing a significant transformation, with an increasing shift towards value-added products such as *iced tea*. As consumer preferences evolve, it is crucial for businesses to understand the factors driving consumer choices in this segment. This study explores consumer preferences for iced tea products, focusing on key attributes such as volume, price, place of purchase, and packaging. The research utilized a sample of 100 respondents and applied conjoint analysis to identify the key factors influencing consumer preferences. The findings reveal that among the attributes studied, the place of purchase is the most significant factor influencing consumer decisions, followed by volume and packaging label, price, while important, has a relatively less impact on consumer preferences compared to other factors. The results of the conjoint analysis reveal that place of purchase holds the highest importance (34.3%), with consumers showing a strong preference for purchasing iced tea from outlets. The volume of the iced tea is the second most important attribute (26.57%), with the 300 mL option being the most preferred. Package label also plays a significant role (22.73%), with minimalist designs favored over colorful stickers. Interestingly, price is the least influential factor (16.39%), though respondents still prefer lower price points, with Rs.150 being the most preferred. The study's results provide valuable insights into consumer behavior, highlighting the importance of strategic marketing and product positioning for iced tea products. By aligning product features with consumer preferences, businesses can effectively cater to market demands and enhance their competitive edge in the iced tea market.

***Keywords**:* Conjoint analysis; consumer preferences; iced tea; marketing strategy; product attributes; Sri Lankan tea industry

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Paper ID: NSALS '25-134 (Oral)

Evaluating paddy production and farmers' profit under Sri Lanka's fertilizer ban policy (a pooled cross-sectional analysis)

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Rice is the staple food of Sri Lanka and the country's major growing crop. Improved high-yield varieties and government fertilizer subsidy programs have helped to fulfill the country's rice requirement for decades. In May 2021, the Sri Lankan government banned the import of agrochemicals to promote organic agriculture, considering the side effects of using agrochemicals on human health, environmental sustainability, and as well as the country's existing trade deficit. Due to various challenges during this period, the ban was lifted in November 2021. This situation significantly impacted yield reduction in the 2021/2022 Maha and 2022 Yala seasons. Hence, the study aims to evaluate the impact of the fertilizer import ban on paddy production, farmers' gross margin, and benefit-cost ratio in the Polonnaruwa district, one of the country's largest paddy-producing areas. Pooled cross-sectional data collected from 253 paddy farmers by the Department of Agriculture between 2018 and 2023 were used for this study. The study employed the Cobb-Douglas Production function to analyze the data. The study results show a 25% yield drop in the ban-impacted period compared to the normal seasons (Adjusted R^2=21.66, P=0.000). A Probit model was used to evaluate the gross margin and benefit-cost ratio. Though the harvest decreased during the ban-impacted period, the increased farm gate price mitigated the negative economic impact on farmers in the Polonnaruwa district. However, there was a huge drop in the marketable paddy surplus. The study highlights the significant decline in marketable paddy surplus and emphasizes the need for long-term strategies for economic, political, and social contexts in reforms.

Keywords: Cobb-Douglas production function; fertilizer import ban; organic agriculture; organic paddy production; Polonnaruwa district

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Paper ID: NSALS '25-142 (Oral)

Determinants of the export performance of coconut shell-activated Carbon in Sri Lanka

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Coconut products are significant contributors to Sri Lanka's economy, with coconut shell activated Carbon being a crucial export commodity. Over the past three decades, significant fluctuations have been identified in the export performance of the coconut shell-activated Carbon industry in Sri Lanka. Therefore, this study aims to find the determinants that affect the export performance of coconut shell-activated Carbon in Sri Lanka by extracting secondary data from the Coconut Development Authority, and World Bank publications. Employing a time series analysis spanning 31 years (1992-2022), the data were analyzed using the Auto Regressive Distributed Lag (ARDL) model to examine both short-run and long-run impacts. Also, Augmented Dickey-Fuller (ADF), and Philip Perron tests were used to check the stationary properties of the determinants. The key findings of the study revealed that in the long run, the export performance was negatively affected by the export volume of other shell products. Nevertheless, the unit price of the Carbon activated did not have a significant effect on export performance. On the other hand, the export performance was positively affected by the inflation rate. However, Foreign Direct Investment (FDI) has a significant negative impact. In the short run, the export volume of other shell products, the exchange rate, and FDI had significant effects. In particular, the values of the inflation rate, GDP growth and the unit price, were also found to be significant. These results highlight the necessity of considering short-term and long-term determinants to improve the export performance of coconut shell-activated Carbon in Sri Lanka. Thus, this study contributes to existing literature by giving comprehensive information on factors affecting export performance and providing relevant recommendations to exporters and policymakers.

Keywords: ARDL model; coconut shell-activated Carbon; export performance; time series analysis

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Paper ID: NSALS '25-153 (Oral)

Minor export crops and economic growth in Sri Lanka

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This study aims to assess how the export of minor export crops drives the economic growth in Sri Lanka, with the purpose of boosting these crops and reducing dependence on traditional exports. To achieve this, we analyzed the relationship between total GDP and the export value of cinnamon, pepper, clove, and other minor export crops. Independent variables of the study are the export value of cinnamon, pepper, clove, and other minor export crops, the annual percentage of the consumer price index, the annual average official exchange rate, while total GDP is the dependent variable. As the unit root test shows variables stationary at both levels and the first difference, this study employs the Autoregressive Distributed Lag (ARDL) bound test, Error Correction Model (ECM) and Granger causality test for the analysis covering annual data for the period of 1975-2022. The variables and economic growth were found to be co-integrated. The study reveals that, in the long run, the exports of cinnamon, clove, and other minor export crops have a positive and significant effect on economic growth, whereas pepper exports have a negative but insignificant impact. Conversely, in the short run, clove and other minor export crops negatively and significantly influence economic growth. Cinnamon negatively and insignificantly influences economic growth, while pepper exports positively and significantly contribute to economic growth. Further, the study found that the annual percentage of the consumer price index, and the annual average official exchange rate serve as long-term determinants of economic growth in Sri Lanka. The result of the long run and short run disparity suggests that while there are long-term benefits, short-term challenges and inefficiencies may need to be addressed. Therefore, the study suggests the government should focus on diversifying and boosting minor export crops export from low-value to high-value products and promote high-quality standards and certifications to ensure value added products meet international expectations.

Keywords: Autoregressive distributed lag model; economic growth; minor export crops; Sri Lanka; time series analysis

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Paper ID: NSALS '25-154 (Oral)

Assessing the entrepreneurial behavior of vegetable farmers in Bandarawela area, Sri Lanka

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The Uva province contributes 13.2% to Sri Lanka's GDP. The Bandarawela agricultural zone within the province is home to 5,955 farmers and 4,963 families who cultivate vegetables approximately across 415 acres of land. However, the lack of proper agricultural infrastructure, including market accessibility, storage facilities, and transportation networks, hinders farmers' entrepreneurial efforts in this area. This study was conducted to assess how farmers continue with agriculture utilizing their entrepreneurial skills amidst these hardships. The study applied random sampling, and data collected through a pre-tested questionnaire. Descriptive analysis was done to determine the socio-economic conditions of the farmers in the area. The results of the analysis revealed that 64% of vegetable farmers belong to the old-age category, with 60% having education up to Ordinary levels. 41% own medium-sized farmlands and 85% are farming as their sole occupation. Most of the farmers (53%) belong to the medium income level (75,000-200,000) and 80% have medium-level mass media participation. Most of the farmers (66%) contact extension officers monthly, however their participation in extension programs is low. A limited number of farmers (60%) have shifted to controlled environment agriculture. Entrepreneurial behavior was measured using innovativeness, risk orientation, management orientation, achievement motivation, decision-making ability, and economic motivation; 76% showed medium-level entrepreneurial behavior. To assess the entrepreneurial behaviour of the farmers, a regression analysis was done (R^2=0.97). There was a significant and positive relationship between entrepreneurial behaviour and independent variables such as occupation, annual income, mass media participation, financial literacy, and the shift to controlled environmental agriculture among the farmers. Based on the research findings, it is visible that improving these facilities will improve the entrepreneurial capacity among the vegetable farmers in Bandarawela area. Proposed policy measures should focus on infrastructure development in protected agriculture, financial literacy, access to credit, extension services, training, education, and mass media participation. Addressing these key areas can contribute to sustainable agricultural development and improve the livelihoods of farmers in the study area.

Keywords: Decision-making ability; economic motivation; entrepreneurship; entrepreneurial behavior; multiple linear regression

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Paper ID: NSALS '25-165 (Oral)

Analysis of export demand of coconut substrates (coco peat) industry in Sri Lanka

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Coco peat is one of the commodities that contributes to the Sri Lankan economy. Sri Lanka, at present, grasps its position as the world's third largest coco peat producer and exporter in the world. However, there is uncertainty in the export volume of coco peat, and the trend shows an intense fluctuation in the last few years. The drive of this study is to examine the relationship and the impacts of four macroeconomic variables, namely the real exchange rate, Free on board (FOB) price of coco peat, the price of competing good, and GDP growth of importing country on the Sri Lankan export volume of coco peat. Hence, this study aims to analyze the factors that cause the export demand for coco peat by using secondary data for the period of 1994-2023. The study employs descriptive statistics, unit root tests, correlation and multiple regression tests to analyze the data. Based on the Augmented Dickey-Fuller test (ADF) and Phillips-Perron unit root tests results, the data series were identified variables as stationary and non-stationary variables. Pearson's correlation test reveals that the real exchange rate has negative correlation while FOB price, price of competing good, and GDP growth indicate a positive correlation with coco peat export volume, respectively. According to the regression results, the coefficient of FOB price and the price of competing good having a positive and significant effect on export demand of coco peat in Sri Lanka and the results show, with 1% increase in the FOB price of coco peat, the export demand quantity of coco peat increases by approximately 3.63% and 1% increase in the price of competing good, the export demand quantity of coco peat increases by approximately 2.86%. These findings are beneficial to the policymakers, coco peat exporters, or manufacturers, and coir dust incorporated product producers in their planning, forecasting, and making the best policy-related, business and investment decisions in the future.

Keywords: Export volume; macroeconomic variables; multiple regression; Pearson correlation

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Paper ID: NSALS '25-170 (Oral)

Feasibility of organic coconut-based intercropping systems: A pre-implementation financial assessment

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The challenge farmers experience while using organic farming methods can be effectively addressed by regenerative organic farming. Compared to buying commercial organic fertilizers, it may be less expensive to produce organic fertilizers on-site utilizing resources that are readily available. In order to ascertain the economic feasibility of the three different models created by the Coconut Research Institute of Sri Lanka, this study intends to provide three models in regenerative organic farming systems. The systems were created to solve the nation's organic coconut monocultures' *in situ* source of organic fertilizers. There were three models: Model 1 for the intermediate zone included gliricidia (*Gliricidia sepium*) and wild sunflower (*Tithonia diversifolia*), Model 2 for the wet zone included rambutan, cassava, gliricidia, and wild sunflower, and Model 3 for the zone included cashew, gliricidia, and wild sunflower. The organic fertilizer was derived from wild sunflower and gliricdia. Metrics such as annual Gross Margins (GM), Payback Period, Net Present Value (NPV), Benefit-Cost Ratio (BCR), and Internal Return of Rate (IRR) were used in economic analysis. The economic analysis's findings showed that all models are economically viable because the NPV value is higher than zero. Furthermore, all three models have a BCR value more than one, indicating economic feasibility. Additionally, due to the high initial investment and low return, the gross margin is shown to be low in the first years for all models. Moreover, the results indicate that the payback period of Model 1 is less than 7 years, and it is less than 6 years for Model 2 and 3. According to the economic analysis, all models were economically viable. The study also assessed the agronomic feasibility of these models. The organic intercropping system implemented in this study can supply up to 90% of the fertilizer requirements of coconuts through the incorporation of green manure crops as intercrops, which significantly reduces the need for external fertilizer. Therefore, it is recommended to select appropriate intercropping systems for organic coconut plantations which can be used to fulfil the nutrient requirement in *in situ* and improve the economic returns.

Keywords: Coconut-based intercropping system; cost-benefits analysis; economic feasibility; feasibility; regenerative organic farming system

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Paper ID: NSALS '25-182 (Oral)

Analysis of export competitiveness of desiccated coconut industry in Sri Lanka

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Processed coconut products are one of leading export commodities of Sri Lanka. Coconut can be processed into several products including coconut oil, desiccated coconut, copra, coconut milk and coconut powder. The high production of Sri Lankan desiccated coconut is an opportunity that needs to be developed in order to compete with its main competitors. Therefore, an analysis is required to discover the competitiveness of Sri Lankan desiccated coconut in the international market. The study aims to analyze the competitiveness of desiccated coconut and to identify the desiccated coconut export market of Sri Lanka based on market share and market growth and to classify desiccated coconut-importing countries using Boston Consulting Group (BCG) matrix in order to facilitate potential strategic marketing decisions. Secondary data were collected from the official websites of the United Nations Commodity Trade Statistic Database, World Bank, International Trade Centre, Sri Lanka Export Development Board and Coconut Development Authority of Sri Lanka for the period of 2013- 2023. Data was analyzed using the methods of Revealed Comparative Advantage (RCA), Market Share Index (MSI), Trade Specialization Index (TSI) and the BCG matrix. Results show that the average value of the RCA for Sri Lankan desiccated coconut in the time period of 2013-2023 is 226.38 above Philippines, Indonesia, Malaysia and India which indicates that Sri Lankan desiccated coconut has a comparative advantage and there is a strong competitiveness in the international market. The average value of the TSI for Sri Lankan desiccated coconut is 0.99 from 2013-2023 which indicates that Sri Lanka tends to be an exporter country for the commodity and the growth rate of the Sri Lankan desiccated coconut is at the maturity stage. In addition, the study found that Sri Lanka has the highest competitiveness in the exportation of desiccated coconut between 2013 and 2023. The BCG matrix indicates that the USA, India and Canada are the significant importers of Sri Lankan desiccated coconut. Sri Lankan desiccated coconut has a big potential to generate high economic advantage in the international market because Sri Lanka has the highest competitiveness for desiccated coconut in the international market. Hence, the adoption of technologies and correct policy decisions to expand the industry are vital.

Keywords: BCG matrix; comparative advantage; MSI; RCA; TSI

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Paper ID: NSALS '25-185 (Oral)

Challenges faced by Kithul jaggery producers in Nuwara Eliya district in the exportation of Kithul products

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The long-established production of Kithul jaggery in Sri Lanka has substantial profit potential, yet its export market remains underdeveloped. Despite its rich heritage and economic promise, the industry has not experienced significant growth in exports, revealing a missed opportunity to leverage this traditional sector for international trade. This study aims to identify the challenges that prevent Sri Lankan Kithul jaggery producers from exporting their products and to prioritize strategies using the Quantitative Strategic Planning Matrix (QSPM). Initially, a list of SWOT factors was created through literature reviews and discussions with industry experts to develop a questionnaire. The current status of Kithul product exports was assessed using internal and external factor evaluation matrices. Strategies were formulated based on the SWOT analysis, and QSPM was employed to prioritize these strategies. The analysis showed overall scores of 2.15 and 2.16 for the internal and external factor evaluation matrices, respectively, indicating a position in the Defensive Strategy quadrant. A total of nine strategies were developed, with the highest priority given to "increasing government intervention." By addressing the primary factors hindering profitable Kithul jaggery production from reaching export levels, targeted interventions can be implemented. Strengthening this sector could enhance foreign exchange earnings and make a significant contribution to national production, thereby bolstering the overall economy.

Keywords: Kithul jaggery; QSPM Matrix; strategies; SWOT analysis

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Paper ID: NSALS '25-202 (Oral)

Factors influencing the quantity of tea sold by brokers in Sri Lankan tea auction: A time-series analysis

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The tea industry plays a crucial role in the economic framework of Sri Lanka, with tea auctions serving as a pivotal trading platform for brokers. This study aims to identify and analyze the key factors influencing the quantity of tea sold by brokers at Sri Lankan tea auctions. The secondary data such as sold tea quantity, tea auction prices, production quantity, export quantity, exchange rates, and inflation rates were collected on a monthly basis for the period of January 2014 to December 2023 from Bartleet Produce Marketing PLC, the Central Bank of Sri Lanka, and the Sri Lanka Tea Board. Data was analyzed using EViews 13 statistical software. To test stationarity among the six variables, the study used the conventional Augmented Dickey-Fuller (ADF) test, and the Johansen co-integration technique to determine the co-integrating equation. The Vector Error Correction (VEC) model was fitted as three co-integrating relationships between these series were evident. Residual analysis was carried out using the Correlogram and Serial Correlation LM test to validate the VEC model. Correlogram values are within the two standard error bounds, indicating no autocorrelation in the residuals. The Serial Correlation LM test reveals no serial correlation, indicating that the VEC model accurately captures the time dynamics of variables. The findings indicate that multiple factors influence the Quantity of Tea Sold, including inflation rates, export quantities, exchange rates, production quantities, and tea auction prices, as determined by Pairwise Granger causality analysis. In the long run, a positive relationship is shown between the exchange rate and quantity of tea sold. Similarly, a positive relationship is observed between the quantity of tea sold and the production quantity. Conversely, a negative relationship is observed between the tea auction price and the quantity of tea sold. Based on the study findings, implementing a comprehensive policy approach that incentivizes increased tea production, monitors inflation rates, and mitigates the negative impact of higher tea auction prices on tea sales could support a healthier and more sustainable tea market in Sri Lanka.

Keywords: Sold tea quantity; tea auction; time series analysis; vector error correction model

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Paper ID: NSALS '25-021 (Poster)

Assessing tourist engagement, awareness and satisfaction in tea tourism: A study of New Giragama tea factory, Central province, Sri Lanka

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Tea is a globally cherished beverage, often associated with hospitality. Sri Lanka, the world's fourth-largest tea producer, has a long-standing reputation for its warm hospitality. Many developing countries, including Sri Lanka, are embracing tea tourism, which is closely linked to their primary income sources from bulk and value added tea. The Ceylon tea brand from Sri Lanka holds significant potential to enhance the tourism sector, positioning tea tourism as a key driver of economic growth for the tea industry. While tea tourism in Sri Lanka is on the rise, there remains a gap in tourists' understanding of tea production. This study addresses the need to improve tourist engagement and knowledge for sustainable tea tourism by evaluating tourist participation in tea-related activities, their understanding of the production process, and the factors affecting their satisfaction at the new Giragama tea factory in Central province, Sri Lanka. A sample of 100 foreign tourists was randomly selected during the peak month of May. Data was gathered through surveys and interviews, analyzed using SPSS, and interpreted through regression and correlation analysis. The findings revealed high levels of tourist engagement in tea processing demonstrations and a strong understanding of the various stages of tea production, reflecting the factory's effective educational initiatives. Multiple linear regression analysis identified cognitive and affective engagement, along with prior visits to tea tourism destinations, as significant predictors of tourist satisfaction. Conversely, age and gender were found to have significant negative effects on satisfaction. To enhance tourist satisfaction, recommendations include continuing interactive demonstrations, tailoring experiences for different age groups, and introducing loyalty programs. Future research could focus on the effectiveness of online marketing strategies, such as social media, blogs, and travel websites, in attracting tourists to tea tourism destinations.

Keywords: Affective engagement; Ceylon tea; cognitive engagement; tea tourism; tourists' satisfaction

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Paper ID: NSALS '25-060 (Poster)

Impact of socio economic indicators on revenue generation of dairy farmers in sub urban areas of Galle district

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This study investigates the low revenue generation among dairy farmers in suburban areas of Galle district and addresses the gap in understanding the factors influencing revenue of dairy farmers in the Galle district. The study explores the impact of various socio-economic factors on the revenue generation of dairy farmers in Ambalangoda and Karandeniya veterinarian regions. Cattle and buffalo rearing farmers of two veterinarian regions were considered as the population for this study. A stratified random sampling method was used to select 104 dairy farmers and data were collected through phone calls and surveys by utilizing a structured questionnaire. The data was analyzed using IBM SPSS 20 software. This study shows that most of the farmers were male (92%) and middle- aged (40-50) individuals actively participated (50%) in dairy farming. The key findings indicate that herd size (β=0.81, P<0.01), milk yield (β=0.32, P<0.01), and milk price (β=0.20, P<0.01) significantly and positively affect revenue generation. In contrast, feed cost (β=-0.28, P>0.01) had a negative impact on revenue. Notably, experience showed a positive correlation with revenue (r=0.55, P<0.01), however the multiple regression analysis revealed a negative impact on revenue generation (β=0.22, P<0.01). This variation may suggest that while experience is generally associated with better revenue outcomes when controlling for other variables; certain experienced farmers may follow less profitable practices. Additionally, education had a negative impact on revenue generation in this study (β=-0.134, P<0.01), possibly due to educated individuals seeking alternative employment opportunities. Other expenditures like veterinary charges, electricity charges and water charges have a negative and significant impact on revenue. Fuel costs, age and gender showed no significant effect on revenue (P>0.01) in these two veterinary regions. These findings highlight the significance of recognizing the socio-economic factors that affect revenue generation among dairy farmers in suburban Galle.

Keywords: Education; feed cost; Galle district; herd size; milk price; milk yield

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Paper ID: NSALS '25-062 (Poster)

Impact of level of milk consumption on the nutritional issues of protein malnutrition: A case study from children under age five in selected divisional secretariat areas in Ampara district

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Protein malnutrition remains a critical health issue affecting children under the age of five, particularly in rural areas where access to diverse and nutritious food is limited. The aim of this study is to assess the impact of milk consumption on the nutritional status of under-age 5 children, focusing on the prevalence of protein malnutrition in selected divisional secretariat areas of Ampara district. Independent variables such as demographic factors, knowledge and awareness, availability, and health status were studied regarding the dependent variables such as stunting, wasting, underweight, and growth faltering which are dairy-related protein malnutrition issues. Sample of 134 dairy consumers who had children was included with the simple random sampling in various GN divisions of Ampara district. Data was analyzed using IBM SPSS version 27 descriptive statistics and regression analysis. According to the result, it showed 11.2% of children suffered from stunting, 29.1% were underweight, 13.4% experienced wasting, and 39.6% were in a state of growth faltering. Regression analysis highlighted significant factors influencing these conditions. Stunting was affected by gender, social and cultural factors, availability of dairy products, and health status. Underweight was linked to income, dietary habits, environmental factors, and milk availability, while growth faltering was influenced by gender, environmental factors, and health status. This study highlights the significant of milk consumption on the protein malnutrition among children under age 5 in Ampara district. It is obvious that the adequate milk intake can promote good health of children while reducing the risk of malnutrition. However, milk consumption remains insufficient in many households, especially in rural areas due to socio economic barriers. Therefore, it is essential to increase awareness about milk nutrition in vulnerable areas. Initiative should focus on improving access to affordable milk to uplift the child health to combat protein malnutrition.

Keywords: Children under five; growth faltering; stunting; underweight; wasting

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Paper ID: NSALS '25-064 (Poster)

Factors influencing export market diversification of pepper (*Piper nigrum* L.) in Sri Lanka

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Pepper (*Piper nigrum* L.) is a key agricultural export crop in Sri Lanka contributing significantly to the country's foreign exchange earnings. Data from the Department of Export Agriculture indicate that India is the primary destination for Sri Lankan pepper exports. Accordingly, this study examines the factors influencing the export market diversification of pepper in Sri Lanka. This investigation focuses on five independent variables: pepper export as a percentage of GDP, the weighted average GDP per capita of export partner countries, infrastructure, human capital, and inflation, with export market diversification as the dependent variable. The Herfindahl-Hirschman Index (HHI) was used to measure export market diversification. Through multiple linear regression analysis, the research identifies that the weighted average GDP per capita of export partners and pepper export as a percentage of GDP significantly influence export market diversification. Conversely, inflation, human capital, and infrastructure do not show a significant impact. These findings suggest that the percentage of pepper export as a percentage of GDP and the GDP per capita of partner countries are crucial for diversifying Sri Lanka's pepper export market. While the other variables may not be statistically significant, long-term investments in infrastructure, human capital, and inflation monitoring are essential for sustaining the competitiveness of the pepper industry.

Keywords: Export market diversification; Herfindahl-Hirschman index; multiple linear regression; pepper export

Underlined is the presenting author.

Paper ID: NSALS '25-081 (Poster)

Assessing the impact of export agriculture support on Small and Medium Enterprises (SMEs) entrepreneurship and export growth in Kandy, Sri Lanka

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This research evaluates the impact of the Department of Export Agriculture's (DEA) support on the entrepreneurial processes and export market development of Small and Medium Enterprises (SMEs) in the Kandy District of Sri Lanka. The study focuses on three primary areas of support: financial assistance, market knowledge, and training programs, assessing how these services contribute to the export performance of agricultural SMEs. A structured survey was conducted with 54 SMEs, collecting primary data on the frequency and effectiveness of the support services provided. Utilizing a cross-sectional survey design and quantitative data analysis techniques-including descriptive statistics, correlation, and regression analysis-the study examines the relationships between the support received and various export performance outcomes, such as export volume and market diversification. The findings indicate that financial assistance is the most frequently accessed service; however, satisfaction levels vary, suggesting that improving accessibility and adequacy of financial support could enhance its effectiveness. Many SMEs found market knowledge useful, but concerns were raised about the relevance of the information provided highlighting the need for more targeted and sector-specific insights. Participation in training programs was also high, yet some respondents expressed concerns about the relevance of the training content to their specific business challenges. A positive correlation was observed between the frequency of support received and overall satisfaction, indicating that consistent engagement with the DEA is essential for enhancing export performance. The study concludes that while the DEA plays a crucial role in supporting SMEs, there is considerable potential to improve the scope and delivery of its services to better meet the needs of agricultural exporters. Recommendations include expanding financial support, customizing market knowledge services, and providing more tailored training programs.

Keywords: Agricultural sector; export market development; financial assistance; market knowledge; SMEs; training programs

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Paper ID: NSALS '25-090 (Poster)

Assessing the effectiveness of the 4PS model in enhancing the level of adoption of Good Agricultural Practices (GAP) of tea smallholders in Ratnapura district

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Sri Lanka's tea industry, largely dependent on smallholder farmers, faces significant challenges in adopting good agricultural practices, which are essential for enhancing productivity and sustainability. Despite efforts by the Tea Small Holdings Development Authority to support these farmers, challenges such as limited resources and low technology adoption persist, particularly in the Ratnapura district. This study evaluates the effectiveness of the Public-Private-Producer-Partnership +Society (4PS) oriented model in promoting good agricultural practices adoption level among tea smallholders in Ratnapura and examines the role of key components within the model in fostering successful partnerships. It also identifies knowledge gaps and practical challenges that hinder effective agricultural practices implementation. Using a mixed-methods approach, the study involved surveys, interviews, and observations of 100 tea farmers across five representative villages, selected through cluster sampling. Data analysis employed descriptive statistics, reliability testing via Cronbach's alpha, and ordinal logistic regression. Findings indicate that 78% of farmers achieved high adoption levels, while 20% were moderate and 2% extremely high. Significant positive correlations were found between good agricultural practices (e.g., harvesting, pruning, shade, weed and fertilizer management) and adoption levels. Although adoption levels and above practices significantly influenced the model's effectiveness, factors such as partnership degree and resource access did not show a statistically significant impact. The study highlights the 4PS model's positive effect on good agricultural practices adoption, suggesting that targeted training and support can enhance sustainability in the tea sector. It underscores the critical role of collaboration among public institutions, private entities, and smallholder farmers in promoting sustainable tea production. In conclusion, the 4PS model has proven to be an effective framework for enhancing the adoption, as demonstrated by significant improvements in key agricultural practices, thereby promoting sustainable tea production in the Ratnapura district.

Keywords: Adoption; partnership; practices; smallholders

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Paper ID: NSALS '25-109 (Poster)

Analyzing tourists' purchasing preferences for Halpe tea products to optimize product promotion strategies and identify market opportunities

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Tea tourism, which combines cultural experiences with nature, has become a growing trend in ecotourism. Sri Lanka, famous worldwide for its Ceylon tea, relies heavily on tea production as a cultural symbol and an economic pillar. Halpe tea, through its Uva Halpewatte tea factory, offers tourists unique experiences, including plantation tours, factory visits, and tea-tasting sessions, promoting its premium black tea products. This research explores the purchasing preferences of 170 tourists from diverse regions, Europe, Asia, and the Americas-focusing on their preferences for green, light-colored, and dark-colored teas. Data collection involved structured surveys and interviews, analyzed using t-tests, ANOVA, multiple regression, and correlation analysis. The study used a 5-point Likert scale to assess satisfaction across various attributes such as product quality, price, and packaging. The results show that tea quality, production processes, and pricing play a key role in tourism satisfaction, while factors like packaging had a smaller impact. Light-colored black tea was the preferred choice across the sample. These findings highlight the need to improve less popular products and promote high-performing ones effectively. By addressing tourists' preferences and feedback, Halpe tea can refine its marketing strategies, enhance product quality, and expand into global markets. This will increase customer satisfaction and profitability while supporting the company's growth locally and internationally.

Keywords: Consumer satisfaction; Halpe tea; marketing strategies; tea tourism; tourists' preferences

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Paper ID: NSALS '25-080 (Oral)

Preliminary study on the comparison of rubber tapping performance of motorized tapping machine and traditional tapping knife

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Rubber tapping in Sri Lanka has traditionally been carried out using tapping knives. Tapping machines have been introduced for this purpose in recent times. Nevertheless, the efficacy of these two methods has not been thoroughly studied in Sri Lanka. Therefore, this study was undertaken to compare the rubber tapping performance between Motorized Tapping Machines (MTM) and Traditional Tapping Knives (TTK) in two different rubber-growing locations: Moneragala and Agalawatta. Tapping time, scrap removal efficiency, latex production, Dry Rubber Content (DRC), yield per tree per tapping, initial flow rate, and plugging index were measured. A Randomized Complete Block Design (RCBD) was used, with 20 replicates per block for each treatment. Each block included two treatments: TTK and MTM. In each location, 20 healthy rubber trees were selected for each treatment. A total of four blocks were established per location. Tapping was conducted over two months, and performance indicators were assessed. In the results, tapping time was not significantly different between treatments in both locations. The traditional knife provided better control over shaving thickness in Moneragala (2.69 mm) shaved by MTM while the TTK shaved only 2.18 mm and achieved higher latex volume per tree (89.9 mL) in MTM and 69.61 mL in TTK. But in Agalawatta, MTM provided 2.33 mm shaved thickness while 2.51 mm was shaved by TTK likely due to operator skill and environmental factors. DRC values were similar across both methods, with Moneragala recording 35% (MTM) and 35.5% (TTK). In Agalawatta, the DRC was 40% for both treatments, suggesting that latex quality remains consistent regardless of the equipment used. The yield per tree per tapping was higher in MTM for both areas. Yield per tree per tapping for MTM in Moneragala was 32.91 g/t/t and in Agalawatta 43.11 g/t/t. Yield per tree per tapping for the TTK method in Moneragala was 29.02 g/t/t and Agalawatta 38.29 g/t/t. These results suggest that while motorized tapping machines offer considerable advantages in productivity, careful consideration must be given to their impact on tree health and sustainability. Future research should focus on optimizing machine settings to ensure sustainability alongside improved productivity.

Keywords: Agalawatta; dry rubber content; Moneragala; motorized tapping machine; traditional tapping knife

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Paper ID: NSALS '25-103 (Oral)

Investigating immature pineapple Bromelain enzyme activity on Chitin extraction

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Bromelain is a natural protein-digestive enzyme that is present in greater concentration in the fruit, core, peel, and leaves of the pineapple plant. Bromelain is widely used in the food and healthcare industries. Due to the proteolytic properties of Bromelain, it is used for Chitin extraction from crustacean shells. Chitin is a polysaccharide made up of *N*-acetyl-D-glucosamine units. It is the second most abundant biopolymer in the world, after cellulose. This research explores the enzymatic method of Chitin extraction from shrimp shells using the Bromelain enzyme of immature pineapple fruit, peel, and leaves of commercial varieties. Firstly, 15g of shrimp shells were crushed and the deproteinization process was carried out by using Bromelain enzyme in a ratio of 1:20 (w/v) and incubated at 55°C for 24 hours followed by centrifugation at 4000 rpm for 45 minutes at room temperature. Then supernatants were demineralized with 8% HCl in the ratio of 1:30 (w/v). Acetone was added at a 1:4 w/v ratio for decolorization. 4% of KOH was added to the samples at a 1:20 ratio to complete the deproteinization. Finally, it was neutralized and then dried at 60°C for 18 hours. Bromelain enzyme activity was determined using the gelatin digesting units. The highest Bromelain activity was found in immature leaves with values of 0.77 mg/mL. The lowest Bromelain activity was obtained from 0.4 mg/mL and 0.08 mg/mL in immature fruit flesh (with core) and immature peel respectively. The results indicated that the highest crude Bromelain enzyme activity was obtained from immature leaves. Hence, the study concluded that immature leaves exhibit significant levels of Bromelain activity. Analyses by Fourier Transform Infrared (FTIR) and X-ray Diffraction (XRD) of the Chitin produced showed that its characteristics were comparable to commercially available chitin. The use of agricultural waste to produce Chitin in this work is truly innovative and emphasizes the potential usefulness to both industry and the environment.

Keywords: Bromelain; Chitin; enzyme activity; immature pineapple; shrimp shell

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Paper ID: NSALS '25-117 (Oral)

Developing an automated firecracker-based repellent system for sustainable crop protection against monkeys' attack in Sri Lanka

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Human-wildlife conflict, particularly between farmers and monkeys is a growing concern in Sri Lankan agriculture. The Toque Macaque (*Macaca sinica*) is a species of monkey endemic to Sri Lanka (locally known as "*Rilawa"*), known for its distinctive toque-like whorl of hair on the head. As human populations increase and natural habitats shrink due to deforestation and land development, monkeys frequently invade farmlands, causing significant crop losses. This conflict has become more severe in areas where agriculture is vital in supporting rural livelihoods. Unfortunately, existing monkey deterrent solutions are too expensive or ineffective, leaving smallholder farmers with limited options to safeguard their crops. This project aims to design and develop a small-scale, automated electric firearm that offers an innovative and cost-effective way to repel monkeys. The system uses a camera-based detection mechanism, employing machine learning specifically a Convolutional Neural Network (CNN) deep learning model and image processing techniques to identify the presence of monkeys in the crop field accurately. When a monkey is detected, the device automatically activates a firecracker-based repellent, creating a loud sound to scare the monkeys away without causing harm. The device was tested in the hostel area of Uva Wellassa University and successfully helped repel monkeys. The fabricated device focuses on affordability, making it accessible to small-scale farmers while ensuring it effectively reduces crop damage by preventing frequent crop destruction, improving agricultural productivity, and safeguarding the livelihood of farmers. It empowers farmers with an automated firecracker to protect their crops, ensuring the repelling of monkeys from the agriculture field.

Keywords: Crop protection; electric firearm; human-wildlife conflict; monkey detection

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Paper ID: NSALS '25-123 (Oral)

Synthesis of reduced Graphene Oxide (rGO) and the effect of its loading on properties of natural rubber composites

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Rubber shows excellent physico-mechanical properties when combined with reduced Graphene Oxide (rGO) due to its special qualities, which include strong electrical conductivity, mechanical strength, and significant surface area. Because of this, rGO-reinforced rubber is appropriate for high-wearing applications including gaskets, car tires, seals, and other industrial components where increased chemical and mechanical resistance are essential for reliability as well as extended service life. In this work, rGO was synthesized using the Modified Hummers method and incorporated into Natural Rubber (NR) at varying levels of 1-4 phr to assess its impact on the composite's physico-mechanical, and chemical properties. The performances of these rGO-loaded NR composites were compared to those containing conventional Carbon Black (CB) filler. The incorporation of rGO into NR composites significantly enhanced their physico-mechanical and chemical properties at lower loadings. Using Tukey pairwise comparisons, it was confirmed that these properties improved markedly with increasing rGO content, reaching optimal performance at 2 phr. With the addition of 2 phr rGO, the tensile strength, tear strength, and resilience were enhanced with chemical properties, such as a lower Swelling Index (SI). Moreover, the reduced Water Absorption Index (WAI) was observed at 2 phr rGO level, compared to composites with higher or lower rGO levels and CB. However, while the hardness of rGO-filled composites could not surpass that of CB-filled NR composites, the overall enhancements in physico-mechanical and chemical properties indicate that rGO is a superior functional filler for NR at an optimal loading of 2 phr. This finding suggests that a small amount of rGO can effectively replace a much higher loading of CB (50 phr), thereby improving composite performance with reduced filler content can be assured.

Keywords: Chemical properties; modified hummers method; optimal loading of rGO; physico-mechanical properties; reduced Graphene Oxide

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Paper ID: NSALS '25-124 (Oral)

Assessing soil erosion hazard using SWAT model in Delthota and Pathahewaheta catchments in upper Mahaweli watershed in Sri Lanka

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Soil erosion is a major environmental concern, and it is one of the most significant issues associated with land degradation. Estimating soil loss due to erosion in these locations can be challenging because of the complicated relationships between topography, climate, land use, and human activities. The purpose of this research was to evaluate soil erosion in the Delthota and Pathahewaheta catchments of the upper Mahaweli watershed in Sri Lanka, predict surface runoff using the Soil and Water Assessment Tool (SWAT) and determine the most effective management approach in soil erosion control. Five hydrological stations: Peradeniya, Nawalapitiya, Weraganthota, Manampitiya, and Calidoniya provided streamflow data that were used to calibrate the (1995–2005) and validate (2006–2016) model. To ensure the model's accuracy, it was calibrated using a reliable dataset and verified over a different time frame. Performance was evaluated using statistical metrics like R^2 and NSE, ensuring adequate calibration and validation indices. At Peradeniya (calibration: R^2=0.82, NSE=0.81; validation: R^2=0.89, NSE=0.89), and Weraganthota (calibration: R^2=0.85, NSE=0.77; validation: R^2=0.86, NSE=0.82) evaluation indices for both calibration and validation periods were satisfactory. Based on the calibration and validation results, the model accurately represents the real soil erosion conditions in the study area. Results indicated that spatial differences in erosion rates and surface runoff levels in Delthota and Pathahewaheta catchments were moderate (117–215 t/ha) to high (216–391 t/ha) from 1995 to 2023 and affected basin sediment output, downstream reservoir storage capacity, and water quality. Applying the SWAT model in assessing soil erosion hazards demonstrated that the model provides a useful tool to predict surface runoff, soil erosion hazards and successfully prioritize vulnerable areas over tropical catchments, and assess different conservation and soil management strategies to reduce erosive processes.

Keywords: ArcSWAT; hydrological modeling; soil erosion modeling; surface runoff; tropical catchments

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Paper ID: NSALS '25-129 (Oral)

Watershed assessment for soil erosion risk prioritization: A case study in Beli Ul Oya sub-basin of Mahaweli river basin, Sri Lanka

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Beli Ul Oya is one of the main tributaries of the Mahaweli river in Sri Lanka. The upper watershed area of Beli Ul Oya predominantly covers with tea lands which show signs of land degradation, demanding proper soil and water conservation to ensure the productivity of tea lands. Therefore, this study attempts to identify the soil erosion-sensitive areas in the Beli Ul Oya sub-basin using morphometric parameters which are widely used in such investigations. Digital Elevation Model (DEM) was derived from a 20 m contour under GIS environment and used as the basic digital layer for this study. Initially, this sub-basin was divided into 17 Micro-Watersheds (MW) as MW1 to MW17 using GIS tools for prioritization purposes. Various morphometric parameters: linear, areal, and relief aspects were determined for each MW and ranks were assigned to identify the priority areas based on their level of susceptibility to soil erosion. The MWs were then classified into three categories high, medium, and low considering the results of morphometric analysis and prioritization of MW. Changes in the areal extent of tea land use that have occurred, especially in high-priority areas were investigated using Google Earth images and Google Earth Pro software applying visual observation techniques. The results of the study revealed that Beli Ul Oya extends up to Strahler's 6th order, displaying a dendritic drainage pattern in an area over 152.6 km². The MW prioritization results indicated that MW7, MW12, MW13, and MW16 fall under high priority. Literature reveals that such high-priority areas are under very severe erosion susceptibility zones, and they need immediate attention for mechanical soil conservation measures. Further tea land uses have significantly reduced from 2003 to 2023, and this indicates that the soil erosion risk in the identified high-priority areas would be amplified without proper control measures. Therefore, this research anticipates that these findings might provide information to planners, land managers, and decision-makers for the implementation of sustainable management activities to reduce the potential soil erosion risk, especially in the identified 4 MWs to secure the tea productivity in those areas.

Keywords: Morphometric parameters; priority areas; soil conservation; tea land use; watershed management

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Paper ID: NSALS '25-151 (Oral)

Enhancing the flexibility of palmyrah tender leaves for handicraft making in Jaffna district

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Palmyrah (*Borassus flabellifer* L.) tender leaves play a crucial role in the handicraft industry in Sri Lanka, serving as a primary raw material for various artisanal products. This study aims to compare the flexibility of tender leaves sourced from the Jaffna and Batticaloa districts to enhance the flexibility of Jaffna leaves to improve handicraft production. Tender leaves were systematically collected from ten strategically selected locations within both districts to ensure representative sampling. A sensory evaluation was conducted with thirty experienced handicraft teachers to assess and compare the flexibility and overall quality of the tender leaves from both districts. To enhance the flexibility of leaves from Jaffna district, various treatments were applied, including soaking in water and treating with specific concentrations (8% and 10%) of several chemical agents: Sodium Hydroxide, Potassium Hydroxide, baking powder, Citric acid, and Sodium Carbonate. Following the application of these treatments, a subsequent sensory evaluation was performed to investigate the effects of the treatments on the flexibility of the tender leaves. Untreated tender leave from the Jaffna district was used as the control. Color, flexibility, thickness, uniformity, brightness, and overall acceptability are the parameters measured using sensory tests. The sensory test data were analyzed using the Friedman test within Minitab 17 statistical software at a 95% confidence level. The deflection method was used to measure the flexibility of tender leaves. Initial findings indicate that the handicraft leaves sourced from the Batticaloa district exhibit superior quality compared to those from the Jaffna district, particularly regarding flexibility. Notably, the experimental results revealed that leaves from the Jaffna district, when treated with 10% Potassium Hydroxide for 1 day, demonstrated significantly ($P<0.05$) enhanced flexibility while exhibiting reduced tensile strength in comparison to leaves from the Batticaloa district. Among all treatments assessed, the 10% Potassium Hydroxide treatment emerged as the most effective method for improving the flexibility (1.0±0.1cm) of leaves from the Jaffna district, highlighting its potential application in enhancing the quality of handicraft production in the region.

Keywords: Chemical treatments; flexibility; handicraft; Potassium Hydroxide; sensory evaluation

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Paper ID: NSALS '25-175 (Oral)

Deproteinization of natural rubber using Ficin enzyme extracted from Fig (*Ficus racemosa*) fruit latex

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This study focuses on the effect of Ficin enzyme treatment on crepe rubber to reduce protein content. The presence of proteins in natural rubber latex can lead to several issues, such as allergic reactions, reduced mechanical properties, and poor aging resistance. Several deproteinization methods are used today and several issues are related to this method. Chemical methods are costly, and Papain enzyme-treated rubber-made final products are somewhat dark in color. Ficin is a protease enzyme derived from the latex of *Ficus racemosa* (fig plant) fruit and significant proteolytic properties with reduced allergenicity and can be used to deproteinize crepe rubber prepared from coagulated natural latex. *F. racemosa* fruit latex was subjected to the centrifugation process to obtain the Ficin enzyme supernatant. The enzyme supernatant was applied at different amounts (0 mL, 150 mL, 200 mL, 250 mL) to 6 L of Natural Rubber Latex (NRL), and crepe rubbers were prepared. Raw rubber properties of treated crepe rubber such as Nitrogen content, Lovibond color index, and Plasticity Retention Index (PRI) were tested according to the ISO standards. The effects of the Ficin enzyme on crepe rubber were studied using Analysis of Variance (ANOVA). The results showed a gradual decrease in Nitrogen content with increasing Ficin enzyme volume indicating a significant decrease in protein content in crepe rubber. The resulting Nitrogen content was similar to the reduction of Nitrogen content by conventional Papain treatment. In contrast, the color index of enzyme-treated crepes was darker in color due to the resin contained in the enzyme supernatant. PRI value decreased as the enzyme concentration increased, suggesting potential changes in the non-rubber content present in the rubber. The study found statistically significant evidence ($P<0.05$) about the enzyme effect on the raw properties of crepe rubber. This research provides valuable insight into the potential use of Ficin enzyme treatment to improve the quality and safety of natural rubber products by reducing allergenic protein content.

Keywords: Crepe rubber; deproteinization; Ficin enzyme; natural rubber latex; plasticity retention index

Underlined is the presenting author.

Paper ID: NSALS '25-200 (Oral)

Capability of cost reduction through utilizing White Reclaim Rubber (WRR) for solid tire center compound

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This study investigates the feasibility of incorporating White Reclaim Rubber (WRR) into solid tire center compounds as a cost-effective alternative to elastomeric materials used in solid tire manufacturing. The primary objective was to assess the potential for cost reduction without significantly compromising the physico-mechanical properties essential for tire performance. Five formulations were prepared with varying proportions of WRR and Ribbed Smoked Sheet (RSS), and their properties were systematically evaluated through density, rheological, tensile, hardness, and resilience tests. The best combination was found in the formulation with a 25:75 (WRR: RSS) ratio. This formulation provided a balance between cost savings and performance. At this ratio, the tensile strength was reduced from 196.7 kg/cm^2 to 186.31 kg/cm^2, a minor reduction still meeting industry standards. The cost-saving achieved with this formulation was 9%, reducing the material cost from Rs. 526.48 per kg to Rs. 481.19 per kg. Incorporating WRR can lead to substantial cost savings, with up to a 32% reduction in material costs observed in the formulation with the highest WRR content. However, mechanical properties like tensile strength and resilience significantly (P<0.05) decreased at higher WRR levels, making the 25:75 (WRR: RSS) ratio the optimal choice for balancing cost-efficiency and performance. WRR can support sustainability efforts by recycling rubber waste, contributing to environmental benefits while offering a cost-effective alternative for manufacturers. The findings suggest that future research should optimize WRR content to balance performance and cost-effectiveness. Additionally, real-world testing and further analysis are recommended to validate these findings across a broader range of applications in tire production.

Keywords: Cost reduction; ribbed smoked rubber; rubber recycling; solid tire manufacturing; white reclaim rubber

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Paper ID: NSALS '25-206 (Oral)

Optimizing the performance of flame weeder for tea fields

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Weeding is the essential process of removing undesired plants from crop fields and can be accomplished by physical, chemical, or biological methods. Thermal weeding, a physical method, uses heat to disrupt a weed's cellular structure and function. Although chemical herbicides are widely used in tea plantations, no thermal weeding is specifically designed for tea fields. This study aims to design and optimize the performance of a flame weeder for inter-row weeding in tea fields. A uniform grass field was selected for the study at the Badulla area near Uva Wellassa University. The experiment used a two-factor factorial design with weeder movement speed (S) and number of runs (R) as variables. S1 (0.02 km/h), S2 (0.06 km/h), and S3 (0.12 km/h) are three different levels of S, and 1 run, 2 runs, and 3 runs are three different levels for runs. Altogether, there were nine different treatment combinations, and the grass was exposed to all these combinations with triplicate applications. Subsequently, Killing Rate (KR), Weeded Area Percentage (WAP), and Recovery Rate (RR) were measured. Results were analyzed using the Response Surface methodology. The results revealed that speed and number of runs significantly (P<0.05) influenced the performance of the weeder. The response surface analysis shows that the settings of S1 and 3 runs provide strong overall performance for the KR, WAP, and RR. An optimal speed of 0.02 km/h combined with three runs showed a 95% KR, a WAP of 90%, and a RR of 15%. Lower speed and higher numbers of runs increase performance. There is no interaction between speed and the number of runs, which does not significantly affect the performance parameters. This research contributes to the development of non-chemical weed control strategies. It highlights the potential of thermal weeding in young tea fields.

Keywords: Flame weeding; killing rate; recovery rate; thermal weeding; weeder efficiency

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Paper ID: NSALS '25-208 (Oral)

Raw cashew nut-shell liquid as an alternative plasticizer for Ribbed Smoked Sheets (RSS) compounding

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The commercial use of synthetic plasticizers in the rubber industry, particularly those based on petroleum, poses substantial environmental and health problems due to their volatility and the release of carcinogenic chemicals. This study employed Raw Cashew Nut-Shell Liquid (RCNSL), a by-product of the cashew industry, as an environmentally friendly alternative plasticizer for Ribbed Smoked Sheets (RSS). RSS rubber compounds were prepared using RCNSL with RSS in varied levels (5: T_1, 10: T_2, 15: T_3, and 20: T_4 phr), and Dioctyl Phthalate (DOP) was used as control (C) at 20 phr. Fourier Transform Infrared Spectroscopy (FTIR) was used to characterize RSS compounds and mechanical tests were performed to determine tensile strength, tear strength, and hardness according to the standard. The FTIR test indicated the formation of new Hydroxyl (OH) bonds at the 3600-3200 cm^{-1} wavelength, implying the presence of OH bonds that may enhance the material's strength. The tensile strength and tear strength of all treatment samples were significantly (P<0.05) higher than the control sample. The highest tensile strength (P<0.05) was recorded for the T_3 treatment while the highest tear strength (P<0.05) was observed for the T_4 sample. The hardness of T_1, T_2, and T_3 were significantly (P<0.05) higher than control. Among them, T_1 showed the highest (P<0.05) hardness value. These findings suggest that RCNSL can be used as a sustainable alternative plasticizer with improved mechanical qualities for compounding with RSS, minimizing the environmental impact of rubber manufacturing.

Keywords: Cashew nut-shell liquid; Dioctyl Phthalate; mechanical properties; plasticizer; ribbed smoked sheets

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Paper ID: NSALS '25-209 (Oral)

Comparative analysis of Carbon quantum dots derived from banana peels and coffee grounds: Synthesis, characterization, and optical properties

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This study investigates the synthesis, structural properties, and antimicrobial effects of Carbon Quantum Dots (CQDs) derived from banana peels and coffee grounds. CQDs, which are nanoparticles smaller than 10 nm, possess unique optical and chemical characteristics, making them suitable for bioimaging and optoelectronics. Using a hydrothermal approach, the CQDs were synthesized and subsequently analyzed via UV-vis spectroscopy, Fourier-Transform Infrared spectroscopy (FTIR), and X-ray Diffraction (XRD). The analyses confirmed intense photoluminescence of both CQD types, demonstrating potential applications in biomedicine such as bioimaging, drug delivery, gene delivery, and cancer therapy. The well diffusion method assessed the CQDs' antibacterial activity against *Staphylococcus aureus*, revealing significant inhibitory effects, thereby highlighting their potential in various medical applications. Particle size analysis indicated substantial size reductions post-synthesis. The particle size of coffee grounds decreased from 1.09 mm to 2.99 nm, while banana peel powder reduced from 1.30 mm to 2.01 nm. These results confirm successful nanoparticle formation and suggest enhanced optical properties due to quantum confinement. Furthermore, the study recorded material conversion rates, showing a weight retention of 50.5% for coffee grounds and 54.5% for banana peel powder after hydrothermal treatment. The findings underscore the value of agricultural waste as a sustainable source for generating nanomaterials with broad utility in advanced technologies.

Keywords: Antibacterial properties; banana peel; Carbon quantum dots; coffee grounds; hydrothermal synthesis

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Paper ID: NSALS '25-211 (Oral)

Evaluation of APSIM model accuracy in predicting sugarcane yield: A case study at Galoya plantation, Sri Lanka

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Sugarcane (*Saccharum officinarum* L.) contributes only 15% of Sri Lanka's sugar demand, leading to high import dependency. This study evaluates the APSIM-sugar model for predicting sugarcane yield in Hingurana (Galoya plantation). Input data included NASA power weather data, APSOIL soil data, and management practices. The objectives of this study were, (a) to calibrate and validate the APSIM-sugar model's accuracy in predicting sugarcane yield by comparing simulated yields with historical data and (b) to identify key parameters in the APSIM-sugar model influencing yield predictions. The calibration process, using yield data from 2013 to 2018, optimized parameters like sowing dates, fertilizer application dates, and rates, improving model accuracy. It achieved an R^2 of 0.86 and an RMSE of 26.08 tons/ha, closely aligning simulated yields with observed data. Validation using independent data from 2019 to 2022 confirmed the model's high predictive accuracy, achieving an R^2 of 0.95 and an RMSE of 9.02 tons/ha, indicating strong agreement between observed and predicted yields. Additionally, the model's Nash-Sutcliffe Efficiency (NSE) score was 0.61 indicating that 61.2% of yield variability was accurately predicted. However, a slight overestimation was observed, which may be attributed to specific model limitations, such as assumptions regarding temperature sensitivity, soil variability, or the inability to accurately account for localized agricultural practices. These include the combined use of rainfall and canal water in actual cultivation and the unique environmental nuances of Sri Lankan conditions. APSIM-sugar shows promising potential for improving yield forecasts, but enhancing its climate sensitivity and adaptive management capabilities is necessary for greater precision. Future applications should prioritize adjustments to better capture local management approaches and environmental parameters, potentially making APSIM-sugar a more robust tool for optimizing sugarcane yield predictions in Sri Lanka's unique agro-climatic context.

Keywords: APSIM-sugar model; calibration; crop modelling; validation; yield prediction

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Paper ID: NSALS '25-213 (Oral)

Acoustic sensor technology for soil sensing in precision agriculture: A review

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Acoustic sensor technology has emerged as a powerful tool in precision agriculture, offering non-destructive and efficient means of soil sensing and monitoring. Due to the lack of existing studies providing an overview of acoustic sensor application in soil sensing, the current study was conducted to address this research gap. This review provides a comprehensive overview of the different applications of acoustic sensors in soil sensing. Acoustic sensors are mainly utilized for measuring soil depth variability, bulk density, moisture content, and texture analysis. In measuring the soil depth variability, soil hardpan was detected between 20 Hz to 20 kHz, which showed a better relationship between the cone index and sound level with a gradual increase of the depth. In soil bulk density assessment, sensor fusion approaches integrating mechanical, dielectric, and acoustic sensors within 20 Hz to 20 kHz showed the maximum correlation to soil volumetric water content (R^2=0.78) and soil water content (R^2=0.80) with the effect of bulk density. Acoustic sensors were used in soil moisture content measurement, under diverse methodologies; continuous wave detection, and pulsed acoustic wave techniques. Acoustic velocity decreased with increasing gravimetric moisture content. In this application, 150 Hz to 12,500 kHz frequency range was applied and the maximum soil volumetric water content (R^2>0.96) was achieved. Utilizing multiple tone waves, amplitude and soil moisture content exhibited precise estimation (R^2=0.999). In soil texture determination real-time sensors and impedance tube microphones were combined with acoustic technology by enhancing longitudinal waves, where different acoustic emission signals were generated with similar moisture level and bulk density. Non-invasive monitoring, real-time monitoring, versatile applications, low cost, and environmental friendliness are the advantages of acoustic sensors. However, challenges of using acoustic sensors in soil sensing are variations of soil temperature and structure along the soil, soil profile discontinuity, and differences in the characteristics of the probes and cones. Future research directions may focus on refining sensor technologies, expanding sensor applications in soil sensing, and integrating acoustic sensing with other precision agriculture tools for better soil management.

Keywords: Acoustic; bulk density; microphone; moisture; sensors; texture

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Paper ID: NSALS '25-214 (Oral)

Advancements in acoustic sensing technology for enhanced pest management in agriculture: A review

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Acoustic sensing technology offers significant potential for transforming pest management in agriculture. This study aims to review recent advancements in using these sensors to manage pests across diverse cropping systems for pest detection, species identification, monitoring, control, and assessing infestation stages. In pest detection, monitoring and control, wireless sensor network, acoustic emission detectors; AED2000 and AED2010, micro-electro-mechanical systems and commercial recording instruments were combined with acoustic technology. In sugarcane, the population of cane grub were detected with AED2000 between 300-1000 Hz by enabling a surveyor while borers, white flies with wireless sensor network were detected by an alarm. Red palm weevils were detected using commercial recording instruments that showed that the average detection precision was 98%. In pest species variations *Trogoderma inclusum* and *Tenebrio molitor* were detected with ceramic vibrational sensors and laser Doppler vibrometer instruments. A stronger acoustic signal was detected for *Tenebrio molitor* in rice. Utilizing bioacoustics, the red palm weevil's larvae was detected after the first infestation stages at 44.1 kHz, where its eating sound had an average detection precision of about 96%. In differentiating the pest size, piezoelectric sensors were incorporated with AED2010 to detect adult beetles in grain. Study reported that larger insects (weight>0.27 g) were detected easily than smaller insects. Acoustic sensors paired with accelerometer and amplifier unit *D. albohirtum* and *Antitrogus* spp., were detected in sugarcane using the unique sound. The limiting factors in utilizing acoustic sensors in pest detection are background noises, internal plant sounds, loss of temporal and frequency information, inability to detect smaller insects, and the absence of morphological features of pests. Future research should focus on optimizing sensor designs to improve accuracy and sensitivity in detecting a wider variety of agricultural pests. Practical applications could include the development of advanced data analytics algorithms to enhance real-time pest monitoring and decision-making. Additionally, expanding sensor networks to cover diverse agricultural environments and pest species will enable more comprehensive pest management solutions, facilitating early detection and targeted interventions.

Keywords: Acoustic sensors; detection; frequency; infestation; pest

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Effects of origin and processing methods on physical properties of green tea: A meta-analysis

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Green tea (*Camellia sinensis* L.) is a non–alcoholic drink adored by tea lovers globally. This meta-analysis investigates the effects of origin, drying method, and temperature on the physical properties of green tea among one hundred and twelve studies. This research aims to clarify how geographic origin and processing techniques influence the sensory attributes of green tea, enabling informed decision-making for producers, researchers, and consumers. Geographic origin significantly influences green tea's aroma and physical properties. The qualities and characteristics of various types of tea are mostly determined by its appearance, aroma, taste, and color. Chinese and Indian teas are similar in aroma, while Indonesia and Vietnam differ significantly from each other, China's green tea shows a broad range of color values, in contrast to the narrower ranges seen in Indonesian and Korean green teas. The findings indicate significant differences between China and both Korea and Indonesia, though these differences are not substantial when compared individually. There is no significant difference in the appearance of green tea from China and India; however, there is a significant difference between the appearance of green tea from Vietnam and Indonesia. Similar to aroma, there are no significant differences between the groups of China, India, and Vietnam, as well as Indonesia and Vietnam. Green tea aroma varies significantly by drying method, with drum-dried tea having a distinct profile, while Far Infrared (FIR) and hot air-drying yield similar aromas. Drum dried method has a measurable impact on the appearance, taste, and infusion color of the green tea. While considering three temperature ranges (<90°C, 90°C–110°C, >110°C), there are no statistically significant differences in aroma and taste across the different drying temperature groups. For the analysis, Kruskal-Wallis's test and Dunn's test were used with outliers removed for accuracy. This study concludes that the origin and processing methods significantly influence green tea's qualities, with geographic origin affecting aroma and color, and drying methods shaping sensory attributes. The drying temperature has minimal impact. Therefore, improving drying methods and focusing on regional traits can enhance green tea quality, with further research on consumer preferences recommended.

Keywords: Geographical origin; green tea; meta-analysis; physicochemical parameters; sensory attributes

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Formation of shining and quick drying shoe polish using banana (*Musa sapientum*) peel and coconut (*Cocos nucifera*) shell charcoal

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The research focuses on developing an eco-friendly and efficient shoe polish using banana (*Musa sapeium*) peel and coconut (*Cocos nucifera*) shell charcoal. The study explored the preparation processes of coconut shell charcoal powder and banana peel extract, which were integrated into various formulations of shoe polish. Four different samples of shoe polish were prepared by varying the banana peel extract (10g: C1, 20g: C2, 30g: C3, and 40 g: C4) while using coconut shell charcoal as a core ingredient. The control treatment was commercially available shoe polish (C5). Firstly, the pH values of the new shoe polish formulations were compared with the control. Furthermore, properties such as shine, quick-drying, water resistance, rub resistance, and fading resistance were evaluated after applying the polish samples on three different shoe types: school shoes, leather shoes, and safety shoes. A customer satisfaction survey was conducted with thirty participants evaluating the polish on the above three shoe types. According to the results, the pH values of C4 were comparable with the C5 (control). According to the customer satisfaction survey results, the C4 shoe polish sample received a good grade for all the measured properties for all three types of shoes. The results indicated that the banana peel and coconut shell charcoal-based shoe polish demonstrated significant potential as a sustainable eco-friendly alternative to commercial products, particularly in terms of shine and drying time. The findings also suggest that this formulation could offer environmentally conscious consumers a viable, natural option for shoe care.

Keywords: Banana peel extract; coconut shell charcoal powder; customer satisfaction; eco-friendly shoe polish

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Paper ID: NSALS '25-222 (Oral)

Machine learning-based yield prediction for rubber (*Hevea brasiliensis*) cultivation

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Rubber (*Hevea brasiliensis*) is one of the four main industrial raw resources in the world that is grown for its latex. About 98,584 hectares of rubber are produced in Sri Lanka, which holds a 0.6% market share in the world market for natural rubber. Current agricultural setups with limited resources necessitate technology-enabled smart solutions that maximize production while consuming the fewest resources possible. Although satellite imagery and Unmanned Aerial Vehicles (UAVs) have been widely used for yield estimation, growth assessment, and crop monitoring in rubber-producing regions around the world there is a significant research gap in the application of those technologies to rubber plantations in Sri Lanka. This study aimed to improve rubber plantation management by developing a latex yield prediction model using machine learning techniques, climate, and remote sensing data. Latex yield data of three rubber plots were collected from January 2016 to January 2024, focusing on 10 to 20-year-old RRIC 121 rubber plantations in Kaburupitiya area of Matara district, Sri Lanka. Additionally, data on five weather parameters (rainfall, temperature, relative humidity, wind speed, and sunshine hours) were included in the analysis. Sentinel-2 satellite images were used to calculate the Normalized Difference Vegetation Index (NDVI). All the data sets (latex yield, NDVI, and weather parameters) were used as inputs to build the prediction model with 80:20 for training and testing purposes. Nine commonly used machine learning algorithms for crop yield predicting were tested (Linear Regression, Random Forest, Gradient Boost, XGBoost, KNN, Decision Tree, SVR, CatBoost, and LightGBM). The algorithm with the highest accuracy was selected by evaluation metrics such as R^2 and mean square error. The study found that the XGBoost model outperformed the others, with an accuracy of 76.88% and an R^2 score of 0.77, according to the results. Additionally, CatBoost and Random Forest models showed good prediction ability with corresponding accuracies of 73.36% and 71.10%, respectively. The study highlights the novelty of integrating NDVI with climate and yield data for rubber plantations. This study contributes to the development of knowledge on precision agriculture for rubber cultivation and provides valuable insights for improving plantation management and yield forecasting.

Keywords: Machine learning; predictive models; remote sensing; rubber plantation; yield prediction

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Paper ID: NSALS '25-017 (Poster)

Determination of the curing and physio-mechanical properties of sugarcane bagasse fiber powder as a potential filler in natural rubber compound

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Ribbed Smoked Sheet (RSS) rubber is a kind of raw Natural Rubber (NR) made by latex *Hevea brasilliensis*. The ribbed smoked sheet is also the most commonly used raw NR type in the production of dry rubber products such as tires, tubes, automobile parts, and so on. However, when only NR is used in the rubber business, the finished products do not have appropriate mechanical properties. Initially, Carbon Black (CB) fillers were used to increase mechanical qualities. However, there are significant disadvantages to using CB as a filler. CB is damaging to the environment and carcinogenic to human life. The researchers began to investigate low-cost natural fillers. Sugarcane Bagasse (SCB) was used as a natural filler in the polymer industry. It could be turned into useful materials like fuel, chemicals, paper, and more. Thus, SCB powder and CB were separately incorporated with NR and their curing and physio-mechanical properties were evaluated following standard test procedures. When considering the Mooney viscometer data, scorch time (T_{35}) is high in SCB powder and NR composites. Under physio-mechanical properties, SCB and NR have higher tensile values than CB and NR, but it gradually decreased with the filler loading in both (the control has shown a value of 11.05 MPa and all other composites shown value ranging from 12.34 MPa). SCB powder showed uneven fluctuation of hardness properties and tear strength (The control has shown a value of 14.71 Nmm-1and all other composites showed value ranging from 24-33 Nmm-1). X-ray diffraction characterization expressed SCB powder has a high amount of Silica. The Fourier transform infrared spectroscopy results suggest a reduction in the Hemicellulose and Lignin content following alkaline treatment of the fibers in conclusion, preferred curing characteristics and improved mechanical properties have been archived. However, it has a high amount of Silica therefore silica extraction can be done, and further studies are suggested. In the future, we can use SCB powder to extract the Silica by using the sol-gel method and it can be used as potential filler.

Keywords: Carbon black silica; natural rubber; sugarcane bagasse powder

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Paper ID: NSALS '25-172 (Poster)

Assessment of crop water requirement of chili *(Capsicum annuum)* variety MICH HY 1 grown in protected houses

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Efficient water utilization is crucial for sustainable agriculture, particularly in regions with limited water availability. This study aimed to evaluate the growth and yield performance and Water Use Efficiency (WUE) of green chili *(Capsicum annuum)* under different irrigation regimes to find out optimum irrigation level. The experiment was conducted using the MICH HY 1 chili variety grown in a medium consisting of compost, topsoil, and half-burned paddy husk in a ratio of 1:2:1 in protected house at the National Centre for Non-Destructive Testing, Sri Lanka Atomic Energy Board. Three irrigation treatments were implemented based on Allowable Depletion Level (ADL) of the potting media; T1 (25% ADL), T2 (50% ADL), and T3 (75% ADL), with two-day irrigation interval. Growth parameters, including plant height, number of leaves, flowers, pods per plant, dry weight of pods and WUE (kg/L) were measured. The experiment followed a completely randomized design with 15 replicates, and data were analysed using one-way ANOVA (α=0.05). In addition, atmospheric water vapour was collected to assess the environmental conditions affecting the plants. Vacuum cryogenic extraction was employed to extract unfractionated water from both leaves and soil samples for stable isotope analysis and obtained graphical interpretation. Results revealed that there was a significant (P<0.05) difference in T3 and T2 treatments for plant height. The highest number of pods was observed in T1 treatment. The dry mass of pods per plant was significantly higher (P<0.05) in T1 treatment. The WUE was significantly (P<0.05) higher in T2 and T3 treatments. Stable isotopes of water extracted from leaves, soil and atmospheric moisture have separated into three clusters around the Local Meteorological Water Line (LMWL) in the resulting graphs. Due to isotope fractionation, lighter isotopes (^{1}H,^{16}O) were the first to leave leaves during transpiration process and heavy isotopes (^{2}H,^{18}O) tend to stay in leaves. This study suggested maintaining a higher irrigation level (T1) resulted in maximized chili plant vegetative growth and yield while lower irrigation level of T2 and T3 still provided satisfactory WUE. The study showed the distinct isotopic signals from transpiration and evaporation which separates total water flux in agricultural fields.

Keywords: Green chili; growth performance; irrigation management; stable isotope; water use efficiency; yield performance

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Paper ID: NSALS '25-207 (Poster)

Robotics in precision agriculture: A systematic literature review of applications, challenges, and future prospectives

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The rapid increase in the world population has demanded that humans should invent and develop emerging technologies to face food insecurity by providing quality foods as per the demand of its consumers. Precision Agriculture (PA) is being revolutionized by robotics, enabling high efficiency and sustainable resource utilization. Therefore, the purpose of this study was, (a) to examine the existing robotic applications in agricultural practices, (b) to identify the challenges in robotic applications in agricultural practices, and (c) to explore future perspectives towards robotics applications in precision agriculture. A set of 136 papers published in the English language were obtained from various academic databases (Science Direct, Springer, Research gate) by using "Precision agriculture", "Robotics", and "Robotics applications in PA" keywords. Research papers published between 2014-2024 were obtained and elimination was done for duplicates. The applications, advantages, disadvantages, future directions, and potential dangers of using robotics in PA were reviewed. Land preparation, irrigation techniques, robotics uses in planting sites, chemical applications, weed detection, control, and harvesting are the major applications of robotics in developed countries. Robotics are more suitable for agricultural practices due to their high efficiency and high performance. Some of the drawbacks observed are high initial capital, high technical knowledge, high energy usage, and challenges with data extraction. This paper also highlights some of the challenges and potential benefits associated with robotics in future agricultural practices. A recommendation is made on the technology transfer and its drawbacks to the lower level of the agricultural industry. Overall, this review provides insight into emerging robotic technologies that are transforming the future of farming.

Keywords: Applications; challenges; precision agriculture; robotics

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AGRICULTURAL MICROBIOLOGY AND BIOTECHNOLOGY

NSALS '25-013	**Effect of commercial Urea as a replacement for Ammonium Nitrate in nutrient media for *in-vitro* propagation of sour banana (Mysore AAB)** *D.W.C. Nilakshika, N.M.C. Nayanakantha, H. Rohanadeera*	**57**
NSALS '25-026	**Efficacy of Chitosan and garlic extracts as a bio-fungicide in managing fusarium wilt disease of tomato (*Solanum lycopersicum*)** *S.D. Mekhala, N.M.C. Nayanakantha*	**58**
NSALS '25-033	**Efficacy of *Trichoderma asperellum* as a biocontrol agent in managing anthracnose disease in chili (*Capsicum annuum* L.)** *B.M.G.D.K. Bannak, N.M.C. Nayanakantha*	**59**
NSALS '25-035	**Assessment of antioxidant activities in various rose varieties for skin care applications** *W.M.S.N. Wanasinghe, K.G.C. Senarathna*	**60**
NSALS '25-044	**Investigation and isolation of potential Zinc solubilizing microorganisms to use as bioinoculants in soils** *M.S.F. Hathifa, A.M.K.C.B. Aththanayake*	**61**
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NSALS '25-188	**Antiviral properties of compounds derived from *Acalypha indica* against Seneca virus A 3C protease** *S. Poorni, K. Karunarathna, N.M.T. Anupama, W.M.M.P. Hulugalla, A. Hasintha, N. Jayampathi, H. Gunathilaka, H. Wijekoon, B. Jayawardana, L. Ranathunga*	**72**
NSALS '25-194	**Identification of bioactive compounds of *Brucea javanica* as potential inhibitors of African swine fever virus E296R protein: A computational and molecular dynamics analysis** *S. Poorni, H. Gunathilaka, N.M.T. Anupama, W.M.M.P. Hulugalla, N. Jayampathi, A. Hasintha, K. Karunarathna, A. Peiris, A. Subasingha, B. Jayawardana, L. Ranathunga*	**73**

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Paper ID: NSALS '25-013 (Oral)

Effect of commercial Urea as a replacement for Ammonium Nitrate in nutrient media for *in-vitro* propagation of sour banana (Mysore AAB)

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The Mysore AAB, or sour banana, is a widely consumed fruit in Sri Lanka due to its flavor, texture, adaptability, cultural importance, high nutritional content, and accessibility. Although protocols for *in-vitro* propagation of sour bananas are available, there is a need to improve cost-effective rooting and acclimatization protocols for commercial-scale production while improving the survival rate of tissue-cultured plantlets following field transfer. Ammonium Nitrate is used as the main source of nitrogen in the medium used in *in-vitro* propagation. However, Ammonium Nitrate is expensive, and hence in this study, commercial Urea, a low-cost substitute for Ammonium Nitrate, was used as an alternative Nitrogen source. Murashige and Skoog (MS) media without Ammonium Nitrate were prepared using Urea concentrations of 0.5 mg/L (T1), 1.0 mg/L (T2), 1.5 mg/L (T3), 2.0 mg/L (T4), 2.5 mg/L (T5) and, 3.0 mg/L (T6) respectively as treatments (T). Standard MS medium was used as the control. *In-vitro* grown shoots of sour banana: (cultivar *Nadee*) were separated from clusters and sub-cultured in the above-mentioned media. Plants of the same height were used, devoid of roots. Therefore, the differences in shoot and root growth could be attributed to differences in treatments imposed. Data was obtained five weeks after culture, for the parameters *viz.* height of the plant, number of roots, length of root, wet weight of root, dry weight of root, wet weight of shoot, dry weight of shoot, total wet and dry weights of plants. Treated plants were arranged in a Completely Randomized Design (CRD) with 15 replicates for each treatment. The mean values of all treatments were compared by Analysis of Variance (ANOVA) using Minitab software (version 21.2.0.0). Significantly higher shoot lengths and root lengths were recorded in Treatment 5 followed by Treatment 6 as compared to control and other treatments. Significantly higher values for the total dry weight of shoot and root were recorded in Treatment 5 and Treatment 6 as compared to other treatments. Hence, replacing ammonium nitrate with commercial urea at 2.5-3.00 mg/L in the Murashige and Skoog medium was found to be effective in *in-vitro* rooting and growth of sour banana cultivar *Nadee*.

Keywords: Ammonium Nitrate; banana; commercial Urea; *in-vitro* rooting; shooting

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Paper ID: NSALS '25-026 (Oral)

Efficacy of Chitosan and garlic extract as a bio-fungicide in managing Fusarium wilt disease of tomato *(Solanum lycopersicum)*

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Fusarium wilt, caused by *Fusarium oxysporum f. sp. lycopersici*, is one of the most devastating soil-borne pathogens that threaten tomato (Solanum lycopersicum) worldwide production. The disease causes high yield losses and chemical fungicides pose environmental risks and promote resistant strains. Therefore, this necessitates the increasing demand for more viable and environmentally friendly ways of managing this disease. The objective of the study was to investigate the efficacy of Chitosan in combination with garlic extract as a bio-fungicide for Fusarium wilt management. *Fusarium* spp. was isolated from infected tomato plants (variety Thilina) on PDA media. Chitosan-garlic extracts were prepared in a 1:1 ratio and diluted extracts at 0.1% (Treatment 1), 0.075% (Treatment 2), and 0.05% (Treatment 3) and control (water treatment) were used for *in-vitro* experiments. Greenhouse trials were conducted to investigate the effects of Chitosan-garlic extract treatments on the growth and yield characteristics of tomato (var. Thilina) plants. One-month old tomato plants were treated with Chitosan-garlic extracts at T1, T2, and T3 concentrations as a soil drench. Untreated plants were used as controls. Two-month-old tomato plants of the above experiment were inoculated with a spore suspension of *Fusarium* spp., onto stems. *In-vitro* antifungal activity of the Chitosan-garlic extract was assayed on a potato dextrose agar (PDA) medium inoculated with *Fusarium* spp. A significantly higher inhibition of fungal growth was recorded with T1 ($P<0.05$) compared to control and other treatments. Fungal growth inhibition was measured by recording the diameter of *Fusarium* colony growth on PDA plates treated with the Chitosan-garlic extract and comparing it to the control. The results showed inhibition percentages of 38% (T1), 35% (T2), and 15% (T3). Plants treated with Chitosan-garlic extracts at 0.075% concentration showed significantly higher tomato yield. A significantly higher plant height was recorded in plants at all treatments as compared to the control. Fusarium wilt symptoms were recorded from control plants to a significant level as compared to treated plants. Therefore, the Chitosan-garlic extract is an eco-friendly bio-fungicide for managing Fusarium wilt in tomatoes while improving plant growth and yield.

Keywords: Bio-fungicide; Chitosan; Fusarium wilt; garlic extract; tomato

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Paper ID: NSALS '25-033 (Oral)

Efficacy of *Trichoderma asperellum* as a biocontrol agent in managing Anthracnose disease in chili (*Capsicum annuum* L.)

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Anthracnose is a major fungal disease affecting chili plants (*Capsicum annuum* L.), caused by *Colletotrichum* spp. Significant yield losses of chilies due to anthracnose have been reported ranging from 10% to 80% depending on weather conditions and the cultivar type. Hence, the objective of the present study was to evaluate the efficacy of *Trichoderma asperellum* as a biocontrol agent in managing anthracnose disease and improving yield in chili plants. To isolate *Colletotrichum* spp., diseased leaf samples were collected from chili, surface sterilized, cultured on PDA and incubated at 27°C for 192 hrs. Using a commercially available Tricholan^{Tm} biocontrol agent, *Trichoderma asperellum* was isolated on a PDA medium. The dual culture technique was used in *in-vitro* screening for the antagonistic activity of *T. asperellum* against *Colletotrichum* spp. A pot experiment was then conducted to evaluate the effects of *T. asperellum* on chili plant growth and yield across five different treatments *viz* T0 (Control), T1 (0.5%), T2 (1%), T3 (1.5%), T4 (2%). One month after transplantation, plants were inoculated with a spore suspension of *Colletotricum* spp. and anthracnose symptoms were observed 21 days after inoculation. Results of dual culture revealed that *T. asperellum* possesses a high antagonistic activity regarding the growth inhibition of *Colletotrichum* spp. A significantly higher percentage (55.6% at 192 h) of growth inhibition of *Colletotrichum* spp. was observed in response to treatment with *T. asperellum* as compared to control. In the pot experiment, chili plants imposed with T0 (control) showed anthracnose symptoms (85%) with a lesion diameter of (6 mm) after 21 days of inoculation. Also, T3 (1.5%) showed 1.5% symptom development with necrotic lesions (2 mm) and enhanced plant growth. *T. asperellum* treatment at various concentrations did not affect the height of chili plants as compared to the control. However, there was a significant increase in pod weight, with T3 as compared to other treatments and controls. Hence, *T. asperellum* is a promising biocontrol agent for controlling anthracnose while enhancing the yield of chili.

Keywords: Anthracnose disease management; chili plants; *Colletotrichum* spp.; dual culture method; *Trichoderma asperellum*

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Paper ID: NSALS '25-035 (Oral)

Assessment of antioxidant activities in various rose varieties for skin care applications

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Antioxidants are substances that help to protect cells in the body from damage caused by free radicals. Free radicals are unstable molecules that can cause oxidative stress. Antioxidants play a key role in skin care to prevent damage to skin cells. Many antioxidants included in rose petals may affect the health and appearance of the skin. This study focuses on evaluating the antioxidant activity of selected rose varieties, extracted using solvent extraction, useful for skincare applications and comparing the antioxidant activity. In this research Dog rose, Spray rose, climbing rose varieties, and the hybrid tea rose varieties were characterized for their antioxidant activities. The quantitative method used in this study was $KMnO_4$ radical scavenging antioxidant assay. The absorbance of $KMnO_4$ presence of the antioxidant was measured using the spectrophotometric method. $KMnO_4$ titration method also used to determine antioxidant activity of different rose varieties based on redox reaction with Potassium Permanganate in an acidic medium. IC_{50} values were obtained of 6.47, 7.21, 7.47, 9.10, 11.51, 6.11,10.48, 7.87, 7.46, 7.22 in µL/mL for Dog rose, for Rosa *'Rosario'*, Beverly hybrid tea rose, red spray rose, Apricot tea rose, climbing iceberg rose, yellow tea rose, Enchanted tea rose, pink tea rose, and dark red spray rose, respectively. Ascorbic acid was used as the standard to compare the antioxidant activity in rose varieties. Ascorbic acid was obtained at 2.08 µL/mL IC_{50} value. In conclusion, Dog rose exhibited the lowest IC_{50} value and high radical scavenging at the highest concentration (25 µL/mL). It indicates that the Dog rose has the highest antioxidant activity per unit mass of petals compared to other hybrid rose varieties. Other rose varieties also have strong to moderate antioxidant activities. On the other hand, Apricot tea rose, and yellow tea rose have weak antioxidant activity compared with other rose varieties. According to these results, it is suggested these rose varieties have strong and moderate antioxidant activities at high concentrations and could effectively protect skin from oxidative stress and hence could be applied in skin care applications.

Keywords: Antioxidants; Dog rose (*Rosa canina*); free radicals; IC50 values; radical scavenging; redox reaction

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Paper ID: NSALS '25-044 (Oral)

Investigation and isolation of potential Zinc solubilizing microorganisms to use as bioinoculants in soils

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Zinc is a vital micronutrient that supports the growth and development of crops and is a key component in their biochemistry and metabolism. Zinc uptake by plants is confined due to its insoluble forms and the limited availability in soils, which causes Zinc deficiency in plants. To combat this, an eco-friendly strategy is required. Zinc-solubilizing microorganisms, which are abundant naturally, can provide a promising approach to sustainable agriculture. The present study aimed to determine the potential of Zinc-solubilizing microorganisms to be utilized as bioinoculants in soils by isolating and comparing their solubilization indexes. The agricultural soil samples were obtained from five different fields in Guruthalawa, Sri Lanka. The efficiency of solubilization was evaluated using isolates that form clear zones on Zinc-solubilizing agar medium containing Zinc Carbonate, following the serial dilution method. The solubilization index was calculated using Microsoft Excel, and the isolates' significant differences were investigated using R Studio. Eight Zinc-solubilizing bacteria and four Zinc-solubilizing fungi were isolated during the study. Based on morphological and biochemical characteristics and a reference to Bergey's manual of systematic bacteriology, the isolates were classified into the genera *Bacillus* and *Enterobacter*. Based on microscopic observations, fungal isolates were identified as *Penicillium* sp. The statistical tests indicated that each bacterial isolate's solubilization index showed a difference from the others ($P<0.05$). The most distinct strain is strain 3 (*Bacillus* sp.), which exhibited the highest mean values (4.04). The fungal isolate's solubilization index showed no difference from the others ($P>0.05$). According to the findings, it is recommended that the isolated strains can be applied to the soil as cost-effective bioinoculants to improve plant uptake of Zinc and minimize pollution from chemical fertilizers. Further studies are recommended to identify the strains and their impact on soil quality.

Keywords: Solubilization index; Zinc-solubilizing bacteria; Zinc-solubilizing fungi

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Paper ID: NSALS '25-046 (Oral)

Phenotypic and genotypic determination of Tetracycline resistant *Escherichia coli* isolated from commercial broilers

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An antimicrobial agent is a naturally occurring, semi-synthetic, or synthetic substance that exhibits antimicrobial activity in concentrations attainable *in-vivo*. Antimicrobial agents are active against bacteria, viruses, fungi, and protozoa; however, antibiotics that exhibit bacteriostatic and bactericidal properties are subjected to more research due to the development of resistance which challenges global public health. This study was conducted at the Veterinary Research Institute (VRI), Peradeniya, Sri Lanka using *Escherichia coli* isolates originating from poultry caecum. Furthermore, the isolates were previously identified and confirmed at the VRI. All the isolates were subjected to re-identification and re-confirmation by employing Gram staining and biochemical tests for Gram-negative bacteria respectively. The biochemical tests performed were citrate, urease, triple sugar iron, and indole/motility tests. A total of 100 pure *E. coli* isolates were then subjected to the Minimum Inhibitory Concentration (MIC) test. The agar dilution method of MIC testing was performed following the standardized protocol of the European Committee on Antimicrobial Susceptibility Testing (EUCAST); subsequently, resistance or susceptibility was determined referring to the breakpoint table values of the EUCAST and the Clinical Laboratory Standards Institute (CLSI). All the Tetracycline-resistant isolates were subjected to molecular analysis to determine the presence of the *tet*A gene which is a commonly available resistant determinant in *E. coli*. The boiling method of bacterial DNA extraction, PCR, and agarose gel electrophoresis were performed under the genotypic analysis. 96% resistance was determined in the agar dilution method of MIC testing. The recorded MIC values ranged between 2 µg/mL and ≥128 µg/mL; furthermore, a minimum concentration of ≥128 µg/mL was required to inhibit the growth of 74% of the isolates. According to the molecular analysis, the presence of the *tet*A gene was confirmed in 46% of the resistant isolates. In conclusion, *E. coli* isolated from commercial poultry has developed a higher resistance to Tetracycline and the presence of the *tet*A gene in *E. coli* was confirmed. This study highlighted the potential public health risk of the development and transmission of Tetracycline resistance within the food chain; therefore, continuous monitoring of the other resistance determinants can be recommended.

Keywords: Antibiotics; antimicrobial agents; poultry caecum; public health; resistance

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Paper ID: NSALS '25-047 (Oral)

Morphological and molecular characterization of wild macrofungi from localities in the mid and up-country intermediate zones (IM 1a and IU 3c) in Badulla district, Sri Lanka

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Macrofungi are fungi that produce fruiting bodies visible to the naked eye. Sri Lanka's rich fungal biodiversity, particularly macrofungi, remains largely unexplored. This study aims to identify and characterize wild macrofungi collected from the Mid-Country Intermediate Zone (IM 1a) and Up-Country Intermediate Zone (IU 3c) in the Badulla District, Sri Lanka. Macrofungi samples were collected from the above area based on the accessibility and the relative abundance. Macromorphological identification of the samples was carried out using morphological descriptors viz size, shape, color and structure of the pileus, context, and stipe. Micromorphological characterization was performed by observing basidia, asci, cystidia, basidiospores/ascospores, and hyphae using an Optika B190TB compound microscope, with images captured using Optika Vision Lite version 2.13 software. DNA was extracted from five selected dried macrofungal samples and DNA sequences were obtained. Primary identification of selected species was done using BLAST. Maximum likelihood phylogenetic analysis was done in RAxML using GTR+Gamma substitution model with 1000 bootstraps. A total of 28 wild macrofungi specimens were collected from the study area. Most of these samples, 22 out of 28 (78.6%), were obtained from the up-country intermediate region (IU 3c), while the remaining six (21.4%) were collected from the mid-country intermediate region (IM 1a). The collected specimens belonged to 7 orders, representing 15 families and 19 genera. The majority of the samples represented the order Agaricales (67.86%) and were followed by the orders Boletales (7.14%), Polyporales (7.14%), Russulales (7.14%), Dacrymycetales (3.57%), Phallales (3.57%), and Xylariales (3.57%). Additionally, 14.29% of specimens belonged to the family Agaricaceae specimens and were followed by the families Physalacriaceae, Psathyrellaceae, and Strophariaceae, each representing 10.71% of macrofungi within studied specimens. Macrofungi of genera *Oudemansiella* and *Agrocybe* each represented 10.71% of the collection. Interestingly, molecular identification of selected macrofungi samples confirmed that *Agrocybe retigera* and *Scleroderma albidum* were reported for the first time from Sri Lanka.

Keywords: Fungal diversity; ITS region; phylogenetic analysis; wild mushrooms

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Paper ID: NSALS '25-048 (Oral)

Phenotypic and genotypic resistance of coagulase-positive *Staphylococcus* spp. to Tetracycline isolated from cow milk

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Mastitis is an inflammation of the mammary gland accompanied by physical, chemical, and microbiological changes. It is one of the barriers hindering the achievement of Sri Lanka's national goal of self-sufficiency in dairy production. *Staphylococcus aureus*, a coagulase-positive *Staphylococcus* species, is often associated with bovine mastitis, causing huge economic losses and treatment failures. Tetracycline resistance in *Staphylococcus aureus* poses quite a challenge in treating bovine mastitis. This study focused on Minimum Inhibitory Concentration (MIC) testing and the determination of Tetracycline-resistant genes (*tet*A and *tet*B) to investigate both phenotypic and genotypic resistance to Tetracycline among *Staphylococcus aureus* isolates obtained from infected cow milk. A total of 26 previously identified *Staphylococcus aureus* isolates were subjected to MIC testing using the agar dilution method to test their resistance levels to 12 different Tetracycline dilutions: 128, 64, 32, 16, 8, 4, 2, 1, 0.5, 0.25, 0.125, 0.0625 µg/mL. The MIC testing was conducted according to the European Committee on Antimicrobial Susceptibility Testing (EUCAST) guidelines. Agarose gel electrophoresis and Polymerase Chain Reaction (PCR) amplification were used to identify the *tet*A and *tet*B resistance genes to determine the genetic basis of Tetracycline resistance in *Staphylococcus aureus* isolates. According to the MIC test results, 19% (5/26) of the isolates showed a high level of Tetracycline resistance, with MIC values ≥16 µg/mL, indicating their strong resistance. Additionally, 4% (1/26) of the *Staphylococcus aureus* isolates showed intermediate resistance, with a MIC value of 8 µg/mL. In contrast, 77% (20/26) of the isolates were identified to be susceptible, with a MIC value of ≤4 µg/mL, showing sensitivity to Tetracycline. These results indicate that a small proportion of the isolates tested are resistant to Tetracycline. The results of the genotypic analysis revealed that none of the isolates tested positive for both the *tet*A and *tet*B genes. This suggests that the presence of the most prevalent Tetracycline-resistant genes such as *tet*K and *tet*M, may be contributing to the observed phenotypic resistance of *S. aureus* in infected cow milk. This study emphasizes the complexity of antibiotic resistance and the significance of comprehensive studies to identify other resistance determinants.

Keywords: Antibiotic resistance; antimicrobial susceptibility testing; bovine mastitis; resistant genes

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Paper ID: NSALS '25-051 (Oral)

Isolation and testing of the bio-controlling ability of *Trichoderma* isolates from the rhizosphere soil of chili plants against *Fusarium*

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Trichoderma is a genus of filamentous fungi often used in biofertilizers and bio-controlling formulations due to their potential to improve soil fertility and manage plant health. *Fusarium* is a soil-born pathogen, which poses a significant threat to chili crops by causing various diseases including Fusarium wilt and root rot. Extensive usage of chemical pesticides and fertilizers leads to harmful impacts on the environment and human health. This situation shows the need for sustainable and biological substitutes to efficiently control plant diseases and increase soil nutrient levels. Hence, this research aimed to develop a bio-controlling formulation against *Fusarium* pathogens of chili plants. Rhizosphere soil samples were collected from ten chili plants in Badulla district. The screening and isolation of *Trichoderma* species was done on *Trichoderma* Selective Medium (TSM) using the spread plate technique. A volume of 0.1 mL of soil suspensions was transferred aseptically into petri plates containing the *Trichoderma* selective medium and spread for even distribution. The plates were incubated at room temperature for seven days. Grown colonies were observed and sub-cultured on fresh TSM and PDA media. Isolates were characterized by morphologically observing their colony characteristics and using the slide culture technique. A total of five *Trichoderma* isolates were identified and coded as T-A2, T-B2, T-D2, T1-D2 and T-E1 for convenience. The bio-controlling ability of five *Trichoderma* isolates against *Fusarium* was assessed using dual culture plate assay placing seven days old *Trichoderma* disk (5 mm) on one side and a *Fusarium* disk (5 mm) on the opposite side of the same PDA plate. After 7 days of incubation, the percentage inhibition in radial growth of *Fusarium* was calculated. T-D2 showed the highest inhibition percentage of 67.25±4.55% followed by T-E1 (64.44±3.11), T-B2 (62.53±4.32), T1-D2 (59.96±7.25) and T-A2 (53.67±8.68). All five isolates inhibited the growth of *Fusarium* revealing their potential to be used as bio-controlling agents. Identification of the isolates using molecular techniques should be done to develop a bio-controlling formulation for chili plants against *Fusarium*.

Keywords: Bio-controlling agent; chili; fungi; *Fusarium*; *Trichoderma*

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Paper ID: NSALS '25-071 (Oral)

Effect of biofilm biofertilizers on paddy soil biofilm formation and mycorrhization in *Oryza sativa* L.: A laboratory simulation study

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Rice (*Oryza sativa* L.) is the staple food for a larger proportion of the world's population. Excessive use of chemical fertilizers (CFs) in rice farming directly affects the composition of soil microbial populations, leading to decreased abundance and diversity of soil microbes ultimately resulting in degraded agroecosystems. Biofilm biofertilizers (BFBFs) have been developed as an environmentally friendly alternative for reducing excessive CF usage in rice farming. The BFBF promotes the formation of mycorrhizal networks, which play a crucial role in nutrient transport and plant health. This study compares two fertilizer practices: CF practice [simulated using Yoshida's nutrient medium at 100% DOA CF recommendation (425 kg NPK/ha)+micronutrients] and, BFBF practice [simulated using Yoshida's nutrient medium at 66% DOA CF recommendation (225 kg NPK/ha)+micronutrients+BFBF (2.5 L/ha)] with Control [only micronutrients]. The experimental setup was constructed using two transparent glass plates, measured 25 cm×0.4 cm×15 cm in size, with a gap of 0.4 cm between the two plates. Then, sieved sand (1-2 mm), was filled into the gap of the glass plate structure and each structure was planted with three rice plants. At 3'08 rice variety was used as the test crop. *Aspergillus niger* spores were added as the stimulant mycorrhizal inoculum, and BFBF was added with soil extract. After 60 days, mycorrhizal networks were visible under 10x40 magnification with BFBF practice, indicating an enhanced symbiotic relationship between the stimulant mycorrhizal fungus and rice roots. The mycorrhizal networks were not observed under 100% CF practice, suggesting that 100% CF may inhibit such beneficial interactions. Minimal mycorrhizal networks were observed in the control treatment. The study concludes that the BFBF practice enhances beneficial microbial interactions, particularly forming beneficial fungal networks in paddy soils.

Keywords: Biofilm biofertilizer; mycorrhizal networks; rice (*Oryza sativa* L.); symbiotic relationship

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Paper ID: NSALS '25-074 (Oral)

Induction of callus from anther culture of selected tomato (*Solanum lycopersicum* L.) germplasm for haploid plant production

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Tomato is a globally significant and one of the most widely cultivated crops and hence greater attention has been made to increase the breeding efficiency to produce novel varieties to meet the high local demand of tomatoes. Anther-culture is an efficient *in-vitro* technique for obtaining haploid plants and serves as an important tool for accelerating breeding schemes, enabling faster development of pure lines compared to traditional breeding methods. The objective of present study was to identify the best callus induction media and suitable varieties of tomato for anther -culture. Anthers at uninucleate stage obtained from tomato plants of three varieties *viz*, KC1, Thilina, and Lanka Sour were tested on MS media containing four hormonal combinations as treatments: Treatment T1 (2 mg/L Kinetin + 2 mg/L NAA), T2 (2 mg/L BAP + 2 mg/L NAA), T3 (2 mg/L Kinetin + 2 mg/L BAP) and T4 (2 mg/L Kinetin + 2 mg/L NAA + 2 mg/L BAP). Each variety had five replicates, and each treatment had twenty replicates. The experiment was arranged as a Completely Randomized Design (CRD). Data was analyzed using a two-way Analysis of Variance (ANOVA) and statistical analysis was done by Minitab software. Among treatments, significantly highest percentage of callus formation and greening rate (72.5%) was recorded from the variety KC1: at T2 (72.50±9.19) and T4 (72.50±16.95), respectively. Significantly lowest values of callus formation, (12.50±0.00), and greening rates (12.50±0.00), were obtained by the variety Thilina in all media, proving that this variety is not suitable for anther-culture. These findings underline that media composition and variety selection can have a major impact on the success of anther-culture. KC1 was very promising regarding haploid plant yield and may be a good candidate for future tomato variety development. The present work will help breeders in anther-culture optimization, speeding up new variety development, and making tomato breeding more efficient.

Keywords: Anther-culture; callus induction; haploid plants; media composition; plant breeding; tomato germplasm

Underlined is the presenting author.

Paper ID: NSALS '25-138 (Oral)

Genetic characterization of the MC1R gene in Thamankaduwa white local cattle

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The Melanocortin 1 receptor (MC1R) gene has been considered a key determinant of coat color variation in cattle. The present study focuses on the genetic characterization of the MC1R gene in Thamankaduwa white cattle, which are indigenous to Sri Lanka and predominantly found in the Eastern, Southeastern, and North Central provinces. Although the variations of the MC1R gene are adequately documented in most other cattle breeds, limited studies exist on local cattle populations like the Thamankaduwa white. The primary objective of this study was to characterize SNP variations in the MC1R gene of Thamankaduwa white cattle and further comparison with MC1R gene sequences of other breeds of *Bos indicus*, *Bos taurus*, and *Bos grunnien species*. Genomic DNA was extracted from whole blood samples (n=06), and the MC1R gene was amplified by PCR followed by sequencing. Sequence alignment and phylogenetic analyses were performed using BioEdit and MEGA software. A total of six SNP variations (c.218T>A, c.296T>C, c.374T>A, c.415C>T, c.581C>T and c.661C>T) were identified in the MC1R sequences of Thamankaduwa white cattle, aligning with other bovine species. In addition, two unique SNPs (c.310G>-, c.871G>A) were detected when compared to brown coat-colored cattle, and seven SNPs (c.583T>C, c.663C>T, c.830T>C, c.853G>A, c.880G>A, c.906C>G and c.927C>T) were identified when compared to Tharparkar cattle. These findings provide important insights into the genetic basis of coat color in Thamankaduwa white cattle and identified SNPs will genotype using extra sampling for verification and to perform marker association studies with white coat color phenotype and other economically valued traits for selection and breeding.

Keywords: Coat color, genetic variation, single nucleotide polymorphism, Sri Lankan local cattle

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Paper ID: NSALS '25-147 (Oral)

Antibacterial Phenazine-1-Carboxylic acid from the entomopathogenic fungus *Penicillium citrinum*

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Entomopathogenic fungi are a particularly important group in agriculture for controlling insect pests. These fungi, isolated from insect hosts, are known to biosynthesize various bioactive secondary metabolites. The increasing prevalence of antibiotic resistance necessitates the exploration of novel antibacterial agents. Thus, the current study focuses on isolating antibacterial compounds from *Penicillium citrinum* isolated from a beetle (*Harmonia* sp.), an untapped resource in Sri Lanka. *P. citrinum* fungus was cultured on a large-scale using potato dextrose agar (PDA) medium, and after 13 days of incubation at room temperature, the compounds were extracted into ethyl acetate. The crude ethyl acetate extract (~1000 mg) of *P. citrinum* was purified by sequential bioassay guided fractionation methods, using solvent-solvent partitioning followed by Sephadex LH20 (methanol), silica gel chromatography (5% hexane-95% ethyl acetate to methanol) and finally through reversed phase high performance liquid chromatography (acetonitrile & water) to isolate the antibacterial secondary metabolite, phenazine-1-carboxylic acid (PCA). The structure of the active compound was determined by 1D and 2D NMR data. PCA was active against Gram positive *Staphylococcus aureus* (ATCC 25923) and *Bacillus cereus* (ATCC 11778). This is the first time the well-known PCA was discovered in a *Penicillium* species, although it was previously isolated from certain bacteria as well as from the phytopathogenic fungus *Truncatella angustata*. The production of PCA by *P. citrinum* is likely intended to inhibit other pathogenic bacteria and fungi that may attack the host beetle. This study confirms that the entomopathogenic fungus, *P. citrinum* is a promising source of bioactive natural products.

Keywords: Antibacterial activity; antibiotic resistance; entomopathogenic; *Penicillium citrinum*; Phenazine–1–Carboxylic acid

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Paper ID: NSALS '25-149 (Oral)

Effect of Ultraviolet (UV) radiation on different *in-vitro* growth stages of Madonna lily (*Lilium candidum*) and Zebra plant (*Haworthiopsis attenuata*)

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Lilium candidum (Madonna lily) and *Haworthiopsis attenuata* (Zebra plant) are economically significant species in the ornamental plant industry, yet the lack of improved breeding methods limits the ability to enhance desirable traits. Ultraviolet-C (UV-C) radiation at 253.7 nm, known for inducing genetic variability through mutations by impacting DNA and physiological processes, was applied to explants at different growth stages of the Zebra plant and Madonna Lily at durations of 0, 45, and 60 minutes to observe its effects on various growth parameters. The experiments were conducted using sixty replicates in a completely randomized design and analyzed the number of leaves and roots per plant, average root and leaf length, plant height, and callus diameter at two-week intervals, while survival percentage and color development were after a one-month interval. Results showed that fully grown Madonna lily and Zebra plants could tolerate prolonged UV-C exposure but with varying effects. For Madonna lily, a 60-minute exposure was effective for many growth parameters by showing statistical significance (P<0.05), except for leaf number. In contrast, a 45-minute exposure produced effects similar to the control. In the Zebra plant, significant variation was observed across all growth stages; however, the full-grown stage exposed to 60 minutes of UV-C displayed increased leaf length without affecting root number (P>0.05). Optimal color development occurred at 45 minutes exposures, suggesting potential mutations. The findings suggest that 60 minutes of UV-C exposure is ideal for observing potential mutations in both species, particularly in fully grown plants. These results provide a foundation for developing improved cultivars for commercial floriculture with enhanced characteristics.

Keywords: Color development; exposure time; induced mutation; *in-vitro* growth; UV-C radiation

Underlined is the presenting author.

Paper ID: NSALS '25-186 (Oral)

Identification of plant-derived inhibitor from *Gymnema sylvestre* targeting African swine fever virus DNA polymerase X (ASFVPolX) enzyme

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African Swine Fever Virus (ASFV) is a potent disease with high mortality that causes severe hemorrhagic disease in domestic and wild pigs. Therefore, new vaccines against ASFV are required to protect swine herds. The current study investigated the inhibitory effects of selected compounds from *Gymnema sylvestre* on ASFV, focusing on their effects on the Base Excision Repair (BER) mechanism of the virus. This study aimed to evaluate the efficacy of this drug in blocking viral and bacterial infections by targeting ASFV DNA polymerase X (ASFVPolX), an important enzyme for the DNA repair process. We conducted a comprehensive electronic literature search up to April 2024 and found that *G. sylvestre* and 36 candidate compounds were identified. The pharmacokinetics of these compounds were assessed using SwissADME according to Lipinski's rule of five. This analysis identified 19 compounds that were classified as "drug-like" candidates based on whether they met these criteria. Virtual laboratory experiments were performed using PyRx 8.0 using the three-dimensional structure of ASFVPolX from the PDB repository to assess binding energies. The selection process was designed to prioritize compounds with energy values below -5 kcal/mol. Stigmasterol was considered a valuable candidate with an energy of -7.6 kcal/mol and significant interactions with key residue regions such as He 115, Arg 127, Val 120, and Leu 123. A stable parameter is stored in the ASFVpolX function, and the continuous Root Mean Square Fluctuation (RMSF) data show the variance of the sample size supporting the stability of the variant co-mixed in the complex. Detailed analysis of the protein-ligand contacts also revealed hydrogen bonds and hydrophobic interactions to be important for inhibitory activity. In addition, analysis of the secondary structure and torsional profiles revealed no significant changes indicating the stability of the association. Overall, our results indicate that stigmasterol derived from *G. sylvestre* exhibits potential as an ASFVPolX inhibitor and further *in-vitro* and *in-vivo* studies are needed to determine its efficacy against ASFV.

Keywords: African Swine Fever Virus; DNA polymerase X; drug-like candidates; *Gymnema sylvestre*; molecular dynamics simulations; virtual screening

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Paper ID: NSALS '25-188 (Oral)

Antiviral properties of compounds derived from *Acalypha indica* against Senecavirus A 3C protease

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Senecavirus A (SVA) is a single-stranded RNA virus belonging to the family *Picornaviridae*. It is identified as the causative agent of swine Idiopathic Vesicular Disease (IVD) and is associated with Epidemic Transient Neonatal Losses (ETNL), leading to significant economic distress in North America. The viral genome of SVA encodes essential proteins, including the 3C protease (3Cpro), which plays a crucial role in the virus's lifecycle and represents a viable target for antiviral drug development strategies. The present study assessed the antiviral properties of bioactive compounds derived from *Acalypha indica*, a plant with a longstanding history in traditional Asian medicine. An extensive literature review was conducted on the antiviral properties of *A. indica* that was published up to June 2024. 58 bioactive compounds were identified from *A. indica* with 28 compounds meeting the criteria outlined by SwissADME and conforming to Lipinski's rule of five. The virtual screening was conducted using PyRx 8.0 to evaluate the binding affinities of selected compounds at the active site of 3Cpro. Compounds with binding affinities exceeding -5 kcal/mol were further analyzed through blind docking with CB-Dock2. Notably, two lead compounds, Etioporphyrin III and Harderoporphyrin, achieved binding affinities of -8.3 kcal/mol, comparable to luteolin, a recognized SVA inhibitor. To assess the binding stability and dynamics, Molecular Dynamics (MD) simulations were performed at 310 K for 100.1 ns. Etioporphyrin III exhibited superior stability, demonstrated by a lower Root Mean Square Deviation (RMSD) of approximately 1.2 Å, in contrast to Harderoporphyrin's RMSD of 1.6 Å, indicating stable interaction with the active site of 3Cpro. Additionally, Root Mean Square Fluctuation (RMSF) analysis indicated diminished fluctuations in critical binding residues, namely (His-134 and Cys-160) with Etioporphyrin III, suggesting stronger and more consistent interactions. Moreover, Etioporphyrin III retained stable Hydrogen bonding and hydrophobic interactions, further reinforcing its viability as a potential inhibitor of 3Cpro. Therefore, Etioporphyrin III demonstrates significant inhibitory activity against the 3Cpro protease of SVA, characterized by favorable binding interactions and stability. These findings highlight the need for further *in-vitro* and *in-vivo* studies to confirm its therapeutic potential against SVA infection.

Keywords: *Acalypha indica*; bioactive compounds; molecular docking; molecular dynamics simulations; Senecavirus A; 3C protease

Underlined is the presenting author.

Paper ID: NSALS '25-194 (Oral)

Identification of bioactive compounds of *Brucea javanica* as potential inhibitors of African swine fever virus E296R protein: A computational and molecular dynamics analysis

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African Swine Fever (ASF) is a highly contagious disease affecting domestic pigs, causing major economic losses. African Swine Fever Virus (ASFV) produces a protein called Apurinic/Apyrimidinic (AP) endonuclease (pE296R), which plays a role in protecting the viral genome from oxidative damage caused by porcine macrophages during infection. This protein is essential for the survival and replication of the virus. Targeting the E296R protein provides a potential strategy to inhibit ASFV replication and reduce infection. This study examined *Brucea javanica*, a plant known for its many medicinal properties, including anti-inflammatory and anti-inflammatory properties. The aim was to evaluate the ability of one of the natural products to inhibit the ASFV E296R protein. Through extensive literature review, 122 natural compounds were identified from *Brucea javanica*. Using the SwissADME tool and following Lipinski's rule of five, 20 compounds were selected with drug-like properties for further studies. Virtual analysis using PyRx 8.0 showed that all selected compounds exhibited energy properties higher than -5 kcal/mol. Forward blind analysis using CB-Dock 2 highlighted the best candidates: Pityriacitrin, Bruceolline K and Bruceolline M showed their ability to protect against E296R proteins with binding of -8.7, -7.8 and -7.8 kcal/mol, respectively. Perform Molecular Dynamics (MD) simulations to evaluate stability and interactions with proteins. The Root Mean Square Deviation (RMSD) values ranged from 1.5 to 2.5x, indicating strong stability of the protein-ligand complex in the E296R active site. Root Mean Square Fluctuation (RMSF) analysis showed significant residual changes ranging from 0.8 to 1.2x, indicating a stable interaction. An analysis of the structure confirmed that the protein maintained its integrity, with more than 44% of the structure comprising alpha helices and beta strands. These results demonstrate that Pityriacitrin, Bruceolline K, and Bruceolline M from *Brucea javanica* are effective against ASFV. Further *in-vitro* and *in-vivo* studies are needed to confirm its efficacy against ASF.

Keywords: African Swine Fever Virus; *Brucea javanica*; drug-likeness; E296R protein; molecular docking; molecular dynamics simulations

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Paper ID: NSALS '25-212 (Oral)

Floral and molecular characterization of old tea genetic resources in Sri Lanka

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Tea is the second most consumed beverage in the world. As it is an introduced crop in Sri Lanka, genetic diversity is relatively low. The present study investigates floral and molecular characterization to explore the genetic diversity of Sri Lanka's ancient exotic tea genetic resources introduced in the 1880s. A total of 105 tea accessions including 61 from the Hakgala Botanical Gardens and 44 from the *ex-situ* gene bank of the Tea Research Institute of Sri Lanka were analyzed to gain insight. Morphological and genetic variants, of each accession were done using 17 floral morphological descriptors and seven polymorphic Simple Sequence Repeat (SSR) markers. The morphological studies showed a significant variation in specific floral characteristics, with the 105 accessions showing the most diversity in stigma position and style length. A cluster analysis was carried out for floral morphologies using the Unweighted Pair Group Method with Arithmetic Mean (UPGMA) statistical tool. Three accessions, H63, H1, and H53, displayed unique floral morphologies and came out as distinct clades. Unique floral traits were displayed by H63 and H1, including a spiral-style arm and a recurved curvature with a blunt tip. The highest petal length-to-width ratio and flat curvature were displayed by H53 and as a result, they were isolated as a distinct clade; these traits may offer particular benefits. These genetic differences strengthen the possibility of using these special accessions in breeding programs is strengthened by these genetic differences. The genetic variation within these accessions was further illustrated by the molecular study, which was carried out using seven SSR markers. In addition to confirming the physical findings and highlighting the unique genetic composition of the Hakgala population, the SSR profiles provided information on allelic variations. In conclusion, this study demonstrates the untapped potential of Hakgala's exotic tea genetic resources for improving Sri Lankan tea's genetic base. It lays the foundation for conservation efforts and breeding programs to create tolerant tea varieties by identifying accessions with distinct characteristics.

Keywords: Floral characterization; genetic conservation; morphological descriptors; old tea genetic resources; Sri Lanka tea; UPGMA cluster analysis

Underlined is the presenting author.

Paper ID: NSALS '25-220 (Oral)

Evaluation of root and shoot morphology of F4 generation rice (*Oryza sativa* L.) crosses under iron toxic lowland and upland conditions

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Lowland rice cultivation is in Sri Lanka's Wet Zone and relies on rainfall. However, these fields often accumulate surface water, producing oxygen-deficient conditions that accelerate iron toxicity. Additionally, changing rainfall patterns cause drought periods, encouraging the adoption of upland cultivation techniques. The diverse soil types and limited financial resources among farmers pose challenges to implement effective management practices. Hence, the development of tolerant rice varieties is the way forward. Sri Lanka's rice breeding programs have historically focused on stress tolerance in the above-ground parts of the plant, with limited attention to root development due to the time-consuming nature of such studies. The present study examines root and shoot morphology in F4 generation rice crosses under iron-toxic lowland and upland conditions to address this research gap. Forty-eight F4 lines, 12 parental lines, and three standard checks were cultivated at Rice Research Station, Labuduwa, using the randomized complete block design with two replicates and three progeny lines per cross, and during the study shoot, root, and yield characters were measured. Statistical analyses included one-way ANOVA, Duncan's Multiple Range Test, and Pearson correlation. According to the results, Cross 2 and Cross 6 showed the most promising under both conditions according to yield and root performances-key root traits such as root length, width, and volume correlate with yield components. Root volume showed a positive correlation with the number of tillers ($r=0.451$, $P<0.05$) and effective tillers ($r=0.491$, $P<0.01$), highlighting the importance of a robust root system for vegetative growth and yield. Flag leaf width was moderately correlated with seeds per panicle ($r=0.440$, $P<0.05$) and filled grains ($r=0.402$, $P<0.05$), indicating its role in photosynthesis and grain filling. Additionally, root length exhibited a significant positive correlation with filled grains ($r=0.408$, $P<0.05$), underscoring its importance in nutrient uptake. These findings emphasize optimizing root and shoot traits for improved yield and resilience under challenging conditions. The study suggests a balanced focus on both morphological traits is essential for developing high-yielding, stress-tolerant rice varieties.

Keywords: F4 generation; iron toxicity; rice breeding; root morphology; shoot morphology

Underlined is the presenting author.

ANIMAL PRODUCTION AND TECHNOLOGY

NSALS '25-005	**Development of a complete dog food utilizing offcuts of Yellowfin tuna (*Thunnus albacares*), and Swordfish (*Xiphias gladius*) for young adult dogs** *E.M.T.N. Ekanayaka, C.S. Kahakotuwa, I.M.I.V. Ilangakoon, E.D.N.S. Abeyrathne*	**78**
NSALS '25-006	**Development of a snack for young adult cats (*Felis catus*) using Yellowfin tuna (*Thunnaus albacares*) and Swordfish (*Xiphias gladius*)** *C.S. Kahakotuwa, E.M.T.N. Ekanayaka, I.M.I.V. Ilangakoon, E.D.N.S. Abeyrathne*	**79**
NSALS '25-011	**Sequential separation of Lysozyme, Ovomucin, globular protein and ovoinihibitor from chicken egg white** *G.D.Y. Pabasari, A.G.A.W. Alakolanga, D.U. Ahn, E.D.N.S. Abeyrathne*	**80**
NSALS '25-043	**Effect of dietary Canistel fruit (*Pouteria campechiana*) meal on growth performance and egg quality traits of Japanese quail (*Coturnix coturnix japonica*)** *K.M.N. Nadeesha, N.M.N. Nambapana*	**81**
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Paper ID: NSALS '25-005 (Oral)

Development of a complete dog food utilizing offcuts of Yellowfin tuna (*Thunnus albacares*), and Swordfish (*Xiphias gladius)* for young adult dogs

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Food is an essential element for the health and well-being of dogs. Dogs can meet their nutrient requirements through a balanced diet. There is an obvious lack of fish-based dog food in Sri Lankan dog food industry other than the meat-based products. The objective of this research was to develop a dog food as a cookie using offcuts of Yellowfin tuna (*Thunnus albacares*) and Swordfish (*Xiphias gladius)* for young adult dogs (more than 24 months of age). The nutritional requirements of dogs were identified, and the ingredients were selected to meet those needs. Two separate cookies (Tuna, Swordfish) were formulated using swordfish and yellowfin tuna as the major protein sources, based on the European nutritional guidelines for young adult dogs. The dog cookies were made according to the rations and baked at 150℃ for 20 minutes. The sensory qualities of both experimental diets were evaluated with the participation of nine young adult dogs. The prepared cookies were stored under vacuum-packed conditions and tested for lipid oxidation, pH and microbial growth. Dogs were divided into three groups and separately fed two experimental diets and one commercial dog food. Sensory attributes such as fecal consistency, fecal frequency, palatability, water intake, behaviors, allergic reactions, skin and coat condition, weight and height were monitored for one month. Both experimental diet groups showed improvement in skin and coat condition. During weeks 1 and 2, the experimental groups showed less palatability than the commercial group, but this improved after 2 weeks. There were no differences in other sensory attributes between the two experimental and the commercial diets. The shelf life was evaluated for up to five weeks. The pH value ranged between 5.00 and 6.00 throughout the period (P<0.05). Under lipid oxidation, Thiobarbituric Acid Reactive Substances (TBARs) values were below the standard value of 3 mg Malondialdehyde (MDA)/kg (P<0.05). The highest antioxidant activity was observed in the Swordfish diet was (57.74±0.02) compared to the tuna diet (76.24±0.08) (P<0.05). No microbial growth was observed within one month. In conclusion, dog food formulated using the offcuts of Yellowfin tuna and Swordfish as main ingredients is a suitable alternative food for dogs.

Keywords: Coat condition; fecal consistency; lipid oxidation; palatability; sensory attributes

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Paper ID: NSALS '25-006 (Oral)

Development of a snack for young adult cats (*Felis catus*) using Yellowfin tuna (*Thunnaus albacares*) and Swordfish (*Xiphias gladius*)

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Cats are closely associated with human, and their dietary needs must be met to avoid nutritional deficiencies. In Sri Lanka, the availability and affordable cat food is limited, and the fish-based cat food production is low. The objective of present study was to develop a nutritional snack as a pet food for young adult cats (*Felis catus*) using offcuts of Yellowfin Tuna (*Thunnaus albacares*) and Swordfish (*Xiphias gladius*). Two separate tuna and swordfish-based snacks were formulated according to the ration and the European nutritional guidelines for young adult cats. Nine young adult cats were tested with three diet groups. They were separately fed two formulated snacks and a commercial diet. Sensory attributes of fecal consistency, skin and coat condition, periodic weight, water intake, palatability, allergic reactions and behavior patterns were monitored for three weeks and data were analyzed using simple ranking testing. Formulated snack groups showed semi-solid fecal consistency in the first two weeks, then became normal in the third week. The palatability was higher in formulated snacks compared to the commercial diet throughout the sensory period. There was no difference in other sensory attributes among the three groups. The shelf life of the developed products was evaluated up to 5 weeks using lipid oxidation, protein oxidation, pH analysis and microbial assay for yeast and mold growth. Further, there was no significant differences in lipid and protein oxidation up to 5 weeks between the two formulated snacks ($P<0.05$). Thiobarbituric Acid Reactive Substances (TBARs) values were found below the standard value of 3 mg Malondialdehyde (MDA)/kg under lipid oxidation. The highest antioxidant activity of tuna-based snack was 54.12±0.15 while swordfish-based snack was 62.13±0.14. There was a significant difference in pH value between the two snacks up to 5 weeks ($P<0.05$). There were no observations of yeast and mold growth within the 5 weeks. The formulated snacks were more palatable compared to the commercially available diet and there were no allergic reactions due to the formulated products according to the sensory evaluation. The final two products were stable for 5 weeks of storage time and suitable for young adult cats.

Keywords: Cats; formulated snacks; palatability; Swordfish; Yellowfin tuna

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Paper ID: NSALS '25-011 (Oral)

Sequential separation of Lysozyme, Ovomucin, globular protein and ovoinihibitor from chicken egg white

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Separation of Lysozyme, Ovomucin, globular protein and ovoinhibitor is important, as Lysozyme, and Ovomucin contain antibacterial, antiviral properties and ovoinhibitor contains inhibitory activities that can be utilized in pharmaceutical industry. These four proteins contain some preservative and foaming abilities which can be applied in the food industry. However, there is still no sequential separation method for these proteins. Some of the individual separation techniques have complex procedures that require while also being more costly; consequently, they cannot be scaled up. The objective of this study was to develop a simple, scalable, high-yielding, sequential separation method for Lysozyme, Ovomucin, ovoinhibitor, and globular proteins from chicken egg white. Egg white foam was prepared and dissolved using 0.6% (v/w) Sodium Dodecyl Sulfate (SDS) at 9.0 pH. Dissolved foam was used to separate Lysozyme using FPC 3500 cation exchange resin. After that, Ovomucin was separated from the supernatant using isoelectric precipitation and centrifugation. Ovoinhibitors were precipitated using 95% Ethanol until it became 35%, distilled water and centrifugation. Supernatants were obtained while separation of ovoinhibitor was used to separate globular protein by using isoelectric precipitation and centrifugation. The yield of Lysozyme and ovoinhibitor was >26% and >25% as well Ovomucin was >44% and the globular protein was >16% on the laboratory scale. The SDS-PAGE of the separated proteins showed >81% purity for Lysozyme, >41% for Ovomucin and >24% for globular protein, ovoinhibitor. Fourier Transform Infrared Spectroscopy (FTIR) results showed the functional activity of each protein after separation. FTIR images of each separated protein mainly focus on the Amide I and Amide A, as the Amide I band is primarily associated with the C=O stretching vibration. Whereas Amide A is due to the N-H stretching vibration which confirms each protein structure and activity. The developed protocol separates proteins in sequence, and the method is simple, easily scale up.

Keywords: Egg white protein; globular protein; Lysozyme; ovoinhibitor; Ovomucin; sequential separation

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Paper ID: NSALS '25-043 (Oral)

Effect of dietary Canistel fruit (*Pouteria campechiana*) meal on growth performance and egg quality traits of Japanese quail *(Coturnix coturnix japonica)*

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The increasing cost of traditional feed presents serious difficulties for the production of poultry, highlighting the need for alternative feed sources to reduce the production cost, thereby increasing profitability. This study aimed to determine the possibility of using Canistel Fruit Meal (CFM), an underutilized *Sapotaceae* resource, as a non-conventional feed resource to replace maize in quail diet. The study was conducted under uniform environmental conditions and having 2 weeks of acclimatization period. Giving Completely Randomized Design, hundred-layer Japanese quail birds were allocated into 20 pens received one of four diets *ad libitumly* from week 3 to week 16. The nutritionally balanced four different CFM inclusion levels (0%, 10%, 20%, and 30%) as treatment groups were used each having five replicates. Weight gain of layer quail birds, feed intake, Feed Conversion Ratio (FCR), egg production and egg mass per week were measured during the experimental period. After 12 weeks, randomly selected one egg from each replicate was subjected to test the egg quality parameters such as yolk color, yolk index, yolk: albumen ratio, shape index, shell weight, and shell thickness. The data were analysed using one-way ANOVA, Minitab 17.1 version. The treatment groups showed significant improvements in FCR and egg production. The group that received 30% CFM had the lowest (P<0.05) FCR when compared to the 0% CFM (control). There were significant (P<0.05) differences in weight gain among the control group, 10%, 20%, and 30% CFM groups. Feed intake was lower (P<0.05) in 10%, 20%, and 30% of CFM compared to the control group. The 10% CFM fed group showed the highest (P<0.05) yolk to albumen ratio, indicating a positive impact on egg quality. There were no significant (P<0.05) differences in other egg quality parameters among the treatments. This study concluded that the Canistel fruit meal could be included into layer quail diet up to 30%, without any negative effects on growth performance and egg quality parameters offering a cost-effective solution for quail production.

Keywords: Alternative feed; canistel fruit; layer; maize

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Paper ID: NSALS '25-066 (Oral)

Quality evaluation of red (*Amaranthus cruentus* L.) and green (*Amaranthus graecizans* L.) Amaranth as an alternative forage crop for dairy cattle

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Water and forage scarcity during dry periods necessitates resilient, nutrient-dense forage crops to support dairy cattle. Amaranth, with its high nutritional value, adaptability, low cost, and rapid growth, shows promise as an alternative. This study evaluated the growth performance and nutritional composition of red Amaranth (*Amaranthus cruentus* L.) and green Amaranth (*Amaranthus graecizans* L.) to address the limited research comparing these varieties for fresh forage, hay, and silage production. Field experiments were conducted in Badulla (AE region: IM 1a, soil type: Mountain regosols) using a Randomized Complete Block Design with two treatments (red and green Amaranth) in triplicate, assessing plants weekly for key metrics such as plant height, leaf count, and stem height. Nutritional evaluations were performed on fresh forage at two harvesting intervals (45 and 90 days after planting), hay, and silage, focusing on dry matter, crude protein, crude fat, Acid Detergent Fiber (ADF), Neutral Detergent Fiber (NDF), ash, and silage pH. The data were analysed using Microsoft Excel 2010 and Minitab 17.0 with one-way ANOVA. Red Amaranth showed superior growth, with greater height (129 cm at harvest) and leaf count, as well as higher crude protein and fat content in fresh forage, hay, and silage. Dry matter content did not differ ($P>0.05$) between red and green Amaranth. Red Amaranth had higher crude protein (21.57%, $P<0.05$), crude fat (3.03%, $P<0.05$), and ADF ($P<0.05$), while NDF and ash contents showed no differences ($P>0.05$). In the hay, red Amaranth recorded higher crude protein (22.57%, $P<0.05$), crude fat (28.83%, $P<0.05$), ADF (30.77%, $P<0.05$), and NDF (41.21%, $P<0.05$), with no differences in ash content ($P>0.05$). In silage, red Amaranth showed higher crude protein (15.92%, $P<0.05$), crude fat (2.51%, $P<0.05$), and NDF (40.71%, $P<0.05$), while green Amaranth had higher dry matter (17.94%, $P<0.05$) and ash content (14.95%, $P<0.05$). ADF and pH levels showed no differences ($P>0.05$). In conclusion, red Amaranth offers superior growth and nutrition in mountain regosol soil, making it a viable forage crop for enhancing dairy cattle nutrition in resource-limited areas.

Keywords: Dairy cattle; forage crop; silage production

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Paper ID: NSALS '25-076 (Oral)

A study on the prevalence of haemoparasites in cattle, buffalo, goats, and chicken reared in mixed farming systems in Oddusudan veterinary range

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Haemoparasites cause significant economic losses to the livestock causing animal deaths and production losses. They are transmitted through vectors including ticks, fleas and lice. Mixed breed farming increases risks of haemoparasitic disease transmission among species. This study was developed to investigate the incidence of hemoparasites in cattle, buffalo, goats, and poultry in mixed farming systems in Oddusudan, with an emphasis on the implications for livestock health and farmer livelihood. A total of 120 thin blood smears were prepared from the blood collected from cattle, buffalo, goats and chicken. The thin blood smears were stained with Giemsa stain, and they were observed for the presence of haemoparasites such as *Theileria spp*., *Babesia spp*., *Anaplasma spp.*, *Leucocytozoon spp*. and *Plasmodium spp.* The most common hemoparasites found in cattle were *Theileria spp*. 70% prevalence and *Anaplasma spp*. 8%, prevalence especially in animals aged 1 to 5 years. 36% prevalence of an average milk output of 2.5 L. Buffaloes showed similar trends, with *Theileria* 79 prevalence, *Babesia bigemina* 4% prevalence, and *Trypanosoma* 4% prevalence detected in the 1-5 years age group. Goats carried *A. ovis* 18% prevalence and *Theileria* 43% prevalence, whereas chickens carried *P. juxtanucleare* 60% prevalence, and *Leucocytozoon* 15% prevalence. Molecular identification by PCR verified the presence of *Theileria orientalis* 45% prevalence and *Babesia bigemina* 18% prevalence which were visually identified using species specific primers. The study recommended constant surveillance for haemoparasites, reducing hemoparasite prevalence using vector management strategies, increased coordination between farmers and veterinarians, and educational initiatives. The study emphasizes the necessity of integrated disease management for animal health, production, and the long-term viability of mixed farming systems, while also giving important insights into hemoparasite epidemiology.

Keywords: Buffalo; cattle; chicken; goats; haemoparasites; mixed farming systems

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Paper ID: NSALS '25-078 (Oral)

Prevalence of zoonotic protozoan gastrointestinal parasites in goats across three agro-climatic zones of Sri Lanka

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Zoonotic protozoan gastrointestinal parasites pose a significant threat to both livestock and public health, especially in regions with diverse climatic conditions. This study aimed to assess the prevalence of two major zoonotic protozoan parasites, *Cryptosporidium* and *Giardia*, in goats across three distinct agro-climatic zones in Sri Lanka: the wet zone (Kandy), intermediate zone (Badulla), and dry zone (Mullaitivu). A total of 126 fecal samples were collected per rectum from goats aged between 2 to 5 years old during the period from April to July in 2024. Samples were subjected to Sheather's sucrose flotation, and the coverslip washings were screened using Ziehl-Neelsen staining and Iodine staining for *Cryptosporidium* oocysts and *Giardia* cysts respectively. The study found variable prevalence rates across the three zones, with the highest infection rates for *Giardia* 25% in the wet zone, while 12% and 8.33% were detected in the intermediate zone and dry zone, respectively. Prevalence of *Cryptosporidium*, in wet zone and intermediate zone are 16.6% and 20% respectively. None of the samples in the wet zone were positive for the presence of *Cryptosporidium*. No significant difference in *Giardia* positivity across the three zones ($P>0.05$) and a significant difference was observed for the presence of *Cryptosporidium* in different studied agro-climatic zones, ($P<0.05$). Climatic conditions and local farming practices may influence the parasite burden across these regions. These findings underscore the need for further research, enhanced biosecurity measures to prevent meat and water contamination, and farmer education to mitigate zoonotic transmission risks in goats. Identifying specific environmental, climatic, and management factors contributing to parasite prevalence, as well as exploring the role of seasonal variations and potential wildlife reservoirs in the transmission dynamics of *Cryptosporidium* and *Giardia* among livestock in Sri Lanka is both timely and crucial.

Keywords: *Cryptosporidium*; *Giardia*; goats; prevalence; zoonoses

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Paper ID: NSALS '25-098 (Oral)

Effect of Coated Sodium Butyrate (CSB) on growth performances and intestinal health of commercial broilers

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This study evaluated the effects of Coated Sodium Butyrate (CSB) on growth performance and intestinal health in broilers. A total of 360-day-old Ross 308 chicks were assigned to three dietary treatments with six replicates of 20 chicks each: a basal diet without antibiotics (T1), a basal diet supplemented with an Antibiotic Growth Promoter (AGP, Chlortetracycline) (T2), and a basal diet supplemented with CSB (T3). The experiment followed a Randomized Complete Block Design (RCBD) over 42 days. Weekly growth parameters, including body weight, feed intake, weight gain, Feed Conversion Ratio (FCR), and survivability, were recorded. At the end of the trial, gut samples were collected to evaluate intestinal health, including gut length and histopathological features such as villi damage, epithelial changes, inflammatory cell aggregation, and hemorrhages in the mucosa and the submucosa. Histopathological parameters were graded on a severity scale, with "+" indicating mild changes and "+++" indicating severe pathological alterations. Results demonstrated that both CSB and AGP treatments significantly enhanced growth performance (body weight, feed intake, weight gain, FCR, and survivability) and intestinal health parameters (gut length and histopathology scores) (P<0.05). Notably, histopathological analysis revealed that the CSB group exhibited significantly lower cumulative severity scores compared to the AGP group, indicating reduced intestinal pathology. CSB supplementation outperformed AGP in promoting growth and intestinal health, highlighting its potential as an effective and sustainable alternative to AGPs in antibiotic-free broiler production.

Keywords: Antibiotic-free production; broilers; coated Sodium Butyrate; growth performance; intestinal health

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Paper ID: NSALS '25-152 (Oral)

Effect of plant essential oils on pathogens and water quality in swine farm effluents

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An eco-friendly cleaning agent must be developed for swine sheds to minimize the environmental pollution associated with swine farming. Various studies have proved plant-based essential oils possess anti-microbial properties. The objectives of this study were to measure the potential of three plant-based essential oils to reduce the pathogens and improve the water quality in swine farm effluents and compare their effectiveness with a commercially available detergent that is used to clean swine sheds as an initial step of producing an eco-friendly cleaner. Effluent samples were collected from the Horakelle NLDB farm. The effect of Clove oil, Cinnamon oil and Lemon-grass oil in three concentrations of 1500 mg/L, 2000 mg/L and 2500 mg/L on chemical and biological water quality parameters was tested and compared with the same concentrations of commercially available chemical cleaner on those parameters. Total Dissolved Solids (TDS), pH, electrical conductivity, hardness, and alkalinity were checked under physicochemical water quality parameters. Total Plate Count (TPC) and *Escherichia coli* counts were tested under biological water quality parameters. After the tests, when comparing the treatments including the commercial cleaner, the treatments with Clove and Cinnamon showed the most neutral pH values. Cinnamon and Lemon-grass treatments showed the lowest TDS values, and Cloves showed the lowest electrical conductivity values. The treatments with Cinnamon showed the lowest hardness value. There was a significant difference (P<0.05) in TDS, pH, electrical conductivity, and hardness from the control when using essential oils in a 1500 mg/L concentration. The treatments with Cinnamon and Clove showed the lowest values of alkalinity. To get a significant difference (P<0.05) from the control in alkalinity, a concentration of 2000 mg/L had to be used. In addition, among the three essential oils, Lemon-grass oil showed the best anti-microbial effect in total plate count. However, commercial chemical cleaner was most effective against the TPC among all treatments. A 100% anti-microbial effect was demonstrated by all three essential oils and commercial cleaners against *Escherichia coli*. In conclusion, when comparing the three oils, Clove and Cinnamon show the best effects on chemical water quality parameters, while Lemon grass has the best anti-microbial effects.

Keywords: Essential oil; pathogens; swine waste; water quality

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Paper ID: NSALS '25-171 (Oral)

Investigation of pathogen profile, risk factors, antimicrobial resistance, and hematological changes of dairy calves infected with navel infection

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This study investigates the risk factors, pathogen profile, antimicrobial resistance, and hematological changes associated with navel infections in dairy calves at Ambewela dairy farm, Nuwara Eliya, Sri Lanka. The information of total 94 calves diagnosed with navel ill between 2022 and 2024 at Ambewela farm were included in the study to analyze risk factors such as age, sex, breed, and seasonal influences. Umbilical swabs from five severely infected calves currently at farm were collected and subjected to microbiological analysis to identify the pathogen profile. Blood samples were also collected to assess hematological changes associated with navel infection. Results indicated a higher prevalence in Friesian calves (70.21%) compared to Ayrshire calves (29.78%). Male calves were more susceptible (68.08%) than female calves (31.91%), and cases were more common in calves under 30 days old (75.53%) than in those aged 30 days or older. Seasonal peaks were observed in the months of June-July and November-December. Microbiological analysis identified *Staphylococcus aureus*, *Escherichia coli*, and *Proteus spp*. as the primary pathogens associated with navel infection at Ambewela farm. Antimicrobial susceptibility testing revealed high resistance in *Proteus spp.*, particularly to Tetracycline and Neomycin, while *Staphylococcus aureus* showed universal susceptibility. Hematological analysis indicated elevated platelet counts, White Bood Cell (WBC) levels, and Neutrophil counts (72.1%), suggesting an inflammatory response. In conclusion, navel infection was more prevalent among male calves under one month old, particularly in Friesians, with seasonal peaks in June-July and November-December. The study emphasizes the need for targeted antibiotic selection based on resistance profiles to effectively manage navel infection. Further research involving a larger sample size across multiple farms is recommended to validate these findings more broadly.

Keywords: Antimicrobial resistance; dairy calves; navel infection pathogen profile; risk factors

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Paper ID: NSALS '25-201 (Oral)

Tibia characteristics and occurrence of footpad dermatitis in Cobb 500 broiler chickens fed two commercial vitamin-mineral premix mixtures

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This study analyzes the effects of two commercial vitamin-mineral premix mixtures on tibia characteristics and footpad dermatitis in 500 Cobb broiler chickens. Two hundred "Cobb 500" broiler chicks (37.08±0.19 g) were randomly assigned into two groups (Control and Treatment), each having 4 replicates and 25 birds per replicate in completely randomized design. Two groups were administered vitamin-mineral poultry premixes: the control group received mixture A (Zagro), while the treatment group received mixture B (Intraco). Both starter (Vitamin 0.10%, Mineral 0.10%) and finisher (Vitamin 0.05%, Mineral 0.10%) feeding phases were included for the study, which spanned from day 0 to day 36. On day 21 of the experiment, 20 birds per replicate (a total of 160 birds) were randomly selected to assess foot pad dermatitis using the Welfare Quality® Assessment Protocol for Poultry. Following slaughter, two left drumsticks were randomly selected from each replicate (8 drumsticks per treatment) and chilled at -18°C in a blast freezer for subsequent tibia analysis. Data was analyzed using a Complete Randomized Design at $P<0.05$ significance level. The results revealed that the tibia ash percentage was significantly higher in the treatment group compared to the control group ($P=0.003$). There was no significant difference in tibia weight ($P=0.470$), tibia length ($P=0.072$), and the weight-to-length index ($P=0.972$) between the two treatments. Footpad dermatitis was evaluated using a scoring system based on the presence of no, mild, moderate, or severe lesions. At the beginning of the experiment, no foot pad dermatitis was observed in any birds. On day 21, no severe lesions were detected in either group. There were no significant differences in the occurrence of no lesions (control: 90%, treatment: 85%, $P=0.207$), mild lesions (control: 11.25%, treatment: 7.5%, $P=0.320$), or moderate lesions (control: 3.75%, treatment: 2.5%, $P=0.670$) between the groups. The findings of this study indicate that vitamin-mineral premix mixtures (A) and (B) exert comparable effects on footpad dermatitis and tibia characteristics in Cobb 500 broilers. However, broilers fed with mixture B (Intraco) demonstrated a significantly higher tibia ash percentage compared to the control group. These findings support the incorporation of novel vitamin-mineral premix mixtures into broiler diets, offering potential benefits for feed formulation.

Keywords: Ash percentage; Cobb 500 broilers; footpad dermatitis; tibia characteristics; vitamin-mineral premix

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Paper ID: NSALS '25-216 (Oral)

Consumer perception and purchasing intention on welfare-friendly meat products in Galle district

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The consumption of welfare-friendly products is rising daily among the global population, driven by concerns regarding farm animal welfare and non-communicable diseases. However, consumers in Sri Lanka exhibit a lack of knowledge concerning welfare-friendly products. A survey was conducted in the Galle district utilizing a simple random sampling method across 17 divisional secretariat areas. The study involved 280 customers from supermarkets and grocery stores and was designed to assess purchasing intentions for welfare-friendly meat products, with a 95% confidence level applied to the analysis. The chi-square test was used to analyze the influence of demographic variables on awareness and purchasing behavior related to welfare-friendly meat products. The data were analyzed descriptively using Microsoft Excel (2016). A total of 81% of respondents indicated that they were unaware of farm animal welfare, while 85% of respondents reported a lack of awareness regarding welfare-friendly meat products. Among the total respondents, 81% expressed a willingness to purchase welfare-friendly meat products once they turned available in the market. Among the respondents, 59% expressed a desire to pay a premium for such products. Additionally, 33.1% of respondents were willing to pay a 1-3% price increase for welfare-friendly meat products. Among the total respondents, 38.4% indicated they would not be willing to pay an additional amount for welfare-friendly meat products. Among the total respondents, 71.1% believe that welfare-friendly meat products are healthier and of superior quality. A majority of respondents (96%) preferred purchasing fresh meat over processed meat if welfare-friendly meat products become available in the market. The findings provide valuable insights for developing marketing strategies to promote welfare-friendly meat products and enhance purchase intention among Sri Lankan consumers.

Keywords: Animal welfare; consumer perception; purchasing intention; welfare-friendly meat

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AQUATIC SCIENCES

NSALS '25-031	**Abundance and variation of pathogenic bacteria in coral mucus from the Pareiwella reef, Tangalle, Sri Lanka** *A.M.W.S. Alahakoon, Y.M.H.C.K. Samaradiwakara, S.S.L.H. Rosa, M.F.M. Fairoz*	**94**
NSALS '25-036	**Abundance and distribution of microplastics in surface sediment of Negombo lagoon, Sri Lanka** *M.S. Marapana, B.M.C.A. Bandara, W.K. Suwandahannadi, H.P.T.S. Hewathilake, P.B.T.P. Kumara, K.P.G.K.P. Guruge*	**95**
NSALS '25-037	**Microplastic pollution in mangrove sediments around Negombo lagoon, Sri Lanka** *B.A.A.D. Bamunuarachchi, B.M.C.A. Bandara, W.K. Suwandahannadi, P.B.T.P. Kumara, K.P.G.K.P. Guruge*	**96**
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Paper ID: NSALS '25-031 (Oral)

Abundance and variation of pathogenic bacteria in coral mucus from the Pareiwella reef, Tangalle, Sri Lanka

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Coral produces mucus as a nutrient source and protective barrier in symbiosis with zooxanthellae. Organic matter in mucus fosters bacterial growth and overfishing and eutrophication promote pathogenic bacteria in coral mucus, negatively impacting coral health. This study investigated the prevalence and abundance of pathogenic bacteria genera such as *Vibrio, Shigella, Salmonella, and Escherichia* in coral mucus collected from three coral genera: *Acropora, Montipora, and Pocillopora* in the Pareiwella reef. Coral mucus samples were cultured using Xylose Lysine Deoxycholate (XLD) and Thiosulfate Citrate Bile Salts Sucrose (TCBS) agar to identify and count bacterial colonies. TCBS agar was used to isolate and quantify *Vibrio* species, while XLD agar was employed to detect and enumerate *Salmonella, Shigella, and E. coli* colonies. Colony counts, expressed in CFU (colony-forming units), were further analyzed to calculate the Coral Health Index (CHI). Samples were collected from four colonies per coral genus at five random locations within Pareiwella reef in October 2023 and January 2024. The mucus was harvested using the air exposure method and collected into sterile tubes. After collecting, the samples were stored in an icebox to prevent degradation and transported to the laboratory. The volume of 500 µL of mucus from each sample was plated onto pre-prepared culture media and incubated at room temperature for 24 hours. This procedure was repeated for every sampling day. The CFU counts were recorded and analyzed with a one-way ANOVA test using Minitab version 19. The study revealed that *Pocillopora* exhibited the highest CFU counts for *Vibrio* (238±75/mL) and *Salmonella* (4±1/mL), while *Montipora* showed the highest CFU counts for *Shigella* (120±15/mL) and *E. coli* (290±20/mL). Significant variations in microbial colonization among the different coral genera were observed as follows: *Shigella: Montipora* > *Acropora* > *Pocillopora* (P=0.03), *Vibrio: Pocillopora* > *Montipora* > *Acropora* (P=0.00), *Salmonella: Pocillopora* > *Acropora* > *Montipora* (P=0.00), *E. coli: Montipora* > *Acropora* > *Pocillopora* (P=0.00). The CHI, calculated based on *Vibrio* counts, approached 0.98, indicating a healthy reef status. Future research should increase sample replication for more reliable findings.

Keywords: *Acropora;* colony-forming units; coral health index*; Montipora; Pocillopora*

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Paper ID: NSALS '25-036 (Oral)

Abundance and distribution of microplastics in surface sediment of Negombo lagoon, Sri Lanka

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Microplastics (MPs, particle size<5 mm) have been identified as a threat to aquatic ecosystems, including lagoons. However, the evaluation of MPs in Sri Lankan lagoons is limited. Therefore, this study was designed to assess the abundance and characteristics of MPs in surface sediment of the Negombo Lagoon, Sri Lanka. Samples were collected at six inlets to the lagoon (Dutch canal, Hamilton canal, Kuda Ganga, two canals from the industrial zone and hospital zone and Dadugama Oya), and lagoon mouth, and from a location within the lagoon towards the north-west direction. Surface sediment samples (sediment depth<30 cm) were collected using a metal shovel during the first inter-monsoon, 2024. Three replicates of oven-dried surface sediment samples from each location (200 g DW/replicate) were subjected to NaCl (density 1.2 g/mL) based density separation and organic matter digestion with 10% KOH. The abundance, size, shape, and color of the extracted MPs were observed under a stereomicroscope. The polymer compositions of MPs were analyzed using Attenuated Total Reflectance-Fourier Transform Infrared (ATR-FTIR) spectroscopy. MPs abundance in surface sediment ranged from 30.83±5.06 particles/kg DW (location within the lagoon) to 1466.67±104 particles/kg DW (Kuda Ganga) with a spatial variation in MPs abundance among the sampling locations (One-way ANOVA, P<0.05). It reflects the influence of direct and indirect pollution sources of varying magnitudes, and hydro-dynamic properties of the lagoon. The most abundant MPs size and color in Negombo lagoon surface sediment samples were large (1.1–5 mm; 54.45%) and white (55.07%), respectively. Fibers were the dominant microplastic type (31.18%), followed by foam (30.13%), pellets (21.09%), fragments (16.37%), and films (1.22%). The most abundant polymer types were polyethylene (56.67%), followed by polypropylene (26.67%) and polystyrene (12.22%) indicating the potential influence of improper disposal of packaging materials, fishing industry waste and the MV-Xpress pearl ship accident. Our study confirmed that MPs are deposited in Negombo Lagoon surface sediments. Implementation of effective plastic waste management and establishing robust monitoring are recommended to control MPs pollution in the Negombo lagoon.

Keywords: Inter-monsoon; marine debris; microplastic pollution; plastic waste; X-Press pearl ship

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Paper ID: NSALS '25-037 (Oral)

Microplastic pollution in mangrove sediments around Negombo lagoon, Sri Lanka

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Mangrove ecosystems are highly vulnerable to Microplastics (MPs) pollution, as mangroves and waterlogged sediments are considered MP sinks. However, studies on microplastic pollution in mangrove surface soil in Sri Lanka are limited. Therefore, this study was designed to evaluate microplastic pollution in the surface sediments (depth <10 cm) of mangrove patches around the Negombo Lagoon. Five mangrove patches, including Dadugama Oya, Kadolkele, and three islands in the Negombo Lagoon, were randomly selected. Three sampling plots (area ~10 mx5 m/plot) were randomly deployed at each site. Approximately 1 kg of surface soil was collected from each plot following a 5-point method. Saturated NaCl (density, 1.2 g/cm^3) and 10% KOH were added to 200 g of oven-dried sediment samples for the density separation of MPs. The size, color and shape of MPs were observed under the stereo microscope. The hot needle test was done for primary verification of MPs, and Attenuated Total Reflectance-Fourier Transform Infrared (ATR-FTIR) spectroscopy was used for polymer identification. There was a spatial variation in MPs abundance in the surface soil in the Negombo mangrove forest (One-way ANOVA, P<0.05). The highest microplastic abundance was recorded at the Kadolkele mangrove site (22.96±6.70 particles/kg m² DW), where anthropogenic activities are prevalent. Dadugama Oya mangrove site had the lowest MPs abundance (7.67±2.28 particles/kg m² DW), which is an isolated mangrove patch. The average MPs abundance within the five locations in the Negambo mangrove forest was 12.86±1.93 particles/kg m^2 DW. In all locations, small (0.1-1 mm) MPs were dominant (74.97%). The most abundant color was blue (40.43%), followed by white (30.22%), black (14.38%), turquoise (7.34%), red (3.50%), transparent (2.51%) and green (1.62%). Fiber was the dominant microplastic type (61.81%) in all locations over pellet (18.36%), fragment (8.66%), foam (7.81%), and film (3.55%). The dominant polymer type was low density polyethylene (68.18%). Improper disposal of fishing nets, domestic and industrial plastic wastes, and MV-X press pearl ship accidents are potential MPs sources in the Negombo mangrove forest. This study highlights the level of MPs contamination in the surface soil of mangrove patches around the Negombo lagoon. Continuous monitoring of microplastic pollution in mangroves is important for managing MPs pollution in the coastal zone of Sri Lanka.

Keywords: Blue; mangrove; microplastics; spatial variation; surface sediment

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Paper ID: NSALS '25-061 (Oral)

Analysis of the level of farmers' Knowledge, Attitude, and Practices (KAP) on seaweed farming in Northern province, Sri Lanka

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Small scale seaweed farming is continuously, evolving as a significant income source for the coastal communities in Northern province, Sri Lanka. Since the farmers are one of the most significant stakeholders in the plant-based cultivation industry, this study focused on assessing the levels of Knowledge, Attitudes, and Practices (KAP) of seaweed farmers across the districts of Jaffna, Kilinochchi, and Mannar in Sri Lanka. A structured questionnaire was administered to 132 farmers, representing 30% of the farming population in each district. The major sections surveyed under each category (Knowledge, Attitude, and Practices) include understanding of cultivation techniques, economic impacts of seaweed farming, and the use of best management practices. The KAP index was computed using IBM SPSS (23.0) statistics and Microsoft Excel (2019), with three scores; "Good" (≥75%), "Fair" (50-74%), and "Poor" (≤49%). Overall KAP scores fell within the "Fair" range of 50-74% in all districts. Overall, farmers in Kilinochchi district achieved the highest knowledge score at 60.22%, while Jaffna and Mannar exhibited significantly lower results, showing "Poor" knowledge with levels of 46.02% and 43.03%, respectively. A predominant positive attitude towards seaweed cultivation was observed across all three districts, with an average of 68.76%, exhibited low trend variations. However, the study surveyed various best management practices but focused on disease management, which showed significant gaps, especially in Mannar and Jaffna, where farmers struggled with identifying and managing seaweed diseases. Statistical analysis using one-way ANOVA indicated that the Kilinochchi district showed significantly higher KAP scores ($P<0.05$) in comparison to Mannar and Jaffna districts. These findings highlight the need for focused educational initiatives, especially in Jaffna and Mannar districts, to address the knowledge gap and enhance seaweed farming practices. Focused efforts such as enhanced training programs, new farming techniques, and improved resource access are essential to elevate farming practices. Addressing these areas can significantly boost production in seaweed farming, leading to improved livelihoods and economic development of the local community.

Keywords: Coastal communities; knowledge, attitude and practices index; seaweed cultivation; seaweed farmers; Sri Lanka

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Paper ID: NSALS '25-063 (Oral)

Phytochemical composition of brown seaweed species *Sargassum polycystum* and *Padina antillarum*

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There is a growing interest in phytochemicals extracted from seaweeds. Brown seaweeds are rich in bioactive compounds that exhibit anticancer, antidiabetic, and antioxidant properties, making them valuable for applications in the food, pharmaceutical, and cosmetic industries. This study was conducted to analyze the phytochemical composition of brown seaweed species, *Sargassum polycystum* and *Padina antillarum*. *S. polycystum* and *P. antillarum* were collected from Dickwella and Negombo areas from April and May 2024. Both seaweed species were cleaned, oven dried (40℃ for 12 hours) and extracted using Ultrasound-Assisted Extraction (UAE) method. Trace elements including heavy metals were analyzed using Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES). The extractions of two seaweed species were analyzed separately for tannins (Spectrophotometry), total flavonoids (Aluminum Chloride method), Fucoidan (Colorimetric method), Fucoxanthin (HPLC), total phenolic (Folin-ciocalteu method) and radical scavenging activity (DPPH method). Heavy metals and trace metals were below the certified levels in both species. *S. polycystum* had contents of tannins (20.74±1.06 mg RE/g DW), Flavonoid (11.69±0.57 mg RE/g DW), Fucoxanthin (0.34±0.02 mg/g), Fucoidan (0.23±0.07 mg/g) and total phenolic content (0.31±0.00 mg GAE/g DW) while *P. antillarum* had the same phytochemicals at levels of 25.46±2.52 mg RE/g DW, 13.80 ±0.28 mg RE/g DW, 0.36±0.05 mg/g, 0.14±0.04 mg/g and 0.47±0.01 mg GAE/g DW, respectively. *P. antillarum* showed significantly higher DPPH radical scavenging activity (34.11±0.21%) compared to *S. polycystum* (30.94±1.17%) (P<0.05). There were no significant differences in Fucoxanthin and Fucoidan contents among the two species (P>0.05). *P. antillarum* has a high content of tannin, flavonoids and phenolic content. Results revealed that both tested seaweeds contain considerably higher levels of phytochemicals indicating their potential health benefits. Further studies can be conducted to examine the phytochemical composition of these brown seaweed species cultivated under the same environmental condition.

Keywords: Fucoidan; fucoxanthin; HPLC; phytochemicals

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Paper ID: NSALS '25-065 (Oral)

Post-harvest fish handling practices and quality loss analysis at Gurunagar fishing village, Jaffna district, Sri Lanka

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Fish post-harvest loss is a critical issue threatening global food security, economic stability, and resource sustainability, particularly in coastal communities. Gurunagar fishing village in Jaffna, Sri Lanka, is an important coastal fishing center, that supports local fishermen's livelihoods and contributes to the region's seafood production. However, the post-harvest fish handling practices and quality loss had not previously been assessed, leading to the conducting of a survey and sensory analysis to address this gap. Primary data on fishing practices, fish handling practices, fish species, and marketing systems were collected from 150 individuals using a semi-structured questionnaire and individual interviews from March to July 2024. A sensory-based assessment tool was also used to quantify quality loss in fish. Secondary data was obtained from the Department of Fisheries and Aquatic Resources and journal articles. Data was statistically analyzed using SPSS. Results revealed the major reasons for fish spoilage comprised 25.3% due to inadequate use of ice, 20% from damage during unloading and sorting, and 13.3% from bycatch species. The fish were initially fresh at the landing site, exhibiting a lower quality loss of 11.11±4.35%; however, as the day progressed, this loss increased to 11.67±6.25% at the auction place, and ultimately to 13.33±5.33% at the fish market. This contributed to an overall quality loss of approximately 31.95%, resulting in a deterioration of fish quality that renders an estimated 917 tons of fish annually unfit for premium markets, leading to an estimated financial loss of LKR 480 million annually. Most fish at the market level crossed defect points ≥3.3 due to poor handling practices in unhygienic conditions. Survey data from fish sellers revealed that 76.67% of unsold or low-quality fish were used in dry fish production. Education levels of fishermen and fish sellers, along with their experience, fishing duration, types of fishing crafts used, personal hygiene, and awareness of fish handling practices, significantly influenced post-harvest quality loss ($P<0.05$). Initiatives are encouraged to improve infrastructure and storage facilities for small-scale fisheries, develop supportive policies, and provide training to fishermen and sellers to enhance livelihoods while reducing post-harvest fish losses.

Keywords: Fishermen; quality loss; seafood; sensory; small scale fishery

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Paper ID: NSALS '25-085 (Oral)

Automated quality grading of processed *Holothuria scabra* using deep learning and image processing techniques

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Sea cucumbers, essential marine organisms with significant ecological and economic importance, are increasingly being exported from Sri Lanka for high prices. However, the quality assessment during post-processing heavily relies on manual grading processes. This manual grading is highly dependent on individual expertise, leads to inconsistencies in grading, which can adversely affect the export quality of *Holothuria scabra*, a commercially important species of bêche-de-mer. This study focuses on developing an automated grading system for processed *Holothuria scabra* using image processing and deep learning techniques, utilizing primary images to ensure robustness and reliability. The system was designed to classify processed *Holothuria scabra* into three quality grades Class A, Class B, and Class C based on their major visual attributes such as width, height and color. To identify the attributes, YOLOv8 was used to create a bounding box on the images and capabilities of OpenCV, NumPy, and Pandas libraries were leveraged. A deep learning model utilizing a Convolutional Neural Network (CNN) was developed for feature extraction and classification. For enhanced performance, CNN was integrated with a Long Short-Term Memory (LSTM) network, creating a hybrid model to capture spatial and temporal features from sequential image data. After 50 epochs, the model achieved approximately 91.73% accuracy on the training dataset and over 90.50% accuracy on the validation dataset. The average demarcations for each class are as follows: Class A has an average width of 20.48–24.98 mm, a height of 85.14–94.93 mm, colors in Licorice (#1a1110) and Sandy Taupe (#967117); Class B has an average width of 20.11–29.32 mm, a height of 75.30–84.83 mm, colors in Dark Gray (#a9a9a9) and Bistre (#3d2b1f); and Class C has an average width of 21.54–25.44 mm, a height of 76.50–80.41 mm, and colors in Jet (#343434) and Raw Umber (#826644). These results demonstrate the effectiveness of integrating deep learning and image processing techniques for automating the grading process of *Holothuria scabra*. The developed system not only provides an efficient and accurate approach for quality assessment but also supports the sea cucumber industry in Sri Lanka by improving post-processing evaluations and reducing reliance on manual expertise. This automation has the potential to enhance operational efficiency and ensure consistent export quality, benefiting both processors and exporters.

Keywords: Bêche-de-Mer, convolutional neural network, *Holothuria scabra,* quality grading system, YOLOv8

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Paper ID: NSALS '25-102 (Oral)

Assessment of heavy metal concentrations in the water, plankton, sediments, and food fish of Beira lake, Sri Lanka

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Many freshwater reservoirs are contaminated with industrial waste, including heavy metals such as Cr, Cd, Cu, and Mn. These heavy metals can accumulate in aquatic biota such as fish, aquatic plants, plankton, water and sediments with different concentrations, which can affect the health of humans and freshwater ecosystems. Beira lake is identified as the main reservoir in the Colombo municipal region, which is highly contaminated with polluted effluents. The main objective of this study is to assess the total concentration levels of specific heavy metals in *Oreochromis* sp*,* plankton, water, and sediments from six selected sampling sites of the Beira lake. This study was based on four replicates each of sediments, plankton, and water samples from six selected sites of Baira lake and fish samples were collected from all available fish landing sites (two sites). The four selected heavy metals' (Cr, Cd, Cu, and Mn) concentrations available in four samples were assessed using an Atomic Absorption Spectrophotometer (AAS) and statistically analyzed using one way ANOVA. The mean concentration of Cr (0.001224 mg/g) was significantly higher (P<0.05) in sediments, and the lowest average concentration (0.000347 mg/g) was in the flesh of *Oreochromis* sp., indicating that Cr concentration was lower in the aquatic life than in the sediments. All types of samples showed relatively lower Cd concentrations. *Oreochromis* sp. showed a relatively lower concentration of Cd (<0.00001 mg/g) which is not at a harmful level for human health. Average Cu concentrations in sediments were significantly higher: 0.000686 mg/g (P< 0.05) while accumulation of Cu in aquatic organisms was found to be relatively lower. The highest Mn concentration (0.000880 mg/g) was observed in the sediments while fish and plankton showed lower levels, indicating that Mn has a greater tendency to precipitate in the sediments than in aquatic organisms. The findings highlight that the accumulation levels of heavy metals in fish are lower compared to other samples. However, continuous consumption of fish from the Beira lake could lead to the accumulation of heavy metals in the human body. This study highlights the critical need to strengthen pollution control measures and to implement regular monitoring of heavy metal contamination in the Beira lake. These actions are essential to mitigate the risks posed to both human and ecosystem health in the region.

Keywords: Beira lake; freshwater reservoirs; heavy metals; industrialization

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Optimization of the higher stocking density of Green cobra (*Poecilia reticulata*) in aquaponics system with *Echinodorus harbich*

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Guppy fish is one of the highly demanded fish in the ornamental industry. Their production level is crucial in the export market. Fry rearing density recommended by NAQDA, for grow out phase one was 20/ft² in Sri Lanka. Fish and aquatic plant production efficiency can be affected by increasing recommended stocking densities of fish in a controlled environment. Therefore, this research study was conducted to compare the effect of the stocking density on growth performance of *Poecilia reticulata* reared with *Echinodorus harbich* in an aquaponics system. The experiment was conducted for 49 days. Guppy fish with similar mean body size were stocked at four different stocking densities 30 fish/ft² (T1), 40 fish/ft² (T2), 50 fish/ft² (T3), and 20 fish/ft² (control) with three replicates. Water in fish tank was recirculated to hydroponic tanks, where 12 *E. harbich* were grown in net pots on floating Styrofoam boards. Water quality parameters and growth parameters were tested. Data were analyzed using the Turkey pairwise comparison test in Minitab 17 software. However, results that were shown in T2, were significantly higher in weight gain, length gain and specific growth rate of Green cobra ($P<0.05$). T3 has shown significantly higher values in weight gain, length gain, leaf growth and root length gain in *E. harbich*. Availability of suitable level of nitrogenous compounds, plants in T3 treatment have shown high growth performance. Nitrate and Ammonia concentrations were significantly different in T3, and Dissolved Oxygen, pH, temperature ($P<0.05$) and conductivity were not different significantly among treatments ($P>0.05$). Water quality parameters can be enhanced within the favorable range with an aquaponics system. In the aquaponics system, plants are available of nitrogenous compounds for their growth by the absorption of nutrients from fish rearing water while leading to better fish growth. Thereby stocking density of fish can be increased keeping the water quality parameters in a favorable range. This study suggests T2 treatment as the optimum stocking density and commercially advantageous, with the fast harvestable fish growth (within 5 weeks). T3 is better suited for combined plant and fish production, offering satisfactory growth and maintaining favorable water quality.

Keywords: Aquaponics; *Echinodorus harbich*; Green cobra; stocking density

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Paper ID: NSALS '25-110 (Oral)

16S rRNA biomarker designing for shark species identification: Bioinformatics approach

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Sharks, as apex marine predators, are essential for the health and balance of ocean ecosystems, yet they face increasing threats from overfishing, habitat destruction, and illegal finning. Species identification challenges persist due to the higher level of product processing and lack of morphological traits in consumer products. Molecular techniques, specifically DNA barcoding using the 16S ribosomal RNA (rRNA) gene, have become promising alternatives for accurate species identification. This study aimed to design a universal 16S rRNA biomarker to identify various shark species effectively. For this, sequences from 35 shark species across different genera were retrieved from the GenBank database and analyzed for conserved regions with low nucleotide diversity, using MEGA 11 and DnaSP softwares, as suitable primer binding sites ensuring consistent binding across multiple species. Two primer sets from the conserved regions were identified as forward (5'-AACTCCGCCTGTTTACCAAA-3') and reverse (5'-TAGAAACTGACCTGGATTTC-3') universal primers. PCR suitability and thermodynamic properties were tested, affirming the primer pair's robustness under standard conditions without self-annealing or hairpin formation by bioinformatics tools. PCR product size was 664 bp and GC content of forward and reverse primers were 45% and 40% respectively. The annealing temperature was calculated as 51°C. The results highlighted that the 16S rRNA gene contains highly conserved sequences, making it an ideal marker for determining universal primers, while specific variable regions allowed interspecies differentiation. These conserved regions, characterized by minimal nucleotide variability, were identified as potential targets for designing universal primers. These findings suggest that the designed primers provide a reliable tool for shark species identification, applicable in biodiversity monitoring, conservation efforts, and combatting illegal wildlife trade.

Keywords: 16S rRNA; biodiversity conservation; DNA barcoding; molecular markers; shark identification; universal primers

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Paper ID: NSALS '25-111 (Oral)

Development of micropropagation protocol for *Anubias barteri* var. *nana* 'Golden' (Anubias Golden)

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Anubias barteri var. *nana* Golden is one of the highly valued and demanded plants in ornamental aquatic plants industry due to its vibrant color and hardness. However, its very slow growth rate limits large scale production. Micropropagation offers a promising solution to increase production, but suitable protocols for this variety are currently limited. This study aimed to develop a micropropagation protocol for *A. barteri* var. *nana* 'Golden' for initiation stage and determine the most suitable explant type for tissue culturing purposes. The main explants used for the study were shoot tips, rhizome buds and leaf parts. Surface sterilization was done using running tap water, liquid detergent, 0.1 and 0.2% (w/v) Mercuric Chloride and 20% (v/v) commercial Clorox solution with tween twenty for the mother plants before initiation. Treatments were prepared using Murushige and Skooge medium, which contained different concentrations of 6-Benzylaminopurine (BAP) and 1-Napthaleneacetis acid (NAA). For the initiation, three treatments for shoot tips (1 mg/L of NAA+1.5 mg/L of BAP, 1 mg/L of NAA+3 mg/L, BAP and 1 mg/L of NAA+4.5 mg/L of BAP), three treatments for rhizome buds (0.45 mg/L of NAA+1.5 mg/L of BAP, 0.45 mg/L of NAA+3 mg/L of BAP and 0.45 mg/L of NAA+4.5 mg/L of BAP) and four treatments for leaf parts (0.5 mg/L of BAP+2 mg/L of NAA, 0.5 mg/L of BAP+3 mg/L of NAA, 1 mg/L of BAP+2 mg/L of NAA, and 1 mg/L of BAP+3 mg/L of NAA) were applied. After three months, out of all explants only shoot tips exhibited growth, while rhizome buds and leaf parts showed no development. Growth parameters including number of leaves and roots, length of the leaves and roots (cm) and overall plant height (cm) were recorded for the shoot tip cultures. Statistical analysis revealed no significant differences (P>0.05) among the shoot tip treatments. The shoot tips were found to be the most effective explant for initiating *A. barteri* var. *nana* 'Golden' cultures out of the selected explants in this study.

Keywords: Anubias Golden; aquatic plants; leaf parts; micropropagation; rhizome buds; shoot tips

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Increasing the stocking density of Glow tetra (*Gymnocorymbus ternetzi*) by improving the water quality

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This study investigates the effects of increasing the stocking density of Glow tetra (*Gymnocorymbus ternetzi*) on water quality, using a basic filtration system to maintain optimal conditions. Higher stocking densities often lead to deteriorating water quality, which can negatively affect fish health and survival. The objective of this research was to develop a simple, effective, less expensive filtration system that could mitigate these effects and maintain water quality in high-density ornamental fish farming. The experiment was conducted using 12 (1.22 m×1.22 m×0.381 m) cement tanks, divided into four groups with different stocking densities: 200 (control), 250, 300, and 400 fish per tank. A filtration system, consisting of filter sponges, filter wool, ceramic rings, ceramic bars, and activated carbon, was installed in each experimental tank with three replicates. The control tanks were left unfiltered. Key water quality parameters, including Ammonia, Nitrate, and pH, were monitored over a 1-month period of the study. Fish growth was assessed through weekly measurements of weight and length, while daily mortality rates were recorded. The results demonstrated that the filtration system was highly effective in maintaining water quality in the experimental tanks, particularly in those with higher stocking densities. Ammonia retained 0 ppm on all the tanks, even increasing the stocking density. The pH (6.17-7.67) and Nitrate (0.33-4 ppm) levels were maintained well below the harmful levels across all the tanks, even with double the stocking density. The mortality rate in the control group was 1.83%, whereas the mortality rate in the experimental tanks was remarkably low at 0.11%. Fish in the experimental groups showed consistent growth (weight gain 0.48±0.03 g/month; length gain 2.17±0.33 cm/month) with no significant differences in weight gain or length across varying stocking densities (P>0.05). These findings indicate that this filtration method can enhance water quality and reduce fish mortality, thereby supporting higher stocking densities in ornamental fish culture.

Keywords: Fish density; fish growth; filtration method; ornamental fish culture

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Paper ID: NSALS '25-113 (Oral)

Synergistic effects of probiotic *Bacillus clausii* and ginger (*Zingiber officinale* Roscoe) incorporated diets on the growth, survival, and health of *Catla catla*, within the context of a 60-day feeding trial

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Catla catla, prominent species in the Indian major carp polyculture system. However suboptimal survival rates (below 50%) during early life stages in tropical regions due to nutritive deficiencies and underdeveloped immunity, undermine production sustainability. The aquaculture industry seeks sustainable alternatives to antibiotics, focusing on prophylactic and therapeutic feed additives. Yet, limited knowledge and underutilization of nutritive feed ingredients hinder immunity development and optimal growth during early ontogeny. Current study explores the combined supplementation effects of probiotic *Bacillus clausii* (P) and ginger (G) on survival rates, nutrient absorption, and overall health through 60 days feeding trial conducted during the fry-to-fingerling transition period. It also aims to evaluate whether this combination offers superior benefits compared to individual supplementation. Three types of diets were provided: P+G diet (probiotic *B. clausii* 01×10^7 spores per gram, ginger 10 g per kg), G diet (ginger 10 g per kg), and a control diet. Temporal variations in growth indices and health were measured, with continuous morphometric and internal gut observations. At the end of the trial, P+G diet supplemented fish group achieved high survival rate of 93.1%, while the control diet only 54.4%. Repeated measures ANOVA revealed, with the combined supplementation highest ($P<0.05$) total body weight at the end (1.82±0.13 g) and body weight gain (1.54±0.02 g) were observed. Temporal analysis of length gain reveals an unexpected trend of energy allocation patterns between length and weight ($P<0.05$) in the fish. The study also showed that the P+G diet led to a lower Feed Conversion Ratio (FCR), higher Feed Conversion Efficiency (FCE) in the fish. The P+G supplemented *Catla catla* in the present study exhibited superior growth and survival metrics, achieving a Specific Growth Rate (SGR) of 1.87%, FCE of 63.63%, Condition Factor (CF) of 1.07. These results surpassed the performance of both naturally sourced and hatchery-reared counterparts. Continuous observations indicated fewer skeletal deformities and parasitic infections in the incorporated diet systems compared to control group. The findings indicate that combined probiotic and herbal supplementation is a sustainable alternative to antibiotics in aquaculture, enhancing survival, nutrient absorption, and overall health in *Catla catla* during early life stages.

Keywords: *Bacillus clausii*; immunostimulation; integrated supplementation; probiotics; skeletal deformities; sustainable aquaculture

Paper ID: NSALS '25-135 (Oral)

The importance of site selection in marine bioindicator studies: A case study of polychaetes in the urban coastal area of Colombo

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Polychaetes are a vital component of soft-bottom macrobenthic communities and serve as key bioindicators for evaluating the health of coastal ecosystems due to their sensitivity to environmental changes, abundance, and habitat-specific responses. This study investigates the influence of site-specific factors on polychaete distribution across three distinct locations in the urban coastal area of Colombo: Colombo harbor, the Kelani river mouth, and the Beira canal opening. These sites experience unique environmental disturbances, including industrial discharges, sewage input, and freshwater influx, which significantly affect benthic communities and ecosystem health. Marine benthic samples were collected using an Ekman grab sampler along a line transect sampling method, with a spacing of 10 meters between each sample collected from the shoreline towards the ocean, extending up to 100 meters (10 sampling points at each location). A total of 143 polychaete individuals, representing 11 families, were identified across the three sites. Both Colombo harbor and the Beira canal exhibited dominance by pollution-tolerant families. Colombo harbor was predominantly characterized by Capitellidae, indicative of organic enrichment from port activities. In contrast, the Beira canal opening was dominated by Spionidae, a family known to tolerate pollution, but with lower species diversity, likely due to additional environmental stressors such as freshwater inflow. Polychaetes were absent at the Kelani river mouth, which may be attributed to the large volume of freshwater entering the coastal zone, disrupting salinity levels critical for marine species. These findings highlight the importance of environmental variables, particularly salinity and organic matter content, in shaping polychaete distribution and abundance. Furthermore, the absence of polychaetes at certain sites illustrates the challenges of environmental monitoring in such coastal ecosystems, emphasizing the need for strategic site selection in bioindicator studies. Understanding the local environmental conditions and polychaete community structure is essential for accurate interpretations in coastal monitoring. This knowledge may contribute to developing effective management strategies for urban coastal ecosystems, ensuring long-term sustainability.

Keywords: Coastal monitoring; environmental assessment; freshwater influx; marine polychaetes; urban

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Weathering of plastic pellets under ambient condition in a selected fluvial system: A preliminary study

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The plastic debris accumulation in the environment has been continuously increasing over the past decade. In tropical climates, environmental plastic degradation is induced by UV exposure, and prevailing temperature. Most plastic weathering studies have been carried out under simulated, laboratory conditions to identify the changes in physicochemical properties of polymers. However, the weathering process of plastic debris under natural, tropical environment is not adequately studied. Hence, the current study was carried out to understand short term potential physicochemical effects of common polymers under prevailing environmental conditions in a freshwater ecosystem, Badulla, Uva province, Sri Lanka. Virgin, commercial level Polyethylene (PE) and Polypropylene (PP) pellets were deployed within a floating experimental setup in a Rambukpotha stream: micro-catchment basin in the Badulu Oya for six weeks. Exposed pellets were analyzed weekly for weathering-related changes in surface oxidation by Fourier-Transform Infrared (FTIR) spectroscopy using chemical bond indices (Hydroxyl, Carbonyl, and Carbon-Oxygen). Qualitative observation of polymer surface was also examined to identify the level of degradation. The surface morphology of both polymers was clearly changed by increasing yellowness, discolorations and grooves with the exposure time. We observed the clear changes in chemical bond structure due to surface oxidation process by inclusion of Oxygen into the polymer chain of PE (Hydroxyl: 0.0272-0.5524, Carbonyl: 0.0287-0.4308, and Carbon-Oxygen 0.0610-1.7254) and PP (Hydroxyl:0.0700-0.6592, Carbonyl: 0.0902-0.5016, and Carbon-Oxygen: 0.1576-2.1720). Photooxidation could induce the physical and chemical changes of these polymers under the effect of UV radiation. During the study time, the average UV index was recorded as 1.6786±0.328. However, the changes in weight, yellowness level and chemical bond indices of both polymers appeared to be nonlinear during the experimental period. The reverse weathering process could be one of major reasons for the nonlinear pattern of the current results. As a preliminary experimental study, these findings highlight the surface oxidation and weathering of PE and PP polymers even short exposure to UV radiation. The current study recommends the studies on prolonged weathering of microplastics under tropical climate to understand the final fate of environmental plastics in future.

Keywords: Chemical bond indices; plastic debris; surface morphology; ultraviolet solar radiation; weathering

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Paper ID: NSALS '25-167 (Oral)

Influence of sediment composition on marine polychaete distribution in selected locations along the Southern coast of Sri Lanka

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Marine polychaetes are valuable indicator species for evaluating environmental health in coastal ecosystems, making it essential to examine their distribution patterns. This study investigated the relationship between sediment composition and polychaete distribution at three ecologically significant sites along the Southern coast of Sri Lanka: Galle harbor, Unawatuna beach, and the Gin river mouth. These locations were selected for their varying degrees of environmental disturbances, influenced by both natural and anthropogenic activities, which provide diverse conditions critical for understanding polychaete-sediment interactions. Ten benthic sediment samples were collected from each location using the line transect method and benthic grab sampling techniques, utilizing an Ekman Grab sampler. Polychaetes were identified up to the species level based on morphological characteristics, and the sediment samples were analyzed for grain size using the wet sieving method. The results indicated distinct sediment compositions across the three sites. Galle harbor, with a muddy substrate (19.94% of mud), is possibly influenced by harbor activities and other anthropogenic activities, leading to a high percentage (38%) of *Exogone naidina*, a species adapted to mud surfaces suitable for its feeding habitat. Unawatuna beach featured a gravelly-sandy substrate (51.68% of gravel, 47.96% of sand) and was dominant with polychaete species such as *Aricidea wassi cf*. (32%) and *Sphaerosyllis hystrix cf*. (24%) adapted to this sediment type. Gin river mouth, dominated by sandy substrates (92.25% of sand), showed relatively small number of polychaetes (*Cirratulus cirratus*=3, *Ophelina acuminata*=3, *Glycera lapidum*=2, *Polydora* sp. *cf*.=1), likely due to freshwater influx and sedimentation from soil erosion. Findings reveal that polychaete distribution patterns are influenced by the composition of sediment types, with variations reflecting differences in feeding, burrowing, and habitat requirements. As vital bioindicators, polychaetes respond to sediment characteristics, underscoring the importance of incorporating these factors into biological assessments. This study provides baseline data for coastal conservation, supporting the sustainable management of marine resources along the Sri Lankan coast.

Keywords: Bioindicators; environmental health; marine polychaetes; sediment analysis; Southern coast of Sri Lanka

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Paper ID: NSALS '25-173 (Oral)

Developing a new integrated Water Quality Index (WQI) for Sri Lanka to assess drinking water sources

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The Water Quality Index (WQI) method was introduced to represent water quality with a single numeric value. A WQI indicates the water quality level by combining different water quality parameters. This study addresses a critical need to communicate water quality simply by developing a reliable new WQI to assess drinking water sources in Sri Lanka. Four hundred and eighty-eight (488) sample data points with 10 water quality parameters based on the availability of the data (pH, turbidity, temperature, hardness, conductivity, Nitrate, *E. coli*, total coliform, Fe, and F) in the Southern province have been used to develop this index for the Sri Lankan context. Under the methodology, water quality parameter values were initially converted into a common scale using water quality standard reviews, local standards, and health concerns. After that, the raw water quality parameters were categorized using the factor analysis method, where each factor was identified based on the variance and factors that had an Eigenvalue greater than one. Within each factor, the parameters were identified based on the rotation component matrix value. A range from 0 to 5 was used, with quality status ranging from 'very poor' to 'excellent'. The result of the factor analysis from this converted data was used to develop the WQI equation. The index score ranged from 'very poor' to 'very good' in five categories, like the guidelines in the Canadian WQI manual as it was the most available and widely used manual in the world. The comparison of the results between the two methods (Canadian and New) revealed a 54.4% similarity in the water quality recorded by both methods. It was found that there were slight parameter failures in water sources from the Southern province recorded as 'very good' to 'medium', while considerably higher parameter failures were recorded in water sources as 'poor' to 'very poor' according to the developed scale values. It is recommended to have a data set where the weight change in the factor analysis is negligible and to incorporate more water quality guidelines or standards in the future where this methodology avoids personal favor in the weighting of parameters and checks the overall quality of the sample rather than parameter failure check compared to other methods.

Keywords: Drinking water source; factor analysis; water quality index; water quality parameters

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Patterns and trends in fish harvest from Senanayake Samudraya, Sri Lanka from 2011 to 2022

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Senanayake Samudraya (Iginiyagala reservoir) is one of the major reservoirs in Sri Lanka that supports enhancing agricultural productivity in the country through irrigation and local fisheries. The National Aquaculture Development Authority of Sri Lanka (NAQDA) facilitates the stocking of freshwater food fish, including Nile tilapia (*Oreochromis niloticus*), Rohu (*Labeo rohita*), Catla (*Catla catla*), and Mrigal (*Cirrhinus mrigala*) in the reservoir to strengthen its fishery. The current study analyzed the fish harvest from Senanayake Samudraya during 2011-2022, to understand its patterns and trends and the effectiveness of fish stocking in the reservoir. The fish harvest data were obtained from the fishery cooperative bank, Senanayake Samudraya. Data tabulation was conducted using Microsoft® Excel and statistical analysis was done using paired t-test (SPSS ver.27, IBM). Nile tilapia, Mrigal, Rohu and Catla were identified in the harvest as cultured fish. *Puntius sarana, Macrognathus* spp., *Heteropneustes fossilis*, *Ompok bimaculatus*, *Channa striata* (Murrel), *Mistus keletius* and *Labeo heladiva* were identified as non-target fish species. In 2011, the harvest of cultured fish was predominantly Nile tilapia accounting for 78.27% (81.06 tons) of the total yield followed by Catla 17.8% and Rohu 3.93%. This disparity suggests either a competitive advantage for Nile tilapia over the other species or that the stocking practices were skewed in favor of Nile tilapia, possibly due to the higher market demand and/or resilience for adverse environmental conditions. By 2017, Nile tilapia contributed to 39.6% (253.25 tons) of the total yield, followed by Catla (43.5%), Mrigal (16.54%) and Rohu (0.36%). In 2022, the species composition showed 7.2% Nile tilapia (38.22 tons) of the total yield, with Catla dominating (74.74%), followed by Mrigal (11.23%) and Rohu (6.83%). According to the data in 2022, there is a significant shift in the proportions of Catla and Nile tilapia compared to the composition in 2011. The sharp rise of Catla harvest by 2017 is a possible indication that it has emerged as a dominant species in the reservoir, which can be due to its higher adaptability to the tank environment and/or alterations in stocking patterns. The non-target catch indicated a decline over period (P<0.05). The study revealed fluctuation of fish production over time and highlighted the pattern and trends of economically, socially and environmentally viable fish stocking practices in a major Sri Lankan reservoir.

Keywords: Culture-based fish; freshwater food fish; harvesting patterns; non-target catch; Senanayake Samudraya

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Paper ID: NSALS '25-210 (Oral)

Geographical variation in pathogenic bacteria in Bigeye scad (*Selar crumenophthalmus*) along the Western coast of Sri Lanka

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The Bigeye scad (*Selar crumenophthalmus),* is a nutrient-rich fish that is a commonly used in affordable cuisine across Asia, including Sri Lanka. It is typically consumed as curry, but improper preparation or handling can carry a risk of foodborne illness. Fish gut pathogens may affect human health, therefore controlling bacterial contaminations during fish transportation and storage is needed. This study focuses on the effect of geographical variation on three human pathogenic bacteria; Enteropathogenic *E. coli* spp. (EPEC)*, Salmonella* spp. and *Shigella* spp. in the gut of *Selar crumenophthalmus* in Western province costal line of Sri Lanka using microbiological and molecular biological methods. Fresh, five fish samples from each location; Beruwala, Muthuwella and Negombo were collected. The fish were dissected, their guts separated, homogenized and cultured in MacConkey agar. The streak plate method was used for sub-culturing, and thirty-three bacterial colonies were observed. Biochemical tests were conducted using SIM agar test, Simmons citrate and MR-VP tests and resulted in ten suspected isolates. For further confirmation, selective and differential agar, Xylose Lysine Deoxycholate agar (XLD) and Chromogenic *E. coli* agar were used for culturing. The colonies of one Enteropathogenic *E. coli* spp., two *Salmonella* spp. and three *Shigella* spp. were observed as the results. *Shigella* spp. two isolates were sensitive to Chloramphenicol and two *Salmonella* spp. isolates were resistant to all antibiotics (Ampicillin, Chloramphenicol and Erythromycin) in Antibiotic susceptibility test using disc diffusion method. Using QIAGEN kit method, DNA was extracted from bacterial isolates. DNA was quantified using a Nano-drop spectrophotometer. PCR for specific genes (*invA gene, invC gene, bfpA gene, eaeA gene ipaH gene)* was done to confirm the presence of suspected pathogens and bands were observed for *Shigella* spp. (*invC*). The statistical analysis confirmed that there was no significant association between selected pathogens and locations (P>0.05). The overall test results confirmed the presence of suspected pathogenic bacteria in the gut of Bigeye scad fish. Therefore, buying fresh fish will lessen contamination and reduce the risk of infection of foodborne diseases.

Keywords: Bigeye scad; biochemical tests; human pathogenic bacteria; PCR

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Diversity and abundance of cryptofauna associated with coral rubble generated by *Pocillopora* sp. at the selected sites on the Southern coast, Sri Lanka

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Cryptofauna, comprising small and often elusive organisms such as fishes and invertebrates, inhabit the cracks and crevices of dead coral rubble and contribute significantly to coral reef biodiversity. Despite their ecological importance, studies on cryptofauna associated with coral rubble are limited. This study aimed to determine the abundance and diversity of cryptofauna associated with coral rubble fragments derived from *Pocillopora sp*., collected from selected reef sites in Southern Sri Lanka. Coral rubble fragments were collected from Pareiwella, Polhena, and Weligama reefs while snorkeling between November 2023 and January 2024. A total of 12 fragments, each approximately 20 cm² in size, were collected during daylight hours. Four fragments were sampled from each reef to represent different sub-sites within the site. The rubble was gently crushed to extract cryptic organisms, which were subsequently counted and identified to the phylum level using taxonomic guides. The specimens were preserved in 5% Formaldehyde for further analysis. A total of 204 individuals from seven phyla were identified, with Arthropoda being the most abundant phylum of all sites. Using abundance data Shannon-Wiener diversity index (H') was calculated, and spatial variability was assessed using one-way ANOVA. Significant differences in cryptofaunal diversity were observed among the three reef sites ($P \leq 0.05$). Post-hoc analysis revealed that Pareiwella reef exhibited the highest mean diversity (H'=1.12±0.24), followed by Weligama (H'=0.95±0.38) and Polhena (H'=0.50± 0.18). These findings suggest variations in habitat complexity, resource availability, and levels of anthropogenic disturbance among the sites, factors that likely influence the dominance of Arthropoda and their adaptive success in all three cryptic coral rubble environments. The significant spatial variability in cryptofaunal assemblages highlights the importance of implementing site-specific management strategies to conserve these unique communities. Furthermore, the study emphasizes the need for continued research to better understand the ecological roles of cryptofauna in coral reef ecosystems, particularly in nutrient cycling, coral recruitment, and enhancing ecosystem resilience. Long-term monitoring of cryptofaunal communities is essential to assess the impacts of climate change and anthropogenic stressors on coral reef ecosystems and to develop effective conservation strategies.

Keywords: Coral reef; Pareiwella; Polhena; Shannon-Wiener diversity index; Weligama

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A review on the current status of Fish-borne Parasitic Zoonoses (FPZ)

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Diseases or infections that are naturally transmissible from vertebrates to humans and vice versa are classified as zoonoses. Zoonotic diseases are caused by agents, such as parasites, fungi, bacteria, viruses, and unconventional agents. A significant number of marine and freshwater fish species serve as potential sources of medically important parasitic zoonoses. Over half a billion people worldwide are affected by fish-borne helminth parasites alone. Unfortunately, still there are insufficient data available on the influence of human health and economic impact of Fish-Borne Parasitic Zoonoses (FPZ). Therefore, low intentions for research funds are allocated globally even today. This narrative review focuses on zoonotic parasitic diseases that pose serious public health threats world-wide. The objectives are to identify key fish-borne parasitic zoonoses and life cycles, the clinical signs associated with human-infestation, and effective control methods. The fish act as intermediate hosts for the parasites, which humans become definitive hosts upon ingestion. The three major groups of fish-borne parasites are digenetic trematodes, nematodes, and cestodes. These zoonotic infections from helminths species required other mammals to complete their lifecycle. Key trematode families are Opisthorchiidae (e.g., *Clonorchis sinensis, Opisthorchis viverrini*, *Opisthorchis felineus*), Heterophyidae (e.g., *Metagonimus yokogawai* and *Heterophyes heterophyes*), Echinostomatidae (e.g., *Echinostoma hortense* and *Echinochasmus japonicas*), and Paragonimidae (e.g., *P. westermani, P. scrjabini, P. uterobilateralis,* and *P. heterotremus*). The key zoonotic nematode families are Capillariidae (causing Capillariasis), Gnathostomatidae (causing Gnathostomiasis) and Anisakidae (causing Anisakiasis). Additionally, cestodes such as *Diphyllobothrium latum* (Diphyllobothriasis) contribute to zoonotic parasitic infection. Notably, the nematode *Anisakis simplex* is implicated in fishery product allergies. FPZ has significantly expanded beyond its geographical limits due to numerous factors. The transmission of fish-borne parasites is linked to human behavior, especially among communities that consume raw or undercooked fish. Traditional Thai dishes, including koi-pla, pla-som, and plara, are linked with Food-Borne Trematode (FBT) infestation. Aquaculture is a satisfactory opportunity to produce parasite-free fish by breaking the transmission cycle. It is necessary for joint intervention of human, animal and fish health organizations under one health concept to raise awareness to alter traditional food patterns and strengthen disease diagnosis and control measures in health institutions globally.

Keywords: Helminth parasites; intermediate hosts; life cycles; zoonoses

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Paper ID: NSALS '25-070 (Poster)

Antibacterial potential of Fucoidan extracted from *Sargassum polycystum* in coastal Sri Lanka: A study on bioactive properties and elemental composition

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The dominant brown seaweed, especially the genus *Sargassum*, occupies more of Sri Lanka's coast. Main bioactive compound is the cell wall Fucoidan, a Sulfated polysaccharide having eminent antibacterial properties. The Fucoidan extracted from *Sargassum polycystum* was examined in this study to investigate its antibacterial effectiveness. The *S. polycystum* was collected from the Dickwella coastline. The Fucoidan extraction employed an ultrasound-assisted method using 0.1 mol/L HCl with 35 grams of pre-treated seaweed powder using 80% Ethanol and Acetone under optimal conditions. The antibacterial effect of fucoidan was tested against *Staphylococcus aureus* (Gram-positive) and *Escherichia coli* (Gram-negative) with the different Fucoidan concentrations 2, 4, 6, 8, and 10 mg/mL at 620 nm using a microplate reader to determine the minimum inhibitory concentration (MIC); the lowest concentration that inhibits visible microbial growth. Gentamicin and Azithromycin served as positive controls for *E. coli* and *S. aureus*, respectively. The dried seaweed powder was also analyzed for its Phenolic content using the Folin-Ciocalteu method, antioxidant activity by DPPH assay, and elemental contents using Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES). The analysis revealed significantly lower concentrations of macro-elements (Magnesium 73.45 mg/L, Potassium 0.19 mg/L, Sodium 44.65 mg/L) and micro-elements (Iron 4.93 mg/L, Manganese 0.22 mg/L, Zinc 0.22 mg/L) compared to certified standard values. Heavy metals, such as Cadmium (0.011 mg/L), Lead (0.015 mg/L), and Nickel (0.178 mg/L), were detected at low concentrations, indicating minimal toxicity risks. The DPPH radical scavenging activity of the seaweed powder was found to be 44.18%, indicating antioxidant potential. The quantification of Fucoidan in the dried seaweed powder revealed a percentage of 0.5%, as measured through the colorimetric method. The analysis pointed out *S. polycystum* as a non-toxic and valuable source for bioactive compounds due to the significantly lower macro and micro elements content and minimal heavy metals in it. Its functional properties were further validated based on antioxidant potential, where it showed DPPH radical scavenging activity along with Fucoidan content. The evidence on antibacterial efficiency for Fucoidan and its effectiveness at lower dosages of 2-4 mg/mL underlined particularly good perspectives for applications both in pharmaceutical and nutraceutical industries.

Keywords: Antibacterial activity; antioxidant properties; brown seaweed; DPPH assay

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Paper ID: NSALS '25-087 (Poster)

Enhancing high-density culture through biological filtration system for Glow tetra (*Gymnocorymbus ternetzi*)

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High-density culture of ornamental fish requires careful management of water quality within the rearing environment. Optimizing water quality during the rearing stage is essential for high production rates. This study examined the effects of a biological filtration system using natural materials to enhance the high-density culture of Glow tetra (*Gymnocorymbus ternetzi*) during the rearing stage. Glow tetras (1 cm;1.5 g), aged two weeks were stocked in twelve cement tanks (4'×4'×15"). Each experimental tank received one of four treatments, with stocking densities of 250, 300, and 400 individuals per tank, and three replicates, while the control group consisted of 200 individuals per tank. Twelve filter systems were prepared using natural substances, including gravel, bamboo rings, charcoal, and crushed bricks as filter media, housed in 13 L plastic buckets. All experimental tanks, except the control, were equipped with filtration systems. Water quality parameters and growth performance of fish were recorded across all treatments of the experimental tanks weekly over four weeks. Data was analyzed using a two-way ANOVA at a significant level of 0.05 to assess the effects of stocking densities on water quality parameters and growth performance. In all experimental tanks, pH, Ammonia and Nitrate levels were 6.7–7.75, 0 mg/L, and below 10 ppm respectively. Lower fish mortality was recorded for all the treatments. Statistical analysis revealed no significant differences between the control and treatments with other stocking densities for water quality parameters, mortality, and growth performance (P>0.05). In conclusion, the biological filtration system proved to be a viable solution for improving water quality and supporting the health of Glow tetras in high-stocking density aquaculture systems. These findings suggest that implementing such systems can promote sustainable aquaculture practices by enhancing fish health and growth rates.

Keywords: Aquaculture; biological filtration; Glow tetra; sustainable practices; water quality

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Paper ID: NSALS '25-088 (Poster)

Preliminary study on zooplankton diversity in whale watching area, off Mirissa, Sri Lanka

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Zooplankton, though commonly associated with surface drifting, can be found throughout the water column in the marine ecosystem. They are ecologically important heterotrophic organisms. Main objective of this study was to primarily investigate zooplankton diversity in whales abundant off Mirissa sea. Sampling for this study was conducted in the Southern sea off the Mirissa whale-watching site (5° 56' 53.7432" N, 80° 28' 17.7168" E), during the first inter-monsoon months (April-May, 2024). A 60 µm zooplankton net was used for the sampling, which was towed horizontally at a distance of approximately 200 meters with the help of "Whale Paradise Cruise" whale-watching boat. To transfer the collected plankton into a container, the plankton net was backwashed using a wash bottle. The preserved samples were stored in a cool, dark environment until they were processed and analyzed in the laboratory. Subsequently, collected 07 samples were preserved using 2 mL of 70% Ethanol. Microsoft excel employed for data organization and analysis. Zooplanktons were morphologically identified using available standard pictorial guides and literature. A total of 14 zooplankton species were observed including *Corycaeus dahli, Ceratium macroceros, Temora turbinata, Euterpina acutifrons, Parvocalanus elegans, and Gymnodinium lunula. Corycaeus dahli* emerged as the most dominant species, comprising 58.06% of the total plankton population, while *Parvocalanus elegans* was observed in 17.74% of the samples during this season. Shannon-Weiner index for this site was 1.5, Simpson's index was 0.37 and Evenness was 1.3 which indicate higher zooplankton diversity. Several plankton species observed in the samples could not be classified due to insufficient distinguishable morphological characteristics. Hence, we recommend DNA barcoding for more accurate identification of the collected samples or metabarcoding. The Mirissa whale-watching area was found to hold significant ecological value in terms of zooplankton diversity which may relate to a higher abundance of whales as a hotspot. The higher zooplankton diversity in this whale-watching site, Mirissa may be due to the combination of significant environmental factors, natural oceanographic processes, and ecological interactions such as upwelling, seawater currents, tidal mixing, submarine canyons, seasonal plankton blooms, protected areas and low pollution. Hence, the protection of the Mirissa whale watching site will be an important ecological implication.

Keywords: Biodiversity monitoring; Mirissa; Southern Sri Lanka; whale watching; zooplankton diversity

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Paper ID: NSALS '25-094 (Poster)

Effects of Heen Bovitiya (*Osbeckia octandra* L.*)* on growth, breeding performance and survival of Guppy fish (*Poecilia reticulata*)

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The high demand for Guppy fish in the export market requires high growth, breeding, survival, and attractive colors. Due to uncertainties regarding commercial promoters, and lack of studies on the effect of Heen Bovitiya (HB) on Guppy fish**,** the present study evaluated to identify the effect of HB on the growth, breeding, and survival of Guppy. Quadruple groups of 1-month old Guppy juveniles were stocked in 12 indoor glass aquariums (30x15x15 cm^3), at a density of 4 fish per tank, following a sex ratio of 1:1. Diets with 4 different concentrations of Heen Bovitiya Powder (HBP) were used. Diets were formulated by mixing with Commercial Feed (CF) under 0%, 10%, 20%, and 30% percentages of HBP per kg of CF. Fish were fed 5 times daily, and growth performance (total length, total body weight, Specific Growth Rate (SGR%), Body Weight Gain (BWG), length gain) and reproductive performance (days for first spawning, total number of larvae per tank, total number of spawning cycles per tank, and survival rate of fish) were evaluated during 12 weeks. All data was analyzed by using repeated measure ANOVA and one-way ANOVA revealed that there was a significant difference ($P \leq 0.05$) between the dietary treatments. The highest growth performance of female fish in terms of mean body weight (1.39±0.06 g), total length (4.7±0.17 cm), SGR% (3.87±0.07), length gain (2.90± 0.20 cm), BWG (121.11±5.05 g) were observed in the fish fed on treatment 3 (30% HBP) compared to other diets. Considering of male fish in terms of mean body weight (0.80±0.05 g), total length (4.23±0.06 cm), SGR% (3.55±0.29), length gain (2.43±0.03 cm), BWG (68.77±4.61 g) were observed in the fish fed on treatment 3 and, were recorded the significantly highest mean number of larvae per tank (45.33±6.51), and were spawned quickly (55-67 days). In the present study, the highest growth and breeding performance in Guppy was observed in CF with 30% HBP. This study showed that HB can be used as a supplementary diet to enhance Guppy growth and breeding performance in the ornamental industry.

Keywords: Breeding; growth; Guppy**;** Heen Bovitiya

Underlined is the presenting author.

Paper ID: NSALS '25-095 (Poster)

Effect of wild Sunflower (*Tithonia diversifolia*) powder on growth performance and color enhancement of Guppy fish (*Poecilia reticulata)*

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The ornamental fish industry, vital to global aquaculture, relies on enhancing growth and coloration in key species like Guppies to boost market value. Concerns over the cost, fish health, and environmental impact of synthetic additives have prompted this study to investigate alternative feed additives. The present study evaluated Wild Sunflower (WS) leaves and flowers as cost-effective dietary supplements to enhance the growth, survival, and coloration of Guppy fish by assessing growth indices, survival rate, and tail coloration, to identify the most effective treatment for these traits. One-month-old Guppies were used in this research, with three treatments: the control group received Commercial Feed (CF) alone, treatment 1 consisted of CF supplemented with 1% WS leaves, and treatment 2 consisted of CF supplemented with 1% WS flowers. Each treatment was allocated to three replicate tanks (60×30×30 cm^3), with 10 fish per tank, and the fish were fed with the experimental diets three times daily for 42 days. Growth performance was assessed by measuring the length and weight of the Guppies using a standard measuring ruler and analytical balance, respectively. Tail coloration was evaluated using the Toca Color Finder, assigning scores from 1 (dark yellow) to 8 (dark red). The endpoint survival rate of Guppies was determined using a visual count method. Repeated measures ANOVA indicated significant effects of dietary treatments and time on Guppy growth ($P \leq 0.05$). The Kruskal-Wallis test revealed no significant differences in survival rates between treatments ($P \geq 0.05$). At the end of the feeding trial, Guppies fed with the treatment 2 diet exhibited the highest growth performance ($P \leq 0.05$), with a length gain of 1.93±0.06 cm and a weight gain of 0.59± 0.03 g, alongside the most pronounced color enhancement ($P \leq 0.05$) compared to treatment 1 and the control diet. These findings highlight that the effectiveness of CF+1% WS flowers (treatment 2) significantly enhance both growth and coloration in Guppies. Further studies are required to explore various dosages of WS powder to determine their effects on the growth and pigmentation of Guppies and other ornamental fish species.

Keywords: Color; feed; growth; Guppy; *Tithonia diversifolia*

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Paper ID: NSALS '25-101 (Poster)

Investigating the causative agents and factors contributing to high mortality in *Scylla serrata* (Mud crab) in a crab fattening facility in Puttalam district, Sri Lanka

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Mud crab (*Scylla serrata*) farming is an economically sustainable enterprise with huge potential for expansion, especially in the coastal regions of the Puttalam district of Sri Lanka. Despite its economic significance, Mud crab fattening faces challenges due to high mortality rates. This study aimed to investigate the causative agents and contributing factors leading to the high mortality in *Scylla serrata* in a commercial crab fattening facility (vertical crab farm) in the Puttalam district. Live crabs (10 moribund individuals) and water samples were collected and transported to the Centre for Aquatic Animal Disease Diagnosis and Research (CAADDR), University of Peradeniya, for diagnostic investigations. The study identified *Octolasmis* spp., a rhizocephalan parasite colonizing the gills, as a major contributor to crab mortality (~50%). Water quality parameters, such as salinity, Ammonia levels, and Dissolved Oxygen, were found to exacerbate the spread of these parasites, highlighting the impact of environmental conditions on crab health. Bacteriological samples from crab hemolymph were cultured on TCBS and TSA (3% NaCl). Distinct colonies underwent Gram staining, oxidase test, catalase test, SIM test, and OF test. GSP agar was used to identify *Pseudomonas* and *Aeromonas*. Motile gram-negative rods were tested for Vibriostat sensitivity using 0/129 disks. Further, bacteriological analysis revealed the presence of *Vibrio* species, *Pseudomonas* species, and *Aeromonas* species, in the hemolymph of the affected crabs. Bacterial infections, alongside parasitic infestations, might have contributed to the observed mortality rates. The wizard genomic DNA purification kit (Promega) was utilized to extract DNA from crab gill and *Octolasmis* spp. parasite samples. PCR was performed to detect WSSV according to the protocols of the World Organization for Animal Health (WOAH). Viral investigations targeting the White Spot Syndrome Virus (WSSV) showed negative results. The findings suggest improved water quality management and regular parasitic control measures are essential for reducing mortality in crab fattening operations. The study recommends periodic water quality monitoring, gill inspections, and the use of preventive treatments to mitigate parasite infestations. By addressing these factors, the sustainability and productivity of Mud crab farming in Sri Lanka can be significantly enhanced.

Keywords: Crab fattening; gill parasite; Mud crab; *Octolasmis* spp.; *Scylla serrata*

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Paper ID: NSALS '25-106 (Poster)

Effect of powdered shrimp waste on growth performance, color development and retention of Red Comet Swordtail fish (*Xiphophorus helleri*)

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The ornamental fish industry is a major contributor to revenue in the aquaculture sector. Skin color is a key factor in the appearance of ornamental fish. Vibrant fish coloration attracts customers, increasing sales and profits. Shrimp waste is a carotenoid-rich source that enhances acceptability for fish. This research was conducted to study the effect of different concentrations of powdered whole shrimp waste incorporated feeds on the body color enhancement, retention and growth performance of Red Comet Swordtail fish (*Xiphophorus helleri*). Five feed formulations were prepared using different concentration levels of powdered shrimp waste (PSW) as the protein source; 20% (T1), 30% (T2), 50% (T3), and 100% (T4). The control fish feed was prepared without shrimp waste. The formulations were prepared using identical proportions of additional ingredients including fish meal, rice bran, wheat flour and vitamins to ensure balanced nutrient composition across all treatments. The experiment was conducted in two phases as the color enhancement (45 days) phase and color retention (14 days) phase, using 15 glass tanks, each containing 15 fish with an average length of 3.2 cm. The daily feed allowance was given as 5% of their body weight adjusting weekly with the body weight increment and fish were fed twice daily. The photographs of each sample fish were taken with similar conditions to measure the Red, Green, Blue (RGB) values of fish skin to determine the color development of fish body in each weekly treatment using Image J software version 18.0. The initial color values were assumed to be uniform, as fish from the same age batch were used. The color enhancement and growth performance in the fish body was analyzed using two-way ANOVA. T4 showed the most significant results ($P<0.05$) while the least enhancement was found in T1, and color analysis after 14 days showed no loss of color in any group during the retention period. The fish fed with 100% shrimp waste was more effective in enhancing the growth and coloration of Red Comet Swordtail fish.

Keywords: Color retention; formulated feeds; shrimp waste; skin color; Swordtail

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Paper ID: NSALS '25-131 (Poster)

Analyze the shoreline dynamics of Mannar island, Sri Lanka using the Digital Shoreline Analysis System (DSAS)

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Shorelines represent the most dynamic features of coastal environments, constantly shaped by natural processes and human activities. This study focuses on Mannar island, Sri Lanka, along 50 km coastline from Talaimannar to Mannar influenced by monsoons, tides, and human activities. Its ecological and socio-economic importance, including vital habitats and local livelihoods, faces threats from shoreline changes. The analysis of shoreline changes is fundamental to comprehending coastal dynamics, including erosion and accretion patterns, and other coastal processes affecting the island, which is crucial for developing effective coastal management plans and the broader morphological evolution of specific coastal areas. This study aims to analyze shoreline changes, including accretion and erosion using Geographic Information System (GIS) and Remote Sensing (RS) techniques. High-resolution satellite imagery from Google Earth Pro 7.3.6 was obtained for multiple years, from 2008 to 2021, to delineate shorelines through visual interpretation, maintaining a consistent eye altitude of 300 m to ensure accuracy. The digitized shoreline data was processed using ArcGIS 10.8 with the Digital Shoreline Analysis System (DSAS) tool. This study was conducted in Mannar island, divided into four regions: Talaimannar village to Nadukkuda region, Talaimannar pier to Pesalai region, Nadukkuda to Southbar region, and Pesalai to Erukkalampiddy region in the Northern province of Sri Lanka. The Talaimannar village to Nadukkuda region showed the highest average coastal accretion at 4.76±7.94 m/year with 42.30±70.61 m Near Shoreline Movement (NSM), while the maximum End Point Rate (EPR) of 42.45 m/year due to the Northeast monsoon winds, are strong and bring heavy rainfall cause powerful ocean currents that carry substantial amounts of sand and sediment along the coast and the presence of mangroves. In contrast, the Talaimannar pier to Pesalai region exhibited the lowest average accretion at 0.85±2.40 m/year with 7.56±21.34 m NSM, while some specific areas such as Pesalai village experienced erosion up to -7.03 m/year due to the human activities in sand mining. The Nadukkuda to Southbar region and Pesalai to Erukkalampiddy regions showed moderate accretion rates of 2.28±0.95 m/year and 2.40±3.27 m/year, respectively. These findings can serve as valuable input data for sustainable coastal zone management along the Mannar island coast in Sri Lanka.

Keywords: Accretion; erosion; Geographic Information System; Remote Sensing; shoreline dynamics

Underlined is the presenting author.

Paper ID: NSALS '25-198 (Poster)

Determination and characterization of *Vibrio* species contamination in *Litopenaeus vannamei* in hatchery environment

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Vibriosis is a common pathogenic disease in Sri Lankan shrimp industry. This study aimed to investigate the sources and potential routes of *Vibrio* spp. affecting *Litopenaeus vannamei* and to determine the *Vibrio* species using molecular techniques. In this study, water samples were collected from distinct sites including the storage tank, condition tank, maturation unit, and freshwater source used for cleaning purposes. Furthermore, squid samples used for feeding broodstock were also examined. A total of three replicates were obtained from each sampling site. These samples were analyzed using Thiosulfate-Citrate-Bile Salts-Sucrose (TCBS) agar to identify the presence of *Vibrio.* Culture results indicated abundant yellow colonies, in samples from the storage tank, female maturation tank and squid samples. In contrast, no colonies were observed in samples from the condition tank, suggesting effective filtration. Molecular identification of the most abundant morphologically similar yellow colony from the maturation tank was conducted using 16S rRNA gene sequencing. Bioinformatic analysis revealed a more similarity to *Vibrio fortis, Vibrio pelagius* and *Vibrio orientalis* (NCBI Blast similarity above 97%). These findings suggest that the primary contamination sources are the storage tank, maturation tank and squid feed, while filtration system effectively reduces *Vibrio* contamination at certain stages of the hatchery process. Findings from this study can be used in future development of species-specific vaccine against *V. fortis* infection in shrimp.

Keywords: Hatchery environment; *Litopenaeus vannamei*; molecular identification; Vibriosis; *Vibrio* spp.

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CROP PRODUCTION TECHNOLOGY

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Paper ID: NSALS '25-010 (Oral)

Induction of lateral branches in black pepper (*Piper nigrum* L.) nursery plants through hormone treatment and shoot tip removal

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In Sri Lanka, ground runners are commonly used as planting material for black pepper due to their availability. However, they tend to produce only a few lateral branches. This study was conducted to evaluate the effect of Indole-3-Acetic Acid (IAA) treatment and shoot tip removal on lateral branch induction of black pepper plants derived from ground runners during the nursery stage. The planting materials were selected from a new hybrid variety of black pepper called "Dingirala" at 4½ months of planting and were treated until the plants reached seven months of planting. The experiment followed the Completely Randomized Design with eight treatments and three replicates, each replicate consisting of 50 plants. The treatments included IAA concentrations of 50, 100, and 150 ppm combined with either shoot tip removal (with tip cut, TC) or without shoot tip removal (without tip cut, WTC) along with a control. The study aims to enhance the lateral branch induction of black pepper cuttings obtained from ground runners rather than using terminal branches. Results revealed that the 150 ppm IAA, TC treatment produced significantly (P<0.05) higher average number of lateral buds per plant (2.52±0.32) after seven months of planting, compared to the control (0.67±0.29). The same treatment produced significantly higher average number of leaves per plant (8.26±1.70) and leaf increment per plant (3.11±0.68). Additionally, plants that were treated with 150 ppm IAA, WTC exhibited the highest average plant height (63.54±2.32 cm), total fresh biomass (19.73±1.14 g), and total dry biomass (6.87±0.29 g). Despite these positive outcomes, there was no significant difference (P>0.05) in the average plant height increment and internodal length across the treatments. The present study concludes that the application of 150 ppm IAA combined with tip cut significantly enhances lateral branching in black pepper plants. This result is crucial for achieving the major aim of producing healthy, vigorous, and well branched black pepper plants during the nursery stage.

Keywords: Black pepper; Indole-3-acetic acid (IAA); lateral branches; shoot tip removal

Underlined is the presenting author.

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Paper ID: NSALS '25-015 (Oral)

Study on dormant crown disorder of pineapple (*Ananas comosus*) and its response to Ethephon hormone application

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Recently, a novel disorder, termed Dormant Crown Disorder of Pineapple, was reported in Mauritius variety in a commercial pineapple plantation in Gampaha area. Pineapple plants produced partially developed flowers which then became dormant. The purpose of this study was to examine the factors affecting the dormant crown disorder of pineapple and its response to Ethephon hormone application. A field survey was conducted in pineapple fields in Gampaha area to assess the prevalence of the disorder. Rainfall, humidity, air temperature and UV index were measured daily until the end of the experiment. Variation of soil pH and electrical conductivity of experimental site were analyzed. Five different concentrations of ethephon (50 ppm, 75 ppm, 100 ppm, 150 ppm, 200 ppm) hormone were applied to each plant and the experiment was laid out according to the Randomized Complete Block Design with three replicates in each treatment. According to the results of a field survey, 41% of their fields in Gampaha area were affected by this disorder. All the soil conditions were in a suitable range (4.5–5.6 pH) for pineapple cultivation and no considerable climatic deviations were observed during the study period. The application of different concentrations of ethephon had no significant (P>0.05) effect on plant height, number of leaves per plant, canopy diameter and number of eyes of the fruit. Flower initiation happened in only healthy plants and plants with the disorder did not show flower initiation in response to any treatment. In healthy plants, flower induction percentage, diameter of the red heart, length of the inflorescence and perimeter of the inflorescence were increased with increasing concentration of the hormone. Therefore, based on the present evidence, the plant disorder may not be due to the inadequate supply of growth regulators or deviation of the normal temperature, rainfall, relative humidity, radiation and the soil conditions. However, further studies are needed to investigate the effect of genetic variations on this dormant crown disorder in pineapple.

Keywords: Dormant crown disorder; Ethephon; flowering; pineapple

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Paper ID: NSALS '25-016 (Oral)

Evaluation of different potting media on growth of tissue-cultured Cavendish banana *(Musa acuminata)* plants during hardening

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Hardening is essential for tissue-cultured Cavendish banana plants to adapt to field conditions, enhancing their survival and growth. However, high mortality rates and irregular growth due to unsuitable potting mixtures remain a major challenge. This study was performed to evaluate the different potting media ratios on growth performance and survival rate of tissue-cultured Cavendish banana plants during hardening. Five different potting mixtures were prepared using different ratios of goat manure, coco peat and ash, respectively with 1:1:1 (T1), 1:2:1 (T2), 1:3:1 (T3), 1:4:2 (T4) and 2:2:1 (T5-control). The experiment was performed as Completely Randomized Design with three replicates, each replicate consisting of 33 plants. The hardening process involved placing the plants in an acclimatization chamber for 28 days, where temperature, humidity and light were regulated. Afterward, the plants were kept under a shade net with 50% shade level for 35 days. Electrical conductivity (EC), pH and Water Holding Capacity (WHC) were measured in different potting media. The newly tested potting media performed well across all evaluated parameters compared to the control. Plant height, pseudostem girth and number of leaves per plant were measured at seven day intervals, whereas root length and survival rates were measured at the end of the hardening period. T3 and T4 potting media remained within the optimum range for all the media parameters, and it gave better performance for all the growth parameters. The EC, pH and WHC values of T3 and T4 did not show any significant difference ($P>0.05$). In treatment T3, plant height, number of leaves per plant, pseudostem girth and root length were recorded as 16.97±0.98 cm, 6.33±0.46 cm, 3.74±0.067 cm and 16.23±0.74 cm, respectively. Similarly, in T4, the corresponding values were 16.98±1.67 cm, 6.47±0.21 cm, 3.56±0.08 cm and 13.60±0.78 cm. Among the two media ratios tested, plants grown in the T4 potting media achieved the highest survival rate of 86%. In conclusion, the potting media composed of goat manure, coco peat, and ash in a 1:4:2 ratio (T4) was the most effective potting media for hardening tissue-cultured Cavendish banana plants. Optimizing potting media mixtures can significantly enhance growth factors, thereby promoting greater sustainability in commercial banana cultivation.

Keywords: Banana; growth parameters; hardening; potting media; tissue culture

Underlined is the presenting author.

Paper ID: NSALS '25-028 (Oral)

Evaluation of growing media and fertilizer combinations for optimizing soilless cultivation for betel (*Piper betle* L.)

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Soilless cultivation offers a promising alternative for improving the yield and quality of betel, especially in addressing challenges such as soil borne pathogens. Limited studies have been conducted on soilless cultivation systems for betel in Sri Lanka. The study was conducted at Intercropping and Betel Research Station, Narammala inside a net house as a pot experiment. This study was conducted to identify the optimum soilless growing media and fertilizer combination for betel. Three growing media as T_1-Coco chips (100%), T_2-Coco peat (75%) + Coco chip (25%) and T_3-Soil (Control) with three fertilizers as F_1-Albert solution, F_2-Department of Export Agriculture (DEA) recommended fertilizer and F_3-Double the amount of DEA recommended fertilizer were used. The study performed as a Complete Randomized Design with two factor factorial arrangements with six replicates for each treatment combination. As growth parameters, number of leaves per plant, shoot height (cm) and leaf area (cm^2) were measured with weekly interval while leaf weight (g), plant weight (g), root length (cm), root volume (mL) and root weight (g) were measured at the end of the experiment. The interaction effect of media and fertilizer was significant ($P<0.05$) for parameters including number of leaves, leaf area, plant fresh weight and fresh weight of leaves. A higher number of leaves per plant (5.00) were observed in treatment combinations of T_2F_3, T_3F_1 and T_3F_2. The highest leaf area was recorded from T_3F_3 (336.9±72.7 cm^2). The highest plant fresh weight (27.83±4.06 g) and leaf fresh weight (9.52±1.67 g) were recorded in the T_2F_3 treatment combination. In conclusion, coco-peat (75%) combined with coco chip (25%) pellets can be used as optimum soilless growing media for betel with an external fertilizer application of double the amount of DEA recommended fertilizer. Betel demonstrates significant potential for growing under soilless systems, particularly for producing high quality planting materials for cultivation.

Keywords; Betel; chemical fertilizer; coco-chips; coco-peat; soilless culture

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Paper ID: NSALS '25-038 (Oral)

Effect of different colored polythene shades on growth of betel (*Piper betle* L.) at nursery stage

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Betel (*Piper betle* L.) is a culturally and economically important crop in Sri Lanka, serving as a key export and supporting many smallholder farmers. Optimizing nursery conditions is vital for enhancing yield and quality. The nursery stage of betel is typically maintained under black shade nets in Sri Lanka. Black shade nets prolong the nursery period by limiting light for photosynthesis and increasing humidity, which can promote fungal growth. To address these issues, a study was conducted at the Intercropping and Betel Research Station, Narammala to explore the effect of different colored polythene shades on growth of betel. The experiment was conducted using a Completely Randomized Design with three replicates. Four polythene shades i.e., blue, green, red, and yellow were evaluated as treatments and compared with the control (black shade net). Two-nodal cuttings of the '*Maneru'* variety of betel were established in a potting medium composed of equal parts of topsoil, sand, cow dung, and coir dust. Four structures were constructed using the specified colored polythene shades (60-80% light penetration), and the potted cuttings were placed inside, with propagators applied. After 21 days, the propagators were removed, and the cuttings were maintained under the respective shade treatments for seven weeks. The different colored polythene shades had a significant effect (P<0.05) on all tested growth parameters. Betel vines under blue polythene shades showed significantly higher leaf dry weight (1 g/leaf) compared to black shade nets (0.78 g/leaf) at nursery stage. Additionally, based on Munsell color chart readings, 90% of the leaves under blue shade were dark green, likely attributed to high chlorophyll content, while leaves under black shade nets were predominantly green. Vines grown under blue polythene also exhibited greater rooting depth (9.4 cm), vine dry weight (3.0 g), and leaf area (129 cm^2), which were statistically similar to those grown under conventional black shade nets. These findings highlight the potential of blue shade nets as a promising alternative to black nets for betel nurseries. However, further studies are needed to assess the effectiveness of different colored shade nets, particularly in place of polythene shades, before making solid recommendations.

Keywords: Growth; light quality, nursery period; shoot growth

Underlined is the presenting author.

Paper ID: NSALS '25-041 (Oral)

Effect of Potassium Silicate on growth of *Gerbera jamesonii* at acclimatization and field establishment stages in two different potting media

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Gerbera (*Gerbera jamesonii* L.) is a widespread, highly valuable cut flower plant which belongs to the family Asteraceae and is commercially produced under greenhouse conditions. However, due to higher demand, slower growth, and poor quality, Gerbera cannot fulfill the increasing market demand. The success of tissue culture procedure is important because the higher survival percentage of *in-vitro* raised plants during the acclimatization process as well as after field establishment. This study was conducted to explore an effective protocol for the acclimatization stage and field establishment stage to optimize its successive growth of gerbera. *In-vitro* propagated plantlets at two different growth stages (one-month- and two-month-old) were introduced into the two-potting media (1:1 of coir dust + sand and banana fiber + sand) with the application of three different concentrations of Potassium Silicate fertilizer (50, 100, 150 ppm) to attain regular growth at different stages (acclimatization and field establishment). This study was laid out in a two-factor factorial completely randomized design (Potassium Silicate concentrations and potting media) with fifteen replicates for the acclimatization stage and nine replicates for the field establishment stage during four-month period. The treatment combination of coir dust and sand media with 100 ppm of Potassium Silicate fertilizer resulted in higher number of leaves, shoots, leaf area and Chlorophyll content at the acclimatization stage and banana fiber and sand media combined with 100 ppm of Potassium Silicate fertilizer resulted in the significantly greater ($P<0.05$) number of shoots and chlorophyll content at the field establishment stage than other two concentrations of Potassium Silicate. According to the study, all treatment combinations reported 100% of the survival rate for micro propagated gerbera during the acclimatization stage and over 95% at the field establishment stage. The selected treatment combination was not able to significantly change the leaf color at both growth stages. These findings will be beneficial in commercial propagation of Gerbera with the purpose of satisfying the market demand of this valued floricultural plant.

Keywords: Acclimatization; fertilizer; field establishment; growth; potting media

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Paper ID: NSALS '25-059 (Oral)

Screening antagonistic activity of endophytic bacteria from rice (*Oryza sativa L.*) against *Xanthomonas oryzae* pv. *oryzae* and evaluating their growth promotion potential on rice seedlings under *in-vitro* conditions

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Rice serves as a staple food for most of the world's population. Bacterial Leaf Blight (BLB), caused by *Xanthomonas oryzae* pv. *oryzae* is the most significant bacterial disease in rice (*Oryzae sativa* L.), leading to substantial yield losses globally. Use of biocontrol agents offers a sustainable and effective alternative for managing BLB. Rice endophytic bacteria are microorganisms that inhabit the internal tissues of the plant without causing any diseases. Some of them may suppress BLB activity and stimulate growth of the plants. In this study, the causal organism of BLB was isolated from infected rice leaf samples, and identified by colony morphology, chemical tests, and Koch's postulates method. A total of six endophytic bacterial cultures named E1A1, E2C1, E3B1, E4C1, E5C1, and E6C1 were isolated from healthy rice leaf samples. The antagonistic activity of isolated endophytic bacteria against BLB pathogen under *in-vitro* conditions was evaluated by dual culture technique including three replicates. Finally, the ability of isolated antagonistic endophytic bacteria to promote the growth of rice seedlings in terms of germination percentage and vigor index was evaluated *in-vitro*. The results showed a significant difference ($P<0.05$) between the inhibition percentages of various bacterial cultures. The E3B1, E1A1 and E5C1 bacterial isolates exhibited significantly higher inhibition percentage against bacterial leaf blight disease under *in-vitro* conditions, compared to the other endophytic isolates. There was no significant difference ($P>0.05$) in mean germination percentage between different treatments. The results showed that the seed vigor index after 10 days significantly differed among the bacterial cultures. The maximum seed vigor index after 10 days was shown by E2C1, E3B1 and E6C1 endophytic bacterial cultures. These findings highlight the potential of E3B1, E1A1, E5C1, E2C1, and E6C1 bacterial endophytes as biocontrol agents and plant growth promoters for rice, warranting further research under field conditions to validate their efficacy and practical applicability.

Keywords: Antagonistic activity; bacterial leaf blight; biocontrol; endophytic bacteria; growth promotion

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Effect of LED light radiation on growth of tea (*Camellia sinensis* L.) nursery plants

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The quality of nursery plants is crucial for successful tea cultivation, but traditional reliance on natural sunlight is inconsistent and uncontrollable. The absence of standardized artificial light treatments poses a challenge, particularly in controlled environments. Identifying the most effective LED light treatments could transform nursery management by providing a reliable, controllable light source that boosts growth, health and vigor of tea nursery plants. This study aims to identify the optimal LED spectra for promoting growth, health, and vigor of tea plants in nurseries. TRI 3072 tea clone was subjected to five LED light treatments (230 W), namely T1 (100% red light), T2 (100% blue light), T3 (50% red light + 50% blue light), T4 (75% red light + 25% blue light), T5 (25% red light + 75% blue light) from 06:00 hr to 18:00 hr for 14 weeks with sunlight serving as the control (T6). The experiment was laid out in a Completely Randomized Design with eight replicates. Number of leaves, shoot dry weight, root dry weight and root: shoot ratio were measured, and data were analyzed using one-way ANOVA. Mean comparison was done by Tukey Pairwise Comparisons. LED treatment had significant effects ($P<0.05$) on all parameters tested. On the 14th week after exposing to LED treatment, T2 (100% blue light) recorded the maximum plant height (15.13 cm). Leaf count at 13th week was highest under T2 (7), which was statistically similar to T4, T5 and T6. Under 100% blue light, total dry weight per plant (3.37 g/plant) increased by 53.35% compared to the control (2.2 g/plant). Under 100% blue light, there were increases of 54.7% in shoot dry weight and 46.7% in root dry weight compared to the control. Moreover, root: shoot ratio was highest in T1 and T4 (0.28). T2 recorded the lowest root: shoot ratio, which was similar to the control (0.21). Results from this research suggest that 100% blue LED light promotes the growth of tea nursery plants. This accelerated growth could help shorten the nursery period. Extending the duration of the experiment beyond three months would allow for more robust confirmation of these findings.

Keywords: Growth rate; LED light; quality; tea nursery plants

Underlined is the presenting author.

Paper ID: NSALS '25-127 (Oral)

Evaluating the suitability of different coir pith pellets as nursery pots for chili (*Capsicum annuum* L.)

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Coir pith is a by-product of coconut industry, used by farmers as a growing medium in horticulture which often lacks nutrients. However, incorporating growth media with essential nutrients can enhance nutrient delivery and vegetable quality. The present study was performed to evaluate the suitability of different coir pith pellets as nursery pots for the growth and development of chili. MICH HY1 was used as chili variety and four different types of coir pith pellets were used as treatments namely, netless coir pith pellets with fertilizer (T1), netless coir pith pellets without fertilizer (T2), 7C pellets with inside net and fertilizer (T3), and netless QSM pellets with fertilizer (T4, control). The experiment was laid out in a Completely Randomized Design with 30 replicates for each treatment. Physico-chemical parameters of the pellets and growth parameters of the chili plants were measured. The results indicated that T3 coir pith pellets had the highest potassium content (3.88 mg/L), Sodium content (4.61 mmol/L), and water-holding capacity (77.4%). The highest bulk density was observed in T4 pellets (168.5 g/cm³), while T3 pellets recorded a slightly lower value of 168.5 g/cm³. T3 pellets also achieved the highest germination percentage of chili seeds (29.7%). Furthermore, significantly (P<0.05) higher shoot height (12.91±0.12 cm) and root length (2.47±0.31 cm) were observed in chili plants grown in T3 pellets. The findings revealed that T3 pellets demonstrated superior physico-chemical properties and growth performance of chili plants compared to the other coir pith pellets tested. In conclusion, the 7C pellets with fertilizer and inside net were identified as the most suitable nursery pot for chili plant production.

Keywords: Coir pith pellets; nursery stage; seed germination; seedling growth

Underlined is the presenting author.

Paper ID: NSALS '25-143 (Oral)

Development of fertilizer enriched coco peat-based nursery growing media for tomato (*Solanum lycopersicum*) and brinjal (*Solanum melongena*)

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Rising global populations drive the need for more efficient vegetable production. The nursery stage is crucial in vegetable cultivation, and soilless growing media like coco peat are increasingly popular for their favorable physical properties and chemical properties. However, coco peat inherently lacks essential nutrients, requiring continuous nutrient supplementation, which is labor intensive and time consuming. This study aimed to develop a fertilizer enriched coco peat growing medium to support robust growth in tomato *(Solanum lycopersicum*) and brinjal (*Solanum melongena*) seedlings. The experiment consisted of eight treatment combinations of 20-20-20 (N, P, K) fertilizer or Albert solution at varying concentrations: T2 (650 g coco peat+5 g 20-20-20), T3 (650 g coco peat+10 g 20-20-20), T4 (650 g coco peat+15g 20-20-20), T5 (650 g coco peat+20 g 20-20-20), T6 (650 g coco peat+5 g Albert solution), T7 (650 g coco peat+10 g Albert solution), T8 (650 g coco peat+15 g Albert solution), and T9 (650 g coco peat+20 g Albert solution) along with a control (T1: 650 g coco peat). A Completely Randomized Design (CRD) was used with three independent replicates. T8 (650 g coco peat+15 g Albert solution) showed the best performance in tomato nurseries. Early growth indicators such as plant height, leaf length, leaf count, leaf area, and root length were significantly different (P<0.05) among treatments. For brinjal, T9 (650 g coco peat+20 g Albert solution) was the most effective treatment, also showing significant (P<0.05) improvement in early growth parameters. These findings strongly suggest 650 g coco peat+20 g Albert solution is optimal for brinjal and 650 g coco peat+15 g Albert solution for tomato in coco peat-based nursery systems. This study highlights the potential of fertilizer-enriched coco peat to enhance seedling growth, yield, and quality.

Keywords: Coco peat; fertilizer; nursery media; seedlings

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Paper ID: NSALS '25-159 (Oral)

Investigating the factors influencing *Parthenium* weed infestation in Sri Lanka and assessing the reproductive potential of *Zygogramma bicolorata* for mass rearing

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The spread of *Parthenium hysterophorus*, an invasive weed, poses significant threats to Sri Lanka's agricultural ecosystems, with traditional control methods proving inadequate. This study, conducted in two phases, first examines environmental and land-use factors influencing *Parthenium* density across Sri Lanka and later evaluates the reproductive potential of *Zygogramma bicolorata*, a biocontrol agent, for mass-rearing initiatives. In Phase 1, data was collected from 72 locations, representing agricultural, residential, and wildlands, using randomized sampling to assess *Parthenium* density and related variables, including shade conditions, climate, and proximity to water sources. Analysis using ordinal regression indicated that *Parthenium* densities were significantly lower in agricultural and residential areas compared to those in wildlands and that full-sun exposure, as well as proximity to water canals, were associated with reduced weed infestations. Phase 2 involved laboratory trials to assess the reproductive capacity of *Z. bicolorata*. Beetles were collected from several locations in the Jaffna District, sorted by sex, and reared under controlled conditions with fresh *Parthenium* leaves. Life history parameters including fecundity, development from egg to adult and sex ratio were recorded over 25 days. Intrinsic rate of increase (rm) and net reproductive rate (R0) were calculated using SAS 9.1 with the jackknife method, while SigmaPlot visualizations highlighted reproductive trends. Results of reproductive capacity of *Z. bicolorata* revealed that female beetles maximize fecundity early in their lifespan, making them ideal for accelerated population establishment. These findings underscore the potential of *Z. bicolorata* as an effective biocontrol agent and support integrating biological control with existing practices to mitigate *Parthenium* spread, thereby reducing chemical dependency and enhancing ecological and agricultural resilience in Sri Lanka.

Keywords: Biological control; ecological management; mass rearing; *Parthenium hysterophorus; Zygogramma bicolorata*

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Paper ID: NSALS '25-160 (Oral)

Investigation of physico-chemical properties of Ramie fiber (*Boehmeria nivea*) and its feasibility as a fiber source for tissue paper production

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Ramie fiber, known for biodegradability, antibacterial properties and holds promise for industrial applications like tissue paper production. However, challenges such as variability in fiber yield and quality, along with energy-intensive chemical extraction methods, limit its potential. Thus, two experiments were conducted to investigate the physicochemical properties of two different types of ramie fiber (scraped and non-scraped) subjected to different degumming methods (NaOH concentration), and to assess its feasibility for tissue paper production. The first experiment followed a two-factor factorial Completely Randomized Design (CRD) with three replicates. The factors were fiber type (scraped; SF and non-scraped; NSF) and NaOH concentration (2% and 4%). A significant interaction effect (P<0.05) was observed, with the highest dry fiber yield in NSF treated with 2% NaOH (3.9%) and 4% NaOH (4.2%). FTIR analysis showed a partial loss of amorphous content, with more intense cellulose peaks across samples. XRD spectra revealed similar crystalline peaks at 2Θ=15° and 22°, corresponding to the (110) and (200) crystal planes. XRD analysis revealed that the crystallinity index ranged from 49% to 66%, with no significant differences between treatments. The highest breaking load (2.4 N) was recorded in 2% NaOH treated NSF, and the lowest was in SF at 4% NaOH (1.1 N). The second experiment was conducted to assess the possibility of tissue paper production using Ramie fiber which had three replicates and five treatments in CRD: T1 (NSF+2%NaOH+Aloe vera), T2 (NSF+4%NaOH+Aloe vera), T3 (NSF+2%NaOH+Chitosan), T4 (NSF+4%NaOH+Chitosan), and T5 (SF+2%NaOH+Chitosan). A significant difference (P=0.04) in water absorption percentage (WAP%) was observed, with the highest in tissue papers made from chitosan-treated fibers, indicating that chitosan improved WAP% compared to other additives. In conclusion, the use of NSF is most effective with low concentration of NaOH (2%) that is economical and eco-friendly method to extract ramie fiber, with potential for tissue paper production.

Keywords: Aloe vera; Chitosan; physico-chemical properties; ramie fiber; tissue paper

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Paper ID: NSALS '25-183 (Oral)

Screening of groundnut (*Arachis hypogea* L.) lines to mid-season drought condition

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Mid-season drought affects the most vulnerable stages of plant growth in groundnut. The present study aimed to identify groundnut lines resistant or tolerant to mid-season drought and quantify their yield performance. The experiment was conducted at the Grain Legume and Oil Crops Research and Development Center in Angunakolapelessa. A total of 17 short-duration groundnut lines were selected as planting materials. These short duration lines include three recommended varieties (ANKG1, ANKGN4, TISSA), nine ICRISAT germplasm (ICGV4117, ICGV4118, ICGV3090, ICGV3098, ICGV3138, ICGV3186, ICGV3487, ICGV13942, TMV2) four advance breeding lines; ANKSR1 (TMV2×Red Spanish), ANKSR2 (K6×Red Spanish), ANK2021-1(Tissa×2014), ANK2021-2 (Tissa×ICGV3487) and ANK2014 which is a local collection. The experimental design was Completely Randomized Design (CRD) with five replicates. Plants were subjected to regulated watering schedules. For the first 30 days all pots were watered regularly, from days 31 to 60, the drought stress group was relocated to a rain shelter and given minimum "life-saving" irrigation, while the control group continued to receive routine watering. Both groups resumed routine irrigation after day 61. When screening groundnut lines for midseason drought conditions, two critical indicators were considered: Drought Tolerance Efficiency (DTE) and Drought Susceptibility Index (DSI). A DTE greater than 45 indicates good drought tolerance and a DSI of less than 1 suggests that the genotype is less susceptible to drought conditions. The findings of the experiment indicated that ICGV 3487 and ANKSR2 demonstrated significantly greater tolerance to mid-season drought stress, whereas ANK2021-1 and ANKG1 showed only moderate tolerance. This study provides valuable insights into drought tolerance of groundnut lines. Future studies are needed to confirm these results (including a tolerance check for ICGV3487 and a susceptibility check for TISSA). Additional seasonal trials and more comprehensive field evaluations under controlled drought conditions are recommended.

Keywords: Drought indicators; drought tolerance; field evaluation; pot experiments; yield performance

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Paper ID: NSALS '25-195 (Oral)

Investigating the impact of population dynamics on life history strategies of Red Mite in tea plantation: An *in-vitro* study

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The Red Mite (*Oligonychus coffeae*) poses a significant threat to tea cultivation in Sri Lanka and other tea-producing regions due to its pervasive nature and detrimental impact on tea plant health and productivity. This study explores the role of social environmental factors, specifically population size and population density in shaping the life history strategies of Red Mites in Sri Lankan tea plantations. Using petri dishes as controlled environments, varying population sizes and densities of Red Mites were established on tea leaf substrates, enabling a detailed analysis of the mites' growth, reproduction, and survival responses to these conditions. Key life table parameters, including net reproductive rate, intrinsic rate of population increase, mean generation time, and doubling time, were measured. Data analysis was conducted using the GLIMMIX procedure in SAS Studio (version 9.1), with life table parameters for each treatment group computed through the jackknife method. A Generalized Linear Mixed Model was applied to evaluate the impact of population density and size. Results indicate that Mite populations grew faster when densities were low, and sizes were large. Increasing both density and size together reduced net reproductive rates. High population densities resulted in longer generation and doubling times. In contrast, larger population sizes shortened. The findings highlight that effective Red Mite management strategies in tea plantations must consider these social dynamics to mitigate the adverse effects of infestations. This research provides insights that contribute to sustainable pest management practices, promoting ecological integrity and supporting enhanced tea production.

Keywords: Doubling time; history strategies; intrinsic rate of increase; net reproductive rate, social environment life; tea Red Mite

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Paper ID: NSALS '25-218 (Oral)

Evaluation of growth, yield and postharvest quality of salad cucumber varieties for polytunnel cultivation in Sri Lanka

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Salad cucumber is a high demand vegetable crop cultivated especially in the polytunnels for the local and international markets. However, having only a few recommended varieties has hindered the extensive cultivation. This study at Regional Agricultural Research and Development Centre, Bandarawela evaluated the growth, yield, fruit quality, and postharvest performance of four exotic cucumber varieties namely, V_1 (Barika), V_2 (Aaima IT), V_3 (Gen Activa), and V_4 (CU 818) and a control variety, V_5 (Basimah F1) recommended by the Department of Agriculture to assess their suitability for local and export markets. According to the results, V_4 achieved the highest plant height at 50% flowering (89±5.81 cm), while V_1, V_2, V_3, and V_5 showed heights ranging from 43.33 cm to 48.5 cm. In one month, V_4 recorded the highest SPAD value (82.1±13.6). V_4 was the only variety free from pests and diseases. However, yield assessments indicated that V_2, V_3, and V_5 produced higher total yields per vine compared to V_4. Yet V_4 had a larger average fruit weight (178.44±6.08 g), thickest flesh (10.44±0.922 mm), and it might attract markets that prefer harder, heavier fruits. V_4 fruits were the broadest in diameter (37.44±0.511 mm) and the longest (191.28±5.88 mm) in size. Its export potential might be lean by its size unpredictability. On the other hand, V_3 and V_5 showed more consistent fruit sizes, which made them perfect for export markets. Postharvest analysis revealed that V_4 has the least cumulative moisture loss at room temperature. However, under refrigerated conditions, V_2 and V_5 had extended shelf lives. In conclusion, V_2, V_3, and the control (V_5) are ideal for fresh consumption due to their high yields. Despite its lower yield, V_4's resistance to pests and diseases, larger fruit size, thick flesh and larger weight might attract local consumers. Future studies should explore enhanced cultivation techniques to further improve yield and quality.

Keywords: Exotic cucumber varieties; fruit quality; growth parameters; shelf life; yield

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ENVIRONMENTAL SCIENCE AND CLIMATE CHANGE

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Paper ID: NSALS '25-012 (Oral)

Variability of biological productivity indicators in the Arabian sea: Insights from decadal observations (1993–2023)

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The Arabian Sea (AS) is known to be one of the most productive areas in the world's oceans, driven by a complex interplay of physical and biological factors. While the AS is known for its high productivity, studies that specifically link this productivity to climatological data over long-term periods remain scarce. The present study utilized three major parameters such as phytoplankton, Chlorophyll-a and Net Primary Productivity (NPPV) at surface as indicators of primary productivity in ocean ecosystems. The study aimed to understand the relationships among the three parameters, spatiotemporal distributions and their climatological changes over the past three decades. Monthly mean hindcast data (0.25-degree spatial resolution) from 1993 to 2023 were obtained from Copernicus Marine Environmental Monitoring Service. The AS was subdivided into distinct geographical domains to include western, eastern, northern, central parts to investigate spatial differences influenced by varying oceanographic processes. Considering the study area as a whole, the ranges of biological productivity indicators during the study period were 0.11 to 1.12 mg/m³ for Chlorophyll-a, 1.23 to 4.72 mmol/m³ for phytoplankton concentration, and 2.97 to 56.71 mg/m³/day for NPPV. The monthly mean values (±SD) of Chlorophyll-a, phytoplankton concentrations and NPPV were 0.26±0.19 mg/m^3, 1.82±0.61 mmol/m^3 and 13.07±10.48 mg/m^3/day respectively in 30-year period. Pearson's correlation coefficients among the key parameters were significant. Chlorophyll-a had strong positive correlations (P<0.01) with phytoplankton concentration (r=0.92) and NPPV (r=0.98). Moreover, a strong positive correlation (P<0.01) exists between phytoplankton and NPPV (r=0.91). There was a significant difference (P<0.01) of monthly means between three parameters across the four regions, highlighting spatial variability across the basin. The highest values of all three parameters were observed in the western AS, followed by a descending order in the northern, central, and eastern regions. Compared to previous years, the year 2023 showed a marked increase in NPPV particularly in the western AS, indicating enhanced productivity. The study concludes that the western region is the most productive region in AS and serves as a critical zone of enhanced biological activity and productivity, emphasizing its importance for ecosystem health and resource management.

Keywords: Arabian sea; Chlorophyll-a; phytoplankton; primary productivity

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Paper ID: NSALS '25-018 (Oral)

Perception of marine fishers on fisheries insurance: A case study of Tangalle, Sri Lanka

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Marine fishery insurance is an important social protection tool that helps manage risk and uncertainties in the fisheries industry. However, there is limited research on this topic within Sri Lanka's fisheries context. This study aims to explore fishers' awareness and willingness to adopt marine fisheries insurance in the Tangalle fishing community, Sri Lanka. A total of 200 marine fishermen were selected from the Tangalle fishing community. A convenience sampling technique was used to select the fishermen considering the availability of fishermen at the Tangalle fishery harbor at the time of data collection. They were interviewed using a pre-tested structured questionnaire from November 2023 to January 2024. The survey questionnaire included three parts: risk and uncertainties in the fishery industry, current status and perception of fishermen on fisheries insurance including parametric insurance, and socio-demographic factors of the respondents. The binary logistic regression model and descriptive statistics were used for data analysis. Life risk, depletion of fish stock, a reduction of income, and poor living conditions of fishermen were the highest risk types recognized by the fishermen. The majority of fishermen knew that life (81.1%) and vessel insurance (91.7%) were mandatory by law for all fishers. However, only 1.1% of fishermen had obtained a parametric type of fisheries insurance. The current purchased level of parametric insurance by the fishermen was considerably low mainly due to the lack of awareness. Approximately 67.4% of the respondents had no idea about their fishing insurance type, i.e. Loss and damage insurance type or Parametric insurance type. It was found that 32.2% of respondents had an intention of getting parametric type of fisheries insurance. This finding reflects a promising trend of adopting parametric insurance by the fishermen compared to the current status of the purchased limit of the parametric insurance. The results identified two main perceptions that significantly influenced fishermen's intention to purchase parametric insurance. First, reducing Goods and Services Tax (GST) was perceived as to lower premiums (P<0.05). Second, eliminating personal verification for claims processing encouraged adoption (P<0.05). Stakeholders should prioritize developing third-party verification systems for parametric insurance claims. This strategy would better motivate fishers to adopt parametric insurance compared to tax reduction measures.

Keywords: Fishing community; loss and damage insurance; marine fishery insurance; parametric insurance; risk and uncertainties

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Paper ID: NSALS '25-019 (Oral)

Marine fisheries insurance: Insights from financial institutes in Hambantota district, Sri Lanka

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The marine fishery sector faces numerous challenges from natural disasters and human activities, necessitating effective insurance solutions. Currently, two main types of insurance, i.e. loss and damage insurance and parametric insurance, are used in the world to mitigate such challenges. However, in Sri Lanka, the number of companies providing insurance to fisherfolk is limited. This study examined the status of marine fisheries insurance provided by the insurance companies and identified the challenges of providing marine insurance. A total of 24 branches of 15 insurance companies, which were located along four coastal cities in Hambantota district, Sri Lanka, and all branches were selected for this study, but only 19 branches responded. A pre-tested structured questionnaire was used to interview two executive officers from each branch from November 2023 to January 2024. The Wilcoxon signed-rank test and descriptive statistics were used to analyze data. Most companies (84.2%) have worked in the insurance sector for over 20 years. All 19 branches provided fishing insurance with a special focus on delivering loss and damage insurance. Further, the majority covered personal accident cover (89.5%), death due to natural causes (73.7%), missing fisher's compensation (73.7%), disability insurance (63.2%), and hospitalization allowance (73.7%). Only a few companies provided livelihood coverage (26.3%), repatriation travel (15.6%), and education allowance for the children (42.1%) under their fishery insurance. Most of the branches covered total damage to the vessel (68.4%), while fishing gear damage was covered by only 47.4%. The identified challenges in fishery insurance were low affordability and a higher chance of malpractice by the beneficiaries. In conclusion, our study provides insights into the insurance companies that are improving the supply of marine fishery insurance to penetrate the fisheries industry by addressing the identified challenges in parametric insurance.

Keywords: Fisheries industry; fishery insurance; loss and damage insurance; malpractices; parametric insurance

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Urban road dust pollution: A preliminary study from Galle, Southern province, Sri Lanka

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The urban environment is polluted by multiple anthropogenic activities causing serious public health risks. Road dust is considered a critical non-point source of pollution for microplastics and other contaminants that can be translocated into the atmosphere and nearby ecosystems. Urban pollution management is a challenging environmental issue without properly understanding pollution levels and sources. In Sri Lanka, studies on pollution from urban road dust are still limited. This preliminary study investigated the abundance, and characterization of selected pollutants across Wakwella road, a leading metropolitan street in Galle, Southern province, Sri Lanka. Samples were collected from two sub-sites (No: of replicates=3) during April-May 2024. Collected sweep-sand samples were subjected to Wet Peroxide Oxidation followed by density separation and filtration. According to the results, particle abundance is spatially different across the street depending on factors such as traffic intensity (P<0.05). The results revealed that the average particle density±SD of the sub-site with high traffic intensity was 2711.11±255.90 particles/kg DW (Dry Weight), while the 1500.00±281.74 particles/kg DW of average was recorded for the sub-site corresponded to low traffic condition. The recorded particle types in the samples were microplastics (48.93%), glass beads (31.64%), and tire and road wear particles including bitumen (19.44%). Out of eight different color categories, blue (43.60%) colored particles were more abundant, followed by black (38.15%), red (9.54%), grey (4.09%), and other colored (4.63%) particles. The high proportion of microplastics with colored fiber particles highlights the domestic waste (laundry and textiles) discharged from nearby residential areas into the urban vicinity. The black particles further confirm the presence of the tire and road wear particles in the road dust from automobiles. The size distribution data revealed that particles between 1-2 mm in size (32.38%) are dominant out of all size categories. These deposited particles in road dust are likely to be discharged into the receiving water during the rainy season. In conclusion, this study revealed microplastics and the tire, and road ware particles accumulation in road dust of urban areas. As for the future implications, this study suggests conducting a detailed investigation into the composition of road dust and rainwater by surface runoff to understand the potential effects and pathways of urban pollutants.

Keywords: Automobiles; Bitumen; microplastics; road dust; spatial differences; tire wear particles

Underlined is the presenting author.

Paper ID: NSALS '25-121 (Oral)

Treatment of textile dye wastewater using biochar derived from tea waste

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The increasing pollution of water bodies due to textile dye effluents poses significant environmental challenges. The treatment of textile dye effluent is one of the major environmental concerns because of the high degree of resistance and hazardous nature of the synthetic dyes. Conventional processes for treating dye effluents are coagulation, oxidation, adsorption, etc. However, they are expensive. Also, tea waste biomass, which is usually generated in large amounts by tea factories, poses disposal problems, thus polluting the environment and releasing greenhouse gases during their decomposition. This study explores a dual-solution approach for these two environmental problems by using biochar derived from tea waste for the treatment of dye wastewater. This study aimed to produce biochar from tea waste pyrolyzing at temperatures of 300, 400, 500, and 600°C to yield biochar with different surface characteristics and adsorption capabilities to treat dye effluents. The result biochar was tested for dye removal capability, and the necessary optimum conditions were determined as pH 6, biochar dosage of 4 g/L, and 1-hour contact time in batch experiments. Water quality parameters such as pH, turbidity, Chemical Oxygen Demand (COD), Total Dissolved Solids (TDS), and Dissolved Oxygen (DO), were also measured to assess the efficiency of the treatment process. It was observed that the biochar prepared at 500°C demonstrated the highest dye removal efficiency of 79% by light absorbance, compared to the biochar produced at other temperatures and the same amount of commercial activated Carbon under optimum conditions, the biochar produced at 600°C showed a color reduction of 65%. In contrast, activated Carbon attains 56% color removal efficiency. At optimum conditions, biochar produced at 500 °C resulted in the following improvements in water quality compared to the control: The reduction in turbidity from 71.2 NTU to 8.78 NTU, light absorbance from 0.640 AU to 0.256 AU at wavelength 436 nm, and COD from 201.6 mg/L to 128 mg/L. Additionally, electrical conductivity, TDS, and salinity were measured to ensure the quality of the treated dye effluent. The results underscore the potential of tea waste biochar as an effective alternative to activated carbon in treating textile dye wastewater, providing a promising solution for industrial water pollution control.

Keywords: Activated Carbon; adsorption; tea waste biochar; textile dye wastewater; wastewater treatment

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Paper ID: NSALS '25-125 (Oral)

Evaluating the potential of ALOS-2 PALSAR-2 satellite data for above-ground biomass estimation in Kadolkele mangrove ecosystem in Sri Lanka

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Mangrove ecosystems, known as blue Carbon ecosystems, play a vital role in climate regulation through their exceptional ability to store Carbon. Estimation of the Above Ground Biomass (AGB) is essential for understanding their Carbon sequestration capacity in mangrove ecosystem. This study aimed to assess the potential to estimate AGB using freely available ALOS-2 PALSAR-2 data within Kadolkele mangrove ecosystem in comparison with field data. This estimation of AGB through radar data is important for the areas with less accessibility and inaccessibility. Diameter at Breast Height (DBH) measurements were collected from eighty-five circular plots 1 m radius, and the relevant allometric equations were used to estimate the AGB. Backscatter coefficient values of HH and HV polarization from ALOS-2 PALSAR-2 (level 2.2) images were then used to estimate the AGB of mangroves using a simple linear regression model in Google Earth Engine. The field sampling method observed an average AGB of 1,350,375.56 Mg/Ha^1, with values ranging from 426.56 to 7,934,010.46 Mg/Ha^1. In contrast, PALSAR estimated an average of 1,210,568.37 Mg/Ha^1, with a range from -534,149 to 3,157,330 Mg/Ha^1, indicating a 10.35% underestimation for HH polarization. For HV polarization PALSAR estimated an average of 1,232,773.35 Mg/Ha^1, with a range from -382,708 to 3,211,440 Mg/Ha^1, indicating an 8.71% underestimation. The accuracy of the developed models was assessed based on RMSE, MAE, and R^2 values. The RMSE, MAE, and R^2 values for the model developed from the HH backscatter coefficient were 2,463,240.78, 1,914,812.51, and -0.028, respectively. For the model developed from the HV backscatter coefficient, the RMSE, MAE, and R^2 values were 2,342,965.29, 1,900,561.76, and 0.06, respectively. Higher RMSE and MAE values, as well as the R^2 values that are not close to 1, indicate that both models are not effective at estimating the AGB in the study area. This underestimation is likely to result from water canals within the area reducing backscatter. Additionally, level 2.2 speckle filtering averages the pixel values from vegetation and water, lowering vegetation backscatter. These challenges could be addressed through future studies by implementing machine learning algorithms such as Random Forests (RF) or Support Vector Machines (SVM).

Keywords: Blue Carbon; Carbon sequestration; dual polarization; radar

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Paper ID: NSALS '25-126 (Oral)

An analysis of secondary vegetation on abandoned shrimp farms in Anawilundawa Ramsar sanctuary

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The Accelerated Natural Regeneration of Mangroves (ANRM) project was launched in Anawilundawa wildlife sanctuary to regenerate lost mangrove habitats, recognizing the importance of mangroves. The present secondary vegetation has not been evaluated comprehensively in the plots that will be hydrated and planted with mangroves in the time to come. This study therefore assessed the floral diversity of selected already restored and to-be-restored plots to identify plant community dynamics. Floral diversity was assessed using line transects across eight selected plots of different restoration ages. In each plot, three 50-meter line transects were established - each in the top, middle, and bottom sections. Along each transect, three quadrats (0.5×0.5 m²) were placed at the top, middle, and bottom positions to ensure sampling coverage. Herbariums were prepared prior to identification. The species diversity was calculated based on species richness, dominance, and evenness weighted indices. A total of 54 plant species were identified. The salt marshes were characterized by dominant species including *Suaeda maritima, Suaeda monoica*, and *Tamarix indica*. The highest species richness (12 species) was recorded in plots 1 and 2, which were the first restoration plots initiated in 2019, while plot 7, where restoration was initiated in 2023, had the lowest species richness (03 species). The highest evenness (Pielou index=0.47) was recorded in plots 1 and 2. The lowest value (Pielou index=0.22) was observed in plot 23, which had not undergone any restoration yet. Plots 1 and 2 recorded the highest Shannon index (1.17) and Simpson index (0.59), with a diverse species composition dominated by *Suaeda maritima, Suaeda monoica*, and *Cynodon dactylon*-like grass varieties. The lowest Shannon index (0.41) and Simpson index (0.19) were recorded in plots 21 and 23 respectively, both of which were unrestored plots. The results revealed that accelerated natural regeneration through canal construction improved saltwater influx, providing suitable habitats for more halophytes. Continuous monitoring of the restoration plots is important for future management practices.

Keywords: Floral diversity; halophytes; restoration; wildlife sanctuary

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Paper ID: NSALS '25-128 (Oral)

Assessing the health impacts of climate induced extreme weather events: Challenges and adaptive strategies in vulnerable communities

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Climate-induced extreme weather events-including heatwaves, hurricanes, floods, and wildfires-are occurring with greater frequency and intensity due to global climate change, presenting significant risks to human health. Vulnerable communities, such as low-income populations, elderly individuals, and those residing in under-resourced or remote areas, are disproportionately affected due to pre-existing health disparities and limited adaptive capacity. These communities often experience severe physical and mental health impacts from these events, which coupled with inadequate resources, complicate efforts toward adaptation and recovery. Additionally, the study seeks to evaluate and propose adaptive strategies that can be effectively implemented to mitigate health impacts and improve resilience in these populations. Quantitative data, including rates of morbidity, mortality, and incidence of specific health issues such as heat-related illnesses, respiratory complications, and infectious diseases, are gathered from public health records and climate datasets. Qualitative interviews with community members, healthcare providers, and local policymakers provide insights into the lived experiences and adaptive capacities of vulnerable populations. Direct health effects include increased rates of injuries, heat-related illnesses, cardiovascular stress, and respiratory complications due to smoke inhalation from wildfires. Indirect health impacts, such as disease outbreaks following floods or hurricanes and increased rates of anxiety, depression, and Post-Traumatic Stress Disorder (PTSD), are also prevalent. Vulnerable communities face substantial barriers to adaptation, including inadequate healthcare infrastructure, limited access to emergency resources, and socio-economic constraints that restrict recovery and preparedness efforts. Additionally, policy gaps, such as the lack of integrated climate resilience in healthcare planning and limited community involvement in decision-making processes, exacerbate health risks. This study highlights the urgent need for targeted adaptive strategies to mitigate the health impacts of climate-induced extreme weather events on vulnerable populations. Key recommendations include strengthening climate-resilient healthcare infrastructure, implementing community-centered resilience programs, and developing locally tailored early-warning systems to inform and protect at-risk individuals.

Keywords: Adaptive strategies; extreme weather; health impacts; vulnerable communities

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Paper ID: NSALS '25-130 (Oral)

Evaluating the economic impacts of Carbon pricing policies: Legal frameworks and policy implications for sustainable development

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With the accelerating impacts of climate change, Carbon pricing has become an essential policy tool aimed at reducing greenhouse gas emissions while promoting sustainable development. Through mechanisms like Carbon taxes and cap-and-trade systems, Carbon pricing seeks to internalize the environmental costs of Carbon emissions, shifting financial incentives towards low-Carbon alternatives. Understanding these economic and legal dynamics is critical for shaping effective Carbon pricing policies that drive both environmental and socio-economic benefits. This study aims to evaluate the economic impacts of Carbon pricing policies, with a specific focus on understanding, how different Carbon pricing mechanisms influence economic growth and market dynamics, the role of legal frameworks in facilitating or hindering effective policy implementation, and the broader policy implications for achieving sustainable development and equity. Quantitative data on economic performance indicators, including GDP growth rates, sectoral output, and competitiveness, were collected from regions with established Carbon pricing policies. The analysis includes both high-income and low- to middle-income countries to capture variations across economic structures. Additionally, qualitative case studies from selected regions-highlighting successes, barriers, and stakeholder responses were conducted to explore legal and policy factors influencing carbon pricing effectiveness. The study finds that the economic impacts of Carbon pricing are highly context dependent. In high-income regions, Carbon pricing has generally supported emission reductions without significant adverse effects on economic growth, particularly when revenues are reinvested in green technology and infrastructure. In contrast, some low to middle income countries face economic challenges, including increased production costs and competitiveness concerns for Carbon-intensive industries. Legal frameworks also play a critical role in policy effectiveness; strong compliance mechanisms, clear revenue allocation guidelines, and international policy alignment significantly enhance outcomes. The findings suggest that policy designs incorporating equitable revenue reinvestment, targeted support for vulnerable industries, and international cooperation can help balance economic growth with emissions reduction goals.

Keywords: Carbon pricing; economic growth; environmental cost; legal dynamics; policy tool

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Paper ID: NSALS '25-137 (Oral)

Assessing the impact of land use land cover changes on river discharge by correlation analysis: A case study in Nawalapitiya river basin of upper Mahaweli catchment

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Land Use Land Cover (LULC) is a key driver significantly impacting river regimes by altering hydrologic properties. Thus, the present study focused on identifying the impact of LULC changes (2001-2017) on river discharge (RD). Monthly average RD (1990-2023) collected from Nawalapitiya catchment's gauging station (7° 02'51"N, 80° 32'04"E) and digitized LULC maps for 2001 and 2017 of the study area and ArcMap 10.8 software was used for detecting LULC changes. The linear interpolation method was employed to detect intermediate LULC changes in 2005, 2009, and 2013. Pearson correlation analysis was performed to detect the correlation between the percentages of LULC changes and the average RD of each period. Results revealed that the forest areas and built-up areas have significantly increased (79.10% and 71.90% respectively) while cultivation, bare land areas, rock and water areas have reduced by 26.21%, 15.10%, 39.30%, and 25.25% respectively from 2001 to 2017. Results of Pearson correlation analysis revealed that moderate positive correlation of forest (0.4) and built-up areas (0.45) with RD, while cultivation, bare, rock, and water areas exhibited negative correlations with RD, illustrating correlation values -0.37, -0.48, -0.40, and -0.41 respectively. Conferring the correlation analysis results, LULC changes from 2001 to 2017 have moderately impacted on increase in RD insignificantly. Increased forest and built-up areas were identified as the key drivers that impacted on river discharge. Therefore, the study concluded that LULC change at Nawalapitiya river gauging station has a moderate impact on RD variation other than natural seasonal monsoon and climatic effects. Furthermore, the study suggests that continuous research focusing on the trend analysis of river discharge over time along with LULC variations and their impact on catchment hydrology, is essential for ensuring sustainable water resource and land use management in this region.

Keywords: Catchment; correlation; land use land cover; river discharge

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Paper ID: NSALS '25-163 (Oral)

Removal of reactive red dye from aqueous solution using magnetic biochar prepared from Dipping Tank Coagulum (DTC) of rubber glove production

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Glove production is one of the major industries in Sri Lanka that utilizes rubber latex as a raw material. Dipping Tank Coagulum (DTC) is a rubber waste which can cause potent environmental risks. Conversion of this undegradable waste material into useful products has emerged as a challenging problem. Consequently, this study focused on utilizing DTC to produce biochar to remove the reactive red dye from aqueous solutions, which is one of the commonly used dyes in the textile industry in Sri Lanka. The DTC-biochar was modified into its magnetic form by following a heat treatment process at 300°C varying the impregnation ratios of Fe_3O_4:biochar, which was characterized using SEM and FTIR and depicts that the Fe_3O_4 nanoparticles (approximately 150 nm in size) had immobilized on the DTC-biochar particles (approximately 3-5 µm in size). In this study, the adsorption of dye over magnetic biochar was evaluated through batch experiments, by changing the initial concentration of the dye, dosage of the adsorbent, contact time, and the initial pH of the dye solution to optimize the impregnation ratio and optimum condition for the sorption. The adsorption efficiency of the optimized magnetic biochar was tested with Langmuir isotherm. To see the potential of reusability of the used magnetic biochar, a desorption test was done with 0.2 M H_2SO_4 and 0.2 M NaOH solutions. Results show that the magnetic biochar produced by the impregnation of Fe_3O_4 and DTC biochar with the ratio of 3:1 (w/w) had the best adsorption performance with the dye removal percentage of 78.2% at pH 6, contact time of 4.5 hours, initial concentration of the dye solution 10 mg/L, and adsorbent dose of 5 g/L. A comparative study was done with the same dose of industrial activated carbon which removed approximately 83.2% of the initial dye in the available solution. The adsorption isotherm of reactive red dye on magnetic biochar was described well, ensuring favorable adsorption by the Langmuir isotherm model with a high R^2 value of 0.99 and the separation factor RL= 0.208. This study shows that using an industrial waste material generated magnetic biochar is cost effective, environmentally friendly, practically easy executable, and has beatable adsorption capability compared to commercial activated carbon in the textile dye removing process.

Keywords: Dipping tank coagulum; Langmuir isotherm; magnetic biochar; reactive red dye

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Paper ID: NSALS '25-166 (Oral)

Analysis of anomalies of soil properties in Tharanagahawewa area in Puttalam district

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This study investigates soil and water anomalies affecting paddy growth in Tharanagahawewa, Puttalam district, Sri Lanka (7°58'52.14"N, 80°2'29.69"E). The research aimed to identify physical and chemical discrepancies between areas with inconsistent and healthy paddy growth. Six sets of soil and water samples were collected from problematic and normal areas and analyzed for key indicators, including particle size distribution, pH, and conductivity. Results revealed that soils from areas with stunted growth exhibited coarser textures with lower water and nutrient retention capacities compared to the finer-textured soils in productive zones. Additionally, water samples from problematic areas displayed elevated pH and conductivity levels, indicating salinity and alkalinity issues. These conditions can impede nutrient absorption and contribute to soil stress, exacerbating irregular crop performance. The study concludes that the primary driver of irregular paddy growth is the sandy soil texture in problematic areas, which reduces water retention and nutrient availability. These findings highlight the importance of targeted soil management practices, such as improving soil structure and enhancing moisture retention, to mitigate these challenges. Recommendations include the use of organic amendments, soil conditioners, and appropriate irrigation strategies to improve soil health and agricultural productivity. By addressing these soil and water anomalies, this research contributes to a better understanding of sustainable agricultural practices in paddy fields, ensuring long-term productivity and resilience in affected regions. These insights are particularly relevant for the Puttalam district and similar agricultural areas facing challenges in maintaining consistent crop yields.

Keywords: Paddy growth; particle size distribution; salinity; soil anomalies; soil texture; sustainable agriculture; water retention

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Paper ID: NSALS '25-169 (Oral)

Assessment of water quality and coral diversity for conservation of the Kayankerni marine sanctuary, Eastern coast of Sri Lanka

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The Kayankerni marine sanctuary, which is situated on the Eastern coast of Sri Lanka, plays a vital role in preserving marine biodiversity, particularly its coral reef ecosystems. A comprehensive understanding of water quality parameters and coral diversity is essential to support effective conservation efforts. Therefore, water samples were collected from three distinct locations within the sanctuary, and parameters including pH, temperature, Dissolved Oxygen (DO), Nitrate, and Phosphate were analyzed. Coral diversity was assessed by snorkeling over ten of 20 m long underwater transects parallel to the shore, which catalogued the presence and abundance of various coral genera. Descriptive statistical analysis was performed to determine average values for water quality parameters and coral species distribution. The average pH of seawater was 8.25, and the average temperature of 31.14°C indicates warm water conditions, which are typical for tropical reef systems with DO concentration of 2.56 ppm suggest that Oxygen levels are low, which could be a cause for concern. Nutrient levels revealed a mean Nitrate concentration of 0.71 µmol/L and Phosphate at 0.35 µmol/L, suggesting a relatively healthy nutrient status. Coral diversity was dominated by *Acropora* sp., which accounted for an average of 39.69% across transects, and other *Echinopora* sp. (4.47%), *Galaxea* sp. (0.07%), *Goniastrea* sp. (0.09%), *Montipora* sp. (0.77%), *Platygyra* sp. (0.01%), *Pocillopora* sp. (0.05%), *Porites* sp. (2.02%), *Turbinaria* sp. (2.95%) were present. While the presence of macroalgae was minimal at 0.16% dominating *Padina* sp. The Shannon-Wiener diversity index for the coral reefs was calculated as 0.77, indicating a moderate level of species diversity while Simpson's index was measured as 0.29, suggesting a relatively low level of species dominance within the coral community. The pH, typically around 8.1 to 8.3, helps maintain coral calcification rates and overall reef resilience, while DO levels below 3 ppm can lead to metabolic stress and inhibit coral growth and resilience, especially under warming conditions. In general condition, Nitrate and Phosphate higher than 1 µmol/L and 0.1 µmol/L respectively, can encourage algal blooms that compete with coral, disrupting coral-algae symbiosis and promoting macro-algal overgrowth. Having different coral genera within the study site represents positive ecosystem health, while further continuous monitoring of water quality and coral health is necessary to mitigate the adverse effects of climate change and human activities.

Keywords: Coral conservation; coral diversity; marine sanctuary; water quality

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Paper ID: NSALS '25-178 (Oral)

Simple and high throughput approach to enumerate *Escherichia coli* in water by measuring β-D Glucuronidase (GUS) activities via microplate reader

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Contamination of surface water and wastewater through pathogenic microorganisms is a severe issue. Nevertheless, direct monitoring of pathogenic bodies is a comprehensive process with complex procedures. Hence, this research aims to provide a reliable, cost-effective, and efficient protocol for measuring *Escherichia coli* (*E. coli*) in surface water and wastewater. However, this study has been previously implemented at Hokkaido University using Wastewater (WW) and River Water (RW) and manifested its applicability to detect fecal pollution more efficiently than conventional methods. In this study, we aimed to understand the applicability of this method in Sri Lankan urban rivers and WW. Under this method, the determination of β-D-glucuronidase (GUS) activity of *E. coli* was employed. The enumeration is based on the detection of fluorogenic signals, which are being liberated from fluorogenic substrate (4-Methylumbelliferyl-β-D-glucuronide-MUG, 4-Methylumbelliferyl-β-D-glucopyranoside-MUGlc, 4-Methylumbelliferyl-N-acetyl-β-D-glucosaminide-MU-NAG, and 4-Methylumbelliferyl-β-D-galactopyranoside- MUGAL) through GUS activity using a Microplate Reader (MR). Samples were taken from three urban rivers, Gin (G), Kepu (K), and Moragoda (M) representing surface water sources, and two WW treatment plants, Hikkaduwa (H) and Karapitiya (K) representing WW in Galle, Sri Lanka. In this method, water is mixed with liquid substrate, and fluorescence is monitored using MR. Fluorescence intensities of the samples increased linearly over a 2-6-hours period and the slope of the fluorogenic signal intensity of each sample is assumed to be proportional to the *E. coli* concentration of samples. The same sample was applied to the membrane filtration method demonstrating the conventional measurement technique. Then, the correlation between both methods (slope and CFU/mL) was analyzed. According to the results, G, K, and M showed a coefficient of determination 0.82 for MU-NAG, 0.74 and 0.69 for MUG respectively. Moreover, WW plant-derived water from H and K showed 0.72 for MUG and 0.75 for MUGAL. The result showed this simple method provided a total throughput in *E. coli* enumeration to provide relatively reliable, cost-effective, and efficient monitoring of fecal pollution in water and wastewater in Sri Lankan conditions. This method can be further expanded to *E. coli* in various water sources such as groundwater and treated water and other waterborne pathogens.

Keywords: β-D-glucuronidase activity; *E. coli*; fluorogenic; microplate reader; water

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Paper ID: NSALS '25-179 (Oral)

High-resolution mapping and elevation profiling of Panama sand dunes, Sri Lanka: A geospatial assessment of coastal vulnerability and morphological characteristics

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The coastal sand dunes are dynamic ecosystems that protect coastal areas from erosion and strong waves, providing habitats for various flora and fauna, and offering recreational activities due to their aesthetic beauty. Sri Lanka, as a tropical country surrounded by ocean and consisting of different wave actions on shore areas with monsoonal winds, experiences many morphological differences in the littoral zone as specially observed in Panama sand dune which is located on the southeastern coast area. Therefore, developing a high–resolution map of the extent and distribution of Panama sand dunes and the gauging of the elevation profile is essential to provide an assessment of the dunes' general morphology and coastal vulnerability. The study area (7.6785° N and 81.6608° E) was defined in Google Earth Pro (version 7.3) and the DJI Phantom 4 Pro V2.0 drone was utilized to capture images at 50 m altitude. The image overlapping was set to 90% when creating the GPS path by PIX4D Capture Pro software prior to image capturing. The captured drone images were pre-processed to create orthomosaic maps using the Drone Deploy website. Separately, the generated e-sampling grids, each representing a 5 m distance on the ground, were used for elevation data collection using the GPS visualizer website. The downloaded elevation data was utilized for creating the Digital Elevation Model (DEM) using ArcGIS 10.8 software, and the created DEM was used for the accurate assessment of elevation data in the created orthomosaic maps. The elevation attributes of sand dune orthomosaic maps were further statistically analyzed through descriptive statistics using the SPSS statistics 25.0 software. The elevation range and average elevation along the sand dune resulted from the descriptive analysis were 0 to 8.10 m of mean sea level and 2.17 m respectively. Approximately 31.9% of the sand dune area is situated at or near sea level. Estimated elevation is within the lower range, indicating a relatively modest elevation profile compared to global averages (2-15 m). Also, dunes close to sea level are highly susceptible to both natural and anthropogenic forces, often resulting in rapid and sometimes irreversible changes. Therefore, the conservation of the sand dune regions is necessary in Sri Lanka.

Keywords: Coastal morphology; digital elevation model; drone mapping; Panama sand dunes

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Paper ID: NSALS '25-184 (Oral)

Fate and transport of bacteriophages and viruses in soil around on-site sanitation systems in Sri Lanka

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Pit latrines and septic tanks with soakage pits are the most widely used wastewater treatment methods in Sri Lanka. Due to improper design and poor maintenance, groundwater is often contaminated by pathogenic viruses and bacteria released from on-site sanitation systems. This study focuses on viral and bacterial indicators that can be used to investigate the presence of pathogenic viruses and bacteria in the soil surrounding these sanitation systems. Specifically, bacteriophage and PMMoV (Pepper Mild Mottle Virus) serve as viral indicators, while *E. coli* and total coliform are utilized as bacterial indicators. Samples from four significant locations in Galle were subjected to a plaque assay to quantify bacteriophages, and ELISA was performed to detect PMMoV. Additionally, column tests were conducted to simulate on-site conditions in the laboratory. Columns measuring 0.5 m, 1.0 m, and 1.5 m in height were constructed, each containing three different soil combinations; 20% clay and 80% sand, 50% clay and 50% sand, and 80% clay and 20% sand. Plaque assays and ELISA tests were also performed on these soils to measure bacteriophages and PMMoV. Bacteriophages, PMMoV, and *E. coli*, were detected at each sampling location, indicating that the soil around on-site sanitation systems was contaminated with both bacteria and viruses. The removal of *E. coli* was 2 logs dropping below detection limits within 0.5 m of any soil composition when considering an influent concentration of 0 -103 CFU/ml in column Test. However, as *E. coli* concentrations exceed 104 -105 CFU/mL, the bacteria could survive at depths of up to 1.5 m, even in soils with high clay content. The removal rate of total coliform was greater than 2.7 log across all soil compositions at a depth of 0.5 m. Additionally, the removal rate of bacteriophages exceeded 2.1 log at 0.5 m for all soil types considered in this research. PMMoV was found in high concentrations even when *E. coli* levels were low, suggesting that PMMoV was a suitable viral indicator. It is concluded that PMMoV and bacteriophages can serve as biological water quality parameters to ensure safe water access. By extending the experiment to various soil combinations, recommendations can be made regarding the most suitable soil conditions for septic tank construction.

Keywords: Bacteriophages; column test; fate and transport; on-site sanitation systems; viruses

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Paper ID: NSALS '25-189 (Oral)

Investigation of coagulation, antibacterial, and cytotoxicity properties of *Nymphaea nouchali* Burm. f. (Blue water lily) and *Artocarpus altilis* (Park.) Fosh. (Breadfruit) extracts

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Global risks to ecosystems and human health are caused by untreated sewage, industrial waste, and agricultural runoff that contaminate water sources. Microorganisms and other biological contaminants are major causes of water-borne diseases such as Cholera, Hepatitis, Diarrhea, and Typhoid. Chemical coagulants used in many water treatment systems may leave toxic byproducts. This study aimed to compare the coagulation, antibacterial, and cytotoxic properties of *Artocarpus altilis* (Park.) Fosh. (Breadfruit) peel, and *Nymphaea nouchali* Burm. f. (Blue water lily) stem, as natural and eco-friendly coagulants for water treatment. These plant parts were selected based on their natural abundance as waste and possible potential as sustainable alternatives in water purification. Aqueous extracts of the inner peel of *A. altilis* and the inner stem of *N. nouchali* were prepared and their antibacterial effects were investigated by disk diffusion method, coagulation qualities were measured by turbidity using spectrophotometry and cytotoxicity effects of the effective concentrations were investigated by brine shrimp assay. The tests were repeated for effective concentrations of mixed plant extracts. Synthetic bentonite water was prepared as a turbid water model for the coagulation tests. All experiments were carried out in triplicates and statistical analyses were conducted using R-studio. Regarding coagulation properties, the absorbance reduction of *A. altilis* was significantly different at 10^{-3} g/mL, with a mean absorbance reduction of 10.33% (P<0.05). Meanwhile, *N. nouchali* was significantly different at 10^{-4} g/mL, with a mean absorbance reduction of 4.43% (P<0.05). The mixed extract at 10^{-3} g/mL had the highest significant difference with a mean absorbance reduction of 9.87% (P<0.05). However, the positive control, Ferric Chloride (existing coagulant agent) showed a significant reduction of turbidity by 84.07% at 0.1M (P<0.05). None of the extracts showed antibacterial activity against *Pseudomonas aeruginosa*, *Staphylococcus aureus*, and *Escherichia coli.* No significant cytotoxic effects (P>0.05) were demonstrated in the effective dosages for both plant extracts when tested individually and as a mixture. Further research should investigate different organic and inorganic extracting procedures, to yield more potent compounds. Additionally, testing a wider range of concentrations could enhance the effectiveness of these natural coagulants.

Keywords: Antibacterial activity; coagulation; cytotoxicity; natural coagulants; plant extract; sustainable water treatment

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Paper ID: NSALS '25-196 (Oral)

Wastewater treatment plants as a source of microplastic pollution: A preliminary study from Galle, Southern province, Sri Lanka

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A typical wastewater treatment plant contains a significant quantity of microplastics (<5000 µm). Accordingly, one possible pathway of microplastics infiltrating into the aquatic environment is wastewater treatment plants. However, microplastic pollution-related records in wastewater treatment facilities are yet to be investigated in Sri Lanka. This preliminary study was intended to analyze the concentration of microplastics in distinct phases during the local wastewater treatment process. Primarily treated and treated effluent water samples (n=3) were collected separately from a selected wastewater treatment facility in Galle, Southern province, Sri Lanka. Each sample was subjected to wet peroxide oxidation followed by density separation to eliminate organic matter and extract microplastic particles. The quantification and verification of microplastics were primarily conducted by stereo microscopic observations, hot needle test followed by standard, recommended guidelines. The results revealed that both primarily treated and final effluent (treated water) were contaminated with microplastics. The average abundance ±SD of primarily treated water and effluent were recorded as 222.5±42.65 items/L and 113.33±23.33 items/L respectively. However, microplastic abundance from the two treatment phases seems different, highlighting the performance effect of treatment techniques on the removal efficiency of plastics. The recorded microplastic removal efficiency was 49.07% after undergoing all the wastewater treatment technologies. Tiny microplastics (<1 mm) were predominant (72.09%) followed by larger microplastics (1-5 mm) in both samples. Large-sized plastic particles are generally removed by physical treatments. Tiny microplastics could be retained in the final effluent water without following advanced processing technologies. Moreover, out of 12 color categories that were detected, blue microplastics were the most common (42.55%), followed by black (16.80%), red (12.74%), transparent (5.69%), and other minor-colored categories (22.22%). Selective microplastics of distinct colors discharged into the aquatic environment by wastewater treatment facilities denote the alarming threats to biodiversity and ecological stability. The dominant morphotypes of microplastics were synthetic fibers (91.87%), fragments (4.88%), films (2.71%), and foams (0.54%). The receiving water source of this treatment plant is domestic wastewater which is comprised of laundry wastewater in a substantial proportion with the abundance of blue color tiny fibers. In general, this study shows that treated wastewater acts as a source of microplastic pollution in the environment.

Keywords: Domestic; effluent; fibers; microplastics; removal efficiency; wastewater treatment process

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Paper ID: NSALS '25-045 (Poster)

Water access and its implications on farm production: Evidence from Hakwatuna irrigation system in Kurunegala district, Sri Lanka

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Water scarcity has become a global challenge due to adverse changes in the climatic conditions along with the anthropogenic impacts on traditional irrigation systems. As a result, the farmers' livelihoods are highly affected as they are mainly dependent upon traditional irrigation systems for their cultivation. The case of Hakwatuna Oya irrigation system in Kurunegala district, Sri Lanka is not an exception from this scenario. As one of the major traditional irrigation networks Hakwatuna Oya irrigation system serves more than 2500 farm families in the Northwestern region of Sri Lanka, and the expected demand for water from this irrigation system is enormously high, especially during the dry season. However, this system has been facing a huge challenge to satisfy the water needs of the local farmers due to erratic rainfall patterns, increasing encroachments in the tank command, poor maintenance of irrigation networks, and ineffective water management decisions. This study explores the relationship between water access from the tank and farm productivity using the primary data collected from 155 farmers who are the direct users of irrigation water supplied from Hakwatuna irrigation tank. Distance from Hakwatuna tank to the farmer's field was used as the proxy for water access. Farm productivity measures included paddy yield, sales revenue, farm income, net income, and water conflicts among the farmers in the tank command area. Multiple linear regression and logistic regression models were employed to examine the relationship between water access and farm outcomes. The results show that the distance from the water source has a significant negative association with farm outcomes such as paddy yield (P<0.01), sales revenue (P<0.1), and income (P<0.1). However, there is a positive relationship between the distance from the water source and water conflicts (P<0.01). The results indicate that there is a significant negative relationship exists between the distance from the tank and farm productivity, and a significant positive relationship exists between the distance from the tank and water conflicts, suggesting the need to increase water access to support the livelihoods of the local farmers.

Keywords: Farm productivity; Hakwatuna Oya irrigation system; water access

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Paper ID: NSALS '25-009 (Oral)

Determination of best hydrolysis condition for egg yolk Phosvitin and checking the functional properties of its hydrolysates

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Egg yolk solids are mainly made up of Livetins, Lipovitellins, low-density lipoproteins (LDL), and Phosvitin. Phosvitin (PV) is a natural phosphoprotein in egg yolk, which is the most phosphorylated protein in nature. Enzymatic hydrolysis and high-temperature mild pressure (HTMP) methods are used for Phosphopeptide production. The objective of this study was to determine the best hydrolysis conditions for Phosvitin by comparing enzymatic hydrolysis and HTMP methods and to determine the functional properties of the hydrolysates. PV (20 mg/mL) was hydrolyzed with Pepsin, Trypsin, Papain and Protease enzymes up to 24 h and in the HTMP method hydrolysis was done with three pH levels 5.0, 7.0, and 9.0 for up to 60 min (15 min intervals) at 121°C for 0.1 MPa. Then 15% SDS-PAGE was conducted to select the best enzyme and HTMP conditions. Hydrolysis with Protease for 9 h and two different levels of pH 7.0 and pH 9.0 for 15 min were selected as respectively best enzyme and best HTMP conditions for checking degree of hydrolysis (DH) and functional properties such as the antioxidant activity (TBARs and DPPH assays) and metal chelating activity (Fe^{2+} and Cu^{2+} chelating activities). Protease hydrolysates showed higher DH which indicates that higher the DH when presence of higher amino group concentration of the resulted hydrolysates ($P<0.05$). In addition, protease hydrolysates had 65.33±0.25% free amino groups and pH 7.0 and pH 9.0 HTMP hydrolysates had 3.38±0.42% and 19.01±0.25%, respectively and also antioxidant properties were higher in hydrolysates obtain from Protease 9 h method compared to HTMP hydrolysates which obtained at pH 7.0 and pH 9.0 for 15 min ($P<0.05$). All the treatments had higher Cu^{2+} chelating activity, but in the Fe^{2+} chelating activity of Phosvitin and its hydrolysates showed negative results due to their releasing ability. Therefore, the hydrolysis of Phosvitin with protease for 9 h was more effective in enhancing the functional properties of Phosvitin than the HTMP treatment.

Keywords: Enzymatic hydrolysis; functional properties; HTMP; Phosphopeptide; Phosvitin

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Paper ID: NSALS '25-022 (Oral)

Development of nectar from Bael (*Aegle marmelos* L.) fruit and evaluation of its physicochemical, nutritional, and quality parameters

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The growing awareness of the health benefits of natural and functional foods has led to global demand for such products. In this context, fruit nectars have become a popular food category. Bael (*Aegle marmelos* L.) is a subtropical, underutilized fruit renowned for its rich nutritional profile and noteworthy therapeutic properties. This study aimed to formulate a Bael nectar with desirable sensory attributes and evaluate the composition and quality parameters. Mature Bael fruit pulp was extracted, and six nectar formulae were prepared with varying pulp concentrations of 20, 22.5, 25, 27.5, 30, and 32.5% (w/w). Sensory evaluation was conducted with 30 untrained panelists using a nine-point hedonic scale. Analysis of physicochemical, nutritional, and quality parameters was carried out for the selected formulation. Furthermore, the acidity, brix, total sugar content, and titratable acidity of the selected formulation were determined at 7-day intervals for 28 days under ambient conditions. Based on sensory evaluation, treatment formulated with 25% (w/w) Bael pulp, was selected as the most preferred. It resulted in 82.43±0.20% moisture, 13.77±0.03% total sugar content, 2.06±0.15% crude fiber, 0.80±0.10% crude protein, 0.60±0.10% total ash, and 0.45±0.05% salt. The mineral profile showed 9.00±0.05 mg/100 mL Calcium, 5.71±0.13 mg/100 mL Phosphorus, and 0.08±0.21 mg/100 mL Iron content. Functional properties such as total phenolic content, ascorbic acid content, and antioxidant activity (2,2-Diphenyl-1-picrylhydrazyl radical scavenging activity) were 2.10±0.18 mg gallic acid equivalent/100 mL, 22.15±0.33 mg/100 mL and half-maximum inhibitory percentage (IC_{50}): 3.43±0.07 mg/mL, respectively. The changes in acidity, brix, total sugar content, and titratable acidity of the treatment formulated with 25% (w/w) Bael pulp were minimal (P>0.05) compared to the fresh nectar during 28 days at ambient storage, demonstrating its high stability. The physicochemical and quality parameters complied with the Sri Lankan standards of fruit nectar (SLS 1328:2008). The Bael fruit nectar formulated with 25% (w/w) Bael pulp exhibited better nutritional, functional, and consumer-appealing properties.

Keywords: *Aegle marmelos* L.; Bael fruit; fiber; functional foods; nectar

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Paper ID: NSALS '25-023 (Oral)

Development of protective non-edible coating using Dawul Kurudu (*Neolitsea cassia)* leaf extract and Flax seed (*Linum usitatissimum)* gel to enhance the shelf life of bananas

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Bananas are among the most popular fruits globally, valued for their rich flavor, smooth texture, high nutritional content, and convenience. However, they are highly prone to microbial contamination and post-harvest degradation during the storage and transportation process after harvesting. This study focused on developing a non-edible protective coating composed of Dawul Kurudu (DK leaf) extract and Flax seed gel to enhance the shelf life of bananas. The DK leaf extract, known for its potent antimicrobial and antifungal properties, alongside flax seed gel stabilizing capabilities, resulted in a highly effective barrier against spoilage. In this study, immature Cavendish bananas were selected, and different coatings were applied with different proportions of flax seed gels to DK leaf extract (4:1, 3:2, 2:3, 1:4), respectively. Weight reduction, pH, titratable acidity, Total Soluble Sugar (TSS) content, and colony count of bacteria and fungi were analyzed with and without coatings during 15 days of storage. All treatments were triplicated and statistically analyzed using MINITAB software. All developed coatings were transparent and insoluble in water. Weight reduction was significantly different (P<0.05) from coated bananas to non-coated bananas. Among the coated bananas the highest weight retention was observed in coating with flax seed to DK extract (2:3 ratio) over the period. In addition, there was a significant effect on changes in pH, acidity, and sugar content with and without coating for 15 days. The pH and TSS increased, and acidity decreased with the time in all treatments. Among the coatings, increment of pH and sugar content were lowest in Flax seed to DK extract 2:3 ratio. The bacteria and fungi colonies were observed in non-coated bananas after 03 days and the colony formations were observed in coated banana after 09 days. Therefore, the coated banana with the Flax seed gel and DK leaf extract extended the shelf life compared to the non-coated banana. Among the coatings, Flax seed: DK extract ratio 2:3 demonstrated the highest shelf-life keeping quality over 12 days. These findings confirmed that the application of this protective coating can offer considerable protection against microbial development while enhancing the shelf-life and keeping the quality of the banana.

Keywords: Banana; keeping quality; post-harvest loss; protective coatings; shelf life

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Paper ID: NSALS '25-039 (Oral)

Microwave-assisted Far-Infrared drying of grapes

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Traditionally, raisins have been dried using solar drying or hot air-drying methods, often coupled with chemical pretreatments. Infrared radiation enhances the drying process by providing controlled heating, ensuring uniform drying, reducing drying time and ultimately improving the product quality. To deter reliance on chemical pretreatments in raisin processing, this study investigated the effect of Microwave Pretreatments (MP) with Far-Infrared (FIR) drying on the drying time, energy consumption, and physicochemical properties. A FIR prototype dryer was fabricated, equipped with temperature, and load cell sensors, alongside a temperature controller. Fresh grapes at commercial maturity were exposed to different combinations of microwave pretreatments (200 W for 1.5 min and 400 W for 1 min) and temperatures (60, 65 and 70°C). The MP significantly (P<0.05) shortened the drying time from 22 hours to 17.5 hours compared to unpretreated samples. The final DPPH radical scavenging activity (%) of raisin samples varied from 80.32% to 81.65% whereas ascorbic acid content varied from 7.49 to 4.62 mg/100 mL. The final total phenolic content according to the Folin-ciocalteau method varied from 315.76 to 303.26 mg/g. According to the results, the optimum drying condition was MP at 200 W for 1.5 minutes and FIR drying at 60°C for 18.5 hours. This method improved the nutritional profile of treated grapes in terms of antioxidant activity and phenolic content. This study demonstrated that integrating MP with FIR drying effectively accelerates grape drying without compromising their nutritional and antioxidant properties.

Keywords: Dehydration; dryer; microwave-assisted; physicochemical properties; raisin

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Paper ID: NSALS '25-050 (Oral)

Development of duckweed powder incorporated cookie and evaluation of its physicochemical, nutritional, functional, microbial and sensory properties

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Duckweed, a free-floating aquatic plant from the family *Lemnaceae*, is an underutilized nutritional resource with high protein content, providing all essential amino acids. In contrast, wheat flour, the primary structural component of most bakery products, has relatively low protein and micronutrient content. This study aimed to develop cookies incorporating duckweed powder and evaluate their sensory properties, while comparing the physicochemical, nutritional, functional, and microbial properties with the control cookie. Duckweed powder was prepared using a 1:1 ratio of *Spirodela polyrhiza* and *Lemna perpusilla*, which was selected based on preliminary trials. The physicochemical, nutritional, and functional properties of the duckweed powder were determined. Based on preliminary trials optimizing sensory acceptability and quality, four cookie formulations with 10, 20, 30 and 40% duckweed powder substitution were developed, along with the control cookie made of 100% wheat flour. A sensory evaluation conducted with 40 untrained panelists using a nine-point hedonic scale, identified 10% duckweed incorporation as the optimal for appearance, color, aroma, flavor, texture, and overall acceptability. The proximate analysis of the optimized cookie showed differences (P<0.05) compared to the control, with 5.05±0.03% moisture, 12.25±0.02% crude protein, 3.76±0.04% crude ash, 21.45±0.03% crude fat, 10.25±0.03% crude fiber, and 47.23±0.10% digestible carbohydrates. The duckweed incorporated cookies provided 430.98±0.05 kcal per 100 g, 22.43±0.04% sugar, 0.74±0.02% salt, and 1.64±0.03% total dietary fiber. The mineral content (Mg, K, Ca, Na, Fe, Mn, Cr, B) was also enhanced (P<0.05). Functional properties were improved, with higher total phenolic content (1.62±0.03 mg GAE/g), flavonoid content (282.05±0.01 mg CAT/g), 2,2-Diphenyl-1-picrylhydrazyl radical scavenging activity (212.36±1.20 mM TE/g), and α-Amylase inhibition (IC_{50} 2.26±0.02) compared to the control (P<0.05). Microbial analysis confirmed that total plate count, yeast and mold remained below standard limits for one month. All chemical, microbial, and heavy metal contents complied with Sri Lanka Standards Institution requirements. The findings suggest that duckweed powder holds significant potential as a partial substitute for wheat flour, offering enhanced nutritional and functional benefits in cookie formulations.

Keywords: Cookies; duckweed; micronutrients; protein

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Paper ID: NSALS '25-054 (Oral)

The Assessment of food wastage in food establishments in Sri Lanka

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Food waste is the discarded foods during preparation, plating, consumption, and disposal of unopened packaged food. In Sri Lanka, the total food wastage generated is estimated to be nearly 4,000 tons/day and this cross-sectional study was conducted to estimate the amount of wasted cooked food in different food establishments, identify the causes of food waste, and make suggestions to reduce food waste in food establishments. Twenty-three food establishments in urban and semi-urban areas were selected conveniently. Out of the total establishments, 12 were in Negombo, including 3 hotels, 5 restaurants, and 4 cafeterias, while 11 were in Pannala, including 2 reception halls, 5 restaurants, and 4 cafeterias. A pretested interviewer-administrated questionnaire, a face-to-face interview, and observation methods were used to collect information. The amounts of wasted cooked foods were calculated by dividing the total cooked food waste by the total prepared food. Microsoft Excel 2016 and SPSS 16.0 were used for the analysis of the data. The mean daily cooked food waste (kg) in food establishments in urban and semi-urban areas was 121.4±10.1 kg and 81.1±7.4 kg, respectively. The results revealed that cooked food waste in urban areas was higher than in semi-urban areas. The main causes for food waste were excess production and portioning, plate waste from customers due to over-purchasing, inadequate food storage facilities, and quality control issues when handling. The convenient strategies analyzed to reduce food wastages, and it includes reviewing stores frequently, using plating techniques to serve appropriate portions to customers, and keeping and maintaining daily food waste records. This study concluded the significant status of food wastage in all studied establishments with lack of preventing measures. This study raised the necessity of awareness programs for food establishments in order to achieve sustainable development targets of decreasing per capita food waste from retail to customer level by 2030.

Keywords: Establishments; food waste; hotels; semi-urban; urban

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Paper ID: NSALS '25-056 (Oral)

Improvement of viscosity and mouthfeel in drinking yoghurt by incorporating Tapioca modified starch

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Drinking yoghurt is commonly described as a low viscosity stirred yoghurt consumed worldwide. Modified starches are common plant-based natural ingredients used as a stabilizer, thickening agent, and creaminess enhancer. The present study aimed to identify the optimal concentration of Tapioca modified starch that enhances the viscosity and mouthfeel of drinking yoghurt and to assess the physicochemical and microbiological stability of drinking yoghurt with Tapioca modified starch over a defined storage period. Five formulations of drinking yoghurt including a control sample (without added Tapioca modified starch) were prepared with different levels of commercially available Tapioca modified starch (0.6, 0.7, 0.8, 0.9%) with a constant amount of gelatin (0.15%). The treatments were evaluated for sensory attributes (using 30 untrained sensory panel) and viscosity (using a viscometer) at 4°C. During the shelf life of 42 days at 4°C, samples were evaluated for physicochemical properties (pH, titratable acidity, viscosity, and syneresis) and microbial analysis (yeast, mold, and *E. coli*). The prepared drinking yoghurt samples were stored (4°C) in Polypropylene (PP) bottles. The data were analyzed using a completely randomized design. Results showed that, adding 0.6, 0.7, 0.8 and 0.9% of Tapioca modified starch in drinking yoghurt significantly increased the viscosity compared to the control sample ($P<0.05$). Drinking yoghurt with 0.7% Tapioca modified starch scored the highest overall acceptability ($P<0.05$). During the storage, the viscosity was increased ($P<0.05$), the syneresis was decreased ($P<0.05$). Reduced pH and increased titratable acidity were observed ($P<0.05$) due to increased level of microbial count during storage at 4°C. Microbial analysis ensured that the incorporation of Tapioca modified starch did not compromise the safety or quality of the drinking yoghurt for up to day 42 at 4°C. The results from the present study suggests that 0.7% Tapioca modified starch added to drinking yoghurt had significantly improved in viscosity and mouthfeel while reducing the syneresis compared to the control during the 42 days of storage at 4°C.

Keywords: Drinking yoghurt; sensory analysis; stabilizers; storage; viscosity

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Paper ID: NSALS '25-057 (Oral)

An evaluation of executive-level professionals' preference for Traffic Light Labeling system versus Health Star rating format in Sri Lanka

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Non-communicable diseases are a major public health concern in Sri Lanka, underscoring the need for strategies that promote healthier dietary choices. Front-of-pack labeling systems like the Traffic Light Labeling system and Health Star rating aim to improve nutritional awareness and guide choices. According to the Sri Lankan Food Act, the Traffic Light Labeling system is the statutory labeling system, whereas the Health Star rating has not been implemented in the country. This study investigates the preferences and awareness of executive-level personnel regarding various labeling types. A cross-sectional survey of targeted executive-level professionals in Sri Lanka was conducted using a structured questionnaire to gather data on demographics, socio economic factors, and preferences, with purposive sampling employed to ensure the selection of individuals experienced and knowledgeable about the study. Using IBM SPSS version 27, descriptive statistics and regression analysis identified determinants of labeling preferences. The results indicated a preference for the Health Star rating format, as respondents valued its simplified star-based system for its ability to enhance nutritional clarity. Nonetheless, the Traffic Light Labeling system also demonstrated significant appeal, with each labeling format providing distinct advantages in influencing and guiding consumer decision-making. The key significant variables related to preference arising from multiple linear regression were media influence, awareness of front-of-pack labeling systems, purchasing decision factors, awareness of non-communicable diseases, and preference for easy comprehension. Logistic regression analysis identified media influence, preferences for easy comprehension, and income level as significant predictors for labeling preference. These results suggest that although the Traffic Light Labeling system is the legally mandated front-of-pack scheme, incorporating features of the Health Star rating, such as clarity on healthiness, could enhance its effectiveness. An improved Traffic Light approach that integrates aspects of the Health Star rating may better support public health goals to reduce the non-communicable disease burden in Sri Lanka. Further research across broader population segments is recommended to validate these insights and refine front-of-pack labeling policies.

Keywords: Consumer preferences; front-of-pack labeling; health star rating; non-communicable diseases; traffic light labeling system

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Paper ID: NSALS '25-072 (Oral)

Development of sweet potato (*Ipomoea batatas*) flour and corn (*Zea mays*) flour based gluten-free cookie incorporating pumpkin (*Cucurbita maxima*) seed powder and evaluation of its quality parameters

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Sweet potato (*Ipomoea batatas*), widely available in Sri Lanka, is a rich source of unutilized starch, offering the potential for diverse food and industrial applications. Since sweet potato flour and corn flour do not contain gluten they can be identified as potential gluten-free flour sources for food production. Pumpkin (*Cucurbita maxima*) seeds are locally available and nutritious rich food waste. This study explored the potential of developing gluten-free sweet potato flour cookies by incorporating pumpkin seed powder as an alternative ingredient for gluten-free cookie production. Accordingly, various compositions were prepared by using different proportions of corn flour and sweet potato flour (100:0, 75:25, 50:50, 25:75, 0:100) while keeping the other ingredients (2.14% of pumpkin seed powder, margarine, white sugar, baking powder, full cream milk powder, vanilla essence and egg) constant. Sensory evaluation with 35 untrained panelists, utilizing a 9-point hedonic scale, identified the most preferred formulation. The physicochemical properties, proximate composition, nutritional composition and microbial properties of the finalized cookies were evaluated. The developed cookies demonstrated physicochemical properties, including 3.52±0.03 spread ratio, 0.27±0.02 of baking loss, 0.47±0.05 of water activity and 6.17±0.05 of pH. The developed cookies demonstrated a favorable nutritional profile as the energy content was measured at 453.57±2.16 kcal per 100 g, while acid-insoluble ash, acidity of extracted fat, and total dietary fiber were determined to be 0.02±0.01%, 0.37±0.30%, and 1.1±0.08%, respectively. The mineral composition included 1378±1.24 mg/kg of Calcium. Additionally, the cookies contained 17.6±0.16% of total sugar 0.21±0.07% of salt content as sodium chloride and 22.77±0.12% of crude fat. Accordingly, the cookie can be categorized as a cookie with a medium level of sugar, a low level of salt, and a high level of fat cookie. Microbial counts were found to be within acceptable limits, as defined by SLSI ensuring product safety. These findings suggest that the developed cookie serves as an alternative in cookie production, offering a nutritious and flavorful option for consumers with gluten sensitivities.

Keywords: Cookies; corn flour; gluten-free; pumpkin seed powder; sweet potato flour

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Paper ID: NSALS '25-084 (Oral)

Development of ready-to-drink spicy beverage from buttermilk

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The dairy industry is one of the main sectors in the food industry of Sri Lanka, producing a large amount of butter each year. The major by-product of butter production is buttermilk, which is well-known for its digestive health benefits and cooling properties, making it a popular choice in many cultures. Spices such as pepper, curry leaves, and cinnamon are recognized for their medicinal, preservative, and antioxidant properties. In Sri Lanka, however, buttermilk is not effectively utilized. Therefore, this study aims to develop a ready-to-drink spicy buttermilk beverage as a value added product from sweet cream buttermilk. Preliminary trials were conducted to choose the best spice combination for the buttermilk beverage. Accordingly, the three spices selected (pepper, curry leaves, and cinnamon) were dehydrated, powdered, and dry blended at a ratio of 1.25:1.25:1 to create a spice mix. The buttermilk base was prepared by adding sugar, salt, and vanilla at a constant proportion to buttermilk. Three samples were developed using 0.15%, 0.25%, and 0.35% (w/w) of the spice mix, along with a control without adding spices. The samples were evaluated for appearance, color, aroma, taste, mouthfeel, aftertaste, consistency, and overall acceptability using 30 untrained panelists utilizing seven-point hedonic scale. The most accepted sample was further evaluated for physicochemical, microbiological, and organoleptic properties over a 15-day storage period under refrigerated conditions. The results of sensory evaluation using the Friedman test revealed that there was a significant ($P<0.05$) difference among the three tested samples with respect to aroma, taste, mouthfeel, aftertaste, consistency, and overall acceptability. The 0.25% incorporation level of spice mix obtained higher mean values for all sensory attributes except the appearance. Proximate analysis of the final product revealed that the product contained 1.10% of fat, 3.8% of protein, 5.7% of lactose, 89.11% moisture, and 0.77% ash. pH decreased from 6.75±0.03 to 6.33±0.04, and titratable acidity slightly increased from 0.14±0.005 to 0.28±0.01 over the storage period. Based on quality assessments, the product can be stored at 4°C for up to 10 days. The study revealed that an innovative, nutritious buttermilk beverage can be prepared by utilizing spices available in Sri Lanka.

Keywords: Buttermilk; physicochemical properties; ready-to-drink; shelf-life; spices

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Assessing antibacterial properties of *Moringa oleifera* extracts and their application in yoghurt preservation

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Moringa oleifera, a medicinal plant well known for its antibacterial activity, has gained attention as a natural preservative in the food industry. Thus, *M. oleifera* extracts offer a promising alternative to synthetic additives by extending the shelf life of food products. This study aimed to determine the antibacterial properties of extracts from seeds, bark, and leaves of *M. oleifera* and their efficacy in yoghurt preservation. Moringa seeds, bark, and leaves obtained from the same source, were oven-dried, ground, and their aqueous extracts were prepared. These extracts were tested for their antibacterial properties against *Escherichia coli*, *Staphylococcus aureus*, and *Pseudomonas aeruginosa*. The leaf extract demonstrated the highest antibacterial properties and was incorporated into the yoghurt mixture at 1%, 2%, 3%, and 4% concentrations (v/v). A sensory evaluation assessed taste, odor, appearance, consistency, syneresis, color, and overall acceptability using a 5-point hedonic scale with 30 semi-trained panelists. The most accepted extract level was identified based on the mean scores obtained from the sensory evaluation. Selected yoghurt samples from the sensory analysis, were then kept under refrigerated conditions for 28 days and tested for pH, titratable acidity, moisture, total soluble solid, sensory characteristics, and ash content compared with the sample without moringa extract. According to the results, the leaf extract produced the largest inhibition zones (2.40±0.10 cm for *Escherichia coli*, 2.20±0.26 cm for *Staphylococcus aureus*, and 1.87±0.68 cm for *Pseudomonas. aeruginosa*). Sensory evaluation showed that the yoghurt sample with 4% *M. oleifera* leaf extract was most preferred. The yoghurt with 4% leaf extract had a pH of 4.51±0.03, titratable acidity of 0.92±0.03, moisture of 82.70±0.10%, TSS values of 17.30±0.10%, ash of 0.97±0.03% with good sensory attributes of all which were significantly higher (P<0.05) than the control samples after 28 days. The study concludes that *M. oleifera* leaf extract has superior antibacterial properties compared to seed and bark extracts. At a concentration of 4%, it can be used as a natural preservative for yoghurt without compromising its sensory or physicochemical properties.

Keywords: Antibacterial properties; *M. oleifera*; natural preservatives; yoghurt

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Paper ID: NSALS '25-089 (Oral)

Comparison of wine yeast and baker's yeast in alcohol production from *Gracilaria edulis*

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Gracilaria edulis, a red algae rich in bioactive compounds, is widely cultivated for agar extraction. It also shows promise for ethanol production, making it a potential resource for both the bioethanol and alcoholic beverage industries due to the release of bioactive components during fermentation. This study was conducted to assess the effect of two commercial yeast strains: (0.1% w/v) wine yeast and baker's yeast on alcohol production from *G. edulis*, incorporating a 25% pineapple fruit to enhance fermentation efficiency. Dried *G. edulis* was used at concentrations of 5%, 10%, 15%, 20%, and 25%, followed by 24 hours of incubation at 40°C to encourage enzymatic activity. A 7-day fermentation period followed, during which ethanol, methanol, pH, and Brix values were measured to assess yeast performance. Results showed that wine yeast achieved higher ethanol yields, ranging from 3.97±0.06% to 4.97±0.06%, with peak production (4.97%) at 15% seaweed concentration. Methanol values ranged from 12.67±0.58% to 15.67±0.58%. Brix values for wine yeast ranged from 1.90±0.10 to 3.07±0.06, while pH values ranged from 3.91±0.01 to 4.11±0.01. In contrast, baker's yeast produced ethanol concentrations ranging from 2.97±0.06% to 3.97±0.06%, with methanol levels between 13.67±0.58 and 16.00±1.00. Brix values ranged from 1.33±0.06 to 1.73±0.06 and pH levels from 3.72±0.04 to 4.45±0.06. Significant differences (P<0.05) were observed in ethanol production, Brix value, and pH value across all seaweed concentrations for both yeast types, emphasizing the impact of *G. edulis* concentration on fermentation outcomes. These findings indicate that wine yeast is more effective in achieving higher ethanol yields at specific seaweed concentrations. This study highlights the potential of *G. edulis* as a substrate for ethanol and methanol production and provides insights into optimizing ethanol output with different yeast strains while addressing methanol production concerns. Further studies could investigate the use of various carbon sources, such as different fruits, in conjunction with *G. edulis* to explore their potential in enhancing ethanol production.

Keywords: Alcohol; baker's yeast; fermentation; *G. edulis*; wine yeast

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Paper ID: NSALS '25-099 (Oral)

Potential utilization of *Saccharomyces boulardii* as a probiotic in a dairy beverage

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Saccharomyces boulardii is an eukaryotic probiotic with numerous biotherapeutic effects. It is commonly used as a supplement to promote human health and well-being. Inulin is a widely accepted prebiotic for its health-promoting properties. This study was conducted to develop a probiotic dairy beverage incorporating *S. boulardii,* while assessing the microbiological, physicochemical, functional and organoleptic properties during cold storage. Five treatments were prepared, incorporating (1) 2% *S. boulardii* only (2) 2% *S. boulardii* and 0.02% ABT-5 (3) 2% *S. boulardii* and 1% inulin (4) 2% *S. boulardii*, 0.02% ABT-5 and 1% Inulin and (5) 0.02% ABT-5 as the control. The percentages for *S. boulardii* and inulin were determined through experimental trials and the percentage for ABT-5 was selected based on existing literature. *S. boulardii* were selectively enumerated using Sabouraud agar. *L. acidophilus, Bifidobacteria* and *Streptococcus* were selectively enumerated using Rogosa, MRS+L-cysteine HCl and ST agar. The proteolysis activity was measured using the OPA method and SDS PAGE, while antioxidant activity was measured using DPPH free radical scavenging assay. The alcohol content and pH were measured using density/specific gravity meter and pH meter, respectively. The results of this study showed that the addition of *S. boulardii* and Inulin enhanced the survivability of probiotic bacteria. The population of *S. boulardii* was improved by Inulin. The alcohol content was <0.0001 g/mL in all samples, indicating that *Saccharomyces* do not produce significant amounts of alcohol in the beverage. The highest proteolysis activity or free amino group concentration was observed in *S. boulardii*, ABT-5 and Inulin incorporated beverage. SDS PAGE results were confirmed by the results obtained from the OPA method. Significantly (P<0.05) higher DPPH free radical scavenging ability was observed in *S. boulardii*, ABT-5 and Inulin incorporated beverage. Under the sensory evaluation, appearance, consistency, aroma, taste, mouthfeel and overall acceptability were assessed. The highest overall acceptability resulted in the control sample. The second highest overall acceptability resulted in *S. boulardii,* ABT-5 and Inulin incorporated beverage. Therefore, *S. boulardii*, ABT-5 and Inulin incorporated beverage was selected as the most suitable combination in terms of functional properties as an effective carrier of probiotics.

Keywords: Antioxidant activity; Inulin; probiotic; *S. boulardii*; sensory evaluation; synbiotic beverage

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Paper ID: NSALS '25-108 (Oral)

Potential of developing a red wine using king coconut (*Cocos nucifera var aurantiaca*) water and hibiscus (*Hibiscus rosa-sinensis)* flower extract

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Red wines are gaining popularity due to their unique sensory properties and potential health benefits. This study explored the potential of developing a red wine using king coconut water and *Hibiscus rosa-sinensis* flower extract. Fresh hibiscus flower petals (100 g) were ground with king coconut water (250 mL), and the mixture was filtered through a 200-micron sieve to obtain the extract. Four treatments (fermentation media) were prepared using different volumes of king coconut water (950 mL, 900 mL, 850 mL, and 800 mL) and hibiscus extract (50 mL, 100 mL, 150 mL, and 200 mL), along with a fixed amount of sugar (200 g) and they were fermented with yeast (*Saccharomyces cerevisiae)* for 2 weeks at room temperature. Sensory properties: appearance, color, aroma, clarity, sweetness and overall acceptability of the prepared wine samples were evaluated by a sensory panel consisted with 30 semi-trained panelists using seven-point hedonic scale. Total Polyphenol content as gallic acid equivalent (GE), antioxidant activity as Trolox Equivalent (TE), color, alcohol content, pH, titratable acidity and total soluble solids (Brix) of the selected sample and a commercial red wine sample were measured. Sensory data were statistically analyzed using the Friedman test, while physicochemical data were subjected to Analysis of Variance at a 95% confidence interval using MINITAB 17 statistical software. Based on the sensory evaluation, the wine sample made from a medium containing 85% king coconut water and 15% hibiscus flower extract was chosen as the best. The selected wine contained 4.55±0.07 mg/mL of total phenols (expressed as GAE) 11.4±0.57 g/100 mL of total soluble solids, and 11.81±0.32% (v/v) alcohol. Additionally, the wine exhibited an antioxidant activity of 0.09±0.00 mg/mL (expressed as TE), a pH of 3.38±0.01, and a titratable acidity of 4.65±0.02 g/L. Those values were compared with the commercial red wine sample. These findings indicate that red wine with appealing sensory attributes and improved physicochemical properties can be produced by fermenting a king coconut water-based medium enriched with *Hibiscus rosa-sinensis* flower extract. Future research should focus on optimizing fermentation conditions and ensuring product stability.

Keywords: Antioxidant activity; fermentation; *Hibiscus rosa-sinensis*; king coconut; Polyphenol content; wine

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Paper ID: NSALS '25-116 (Oral)

Development and standardization of balloon vine (*Cardiospermum halicacabum* Linn.) and cinnamon (*Cinnamomum verum*) incorporated herbal black tea

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Increasing preference for consumption of healthy beverages has resulted in a surging demand for various types of tea globally. Balloon vine and cinnamon are known for their various therapeutic properties such as antioxidant, anti-inflammatory, anti-microbial, anti-diabetic etc. This study aimed to develop an herbal black tea blend incorporating balloon vine leaves and cinnamon bark. Balloon vine leaves were thoroughly cleaned and dried in an oven at 44°C. Four blends were prepared using varying proportions of dried balloon vine leaves (20, 30, 40, and 50%) and Broken Orange Pekoe Fannings (BOPF) grade black tea (70, 60, 50, and 40%), along with a fixed amount of cinnamon bark (10%). Total Polyphenol Content (TPC) as gallic acid equivalent (mg GAE/g), Total Flavonoid Content (TFC) as quercetin equivalent (mg GAE/g), antioxidant activity as Trolox equivalent (mg TE/g), and total catechin content as percentage (w/w) of the blends were determined following the standard procedures. Sensory properties of these samples were evaluated by 31 semi-trained panelists using a Nine-point Hedonic scale. Sensory data were analyzed by Friedman test. The blend, which was prepared with 10% of cinnamon, 40% of balloon vine leaves, and 50% of black tea received the highest sums of rank and the highest estimated mean for most of the sensory attributes. Therefore, it was selected as the best blend. Polyphenol content, Flavonoid content, antioxidant activity, and catechin content of the chosen blend, were 71.09±7.39 mg GAE/g, 12.73±1.37 mg QE/g, 55.85±3.12 mg Trolox/g, and 0.99±0.00% (w/w), respectively. The substantial polyphenol and flavonoid contents, along with strong antioxidant activity, suggest that the developed herbal black tea blend could serve as a functional beverage.

Keywords: Balloon vine leaves; black tea; cinnamon bark; herbal black tea

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Paper ID: NSALS '25-145 (Oral)

Effects of stabilizing agents and shear homogenization on the emulsion stability of creamed coconut

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Creamed coconut, or coconut butter, is made by grinding desiccated coconut into a smooth paste, retaining oil, fiber, and protein. However, its storage stability poses a major challenge due to the tendency of its water-in-oil-in-water (W/O/W) emulsion structure to undergo layer separation. During storage, fat solidifies and rises to the top while denser components settle, negatively impacting texture, usability, and consumer acceptance. Addressing this issue is crucial for enhancing product quality and extending shelf life. This study investigated the combined effects of stabilizing agents and shear homogenization on the emulsion stability of creamed coconut. A two-factor factorial Completely Randomized Design (CRD) was employed with 18 treatment combinations. Five stabilizer ratios of Carboxymethyl Cellulose (CMC) and Gum Arabic (GA) (1.0% CMC, 0.25% CMC+0.75% GA, 0.5% CMC+0.5% GA, 0.75% CMC+ 0.25% GA, and 1.0% GA) were tested alongside three homogenization durations (0, 4, and 6 minutes). Stability parameters, including the Creaming Index (CI), viscosity, spread ability, Peroxide value, and titratable acidity, were measured over six days at room temperature. Statistical analysis was conducted using Minitab 17. The optimal treatment, consisting of 0.75% CMC+0.25% GA and 4 minutes of shear homogenization, showed the highest reduction in CI (R^2=99.79%), achieving a value of 6.73% after six days. This combination effectively minimized layer separation and improved emulsion stability. Higher stabilizer concentrations and prolonged homogenization durations further enhanced stability, reducing phase separation and improving textural attributes. The study also highlighted significant correlations between processing parameters and stability metrics, underlining the importance of precise formulation and processing control. These findings provide practical solutions to a critical challenge in food emulsions, offering insights into the role of stabilizers and mechanical processing in improving product stability. The research demonstrates how optimized stabilizer ratios and homogenization techniques can enhance the shelf life and consumer appeal of creamed coconut.

Keywords: Carboxymethyl cellulose; creamed coconut; creaming index; gum arabic; homogenization duration; layer separation

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Paper ID: NSALS '25-162 (Oral)

Formulation and nutritional analysis of cookies made from coconut flour, finger millet flour and wheat flour blend

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Today, consumers increasingly demand snacks or cookies that not only offer good taste but also provide nutritional benefits. Despite this demand, the market has limited options for offering both high dietary fiber and low fat included cookie or snacks. Those cookies are small, unleavened cakes, typically crisp, flat and sweet. This research aimed to develop a formulation for coconut flour, finger millet flour and wheat flour incorporated cookie to study its effect on cookie quality. Five formulations were prepared with different percentages of coconut flour, finger millet flour and wheat flour in the ratios of 100:0:0, 85:5:10, 65:25:10, 50:40:10, and 35:55:10, respectively. The sensory analysis of the formulated cookies was conducted with 30 untrained panelists to evaluate acceptability using a seven point hedonic scale for color, crispiness, taste, texture, flavor and overall acceptability attributes. The data obtained statistically analyzed using two-way ANOVA. Accordingly, the best formulation for cookies was 35:55:10 and the proximate analysis showed that percentages of moisture content, crude protein, fat, crude fiber and total ash of cookies as 3.5, 8.6, 18.7, 6.1 and 2.7, respectively. The moisture level (3.5%) also contributed to a crispier texture, as lower moisture content in baked goods typically results in a crunchier product. Changes in taste and odor across the formulations likely resulted from the varying levels of coconut and finger millet flours, which have distinct flavors and aromas. Coconut flour contributes compounds like lactones, which add a mild, creamy aroma, while finger millet flour contains phenolic acids and flavonoids that enhance a unique earthy flavor and slightly nutty aroma. The gross energy value of the selected sample was 4978 kcal/kg. The initial Total Plate Count (TPC) of the selected cookies was $0.66x10^{-1}$ which increased to $4.33x10^{-1}$ CFU/g after 30 days of storage. However, it remained within the acceptable limits of SLS251. The findings suggest that the coconut flour could be incorporated with wheat flour and finger millet flour to develop cookies with appealing sensory attributes.

Keywords: Coconut flour; gross energy value; high dietary fiber; low fat

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Paper ID: NSALS '25-180 (Oral)

Developing a coffee (C*offea arabica*) cherry husk-based wine and evaluation of its quality parameters

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Coffee (*Coffea arabica)* cherry husk, a byproduct of coffee processing, is often discarded as waste, contributing to environmental pollution. This study explores the potential of producing wine from coffee cherry husk transforming it to a value added product. Coffee cherries husks were pulped, and the extract was obtained. Three 650 mL wine musts, each containing different levels of coffee husk soluble solid (8, 6, and 4%) were prepared with fixed amounts of sugar (150 g) and Citric acid (0.2 g). These musts were then fermented using Yeast *(Saccharomyces cerevisiae)* for five weeks at room temperature. Sensory properties: color, aroma, clarity, taste, sweetness, alcohol strength, and overall acceptability of these wine samples were evaluated by 30 untrained panelists using a seven-point hedonic scale. Total Polyphenol content, alcohol content, volatile acidity, pH, titratable acidity, and Total Soluble Solids (TSS) of the selected wine sample were analyzed. This experiment was carried out in triplicate. Sensory data were statistically analyzed using the Friedman test. The wine sample prepared with the must containing 6% of coffee husk soluble solids was selected as the best sample. The selected wine sample contained 0.10±0.03 mg/mL GAE of total Polyphenols, 11.85±0.00% (v/v) alcohol, 4.80±0.33 g/L titratable acidity, and 0.32±0.01% volatile acidity, with a pH of 3.16±0.04. It can be concluded that coffee cherry wine with high sensory acceptance and noticeable physicochemical properties can be prepared by fermenting a must containing 6% of coffee husk soluble solids. Coffee cherry wine is a promising new addition to the beverage industry, transforming byproducts from coffee industry into a potentially valuable product, contributing to waste reduction and environmental sustainability offering a novel addition to the industry with benefits. Further studies should be carried out on scaling production, improving wine stability and assessing market acceptance.

Keywords: Alcohol; coffee cherry husk; Polyphenol; wine

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Paper ID: NSALS '25-192 (Oral)

Effect of fat content of raw cow milk on physicochemical and functional properties of mozzarella cheese

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Mozzarella cheese is an economically important dairy product that has high demand in the food industry due to its unique textural and nutritional properties. The fat content in raw milk used for mozzarella cheese production is an important parameter as it directly effects textural, thermophysical and sensory properties of mozzarella cheese. Understanding the effect of fat content on the performance of mozzarella cheese such as meltability, stretchability, texture and mouthfeel is important for manufacturers as it offers tailor-made products with optimum functionality. This study aimed to evaluate the effects of fat content of raw milk on the techno-functional properties of mozzarella cheese. Mozzarella cheese samples were made with cow milk, which were standardized to four different fat percentages; 1.5, 2.5, 3.5, 4.5% (w/w) and the effect of fat content on meltability, texture profile, microstructure, sensory properties and shelf life were assessed. Image analysis was performed to determine the meltability. Shelf life analysis was done by measuring total colony count and titratable acidity during 28 days of storage at 4°C. Reducing the fat content in milk leads to a decrease in the overall yield of mozzarella cheese (P<0.05). Reducing the fat content increased (P<0.05) hardness, adhesiveness, cohesiveness, gumminess and chewiness whereas, slightly decreased (P>0.05) springiness. Gumminess (9354±96.9) and chewiness (1365.95±14.7) of raw mozzarella cheese were higher (P<0.05) in mozzarella made with 3.5% fat in raw milk compared to other samples. The Scanning Electron Microscopic analysis showed that the size of milk fat globules was larger and more dispersed with a less dense protein matrix in mozzarella made with 4.5% fat in raw milk than other samples. Meltability increases with the fat level (P<0.05). Mozzarella cheese made from 3.5% fat recorded the highest overall acceptability in sensory analysis. Based on the results it can be concluded that increasing fat content in mozzarella cheese enhances meltability, texture and sensory properties by altering the microstructure.

Keywords: Fat; meltability; microstructure; mozzarella cheese; texture

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Paper ID: NSALS '25-225 (Oral)

Effect of sous vide cooking and ultrasonication on tenderization of spent hen breast meat marinated with pineapple juice

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The rising global demand for chicken eggs has significantly boosted poultry production. Consequently, this growth has led to a substantial increase in the number of spent hens-hens that are no longer productive for egg-laying. The primary challenge facing the spent hen industry is the underutilization of spent hens and their byproducts. As hens age, their connective tissues become tougher and more cross-linked, making the meat less desirable. The objectives of this research study are to identify the optimal tenderizing method and conditions for pineapple juice-marinated spent hen breast meat by comparing the sous-vide cooking method and the ultrasonic method and to compare the meat quality parameters of spent hen breast meat marinated with pineapple juice and treated by both the Sous-Vide and ultrasonic methods. The pH, cooking yield, cooking loss, Water Holding Capacity (WHC), texture, Myofibrillar Fragmentation Index (MFI), and sensory evaluation of marinated spent hen breast meat were the parameters determined in this study. Cooking method has no significant effect (P>0.05) on pH, springiness, and chewiness while other parameters tested were affected by cooking method (P<0.05). Time-temperature combination (55°C/5 h, 60°C/4 h) showed no significant difference (P>0.05) on MFI, WHC, hardness, springiness and chewiness while it had significant effects on other parameters (P<0.05). Cooking method and time-temperature combination showed significant effect on cooking loss and yield, pH, MFI, hardness, adhesiveness, cohesiveness and gumminess (P<0.05). The highest MFI was found in Sous-vide (55°C/5 h) and the lowest in ultrasound (60°C/4 h) treatment. The highest hardness was found in meat treated with ultrasound (60°C/4 h) method and the lowest in the control (60°C/4 h) treatment. According to sensory evaluation results, Sous-vide treatment (55°C/5 h) had the highest overall acceptance (P<0.05). These results showed that the sous-vide cooking method had more desirable results, and the 55°C/5 h combination had the highest and preferred results among all the treatments. Consider adding more temperature and time combinations and different pineapple juice concentrations, which may be able to capture the full range of effects on tenderness for future studies.

Keywords: Bromelain; low temperature long time cooking; marination; myofibrillar fragmentation index; tenderness

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Paper ID: NSALS '25-226 (Oral)

Utilization of *Gracilaria verrucosa* red seaweed as a functional ingredient in chicken meatballs

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Growing consumer demand for healthier options has prompted the reformulation of traditional meat products with functional ingredients to reduce health risks. *Gracilaria verrucosa* (GV) is an edible red algae with high fiber content and bioactive compounds that are abundant in Sri Lankan coastal lines. This study was conducted to develop GV seaweed incorporated chicken meatballs and to evaluate their microbiological, physiochemical and functional properties. Based on previous literature, four formulations were prepared with different levels of sun dried GV powder (0, 2, 4, 6%) replacing breadcrumbs. Cooking loss, water holding capacity, texture profile (hardness, adhesiveness, cohesiveness, springiness, gumminess, chewiness), pH, lipid oxidation (TBARs) and free radical scavenging activity (DPPH) were measured over a 4-week refrigerated storage period. Total Phenolics content, total Flavonoids content, Phycoerythrin content, Phycocyanin content, and DPPH Radical scavenging activity of dehydrated GV powder were measured. Sensory evaluation was carried out using 30 untrained panelists to evaluate the sensory acceptability. Meatballs incorporated with 2% GV received the highest overall acceptability among the treatments from Friedman test. Phytochemical analysis of the GV powder resulted in a total Phenolic content of 2.4075 mg GAE/g DW, Flavonoid content of 13.431 mg RE/g DW, Phycoerythrin content of 0.007668 mg/g, Phycocyanin content of 0.00597 mg/g and DPPH radical scavenging activity of 24.94%. With the seaweed incorporation, moisture contents showed significant differences (P<0.05) among treatments. Meat balls with 4% GV showed lower fat and higher ash contents from proximate analysis. However, GV incorporation resulted in increased hardness, reduced pH, lowered water holding capacity, and increased cooking loss (P<0.05). Lipid oxidation was highest in meatballs with 2% GV, but no significant differences were observed among treatments (P>0.05). Additionally, microbial counts remained stable across all treatments without *Escherichia coli* or Salmonella detection. In conclusion, 2% GV seaweed incorporated meatballs were found as a promising value added product suitable for the market, with higher bioactive properties.

Keywords: Chicken meatballs; dietary fiber; functional; *G. verrucosa*; lipid oxidation

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Paper ID: NSALS '25-004 (Poster)

Determination of best hydrolysis condition for egg yolk LDL and checking the functional properties of its hydrolysates

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Eggs are being used in several food industries due to their various excellent structural and functional properties. Egg yolk consists of plasma and granules, plasma is primarily composed of 85% Low-Density Lipoprotein (LDL) and 15% Livetin. LDL are spherical nanoparticles with a lipid core of triglycerides and cholesterol esters in a liquid state surrounded by phospholipids and proteins. Enzymatic hydrolysis and physical methods such as HTMP method, are commonly employed to produce bioactive compounds. The objective of this research was to determine the best hydrolysis conditions for LDL comparing enzymatic and HTMP hydrolysis methods and checking the selected functional properties of the separated LDL with its hydrolysates. LDL was hydrolyzed using trypsin, protease, pepsin and papain at optimum temperature and pH for each enzyme for periods up to 24 hours. Further, LDL was hydrolyzed using HTMP method at temperature of 121°C and pressure of 0.14 MPa at pH of 5.0, 7.0 and 9.0 up to 60 minutes (15 minutes intervals). The best conditions were selected based on 15% SDS-PAGE analysis. Accordingly, Trypsin, Protease, Pepsin, Papain hydrolyzed for 3 h and under HTMP at pH 5.0 for 60 minutes were selected as the best conditions for hydrolyzing the LDL. LDL hydrolysates obtained from these best conditions compared with original egg yolk LDL for emulsification, antioxidant and metal chelation activities. For the degree of hydrolysis, the protease hydrolysis showed 62.14±0.94% free Amino groups concentration, its significantly higher than other hydrolysates (P<0.05). Protease hydrolysis showed significantly higher emulsification activity (P<0.05). Based on the TBAR assay, LDL and Pepsin hydrolysates showed higher Malonaldehyde levels (mg/L), indicating low antioxidant activity. The Protease hydrolysis showed lower Malonaldehyde (mg/L) for TBAR assay (P<0.05). The LDL showed 60.75%, while Hydrolysate obtained from Protease (3 h) showed 90.13±1.80% antioxidant ability in DPPH assay. LDL showed 21.11±1.27% Cu^{2+} chelating ability. The LDL showed lower emulsification activity, antioxidant properties, negative Fe^{2+} chelating and moderate Cu^{2+} chelating ability than its Hydrolysates. In conclusion, Protease enzyme with 3 h hydrolyzing period was found as the best method for hydrolyzing egg yolk LDL to maximize functional properties.

Keywords: Bioactive compounds; egg yolk LDL; enzymatic hydrolysis; functional properties; HTMP method

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Paper ID: NSALS '25-027 (Poster)

Development of cinnamon-infused beetroot *(Beta vulgaris* L.*)* wine and a study on the production process, physicochemical properties, and sensory analysis

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The vibrant red colour of beetroot (*Beta vulgaris* L.) is attributed to its water-soluble pigments known as betalains, making it a potential candidate for red wine production. The present study was conducted to develop a unique red wine by fermenting Cinnamon-Infused Beetroot Juice (CIBJ) using a commercially available active dry Yeast (*Saccharomyces cerevisiae*). The fermentation process was conducted over 7, 14, 21, 28, 35, and 42 days at 25°C, and the physicochemical and sensory properties of the wine were evaluated. Three batches (W1, W2, W3) with different fermentation periods were analysed weekly for pH, brix, specific gravity, Titratable Acidity (TA), Alcohol Content by Volume (ABV), and color. The wine samples were pasteurized at 70°C for 10 minutes to deactivate the Yeast, filtered through Whatman No. 6 filter paper, and stored at 4°C in sterilized glass bottles before sensory evaluation. These wine samples were subjected to sensory evaluation, measuring appearance, aroma, taste, aftertaste, and overall acceptability. Data were analysed using a two-way Analysis of Variance (ANOVA) and Friedman non-parametric tests using Minitab 17 software. The pH of beetroot wine decreased during fermentation, where the initial pH of 4.5 dropped to 3.5 by day 7 but remained stable beyond this period. The Brix value was significantly reduced by day 14 (from 10.4 to 8.5) and unchanged beyond day 35. Titratable acidity steadily increased over time, reaching its peak at day 42 (0.377), while alcohol content increased progressively, recording its highest value of 8.08% at day 35. Sensory evaluation was performed using a 9-point hedonic scale with 20 untrained panellists. The results revealed significant differences ($P \leq 0.05$) across the fermentation periods for sensory parameters. The 42-day fermented wine emerged as the most preferred sample, achieving the highest overall acceptability rating of 6.42±1.70. Panellists favoured this sample for its balanced sweetness, smooth aftertaste, and aromatic cinnamon infusion. The 42-day fermentation period resulted in a wine with optimal physicochemical properties, balanced acidity, and enhanced sensory attributes, highlighting its potential as a novel and acceptable functional wine product.

Keywords: Beet root; cinnamon; fermentation; pasteurizing; wine

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Paper ID: NSALS '25-034 (Poster)

Development of homemade dark chocolate with probiotics addition

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Homemade chocolate is preferred because of its emotional and health benefits; 97.9% of chocolate lovers believe it's healthier than commercially available varieties. Despite its popularity and the growing interest in probiotic-enhanced products, the local market lacks value-added homemade chocolate. Under favorable growing conditions, it is possible to increase the production of homemade chocolate with probiotics by utilizing Sri Lanka's cocoa production terrain. The study aimed to produce delicious homemade dark chocolate with probiotics added. Three different chocolate formulations were initially developed and subjected to a sensory evaluation to determine the best recipe. The treatments that were employed were Treatment 01 (Cocoa beans (CB): Sugar (SU): Milk Powder (MB) 70:30:0), Treatment 02 (CB: SU: MB 62.5:32.5:5), and Treatment 03 (CB: SU: MB 65:35:10). To determine appearance, colour, aroma, sweetness, bitterness, texture, and overall acceptance, the study employed sensory evaluation by using 7 point-Hedonic scale with 35 untrained panels. A 0.25% freeze-dried probiotic culture of *Streptococcus thermophilus* (ST-12) was added to the formulation that was chosen based on the sensory evaluation. The previous studies demonstrated that probiotics had no detrimental effects on the sensory attributes of chocolate. The nutritional composition was determined through proximate analysis, and microbial tests were carried out to ensure probiotic viability during storage and product quality. Treatment 03 had the highest level of sensory approval, according to the findings. Probiotic viability was measured using *Streptococcus thermophilus* isolation agar during refrigerated storage at 4°C over two weeks. The initial probiotic count was 1.136×10^7 CFU/g, which increased to 1.640×10^7 CFU/g after one week, and further to 1.810×10^7 CFU/g by the end of the second week, indicating that the probiotics remained. Probiotic viability increased when the product was refrigerated, indicating that Streptococcus thermophilus remained stable and active over time. The homemade dark chocolate contained 51.93% total fat, 9.79% crude protein, and 2.58% crude fiber. Both the moisture percentage (2.92%) and the ash content (2.41%) fell below the SLS 326:2015 standard limits (<3% and <2.5%, respectively). Using Sri Lanka's favorable cocoa growing circumstances, this research shows the possibility of producing useful chocolate at home.

Keywords: Functional foods; health benefits; homemade chocolate; probiotics; sensory evaluation

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Paper ID: NSALS '25-042 (Poster)

Development of peanut (*Arachis hypogea* L.) based pumpkin (*Cucurbita maxima*) seed spread incorporating different flavors and evaluation of its quality parameters

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Pumpkin seeds are a highly nutritious underutilized natural resource that are often discarded as agricultural waste in Sri Lanka. This research aimed to utilize the lesser-known, nutrition-rich pumpkin seed powder to produce a superior-quality spread and to evaluate its physicochemical, sensory, and microbiological properties. Peanuts (68.9 g) and pumpkin seed powder (31 g) served as the major ingredients, with three samples developed by incorporating scotch bonnet (2.5 g), black pepper (3 g) and garlic (2.5 g) as natural flavoring agents. An unflavored peanut-based pumpkin seed spread was used as the control. The scotch bonnet-flavored spread was selected as the most preferred due to the observable highest sum of ranks based on sensory evaluation conducted with 30 untrained panelists using a 9-point Hedonic scale. Proximate analysis of the selected product revealed moisture content of 3.31±0.01%, total ash content of 3.9±0.1%, crude protein of 31.8±0.1%, crude fat of 36.2±0.1%, crude fiber of 11.4±0.1% and carbohydrate content of 16.7±0.1%. The selected product contained 519.8 kcal per 100 g of energy. Physicochemical analysis showed that moisture content and water activity significantly increased (P<0.05) during a one-month storage period at room temperature, while pH significantly decreased (P<0.05). The selected product was compared with peanut butter and was found to have lower fat but higher protein, ash, fiber, and carbohydrate contents. Microbial counts remained below Sri Lanka Standards Institution (SLSI) standards (10^4 CFU/g) under refrigeration, necessitating preservatives for extended shelf life at room temperature. This product healthier than peanut butter and good alternative to high price Sri Lankan peanut butter market due to incorporation of pumpkin seeds which are typically discarded as a waste.

Keywords: Food waste; microbial safety; natural flavoring agents; physicochemical properties; pumpkin seed

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Paper ID: NSALS '25-049 (Poster)

Minimizing browning and maintaining quality in fresh-cut tender Jackfruit (*Artocarpus heterophyllus* L.) through optimized processing parameters

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Surface cut browning is one of the major limiting factors during commercialization of tender Jackfruit because it directly affects the final product quality and consumer acceptance. Therefore, processed fresh-cut tender Jackfruits used as an ingredient is a new trend and that would be a highly practical way in the food processing industry. The food industry employs various physical and chemical methods to inhibit browning in fresh-cut tender Jackfruit, but chemical treatments are often preferred in processing fresh-cut products due to their ability to streamline operations, enhancing efficiency and reducing costs compared to physical methods. There is a critical gap in optimization of processing parameters for minimizing browning during short-term storage at room temperature in fresh cut tender Jackfruit, crucial for maintaining quality until further processing. This study aims to optimize the processing parameters for fresh-cut tender Jackfruit in polythene bags by investigating the effects of Ascorbic acid and Citric acid solutions combined with storage time on key quality attributes such as firmness, color change, pH, and acidity. Response surface methodology was employed using a second-order polynomial model to analyze the data from a central composite design. Optimized conditions were 0.06% Ascorbic acid and storing for 6.30 hours yielded the best results for maximum firmness (16.07 N), minimal color change (1.84), and pH (5.76) and acidity (0.04%), achieving a desirability score of 0.63. As well as 0.71% Citric acid and storing it for 18 hours yielded the best results for maximum firmness (14.58 N), minimal color change (0.77), pH (4.34), and acidity (0.88%), achieving a high desirability score of 0.82. This optimization fulfills the specific needs of the company and provides valuable references for new entrants in the tender Jackfruit processing industry.

Keywords: Browning; central composite design; desirability; response surface methodology; tender Jackfruit

Underlined is the presenting author.

Paper ID: NSALS '25-058 (Poster)

Effect of different drying conditions on phytochemical content and antioxidant activity of curry leaves (*Murraya keonigii*) collected from dry and wet zone areas of Sri Lanka

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The phytochemicals content and antioxidant activity of plant materials are affected by the drying treatments. This study was conducted to analyze the effect of drying temperatures and their growing zones on the phytochemical composition and antioxidant activity of curry leaves (*Murraya keonigii*) and to evaluate the effect of thermal treatments on sensory attributes. Samples were collected from organic farms in Galgamuwa and Kalutara and were dried at 40, 50 and 60°C up to a moisture level below 12% in dried samples. The total Phenolic content of samples was measured by Folin-Ciocalteau assay and antioxidant activity was measured by DPPH free radical scavenging activity assay. The anthraquinone content of dried leaves was measured by gas chromatography-mass spectrometric method. In addition to that, sensory analysis was conducted for 30 untrained panelists using a 7-point Hedonic scale. Although the significantly highest anthraquinone content was observed in samples collected from Kalutara and dried at 50°C which is 0.02±0.00 mg/kg, the highest total phenolic content and DPPH scavenging were observed in samples collected from Kalutara and dried at 40°C which were 459.6±0.4 µg GAE/mL and 50.3±0.1% respectively. Drying temperature had a significant negative impact (P<0.05) on total Phenolic content and antioxidant activity of curry leaves. When compared with the growing location, phytochemical content and antioxidant activity were significantly higher in samples collected from Kalutara, which is a wet zone area. The sample dried at 40°C had a significantly higher preference rather than the samples dried at 50 and 60°C. According to the findings, samples collected from Galgamuwa area dried at 40°C complied with the maximum residual level for Anthraquinones (<0.02 mg/kg) which is high with Phenols and antioxidant activity. This study highlights that with the increase in drying temperature, the total Phenolic content, antioxidant activity and sensory properties of curry leaves significantly decreased while Anthraquinone content increased. Furthermore, curry leaves grown in the wet zone area contain significantly higher phytochemical levels than in dry zone due to their climatic and environmental stress conditions.

Keywords: Anthraquinones; antioxidant activity; drying temperature; growing area; phytochemicals; total Phenolic content

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Optimization of conditions for the preparation of protein concentrate from *Moringa oleifera* leaf

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Moringa (*Moringa oleifera*) leaf, known for its high protein content and exceptional nutritional value, holds significant potential as a source for producing protein concentrates, which could serve as a sustainable protein source for human and animal nutrition. Maximizing both protein yield and concentration is crucial for the successful commercialization of protein extraction processes. Therefore, this study aimed to optimize the conditions for extracting protein from moringa leaves. Fresh Moringa leaves were ground and extracted using distilled water and alkaline solutions (NaOH) at pH 8, 9, and 10, with a solid-to-solvent ratio of 1:2 (w/v). The resulting extract was filtered through a 200 nm sieve, and the pH of the filtrate was adjusted to 4.5 using 0.1 M HCl to precipitate protein. The mixture was then centrifuged at 3,500 rpm for 30 minutes and the resulting precipitate was collected, dried, and weighed. Proximate composition of Moringa leaf and protein content of dried precipitate were analyzed. Water extraction yielded a precipitate with a significantly higher protein concentration (60.29±0.22%) compared to alkali extraction ($P<0.05$). However, it also resulted in significantly lower protein recovery (30.38±0.23%). In contrast, the alkali solution at pH 10.0 yielded a precipitate with 56.98±0.20% protein content and significantly higher protein recovery (48.78±0.18%). These findings suggest that alkali extraction at pH 10 is the optimal method for industrial-scale protein extraction from Moringa leaves. Further research is recommended to improve yield, enhance protein purification, and evaluate the scalability and economic feasibility of the process.

Keywords: Alkali extraction; leaf protein concentrates; *Moringa oleifera*; proximate composition; water extraction

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Paper ID: NSALS '25-082 (Poster)

Studying the potential of utilizing cassava (*Manihot esculenta*) root starch as the primary starch source in manufacturing Ale beer

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Cassava starch has been featured in many food recipes and industrial applications; however, its use as an adjunct in brewing has not received much attention. This study aimed to evaluate cassava flour as a potential substitute for malt barley in brewing, assessing its impact on sensory, physicochemical, and microbiological properties. Four types of beer were prepared by adjusting the proportions of barley (85%, 65%, 55%, and 45%) and cassava flour (0%, 20%, 30%, and 40%), while keeping malted rice (10%) and malted wheat (5%) constant. The beer prepared without cassava flour served as the control. Sensory evaluation was conducted using 35 untrained panelists after 14 days. Aroma, color, taste, mouthfeel, and overall acceptability were evaluated on a 9-point Hedonic scale. Physicochemical properties, including the HCN content of cassava flour, and the ethanol, methanol, pH, and color of beer samples were analyzed. Microbiological analysis was evaluated on the best-selected sample and control to assess total plate count, coliforms, and *E. coli*. The beer with 40% cassava flour had the highest scores for aroma, taste, and overall acceptability. Increasing cassava content raised total soluble sugar levels, boosting ethanol production. Microbiological analysis showed improved stability in cassava-enriched beers, with no microbial growth detected after one month of storage. Additionally, color intensity, as measured by European Brewery Convention (EBC) color scale values, decreased with higher cassava content. The beer sample prepared with 40% cassava flour recorded the highest ethanol content at 6.33% (v/v) but had the lowest EBC value (12.56), indicating a lighter-colored product. Additionally, no microbial growth was detected in this sample after one month of storage, demonstrating its storage stability. The beer maintained acceptable stability despite a minor decline in pH over time (decreases from 4.18±0.06 at week 0 to 4.08±0.01 at week 4). These findings suggest that cassava flour is not only a viable alternative to malt barley but could also offer cost-effective and sustainable benefits for beer production.

Keywords: Beer; cassava flour; ethanol yield; physicochemical properties; sensory properties

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Paper ID: NSALS '25-100 (Poster)

Optimization of conditions for protein extraction from *Sesbania grandiflora* leaves

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Sesbania grandiflora L., commonly known as vegetable hummingbird, is a small leguminous tree. Its leaves and flowers are commonly consumed as vegetables in Southeast Asia. The leaves are nutrient-dense, containing protein, vitamins and minerals and are known for their medicinal properties, including anti-inflammatory, antimicrobial, anthelmintic, anti-tumor and wound-healing effects. They are particularly noted for their high protein content. This study aimed to optimize protein extraction conditions from *S. grandiflora* leaves. Fresh *S. grandiflora* leaves were cleaned, crushed and extracted using distilled water and alkaline solutions at pH levels of 8, 9, and 10, with a solid-to-solvent ratio of 1:2 (w/v). The extract was filtered through a 200 nm sieve, and the filtrate was collected. The protein was precipitated by adjusting its pH at 4.5 using 0.1 M HCl. The precipitate was separated by centrifugation at 1644 g of g-force for 30 minutes. The precipitate was collected, dried, and weighed. The proximate composition of *S. grandiflora* leaf and the protein content of dried precipitate were analyzed by following standard methods. The precipitate with highest protein yield (54.28±14.14% dry weight basis) resulted by the alkali solution at pH 9. Further, water extraction also yielded a precipitate with a comparable protein yield (52.48±14.24% dry weight basis). The alkali solution at pH 9 is most suitable for protein extraction from *S. grandiflora* leaves. Further, optimization of other parameters such as extraction temperature and solid-to-solvent ratio, is required to maximize the protein yield.

Keywords: Extraction conditions; leaf protein; protein yield; *Sesbania grandiflora* L.

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Edible coating for banana using *Cyclea peltata* leaf, Neem leaf (*Azadirachta indica*) and cassava starch

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This study looked into how *Cyclea peltata* and neem (*Azadirachta indica)* leaf extracts mixed with cassava starch could be used to make edible coatings for bananas that would make them last longer and taste better. To prepare the coating, 10 g of *C. peltata* or neem leaves were taken, washed with distilled water, 100 mL of distilled water was added, and blended. The solution was then filtered using a muslin cloth, and a cassava starch solution was made by dissolving 25 g of starch in 1 L of water, heating to 75°C, and cooling to 25°C. 105 ripened green bananas were washed for 5 min, dried, and soaked for 1 min in treatments of pure *C. peltata*, *C. peltata* 10% or 20% with cassava starch (v/v), pure neem, and neem 10% or 20% with cassava starch (v/v). Control bananas were soaked in distilled water. All seven treatment after 4 h of drying in room temperature, bananas were evaluated over 10 days for weight loss, pH, TSS, treatable acidity, and sensory attributes. Sensory evaluation using a 9-point Hedonic scale showed that bananas treated with 20% *C. peltata* had acceptable color, texture, aroma, and overall acceptability over the 10-day period, control bananas exhibited rapid weight loss, while 20% *C. peltata* significantly reduced weight loss. Brix values increased across all treatments: the control rose from 6.53±0.40 to 23.50±0.66, pure *C. peltata* from 6.80±4.74 to 19.60±3.01, and 10% and 20% *C. peltata* to 19.63±0.90 and 17.20±0.36, respectively. Neem treatments showed a similar trend, with pure neem increasing from 6.77±0.51 to 20.03±0.40, and 10% and 20% neem reaching 18.73±0.47 and 20.33±0.45, respectively. The interaction effects of treatment and time on Brix were highly significant (P<0.05). Acidity was the lowest in the control group and highest in bananas treated with 20% *C. peltata*, which also had a slower ripening rate. The study concluded that 20% *C. peltata* with cassava starch effectively extended banana shelf life, maintaining freshness and acceptability, and prolonging shelf life by 5 days compared to the control. This demonstrates 20% *C. peltata* as a promising natural method for banana preservation.

Keywords: *Azadirachta indica*; banana preservation; cassava starch; *Cyclea peltata*; edible coating

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Development of a coconut milk-based fruit smoothie

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Smoothies are semi-liquid, thick beverages made from fruit pulps or blends. In recent years, growing demand for dairy-free beverages has been driven by increasing Lactose intolerance and shifting dietary preferences. However, fruits with strong acidity and astringency have limited appeal for direct consumption, leading to an increasing demand for their use in mixed beverages. This study aimed to develop a Lactose free, vegan and nutrient rich smoothie using coconut (*Cocos nucifera*) milk and tropical fruits. Six formulations of smoothie were prepared by using varying proportions (w/w%) of papaya (35%, 30%, 25%, 20%, 10%, and 5%) and pineapple (5%, 10%, 15%, 30%, and 35%), along with fixed amounts of coconut milk (40%), banana (16.2%), sugar (3.5%), and Carboxymethylcellulose (0.3%). The maturity stages of fruits were stage 3-5. The best formulation was selected by evaluating the sensory properties of the samples by 30 untrained panelists using nine-point Hedonic scale. The smoothie prepared with 30% of papaya and 10% of pineapple found to be the best formulation. Proximate composition, physicochemical, and functional properties of the selected smoothie formulation were assessed. Further, to determine an optimal preservation technique, three treatments were prepared using the selected formulation: a fresh smoothie, a smoothie with 0.01% Sodium Metabisulfite (SMS) additive, and a pasteurized smoothie (heated to 60°C for 20 min). All samples were packed in pre-sterilized glass bottles and stored in a refrigerator at 4°C and microbial and physicochemical analysis of these samples were conducted over 6 weeks storage time. In the fresh smoothie, the moisture, crude fat, crude protein, crude fiber, carbohydrate and ash contents were 78.36±0.53 %, 6.76±0.42 %, 1.78±0.04 %, 1.82± 0.00 %, 10.62±0.00 %, and 0.66±0.02 % respectively. The physicochemical and functional properties determined in all treatments were pH (5.32-5.61), total soluble solids (14.8-15.1°Brix), titratable acidity (0.20-0.21%), total solids (21.83-29.97%), total sugar (11.90-12.21%), antioxidants activity (DPPH assay) (51.01-61.40%) and viscosity (359-1655 cp). All the data were analyzed using Minitab 17 software. Pasteurization treatment effectively extended the shelf life of the smoothie while maintaining its properties. It can be concluded that 40% of coconut milk, 30% of papaya and 10% of pineapple, 16.2% of banana, 3.5% of sugar and 0.3% of Carboxymethylcellulose is the best formulation for preparation of coconut milk-based fruit smoothie.

Keywords: Banana; coconut milk; papaya; pineapple; smoothies

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Paper ID: NSALS '25-164 (Poster)

Comparative analysis of sun, oven, and freeze-drying techniques on the physicochemical, functional, and antimicrobial properties of *Curcuma longa* (turmeric)

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Curcuma longa (turmeric) is valued for its bioactive compounds with antioxidant, antimicrobial, and therapeutic properties. Traditional sun drying, commonly practiced in Sri Lanka, can lead to inconsistent moisture levels, compromising turmeric's quality and bioactivity. This study compares the effects of sun drying, hot air oven drying, and freeze drying on the retention of bioactivity in turmeric. Fresh turmeric rhizomes were cut into 2–3 mm slices and subjected to three drying methods: sun drying for 5 days, hot air oven drying at 50°C for 10 hours, and freeze drying at -73°C for 24 hours. The dried samples were processed into aqueous solutions using water maceration and analyzed for antioxidant activity (DPPH assay), phenolic content (Folin-Ciocalteu method), and antimicrobial activity (well diffusion method) against *Escherichia coli* and *Staphylococcus aureus.* The raw turmeric showed a moisture content of 81.35±0.92%, antioxidant activity (IC_{50}=0.005±0.007 mg/mL), phenolic content of 152.72±0.40 mg GAE/g, and antimicrobial inhibition zones of 1.53±0.58 cm (*E. coli*) and 1.57±0.58 cm (*S. aureus*). Among the drying methods, freeze drying produced the best results, with the lowest moisture content (5.13±1.00%), the highest antioxidant activity (IC_{50}=0.041±0.86 mg/mL), and the highest phenolic content (121.05±1.04 mg GAE/g). It also showed the highest antimicrobial activity, with inhibition zones of 1.93±0.58 cm (*E. coli)* and 2.13±0.58 cm (*S. aureus*). The effectiveness of each drying method was determined by comparing these results to the raw material's bioactivity. Hot air oven drying yielded intermediate values, with moisture content at 8.91±40.00%, antioxidant activity at IC_{50}=0.056±0.001 mg/mL, Phenolic content at 91.98±1.21 mg GAE/g, and inhibition zones of 1.77±0.58 cm (*E. coli*) and 1.73±0.50 cm (*S. aureus*). Sun drying resulted in the highest moisture content (14.20±80.00%), the lowest antioxidant activity (IC_{50}=0.008±0.02 mg/mL), and phenolic content (52.18±0.46 mg GAE/g), with inhibition zones of 1.40±0.10 cm and 1.47±0.58 cm, respectively. These findings indicate that freeze drying is the most effective method for preserving antioxidant activity, Phenolic content, and antimicrobial properties compared to other drying methods.

Keywords: Antioxidant; *Curcuma longa*; drying methods; *Escherichia coli*; *Staphylococcus aureus*

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Paper ID: NSALS '25-177 (Poster)

Enhancement of cheese yield through fortification of cheese milk with isolated milk protein powder and evaluation of its physicochemical, microbial and sensory characteristics

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Global cheese consumption is expected to increase in the future. Meeting this rising demand requires a holistic approach to enhance cheese yield. The aim of this study was to investigate the potential of Isolated Milk Protein Formula (IMPF) which included ≥85% of dry protein, to enhance cheese yield through laboratory-scale experiments. Four batches of cheese were prepared, incorporating 0%, 0.001%, 0.002% and 0.003% of isolated milk protein powder to 1 L of milk according to w/w basis. Then hydrated for 16 hours at 12℃ temperature and stirred at 500 rpm for 15 minutes to enhance its solubility. Then the resulting milk was pasteurized and used to make cheese following the standard Gouda cheese production process. Composition of cheese milk, pressing weight and maturation steps were kept constants for all samples. Cheese samples were dehydrated until they reached a constant weight and yield enhancements were calculated per L of fresh milk depending on prepared cheese weights, compared to the control sample production. 0.001%, 0.002% and 0.003% of IMPF added cheese samples enhanced their yield by 3.37%, 6.36% and 10.60%, respectively. The proximate analysis of the 0.003% IMPF added cheese sample showed 15.0±0.326% protein, 24.0±0.216% fat and 59.6±0.653% moisture content. pH was measured up to 15 days after production and it varied between 5.93±0.02 to 5.35±0.01. *E. coli* was not found, while total plate count, yeast & mold counts were 3.58×10^4 CFU/mL and 1.0×10^2 CFU/mL, respectively. Based on the yield enhancement, 0.003% IMPF added sample has been selected as the highest yield sample. But when considering sensory characteristics, 0.002% of IMPF added sample had the best sensory characteristics second to the control. In conclusion, IMPF has significant implications for the dairy industry, offering a viable approach to increase production efficiency while maintaining or even enhancing the quality of cheese products.

Keywords: Cheese production; gouda cheese; isolated milk protein powder; yield enhancement

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Paper ID: NSALS '25-190 (Poster)

Prevalence and quantification of Coliform bacteria in street foods from Colombo district: A comparative study of Galle Face, Aluthkade, and Kimbulawala

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This work reveals that the intake of street foods containing Coliform bacteria is a major health risk, thus the need for extensive microbial analysis. This study aimed to evaluate the prevalence and quantification of Coliform bacteria in street food samples from three locations in Colombo district: Galle Face, Aluthkade and Kimbulawala. A 5 g test portion of each sample was initially mixed with 45 mL of peptone water to give a 10^{-1} dilution, and then serial decimal dilutions. Each of the samples was cultured on MacConkey agar media and then incubated for 18-24 h at 37°C. Colonies of a purplish-red or pinkish-red pigmentation with a size of at least 0.5 mm in diameter were interpreted as common coliforms. Our results indicated a widespread presence of Coliform bacteria: 63% or 13 of 20 in Galle Face, 57% or 16 of 28 in Aluthkade, and 33.3% or 3 of 9 in Kimbulawala. Specifically, 20% of samples of fish sold in Galle Face, 42.9% of the samples from Aluthkade, and 11% of samples from Kimbulawala exceeded the safety limit of bacterial load of more than 100 CFU/g. Pursuant to these observations, then there is the need for pro-Acute hygiene measures, and constant supervision of the street foods' vendors. Therefore, the study concludes that even though there is a high incidence of Coliform contamination, various points are more vulnerable to coliform risks and thus require interventions to safeguard citizens' health. Future research might be associated with determination of specific contamination factors, such as water quality or handling that contributes to the presence of Coliform. In conclusion, this study has learnt that monitoring must go on and strict measures have to be upheld to minimize food borne illness associated with foods sold on street.

Keywords: Coliform bacteria; health risk; hygiene measures; microbiological assessment; street food safety

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Paper ID: NSALS '25-199 (Poster)

Development of coconut-based sweetened condensed milk

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The coconut tree (*Cocos nucifera* L.) is often referred to as the "tree of life" by coconut-growing communities due to its significant contribution to foreign exchange trading and are an important part of rural livelihoods and cuisine in Asian coconut-growing countries such as Indonesia, India, the Philippines, and Sri Lanka. Coconut milk, a key ingredient in these regions, is a nutrient-rich source of medium-chain Triglycerides, Iron, Calcium, and vitamins. It is high in saturated fat, primarily Lauric acid, which is also found in human breast milk, and serves as an easily digestible energy source. As a plant-based alternative, coconut milk is particularly suitable for individuals with Lactose-intolerance, a condition affecting approximately 90% of the population in Asia, South America, and Africa. As a result, individuals with Lactose-intolerance are unable to properly digest and absorb the Lactose present in dairy milk, often leading to symptoms such as diarrhea and vomiting. While research on coconut-based milk substitutes has expanded, limited attention has been given to developing alternatives to dairy-based condensed milk. Sweetened condensed coconut milk represents a novel concept with minimal commercial availability, offering a promising solution for Lactose-intolerant consumers and those seeking dairy-free options. Therefore, this study aimed to develop sweetened condensed coconut milk by optimizing sugar and Carboxymethyl Cellulose (CMC) levels. The microbial quality and physicochemical properties of the product were assessed weekly over a one-month period. Organoleptic evaluation by a sensory panel identified the sample with lower sugar and CMC levels as the most favorable. The selected formulation contained 8.51±0.01% fat, 18.34±0.02% moisture, 2.81±0.01% protein, 0.51±0.01% ash, 0.00±0.00% fiber, and 69.83±0.01% carbohydrates. The results of this study indicate how sugar and CMC levels affect the quality parameters, sensory properties, and microbial stability of the product.

Keywords: Carboxymethyl Cellulose; coconut condensed milk; physicochemical properties; sensory acceptability; sugar level

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